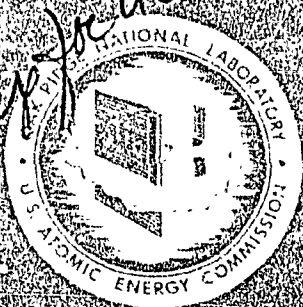


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Annotated Bibliography of
HYDROGEN CONSIDERATIONS
in
LIGHT-WATER POWER REACTORS

G. W. Keilholtz

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HYDROGEN CONSIDERATIONS IN LIGHT-WATER POWER REACTORS

G. W. Keilholtz
Energy Division

FEBRUARY 1976

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FOREWORD

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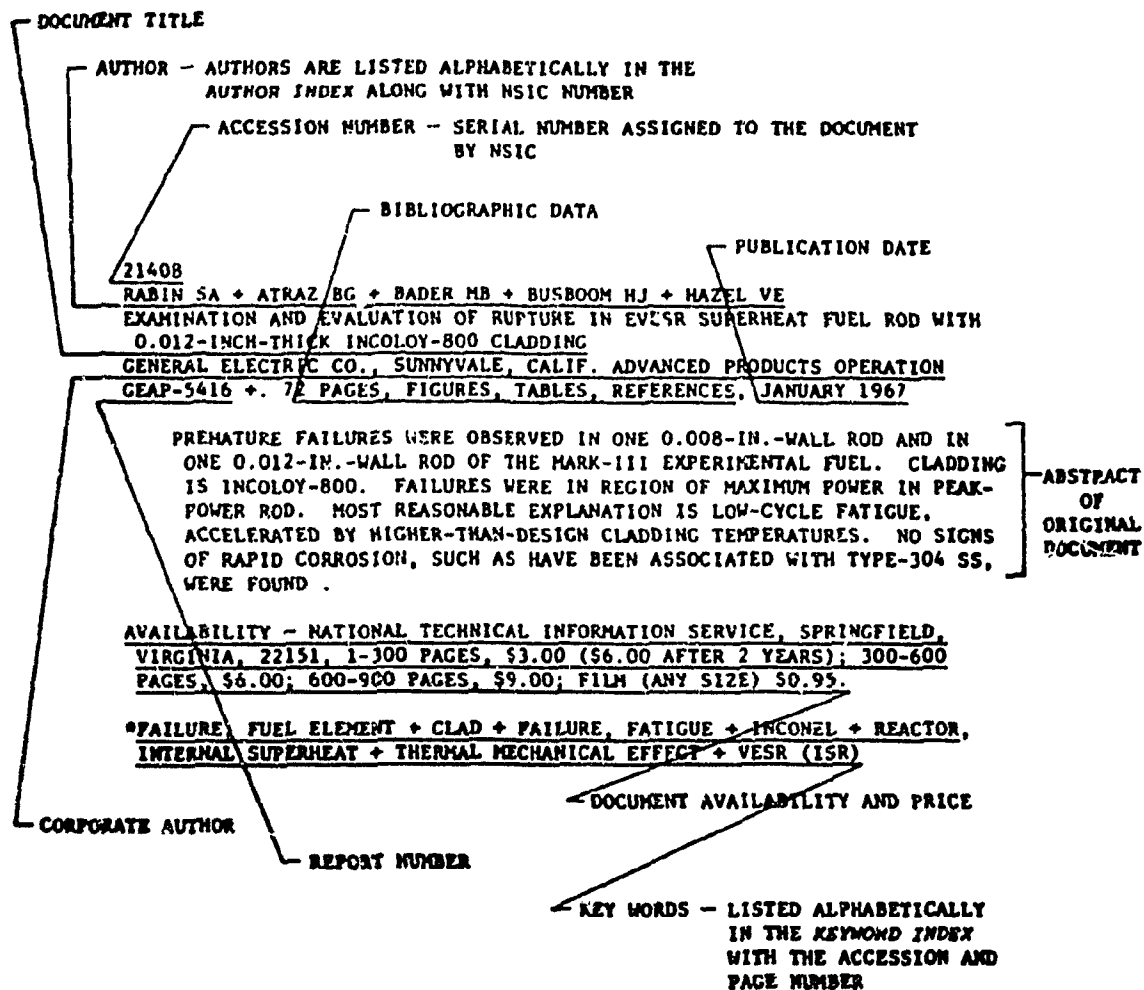
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PARTS AND METHOD OF INDEXING ABSTRACTS



ABSTRACT

This report is a critical review of the literature now available on hydrogen considerations in light-water power reactors (LWRs) and includes a bibliography of that literature. The subject matter includes mechanisms for the generation of hydrogen-oxygen mixtures, a description of the fundamental properties of such mixtures, and their spontaneous ignition in both static and dynamic systems. The limits for hydrogen flammability and flame propagation are examined in terms of the effects of pressure, temperature, and additives; the emphasis is on the effects of steam and water vapor. The containment systems for pressurized-water reactors (PWRs) and boiling-water reactors (BWRs) are compared, and methods to control hydrogen and oxygen under the conditions of both normal operation and postulated accidents are reviewed. It is concluded that hydrogen can be controlled so that serious complications from the production of hydrogen will not occur. The bibliography contains abstracts from the computerized files of the Nuclear Safety Information Center. Key-word, author, and permuted-title indexes are provided. The bibliography includes responses to questions asked by the U.S. Nuclear Regulatory Commission (NRC) which relate to hydrogen, as well as information on normal operations and postulated accidents including generation of hydrogen from core sprays. Other topics included in the ten sections of the bibliography are metal-water reactions, containment atmosphere, radiolytic gas, and recombiners.

**HYDROGEN CONSIDERATIONS IN LIGHT-WATER
POWER REACTORS**

PART I: REVIEW

INTRODUCTION

Hydrogen is generated in light-water-cooled reactor (LWR) systems during normal operation as well as in the course of certain incidents. In either event hydrogen is a potential hazard, and its behavior in reactors is evaluated in this report so that steps may be taken to prevent the accumulation of any explosive mixtures of hydrogen and oxygen or air. This report will (1) evaluate the primary chemical and radiochemical processes that are capable of producing significant quantities of hydrogen during normal operation of a nuclear reactor or after the occurrence of postulated accidents and (2) review the methods of control and types of engineered safety features that are now available to prevent or to mitigate the consequences of rapid hydrogen-oxygen reactions. In addition to the textual material, a bibliography on all subjects is included as the second part of this report.

During normal operation, hydrogen gas generated by radiolysis occurs in the coolant water along with other dissolved gases. This hydrogen is continuously removed in a stripping column and diluted with air before passing through an off-gas treatment system, or it can be converted to water in a recombiner system.

The principal sources of hydrogen generation after a postulated accident to be considered in this report include:

1. High-temperature metal-water reactions.
2. Radiolytic decomposition of the postaccident emergency cooling solutions deposited in the core region and in the reactor sump.
3. Chemical reactions such as those involving the reaction of paint on the inner containment walls with containment spray solutions.

The first part of this report reviews the mechanisms for the generation of hydrogen-oxygen mixtures and then defines the conditions for deflagration or detonation. Some fundamental properties of these mixtures are described and related to the conditions necessary for spontaneous ignition in static and dynamic systems. Limits for hydrogen flammability under conditions likely to be found in reactor atmospheres are evaluated.

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Various methods for hydrogen control in reactor containment vessels are described. A detailed comparison is made of the containment systems of pressurized-water reactors (PWRs) and boiling-water reactors (BWRs), and conditions related to postulated hydrogen explosions are evaluated.

Hydrogen may react with the oxygen in air either by burning as it is generated or, if concentrations of hydrogen and oxygen reach critical values, by detonating. Generation rates and yields from the three sources mentioned above are used to evaluate the consequences of hydrogen accumulations. The various measures that can be taken to control or, preferably, to eliminate hydrogen from the reactor containment atmospheres are then described in detail. Engineered safety features that mitigate the consequences of an accident potentially involving hydrogen include emergency core cooling sprays, controlled purging or venting of the containment vessel, atmosphere inerting, devices to maintain low oxygen concentrations, and recombiners that prevent the accumulation of appreciable concentrations of hydrogen and oxygen. The application of such safety systems to LWR containment systems is evaluated.

In order to better understand the nature of the hydrogen-oxygen reactions, some of the chemical kinetics studies and research investigations that have generated fundamental information on reaction rates and reaction mechanisms are examined. The conditions and mechanics of detonation and deflagration of hydrogen are considered in detail under both static and dynamic conditions, and the rate of flame propagation as influenced by pressure, temperature and composition of the hydrogen mixtures is examined.

Information concerning hydrogen-oxygen reactions has been generated over a 50-year period both by research laboratories and by industrial production plants. Information associated directly with nuclear reactors is limited, and therefore decisions regarding hydrogen behavior must generally be based on experience from other fields and on extrapolations from small-scale laboratory tests. The behavior of hydrogen in PWRs and BWRs is examined by extrapolation of data based on such laboratory tests.

The second part of this report is the bibliography, which contains abstracts obtained from the computerized files of the Nuclear Safety Information Center; key-word, author, and permuted-title indexes are provided. Responses to questions asked by the U.S. Nuclear Regulatory Commission, arranged chronologically, are listed first in the bibliography. Other sections contain information on accidents, fuel meltdown, and metal-water reactions. The generation of radiolytic gas and its recombination are in separate sections.

MECHANISMS FOR THE GENERATION OF HYDROGEN AND OXYGEN

We shall now examine a selected set of circumstances that could produce hydrogen in appreciable quantities. A postulated reactor loss-of-coolant accident (LOCA) followed by substandard performance of emergency cooling could cause overheating and possibly melting of one or more fuel rods, resulting in sudden immersion of molten fuel and metal into water. First a steam explosion and then a metal-water reaction would occur. We are concerned here primarily with processes that may generate enough hydrogen to exceed the explosive limits with air or oxygen. With such advance information, corrective measures can be taken to ensure the integrity of the containment system.

Chemical contributions to the energy releases from metal-water reactions are listed in Table 1 with the heat of reaction at the melting point of the molten material.¹ Free-energy-of-formation data can be used to estimate the thermodynamic possibility of the proposed reactions. Reactions between UO_2 and water, although possible, are considered not to be significant. Gilby² reports the generation of about 12 ml (STP) of hydrogen per gram of UO_2 when UO_2 is dropped into water at temperatures in the range 25 to 260°C. White³ reports the oxidation of solid UO_2 (at 1100 to 1500°C) to UO_{2+x} , where x is about 0.2 and decreases with temperature. Hence, in nuclear-safety considerations, reactions between molten UO_2 and water may be ignored, and explosions may be treated as purely "physical" explosions such as steam explosions.

Table 1. Metal-water reactions⁴

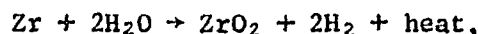
Reaction	Heat of reaction			Free energy of reaction, cal/mole metal
	Cal/mole metal	Cal/g metal	lb TNT/lb metal	
Iron ($T_M = 1535^\circ\text{C}$)				
$\text{Fe}(\ell) + \text{H}_2\text{O}(\text{g}) \longrightarrow \text{FeO}(\text{c}) + \text{H}_2(\text{g})$	+11,180	+200		-1,140
$\text{Fe}(\ell) + 1/2\text{O}_2(\text{g}) \longrightarrow \text{FeO}(\text{c})$	-58,700	-1,050	5.88	-36,250
$2\text{Fe}(\ell) + 3\text{H}_2\text{O}(\ell) \longrightarrow \text{Fe}_2\text{O}_3(\ell) + 3\text{H}_2(\text{g})$	+5,270	+94.2		+8,665 ^a
$2\text{Fe}(\ell) + 3/2\text{O}_2(\text{g}) \longrightarrow \text{Fe}_2\text{O}_3(\ell)$	-99,550	-1,780	9.97	-44,000
$3\text{Fe}(\ell) + 4\text{H}_2\text{O}(\ell) \longrightarrow \text{Fe}_3\text{O}_4(\text{c}) + 4\text{H}_2(\text{g})$	+2,440	+43.6		+2,647 ^a
$3\text{Fe}(\ell) + 2\text{O}_2(\text{g}) \longrightarrow \text{Fe}_3\text{O}_4(\text{c})$	-90,733	-1,623	9.09	-44,136
Zirconium ($T_M = 1852^\circ\text{C}$)				
$\text{Zr}(\ell) + 2\text{H}_2\text{O}(\ell) \longrightarrow \text{ZrO}_2(\text{c}) + 2\text{H}_2(\text{g})$	-122,200	-1,340	7.50	
$\text{Zr}(\ell) + 2\text{H}_2\text{O}(\text{g}) \longrightarrow \text{ZrO}_2(\text{c}) + 2\text{H}_2(\text{g})$	-137,180	-1,504	8.42	-107,830
$\text{Zr}(\ell) + \text{O}_2(\text{g}) \longrightarrow \text{ZrO}_2(\text{c})$	-257,000	-2,817	15.78	-172,450
UO ₂ ($T_M = 2840^\circ\text{C}$)				
$\text{UO}_2 + x\text{H}_2\text{O} \longrightarrow \text{UO}_{2+x} + x\text{H}_2$	None considered significant; Gilby ² reports the generation of 12 ml (STP) of hydrogen per g of UO ₂ .			

^aWater was considered a gas.

Fractional dissociation values for steam as a function of temperature up to 2000°K are reported by Morrison.⁴ Less than 1% of the vapor is dissociated for temperatures up to 2000°K; the need for temperatures above 2000°K to cause significant water-vapor dissociation eliminates this reaction as an important source of hydrogen. The production of hydrogen by thermal decomposition of water is considered to be insignificant.

Metal-Water Reactions

The main sources of metal for the metal-water reactions are zirconium and steel in the core. Hydrogen can be generated within the reactor containment by the high-temperature Zircaloy-water reaction,



and the reaction of molten steel with water,



Zircaloy-water reaction

The zircaloy-water reaction represents the initial source of non-condensable gas (hydrogen) in a reactor-core-meltdown accident; the reaction occurs when steam from water in the pressure vessel contacts overheated Zircaloy cladding. An estimate made by Morrison and the BMI staff⁴ from the core heatup analysis stated that the rate of consumption of Zircaloy is about 10 wt %/1000 sec, provided the necessary amount of water is available.

Steel-water reaction

Because large amounts of steel are used in a reactor, particularly in the pressure vessel, we consider the steel-water reaction as a source of hydrogen. Potentially, the general steel-water reaction could generate massive amounts of hydrogen; however, thermodynamic and experimental data indicate that iron and steel must be nearly molten before they

react appreciably with steam. The stoichiometry is complex, and several oxides might result. The reactions that are possible for this system are enumerated in Table 1. For iron (carbon steel), the reactions with water at 1535°C lead only to FeO — not to Fe₂O₃ or Fe₃O₄. Also, the FeO reaction is endothermic and would not be expected to contribute to the energy released during the explosion. On the basis of free-energy data and its large heat of reaction, the chemical contribution to a "physical" steam explosion appears to be the most significant for zirconium. However, reactor containment vessels are designed to sustain steam explosions.

The rate of hydrogen generation depends on the rates of both the steam boil-off and the metal-water reaction. Contact between large amounts of molten steel and water would cause a steam explosion before the reaction could generate hydrogen. Actually, the combined primary-coolant and emergency-coolant water supplies contain enough water to react with the steel in the pressure vessel. An extensive steel-water reaction would not be expected in a meltdown accident.

Radiolysis of Water

The AEC monograph by Cohen⁵ contains fundamental as well as engineering information concerning the radiation chemistry of water.

Radiolytic decomposition of water containing dissolved salts represents a delayed but potentially significant source of hydrogen and oxygen gas. Although radiolysis of pure water can generate hydrogen in amounts that give partial pressures of only a few tenths of an atmosphere in a closed system, the presence of dissolved salts in the water can cause hydrogen overpressures of many atmospheres. However, the production of such large amounts of hydrogen in a reactor accident would require exposure of large volumes of water to very high doses of radiation.

Generation of hydrogen by radiolytic decomposition of emergency-coolant water during a reactor LOCA was assessed by Carbiener and Ritzman⁶ and by Zittel.⁷ The results indicated that, for BWR systems, hydrogen concentrations >4.1% are possible. A conservative estimate of the time

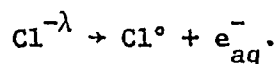
required to reach such a limit was 15 to 100 hr. For PWR systems, the time to reach flammability limits was estimated by Morrison and staff⁴ to be 16 days to 2 months.

The radiation chemistries of water and aqueous solutions are usually described in terms of the spur diffusion model. A summary has been given by Jenks.⁶ Several pairs of radicals, primarily e_{aq}^- , OH, and H_3O^+ (hydronium ion or hydrated hydrogen ion), in pure water are formed in heterogeneous distribution in small, isolated volume elements (spurs) in the initial irradiation process. Species within the spurs interact as all species diffuse into homogeneous distribution. Interaction results in the re-formation of water and in the formation of molecular products. The radiolytic species which appear in homogeneous distribution are: OH, e_{aq}^- , H_2O_2 , H_2 , H, HO_2 , and H_3O^+ . These species may interact further to re-form H_2O , or they may react with other solutes which may be present in the solution.

The extent to which an entity results at a given stage of the overall radiolysis process is reported as a G value, that is, the number of molecules of radicals or the product formed (or destroyed) per 100 eV of energy absorbed. In the modern notation, a subscript is used to designate a primary yield, that is, the yield for the appearance of a species in homogeneous distribution. The primary radiolytic-product yields from pure water are fairly well established and are related to each other by oxidation-reduction balance considerations. The commonly accepted value for G_{H_2} is 0.44 ± 0.01 .

Reactive solutes at high concentrations can react with radicals within the spurs and thus cause changes in the primary yields from those in pure water and, at the same time, cause the formation of additional primary species. For example, a solute such as Cl^- , which presumably could react with OH within a spur, would lower the G_{OH} and $G_{H_2O_2}$ values from those of pure water. This solute would also promote increases in $G_{e_{aq}^-}$ and G_{H_2} , provided new products of the spur reactions (i.e., Cl_2^- and possibly Cl_2) do not remove e_{aq}^- as rapidly as do OH and H_2O_2 in the pure-water system.

Solutes at high concentrations can also be affected by direct action of radiation. For example, the following reaction may occur in solutions that contain chloride ions:

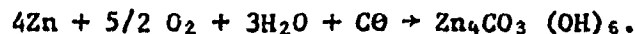
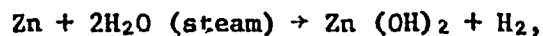
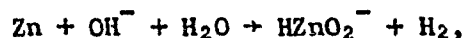


The yields for such a reaction may be very high — five to ten product species per 100 eV of energy absorbed by the parent species (Cl^{-} , in this case).

Protective Coating-Containment Spray Reactions

Protective coating applied to the interior surfaces of reactor containment facilities generally consist of a paint cover over a primer coat. A great deal of the structural steel used in power reactors has been covered with a zinc-based primer coat and then a top coat of paint, either organic or inorganic.

In the case of a design-basis accident (DBA), the coatings may be exposed to extremes of temperature and radiation while exposed to containment spray solutions. Zittel⁹ investigated the reactions between selected primer coats and the hot, borated suppression solutions. He found that all the proposed sprays are active in releasing hydrogen from the zinc-rich primer coat. The probable reactions are:



The data indicate that the slightly acid 3000-ppm boron spray solution is just as active, if not more so, than the two basic spray solutions.

The following conclusions are presented by Zittel:

1. In all cases studied, appreciable amounts of hydrogen are evolved. In ordinary power reactor containment, with a coated surface on the order of 10^5 ft^2 exposed to safety solutions, the hydrogen evolution from the coating-solution reaction may well represent enough

hydrogen to cause an atmospheric concentration of better than 0.5%. This is assuming, of course, that one of the coatings studied was used.

2. The presence of a top coat does little to stop hydrogen generation and in many cases, dependent on the spray solution, will enhance it.

3. The choice of an acid or basic spray solution has relatively little effect on hydrogen generation under DBA conditions. This statement, of course, can be made only in regard to the solutions studied.

4. The visual inspection of a paint coat has little value in predicting hydrogen evolution. Of the coupons studied, it was observed that some of those giving the highest hydrogen yields showed no surface defects. It is conjectural as to whether a pure diffusion process is involved in getting the active agent to the zinc and the hydrogen out, and no effort was made to clarify this point.

5. The amount of hydrogen generated from the reaction with the primer coat may be compared with that generated by the metal-water reaction and with radiolytic hydrogen generated in a DBA in a reactor having the same approximate dimensions (10^5 ft² coated surface) as those studied in this report. (It should be noted that an exact comparison can be made in only a limited sense, because both the metal-water reaction and the protective coating-solution reaction produce hydrogen to essentially a maximum value within a matter of days, while the radiolytic hydrogen may build up over a matter of months.) From the work of La Belle,¹⁰ it can be estimated that 48 hr after a DBA the hydrogen from radiolysis may result in an atmospheric hydrogen concentration of ~0.2% and that from the metal-water reaction in a concentration of ~1.5%. Comparing these figures with the 0.5% figure from protective coating reactions given earlier in this report, it is evident that the hydrogen generated in a DBA from the reaction between safety solutions and paint coatings over zinc-rich primer coats is not an insignificant amount and must be considered in reactor accident analysis.

DEFLAGRATIONS, DETONATIONS, AND SOME FUNDAMENTAL PROPERTIES OF HYDROGEN-OXYGEN MIXTURES

A flammable mixture of gases, such as hydrogen-air or a hydrogen-oxygen mixture, may be diluted with one of its constituents or with other gases until it is no longer flammable. The marginal composition at which such a mixture will become flammable or nonflammable by a slight change in composition is defined as the "limit of flammability."

A combustible gas mixture generally has two limits of flammability, upper and lower, and only when the composition is between these limits will the mixture burn. In the case of hydrogen-air mixtures, the lower and upper limits generally are given in the literature as 4.1 and 74 vol % hydrogen, respectively.¹¹ These limits vary greatly depending on the mixture's temperature and pressure. Also, a simple quotation of the limits of flammability is misleading, because it does not indicate whether the kind of combustion that occurs is deflagration or detonation. Obviously, potentially explosive mixtures should be handled in such a way that the lower limit of flammability is raised and the upper limit lowered, and then the mixture, if ignited, will not detonate.

The lower flammability limits for hydrogen in air are 4.1, 6, and 9 vol % for upward, horizontal, and downward propagation, respectively.¹¹ Although the upper limits for horizontal and downward propagation are somewhat smaller than that for upward propagation, they are not well established. Accordingly, for safety, all the upper limits are taken as 74 vol %. In all cases, the above limits apply to gases maintained at atmospheric pressure and saturated with water vapor at room temperature.

Detonation and Deflagration

"Hydrogen explosion" is an inexact term. The terms detonation and deflagration are more exact and are described briefly below.

Detonation

Knall gas, a mixture consisting of two volumes of hydrogen and one volume of oxygen, will detonate. Detonation is a rapid and violent process characterized by a chemically supported shock wave. The velocity of propagation of the wave is the same as the velocity of sound in the burned gas, which is considerably higher than the velocity of sound in the unburned mixture. Therefore, a detonation wave is said to be supersonic with respect to the unburned mixture. The destructiveness of a detonation is due primarily to the velocity and the very sharp nature of the shock front.

Composition limits for detonation cannot be expressed precisely since the development of a detonation wave depends greatly on the geometry of the enclosure and the point and method of ignition. Shapiro and Moffette,¹² in their evaluation of the safety aspects for LWRs, assume detonation limits to be between 19 and 45 vol % hydrogen.

Detonation limits for Knall gas-steam mixtures vary with steam pressure (density).¹³⁻¹⁷ Detonations in gaseous mixtures normally do not propagate spherically from a point source since energy attrition is too great. The detonation limits for H₂ in air is 20 to 65% at ambient temperature and pressure.^{18,19} The latter reference by Zabetakis has a good section on blast effects.

Deflagration

Deflagration, or simple burning, can produce all the effects usually associated with the inexact term "explosion." The mechanism of a hydrogen-oxygen deflagration is a very complicated, branching chain reaction in which the principal chain carriers are the free radicals H, OH, and O. Ignition occurs in a hydrogen-oxygen mixture when the rate of production of chain carriers exceeds the rate of their destruction.

The rate of flame propagation throughout the remaining unburned gas is called the laminar flame velocity. Flame velocities depend to some extent on whether the direction of propagation is up or down. The dependence on direction results from the tendency of the burned gas to rise. Convective motion makes upward propagation easier and more rapid. Thus,

as stated above, the lower flammability limits of hydrogen concentration in air saturated with water vapor are 4.1% for upward propagation, 6% for horizontal, and 9% for downward propagation. The maximum temperature and pressure reached by the burned gas are determined largely by the original composition and pressure of the mixture.^{20, 21}

Effects of Ignition Energy, Composition, and Temperature on Flame Propagation

Most of the experimental data reported here were obtained by increasing the hydrogen concentration under the specified conditions until ignition occurred. Thus, ignition signaled the end of each laboratory experiment resulting in a data point. Also, most of the investigators did not attempt to determine the difference between deflagration and detonation on an experimental basis. The following discussion does not apply to the 19-45 vol % detonation range.

Effects of ignition energy

Ignition of hydrogen-air mixtures, particularly when the mixtures are well within the flammability limits, occurs with an exceedingly small input of energy. A spark that has such low energy as to be invisible in a dark room will ignite such a mixture. Common sources of ignition are sparks from electrical equipment and from the discharge of accumulated small static electrical charges. Even though the concentration of hydrogen in a mixture is below the limit of flammability, some combustion can be made to occur with an energy of sufficient size and intensity. However, flames so produced are not self-propagating and are extinguished when the source of ignition is removed.

Composition effects

In general, hydrogen-air mixtures burn with a very pale flame; the flames of deflagration-limit mixtures may be invisible. When mixtures that have compositions close to flammability limits are ignited, a ring of flame forms which later breaks up into balls of flame that travel to

the top of the test vessel burning only a fraction of the hydrogen. However, as the proportion of hydrogen in a hydrogen-air mixture is increased, an increasing amount of the hydrogen present will be burned. For example, only about 50% of the hydrogen in a 5.6 vol % hydrogen mixture will burn, and combustion will not be 100% complete until the percentage of hydrogen is increased to 10%. Accordingly, as the hydrogen in hydrogen-air mixtures is increased from 4.1 to 10%, the energy released by the combustion increases out of proportion to the increase in hydrogen.¹²

A hydrogen-air mixture that contains 6 vol % hydrogen, if ignited near the ceiling, would propagate only upward and horizontally until the flame reached the walls and ceilings where the flame would be extinguished. The same mixture, if ignited near the floor, would propagate throughout the whole room, reach a mean temperature of 350°C, and build up a pressure of about 1 atm. As the hydrogen concentration increases beyond 9 vol %, not only will the flame propagate in all directions, but the rate of propagation will increase rapidly.

Ignition temperature and flammability limits

Spontaneous ignition can be induced by increasing the temperature alone, without the addition of energy from a continuous spark source. Even though the spontaneous ignition temperature of a hydrogen-air mixture is 585°C, a 4.1 vol % hydrogen-air mixture has a flame temperature considerably below 585°C.¹¹ The fact that such a mixture will support a self-propagating flame is attributed to the ability of hydrogen to diffuse into the flame more rapidly than do other gases and thus to maintain the necessary concentration for flame propagation. Because the propagation of a flame depends on the transfer of energy from the burned to the unburned gas, and because, in a limit mixture, the amount of energy available for transfer is only enough to propagate the flame, anything that reduces the available energy will affect the flammability limits. Thus, if a vessel has a high surface-to-volume ratio, the cooling effect of the walls of the vessel is significant and the flammability limits are narrowed.

SPONTANEOUS IGNITION IN STATIC AND DYNAMIC SYSTEMS

The problems of the self-ignition of hydrogen issuing from a pipe fracture and of the spontaneous ignition of a static mixture collected in restricted parts of the reactor containment are closely related.

Progress has been made in developing the theory of spontaneous ignition in small hydrogen-oxygen systems in terms of a complex series of reactions of radicals. Chain-breaking reactions in which active radicals are destroyed are an important part of the mechanism. Thus, results in a laboratory experiment are affected significantly by the size of the reaction vessel and also by the nature of its walls. Even though the theory can predict the effect of diluents such as nitrogen, the more complex behavior that occurs when water is present, except in very low concentrations, cannot be predicted. Available information¹⁶ is of two types: (1) a theory, supported by experimental measurements, which allows the prediction of the effects of vessel size and other variables for systems other than the hydrogen-air-steam system of interest; and (2) measurements of spontaneous ignition temperature for the hydrogen-air system in laboratory reaction-vessel geometries that are not necessarily typical of nuclear reactors.

Static Systems

The importance of thermal effects is confirmed by the fact that the spontaneous ignition temperature in static systems is virtually independent of pressure from 1 to 8 atm. In this range the radical-reaction theory of spontaneous ignition predicts a decrease in spontaneous ignition temperature with increasing pressure.

Laboratory experimental data on spontaneous ignition in a static hydrogen-air-steam mixture are not directly applicable to large pressure vessels. The spontaneous ignition temperature 520°C (970°F) possibly might be considerably changed by the conditions to be found in a reactor vessel. Experimental results suggest that a composition effect caused by changing to a nonstoichiometric hydrogen-air mixture or by adding a large proportion of steam would be to increase the spontaneous ignition

temperature above 520°C.^{13,14} The result of these changes is that a static hydrogen-air-steam mixture at the equilibrium temperatures reached in reactor containments is unlikely to ignite spontaneously. The only exception occurs when an effective catalyst is present.

Dynamic Systems

The spontaneous ignition temperatures of dynamic systems have been measured by passing a hydrogen-water vapor mixture through a heated tube and then into air at atmospheric pressure.^{15,16,17} Ignition did not occur unless the temperature of the heated gas exceeded 670°C. Increasing the amounts of water vapor caused the ignition temperature to rise to 800°C.

Prior to ignition, there was an incubation period, the duration of which depended on gas temperature and flow rate. It is interpreted that this incubation period in dynamic systems is required in order for flammable mixtures to form at the corresponding static ignition temperature. This explanation of the incubation period is confirmed by the observation that, if a solid object is placed in the path of the issuing gas so as to cause dispersion of the hydrogen, the ignition temperature decreases to the value for static spontaneous ignition. Thus, the observations reported above seem to be a function of mixing efficiencies.

LIMITS FOR HYDROGEN FLAMMABILITY AND FLAME PROPAGATION

An excellent literature review on the combustion properties of hydrogen-air mixtures has been prepared by Drell and Belles.²⁰ Data are presented on flame temperature, burning velocity, quenching distance, flammability composition limits, minimum spark ignition energy, flashback and blowoff limits, detonation properties, explosion limits, spontaneous ignition, and the chemistry of hydrogen oxidation. The survey covers basic material of importance for flight-propulsion application; however, much of the information furnishes a basis for interpretation of the ultimate behavior of hydrogen in reactor containment systems. Calculated adiabatic flame temperatures are presented for a pressure range from 0.01 to 100 atm and an initial-temperature range from 0 to 1400°K.

A more general publication by Coward and Jones²¹ that still has applicability to present problems was published in 1952.

Effects of Pressure and Temperature

Normal variations of atmospheric pressure do not appreciably affect the limits of flammability. However, larger variations in pressure (10 to 500 atm) can cause effects that are different for each mixture. Generalizations cannot be made. The range of flammability for downward propagation *is narrowed at both limits by moderate increases of pressure* above atmospheric. However, above 200 atm, the upper limit for hydrogen increases.¹¹

To propagate a flame, the layer of unburned gas next to the burning layer must be brought up to ignition temperature. If the unburned gas is already above room temperature, less heat is needed to bring the adjacent layer up to ignition temperature. The range of flammability *is widened at both limits by increasing the temperature* of the mixture.¹¹ For hydrogen-air mixtures, a straight-line relation exists between the limit of flammability and the initial temperatures of the mixture. At 200°C, the lower limit for downward propagation of hydrogen-air mixtures decreases from 9.0 to 7.9%, whereas the upper limit increases from 74 to 81.5%.¹¹

Hydrogen-Oxygen-Additive Systems

The effects of additives on the hydrogen combustion limits may be due to chemical interactions of the additive in the combustion mechanism or to thermodynamic properties of the additive, such as heat capacity and diffusion coefficient.¹³ The main factor in determining whether a mixture near the combustion limit will propagate a flame appears to be the maintenance of a minimum temperature in the flame boundary region.

Chemically inert additives

The effects of inert gases on the flammability limits of hydrogen can be seen from measurements of these limits in mixtures in which the

nitrogen in air is replaced by the inert gas considered. These are shown in Table 2.¹⁴⁻¹⁶

Table 2. Hydrogen flammability limits (%) in hydrogen-oxygen-inert gas mixtures

Mixture	Upward propagation		Downward propagation
	Lower limit	Upper limit	Lower limit
He + 21% O ₂	7.72	75.7	8.7
CO ₂ + 21% O ₂	5.31	69.8	13.1
N ₂ + 21% O ₂ (air)	4.19	74.6	9.0
Ar + 21% O ₂	3.17	76.4	7.0

Compared to nitrogen, carbon dioxide inhibits flame propagation because of its higher heat capacity, and argon promotes flame propagation by virtue of its lower heat capacity and lower diffusion coefficient. Helium has a low heat capacity but diffuses rapidly; thus, its effects on upward and downward propagation are different.

Effects of Steam and Water Vapor

Flammability limits in the presence of steam at 100 psig (7.8 atm) total pressure and a temperature of 146°C (300°F) have been determined to be very similar to those obtained at room temperature for hydrogen-air mixtures in the presence of water.²⁰ Limits have been obtained in autoclave experiments with various hydrogen-oxygen mixtures in the presence of saturated steam at temperatures as high as 260°C (500°F).¹⁷ Shapiro and Moffette¹² have adapted a large amount of data to the interpretation of the hydrogen-oxygen-steam relationships and their application to a PWR loss-of-coolant accident. Zabetakis and others have reviewed the hydrogen-oxygen-water vapor systems.¹⁴

HYDROGEN CONTROL IN REACTOR CONTAINMENT VESSELS

In reactor accident analyses the assumption is made that hydrogen burns as it enters the containment vessel from a break in the primary-coolant pipe. The implications are that the proper atmospheric composition for flammability is maintained and that hydrogen (from metal-water reaction inside the pressure vessel) enters at a temperature above the spontaneous ignition temperature.

If hydrogen burns during entry into the containment vessel, the effect of the additional heat load on containment integrity must be assessed.

If hydrogen does not burn during entry but accumulates in the vessel, a dangerous condition would be created that could lead to an explosion. The resulting shock wave from a detonation might rupture the containment vessel and even result in further core damage. The possibility of a detonation is a real concern when the rapid evolution of large amounts of hydrogen is predicted.

The presence of air in the containment vessel, together with temperatures $>500^{\circ}\text{C}$ that would accompany a meltdown accident, increases the probability of hydrogen undergoing an exothermic chemical reaction with oxygen. The chance that such a reaction will occur depends on several factors. Shapiro and Moffette¹² present data on the flammability, spontaneous ignition temperatures, effects of other gaseous components on the reactions, and conditions for propagation of flames in hydrogen-steam-air mixtures. The flammability limits extend from ~ 4.1 –74 vol % hydrogen, but flammability is affected by the presence of steam and by ambient temperature and ambient pressure.

Measures that prevent the accumulation of hydrogen levels above the 4.1 vol % flammability limit will now be presented. This is well below the 19 vol % detonation limit.¹²

Controlled Purging or Venting

Planned venting or purging of the containment vessel atmosphere has been proposed to avoid excessive gas-pressure buildup. Since fission

products would be present, the off-gas would have to be directed through high efficiency fission-product trapping or cleanup systems. Release of the fission-product halogens might be prevented by passing the vented gas through traps, for example, large chemical scrubbers or charcoal filter beds. Control of the noble-gas radioactivity under venting conditions would be very difficult.

Controlled purging can be used, because hundreds of hours lapse before hydrogen control becomes necessary.²² This long time period before a purge is needed permits the removal, by chemical spray and by radioactive decay, of essentially all airborne radioiodine.^{23,24} In addition, it allows time for removal of particulate matter and for the decay of the noble-gas radionuclides in the atmosphere within the reactor building. The low rates of hydrogen generation also permit purging to be restricted to periods of favorable weather.

Containment-Atmosphere Inerting

A method of hydrogen control used in large BWR containments is known as "inerting" and consists essentially in replacing part of the oxygen in an air atmosphere with nitrogen. The nitrogen is chemically inert toward hydrogen under accident conditions. Nitrogen concentrations of 94 vol % or greater have been specified for use in some BWR plants, in which case ambient concentrations of oxygen may range from 0 to 5 vol % due to the radiolytic decomposition of water producing oxygen as well as hydrogen.

Nitrogen is a gas suitable for inerting, and the technique of inerting with nitrogen is being used in some BWR systems. However, additional measures to cope with the potentially high partial pressures of hydrogen are required. For large PWR systems, containment inerting may not be feasible because of the large volumes of nitrogen that would be required.

The addition of increasing amounts of chemically inert substances to hydrogen-air mixtures causes the upper and lower limits of flammability to approach each other and ultimately to meet. In laboratory experiments effective diluents have been carbon dioxide, nitrogen, helium, and argon, in decreasing order. Water vapor has been shown, as mentioned previously,

to be even more potent than CO_2 in its effectiveness in extinguishing burning hydrogen-air mixtures.¹²

Some objections exist to the use of nitrogen inerting, particularly in regard to the protective clothing and breathing equipment for persons who must make the routine safety inspections inside the inert atmosphere. In addition, the process of removing and replacing the nitrogen during maintenance is both inconvenient and expensive. An example of the problems involved is the case of the Vermont Yankee power reactor.²⁵ Because of serious operational safety problems associated with an inert atmosphere, Vermont Yankee Nuclear Power Corporation requested permission to operate without an inert atmosphere in the containment. A subsequent Atomic Safety and Licensing Appeal Board (ASLAB) ruling now permits operation of the Vermont Yankee reactor without containment inerting.²⁶

Chemical Recombination

Chemical recombination of the hydrogen is a way to prevent hydrogen explosions and at the same time to control increase of hydrogen pressure. However, in each reactor, particularly in BWRs, a supplementary oxygen supply would be needed to consume all the hydrogen that might be produced. Also, heat generated by the recombination reaction would require containment cooling, and forced circulation of the atmosphere might be necessary to prevent the accumulation of explosive gas mixtures in pockets. Therefore, this approach must be classified as an active safety system that would require a source of power for operation.

Flame recombiners

External flame recombiners have been used to recombine H_2 and O_2 in the off-gas from the Homogeneous Reactor Experiment.²⁷ In this system the off-gas stream was diluted with steam to produce a nonexplosive mixture, and the steam was then condensed ahead of the recombiner. The addition of a small quantity of steam to the explosive gas mixture just ahead of the recombiner was necessary to prevent flashbacks and excessive

injector heating. The flame was maintained at a manholed injector and was continuously ignited by a magneto-generated spark.

The principal hazards associated with the operation of a flame recombiner are the possibilities of extinguishment when very little gas is being generated and of flashbacks through the injector holes.²⁸ The most serious accident situation anticipated is a flashback all the way through to the reactor core, which could result in a high-pressure explosion within the reactor containment vessel.

A flame recombiner will be used to dispose of radiolytic hydrogen in Indian Point 2 and 3 reactor units.^{29,30}

Catalytic recombiners

Recombiners used in the Homogeneous Reactor Test (HRT) employed catalytic units.³¹⁻³⁴ The primary recombiner in the HRT was a packed bed that consisted of stainless steel ribbon plated with platinum. The catalyst bed was reactivated periodically by superheated steam at 500°C (932°F) and 17 atm (250 psi). The catalyst must be free from liquid water during operation. The absence of liquid water can be ensured with an external heater if the steam feed is not sufficiently dry. The gas mixture passing through a catalytic recombiner must be diluted below the flammability limit; otherwise, ignition and flashback will occur. Also, steady removal of the heat produced by the recombination reaction from the catalytic recombiners must be ensured.

New improved catalysts that are nickel and nickel-chromium oxide combinations supported on aluminum oxide bases are reported in the literature.³⁵ Performance was also improved by replacing platinized aluminum-pellet catalysts with platinized honeycomb ceramic disks.³⁶

Michels and Horton have described the newest off-gas system from the Atomic Power Equipment Department of the General Electric Company, which features catalytic recombiners along with desiccant-type air dryers and dynamic charcoal adsorbers that operate in the range of 0 to -40°F.³⁷ General Electric's catalytic-recombining charcoal-bed system has been added to the off-gas systems of Dresden 2 and 3 and of Quad Cities 1 and 2.³⁸

Rogers and Lechelt (1973) summarized the factors that affect the design, performance, and cost of catalytic recombiners for boiling-water reactors.³⁹ They include: choice of diluent; condensing or noncondensing reaction; catalyst (pelletized, honeycomb, or wire mesh); preheat temperatures; effluent specification; air in-leakage specifications; pressure-drop specifications; vessel materials; and number of recombiner stages.

Electric recombiners

Westinghouse Electric Corporation (1973) developed a hydrogen recombiner design for use in PWR containments. The recombiner uses electric-resistance heaters to heat a continuous flow of containment atmosphere to above the hydrogen-oxygen reaction temperature.⁴⁰

Virginia Electric and Power Company plans to use an electric hydrogen recombiner in Surry 1 and 2.⁴¹ Two full-capacity recombiners will be installed inside the containment, and controls and power will be from the outside. The McGuire Plant near Charlotte, North Carolina, will also use the new Westinghouse heater-type recombiner.⁴²

COMPARISON OF PWR AND BWR REACTOR-CONTAINMENT SYSTEMS IN RELATION TO POSTULATED HYDROGEN EXPLOSIONS

Ordinary water, known as "light water" to distinguish it from deuterium oxide, or "heavy water," is used as a coolant in so-called light-water reactors and acts both as a moderator and heat transfer fluid. Light-water reactors are now widely used for nuclear power around the world. Two predominant water-type reactor systems, pressurized-water reactors and boiling-water reactors, will be treated separately in relation to their postulated hydrogen problems, because their individual containment designs are very different.

The structure and materials for typical PWR and BWR installations are described in detail in the following sections.

Pressurized-Water Reactor (PWR)

Uranium dioxide fuel, enriched to between 2 and 4 wt % ^{235}U , is contained as sintered pellets in plain tubular cladding. The cladding in early PWRs was stainless steel, but a zirconium alloy is now used. To achieve a high water-coolant outlet temperature without boiling, the system must be very highly pressurized. A massive steel pressure vessel with a removable lid is used to contain the relatively compact reactor core.

The most serious hypothetical accident that could be envisaged with a PWR is a major rupture of a primary loop, although the conventional pressure-containment building is designed to withstand the resulting pressure surge. In some designs an emergency condenser packed with ice is used to reduce the required size of the pressure-containment building. Loss of coolant from the reactor system and the resultant depressurization could result in overheating of the core. Emergency core-cooling systems are incorporated in the reactor design to deal with such an event.

PWR containment system

The PWR system chosen for illustration here is similar to Reactor No. 2 of the Indian Point Nuclear Power Plant, for which the gross thermal power is about 3000 MW(t) and the net electrical efficiency about 32%.⁴ Figure 1 shows details of the reactor-containment configuration, and Table 3 lists details on each of the containment components shown in Fig. 1. The containment structure is a 212-ft-high, steel-lined reinforced-concrete cylinder with a flat bottom; the structure is capped by a 135-ft-ID hemispherical dome. The total volume of the containment vessel is $2.50 \times 10^6 \text{ ft}^3$ and is divided among the major sections of the containment as follows:

<u>Containment section</u>	<u>Volume (10^6 ft^3)</u>
Upper	2.04
Lower	
Inside ring wall	0.27
Outside ring wall	0.19

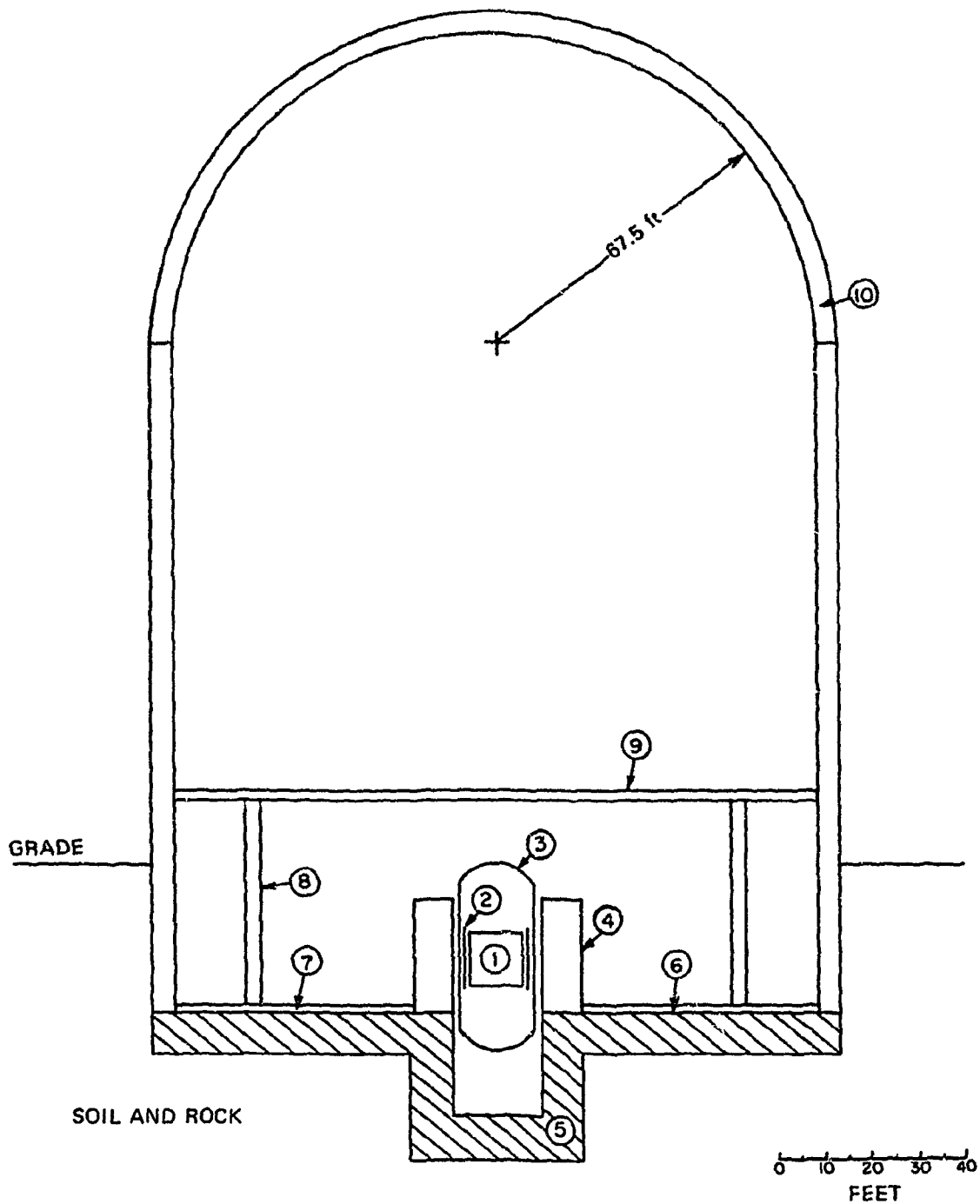


Fig. 1. Schematic of idealized PWR containment system (numbered items are identified in Table 3).

Table 3. Components in idealized PWR containment system

Item	Component	Material	Weight (lb)	Volume (ft ³)	Remarks
1	Core				Core 133.7 in. diam by 12 ft high
	Fuel	UO ₂	215,000	338	
	Cladding	Zirconium	44,000	108	
	Grid plate	Steel	13,250	27	
	Control rods	Stainless steel	1,100	2.2	
	Miscellaneous structure	Stainless steel	292,000	582	
2	Thermal shield	Stainless steel	65,600	131	Hollow cylinder 158-1/2 in. ID, 164 in. OD by 13 ft high
3	Pressure vessel	Steel	900,000	1,360	173 in. ID by 8 in. thick by 43.33 ft high external
4	Biological shield	Reinforced concrete		18,200	Hollow cylinder 19.2 ft ID by 36 ft OD by 25 ft high
5	Mat	Reinforced concrete		172,000	9 ft thick
6	Steel liner on mat	Steel		278	1/4 in. thick
7	Lower floor	Reinforced concrete		26,700	2 ft thick
8	Ring wall	Reinforced concrete		20,900	Hollow cylinder 114 ft ID by 3 ft thick by 44 ft high
9	Upper floor	Reinforced concrete		28,600	Disk 135 ft diam by 2 ft thick
	Steam generators (4)	Steel	610,000 (ea)		
	Pressurizer	Steel	250,000		
	Pumps (4)	Steel	200,000 (ea)		100 in. diam by 28 ft, 5 in. high
	Crane	Steel	400,000		
10	Dome	Reinforced concrete		210,000	
11	Dome liner	Steel		896	0.375 in. thick
12	Side walls above grade	Reinforced concrete		249,000	
13	Side-wall liner above grade	Steel		1,500	0.375 in. thick
14	Side walls below grade	Reinforced concrete		78,000	
15	Side-wall liner below grade	Steel		425	0.375 in. thick

The values for the two volumes for the lower containment regions were adjusted by 20% to allow for the space occupied by equipment and by structural members. During full-power operation of the reactor, the average temperature of the reactor pressure vessel is 305°C (580°F).

The assumption is made that, following the blowdown period of the hypothetical accident, 4.6×10^4 lb of water is available in the bottom hemispherical head of the pressure vessel to participate in the metal-water reactions that produce hydrogen. A further assumption is made that, initially after blowdown, the atmosphere throughout the containment is at a temperature of 130°C (266°F) and consists of steam at 39 psig and air at 19 psig, for a total pressure of 58 psig. For the purpose of analysis, the above conditions can be assumed to apply at the onset of the metal-water reactions when appreciable hydrogen is introduced into the system.

Boiling-Water Reactor (BWR)

The BWR was initially conceived by considering the implications of boiling in the core region of water-cooled reactors. Controlled boiling was found to be possible in a self-stabilizing condition at about half the system pressure of a PWR. In effect, the reactor acts as a recirculation boiler with steam separators and dryers situated in the top section of the reactor pressure vessel.

The BWR uses enriched uranium dioxide fuel and zirconium alloy cladding with square-lattice fuel-element assemblies similar to those of the PWR. The core of a BWR is not as compact as that of a PWR and, to accommodate the jet pumps and steam-drying arrangements, a larger pressure vessel is necessary. However, this disadvantage is offset by the lower operating pressure, which allows the use of a vessel of thinner walls. A special type of pressure-suppression containment is used to deal with the consequences of a primary-circuit rupture. A pressure-relief system in the steel or concrete containment chamber around the reactor is arranged to vent steam to a reservoir of water which acts as an emergency condenser.

BWR containment system

The reactor systems associated with the Browns Ferry Nuclear Power Station are used to illustrate a typical BWR. Figure 2 and Table 4 summarize details of the reactor system.⁴ The Browns Ferry reactors are each designed to produce 3293 MW(t) of heat with a gross electrical output of 1098 MW(e).

The reactor pressure vessel that contains the core is a vertical cylindrical vessel (inside height, 71 ft 7 5/8 in.; ID, 20 ft 11 in.). The minimum wall thickness of the vessel is 6 1/2 in., which includes a minimum of 1/8 in. of stainless steel cladding on low-alloy steel plate. The pressure vessel is housed in the dry well, which is a light-bulb-shaped pressure vessel with a 67-ft-diam spherical lower part topped with a 39-ft-diam cylindrical neck; the overall height of the vessel is 115 ft.

The drywell is connected to the pressure-suppression, or wet, well by eight evenly spaced 6.75-ft-diam vent pipes. The pressure-suppression chamber is a torus-shaped steel pressure vessel located below and encircling the dry well. The torus has a center-line diameter of about 111 ft and a cross-sectional diameter of 31 ft. The design pressure for the dry well and suppression chamber is 62 psig.

Postulated Conditions for Hydrogen Explosions in PWR or BWR Containment Vessels

If the conditions are not proper to cause hydrogen to burn as it enters the containment vessel, the gas can accumulate within the system. Conceivably, the accumulation could continue until the entire containment atmosphere exceeded the 4-vol % hydrogen flammability limit. To exceed this limit in a large PWR would require all the hydrogen generated from the consumption of nearly all the core Zircaloy by metal-water reaction, whereas, in a BWR, less than 3% completion of the Zircaloy-water reaction would be needed. Under these conditions, the presence of an ignition source (e.g., a spark, a hot metal surface, or atmospheric temperature above the spontaneous ignition temperature) would result in an explosive reaction between hydrogen and oxygen. Although system pressure and the

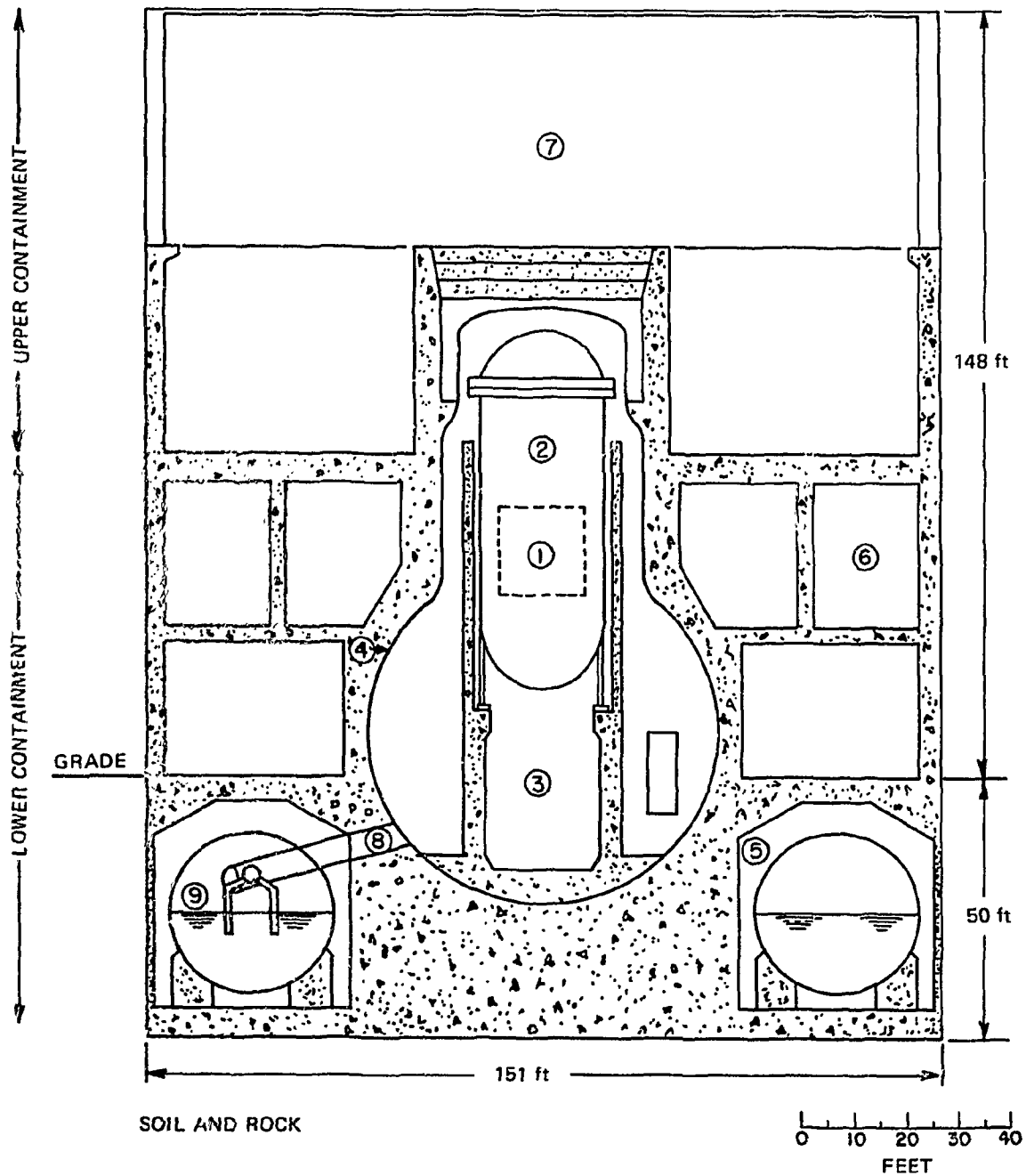


Fig. 2. Schematic of idealized BWR containment system (numbered items are identified in Table 4).

Table 4. Components in idealized BWR containment system

Item	Component	Material	Weight (lb)	Volume (ft ³)	Remarks
1	Inside pressure vessel				
	Core				Equivalent core diam, 187.1 in.
	Pin cladding	Zirconium	7.00×10^4		0.562-in.-OD tube, 0.032 in. thick
	Channel boxes	Zirconium	5.40×10^4		
		Steel	1.44×10^4		
	Fuel	UO ₂ (93% T.D.)	3.72×10^5		0.488-in.-diam pellets
	Core support	Steel	9.00×10^3		
	Dryer assembly	Steel	9.80×10^4		
	Shroud	Steel	3.45×10^5		
	Control-rod system	Steel	1.00×10^4		
2	Pressure vessel				
	Vessel body	Steel	1.23×10^6		Wall thickness about 6-5/16 in. with 7/32-in. stainless steel cladding internally
	Top head	Steel	2.40×10^5		
	Vessel body insulation		2.77×10^5		
	Top head insulation		7.3×10^3		
	Piping	Steel	5.2×10^3		
	Operating water and steam	Water	6.09×10^5		
3	Dry well				
	Outer shell	Steel	9.40×10^5		Wall thickness, 1.15 in.
	Head closure	Steel	1.10×10^5		2.25 in. thick
	Pressure-vessel support	Reinforced concrete	8.45×10^6		
	Pumps (4)	Steel	1.32×10^5		
4	Dry-well insulation	Compressible		8.93×10^3	2-in. thickness above transition zone
5	Lower containment below grade	Reinforced concrete	8.54×10^7		
	Gas volume			4.83×10^5	Suppression chamber cavity without torus
6	Lower containment above grade	Reinforced concrete	1.12×10^7		
	Gas volume			5.92×10^5	
7	Upper containment	Reinforced concrete	1.68×10^7		
	Structural members	Steel	6.75×10^5		Steel frame and panels
	Crane		2.50×10^5		
	Gas volume			1.85×10^6	
8	Vent pipes	Steel	7.60×10^3 ea		Eight evenly spaced 6.75-ft-diam pipes connecting dry well and suppression chamber (wall thickness assumed to be 0.25 in.)
9	Pressure suppression chamber				
	Torus	Steel	5.36×10^5		31 ft diam with 0.385-in. wall
	Vent heater	Steel	5.52×10^4		4 ft 10 in. diam
	Downcomer pipes	Steel	4.17×10^2 ea		24 in. diam by 6-1/2 ft long (96 total)
	Water in torus	Water	8.43×10^6	135,000	

presence of steam would raise the flammability limit, other sources of hydrogen produced by metal-water reactions would tend to cancel such effects. The foregoing comments apply to a containment atmosphere that is continuously well mixed.

Zircaloy reacting with water

Hydrogen-explosion overpressures for each containment vessel were calculated by Morrison and the BMI staff,⁴ using the TNT equivalent model that was applied in their steam-explosion analyses. They assumed stoichiometric reaction of hydrogen with oxygen and an energy release of 1.04×10^5 Btu/lb-mole of hydrogen. The explosions were assumed to originate at the center of each containment vessel. Figure 3 shows the results of these calculations.⁴ The amount of hydrogen available to react is expressed in terms of the percent of Zircaloy in the core which was reacted. For the BWR, the oxygen in the dry-well and wet-well gas is only sufficient to react with the hydrogen formed by the reaction of 10% of the Zircaloy in the core. For the PWR, more than enough oxygen is in the containment to react with all the hydrogen formed by complete reaction of the core Zircaloy. Results indicate that, for both the BWR and the PWR, the containment-vessel design pressure (60 psig) could be exceeded in terms of explosion overpressures for only a very small percent of core zirconium reacted — less than 2% for the PWR and less than 0.1% for the BWR. The lower value for the BWR is due to the combined effects of smaller vessel size and greater mass of zirconium in the core.

Oxygen available for reaction with hydrogen

Another way to express the hydrogen-explosion overpressure is in terms of the amount of oxygen available. Figure 3 shows that even if less than 1% of the available oxygen in either containment reacts explosively with hydrogen, the design pressures of the vessels would be exceeded.⁴ These results show that accumulation of explosive hydrogen-air-steam mixtures must be avoided to ensure containment integrity during a reactor-core-meltdown accident.

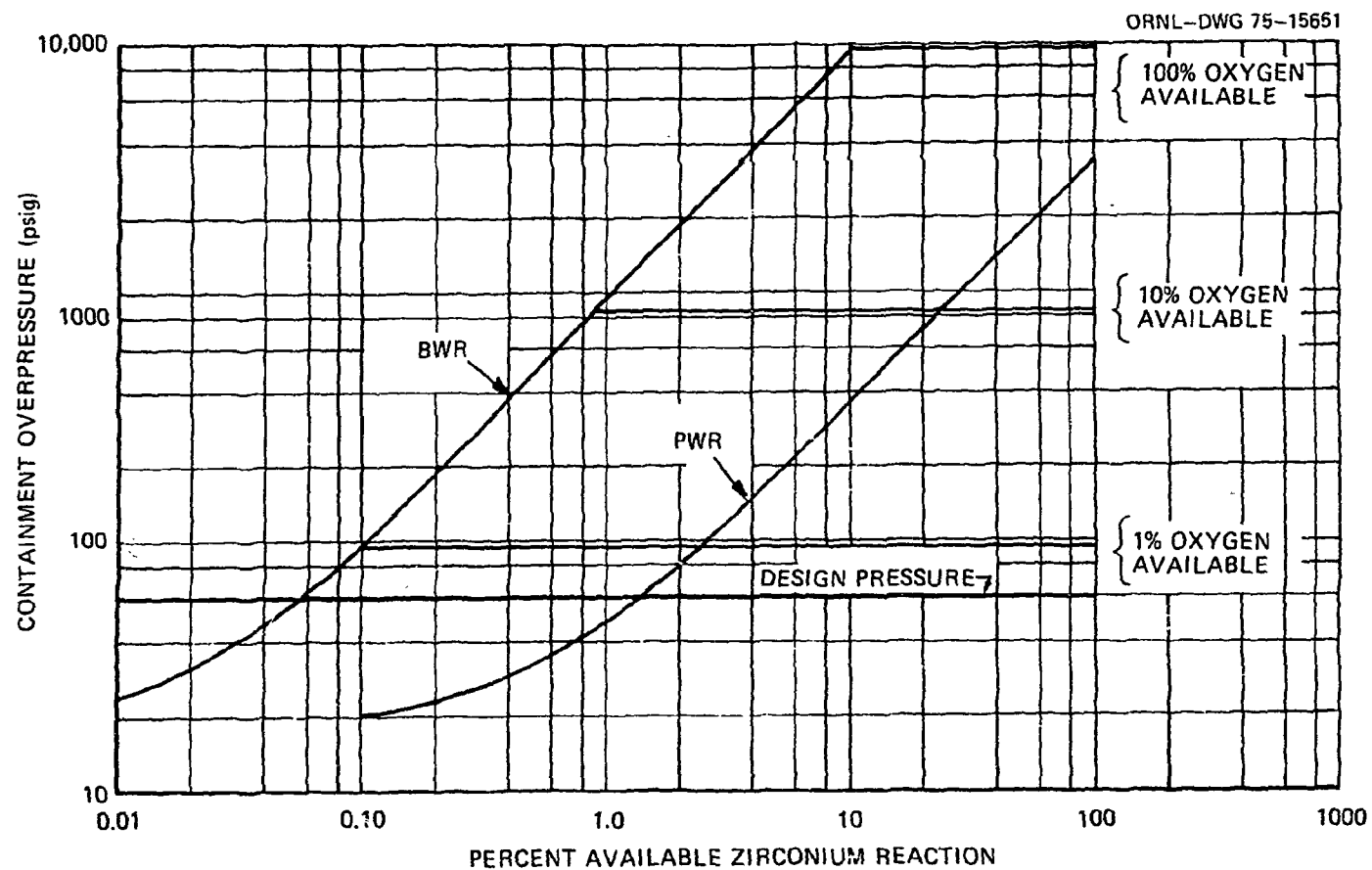


Fig. 3. Hydrogen explosion overpressures for containment vessel -
TNT equivalent.

Stratification of hydrogen

Because hydrogen has a density lower than that of any other gas, slow leakage of hydrogen near the ceiling of a room will cause hydrogen to collect near the ceiling where it could accumulate in dangerous concentrations. This effect can be overcome easily by maintaining a slight circulation of the atmosphere in the room or by venting the ceiling. Stratification is much less likely to occur if the leak is near the floor, since hydrogen readily diffuses through the atmosphere. Even where leaks occur in high-pressure lines near ceilings, the tendency for stratification to occur is lessened by any mixing action of the jet.

Stratification or pocketing of hydrogen in the vessel could become a significant problem in light-water reactors. The PWR containments have internal levels and compartments; in BWR systems the pressure vessel is located in the upper portion of the dry well. The possibility of accumulation of explosive mixtures in these local volumes cannot be completely ruled out, because the tendency for mixing with the rest of the containment atmosphere could be slight.

If hydrogen escaping from a break in the primary-system pipe tended to remain in pockets or to stratify in layers, then potential explosion conditions could be reached much sooner and with less total generated hydrogen than that predicted for the whole containment. The possibility of the pocketing or stratification of hydrogen was considered by Morrison and staff from a very idealized viewpoint.⁴ By use of the Archimedes principle, which states that a body immersed in a fluid is buoyed up by a force equal to the weight of the fluid displaced, the differential equation of motion for a spherical hydrogen bubble in a steam-air atmosphere can be written as

$$\frac{d^2z}{dt^2} = \left(g \frac{\rho_{\text{gas}}}{\rho_{\text{H}_2}} \right),$$

where ρ represents density, g is the gravitational acceleration, t is time in seconds, and z is the vertical distance in the earth's gravitational field. Calculations based on this equation indicate that a 10%

loss of hydrogen in 1 sec would require a bubble radius of about 2 ft. Contributions from eddy diffusion in the real system would lead to even larger bubble radii. Since a reactor's primary piping is smaller than the indicated 2-ft radius, hydrogen pocketing by the bubble-rise mechanism might not occur during hydrogen releases from a primary-system break. However, as previously noted, PWR containments have internal levels and compartments, and in a BWR system the pressure vessel is located in the upper portion of the dry well. Therefore, the accumulation of explosive mixtures in local subvolumes might occur, because little or no bubble rise would take place. The diffusional mixing of such accumulated hydrogen with the rest of the containment gas could require as long as several hours. Convection currents would tend to hasten mixing, but the possibility of hydrogen explosions involving only a portion of the containment gas cannot be ruled out. Thus, calculations should be made to estimate the effects of hydrogen explosions on containment-vessel integrity.

CONCLUSIONS

Hydrogen can be controlled so that serious complications from the production of hydrogen will not occur either during normal operation or during postulated accidents. Engineered safety features and methods for hydrogen control are now available to prevent or mitigate the consequences of a rapid hydrogen-oxygen reaction.

Recombiners utilizing the continuous reaction of hydrogen and oxygen are now being used to ensure that the hydrogen concentration level remains below 4.1 vol %. The three types — flame, catalytic, and electric recombiners — have been improved both in design and operating characteristics. Any one of these three types of recombiners designed and tested for a specific reactor installation may be used. A circulating fan is installed to ensure that hydrogen does not accumulate in small compartments of the containment vessel.

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HYDROGEN CONSIDERATIONS IN
LIGHT-WATER POWER REACTORS

PART II: BIBLIOGRAPHY

COMPUTER SEARCHES OF NSIC FILES

A bibliography consisting of a set of abstracts on hydrogen considerations in light-water power reactors has been prepared. For the reader interested in the methods used for a computer printout of the abstracts, the procedure was as follows: First, to assure that the number of abstracts in the bibliography remained less than 1000, exploratory investigations were projected on the RECON terminal cathode-ray (TV) screen and counted. Then, after considering a number of suitable combinations, the ten computer file searches shown below were selected and printed. The contents of each search is briefly reviewed here before showing the final computer printout of the abstracts. The strategies for the computer file searches are summarized in Table 5, and the contents of the various searches are discussed in the following text.

Table 5. Strategy for the computer file searches

Search Number	Number of Abstracts	Keywords
1	258	Hydrogen + Response to NRC Questions
2	54	Hydrogen + Accident, Loss of Coolant
3	29	Containment Spray, Core Spray, Spray + Hydrogen or Radiolytic Gas
4	35	Fuel Meltdown + Metal-Water Reaction
5	58	Hydrogen + Explosion
6	48	Hydrogen + Oxygen
7	29	Hydrogen + Metal-Water Reaction
8	154	Radiolytic Gas
9	50	Recombiners
10	77	Containment Atmosphere, Inert
	<u>792</u> =	Total Number of Abstracts in the Computer Printout

Search 1: Response to NRC Questions on Hydrogen

All 258 abstracts in the first search are included in this report. Many of the early abstracts are brief and refer to answers on pages in the PSARs or SARs. An effort has been made in preparing later accessions to provide more direct information in the abstract rather than using references alone.

It is interesting to note a chronological transition in the content of the question and answers. In the beginning it was suggested that conditions were such that hydrogen would not be a major problem. This then progressed to methods for prevention of hydrogen buildup in reactor containments. The sequence was: first, simple venting to the atmosphere; then, as restrictions on gaseous effluents were tightened, inerting with nitrogen was proposed as well as release to expansion volumes; this was followed by controlled release through fission-product trapping systems. Today the emphasis has shifted to recombiners for hydrogen and oxygen with proposed total control over the hydrogen buildup in the reactor containment systems.

Even though many excellent theoretical calculations have been made illustrating that hydrogen cannot stratify, circulators are now being required to prevent the remote possibility of hydrogen stratifying in individual compartments of a reactor containment.

Search 2: Loss-of-Coolant Accident

The 54 abstracts vary in content but primarily contain information on conditions for hydrogen generation, the resulting pressure buildup, and the capability of the containment to withstand these pressures. Some recommendation for temperature, pressure, and hydrogen control are suggested.

Search 3: Spray Systems

The 29 abstracts relate to containment spray research and development, design criteria, and radiolytic gas. Related topics will be found in the other searches. Some responses to NRC questions have been retained in this section.

Search 4: Fuel Meltdown

The 35 abstracts contain information on the consequences of fuel meltdown in terms of fuel damage, flow blockage, heat transfer models, and the significance of chemical energy emergency core-cooling systems. Information is also given on the chemical and physical changes that take place upon the meltdown of a subassembly or a portion of a nuclear reactor core. Core heatup analysis models consider the Zircaloy corrosion rates under loss-of-coolant conditions.

Search 5: Hydrogen Explosions

The 58 abstracts cover hydrogen flammability data, suppression of gaseous hydrogen-oxygen detonations, and some operating experience with liquid hydrogen and cryogenic systems. Some of the abstracts in this search relate experiences in the NASA aerospace program as well as reports on the bubble chamber explosion involving liquid hydrogen. Hydrogen explosions in chemical processing systems are reported. Design criteria related to the safety analysis of storage systems for liquid high-level waste is considered. Hydrogen detonations in reactor off-gas systems are reported for several installations.

Search 6: Hydrogen-Oxygen Reactions

The 48 abstracts include reports on ozone explosions under cryogenic conditions, methods for extinguishment of liquid hydrogen fires, vapor-phase explosions in chemical processing equipment, and the application of nuclear energy to the production of hydrogen.

The NASA reports contain considerable information on combustion safety in the spacecraft environment. Monitoring methods for oxygen, nitrogen, and hydrogen content are reviewed and their limitations in the presence of moisture are listed. The combustion limits of steam-diluted hydrogen-oxygen mixtures at high temperatures of 950°F lead to a problem of preventing thermal initiation in the mixture.

Search 7: Metal-Water Reactions

The 29 abstracts are concerned with both laboratory experiments that illustrate fundamental properties of metal-water reactions producing hydrogen and safety evaluations for specific power reactors. Metal reactions with both water and steam are included in the safety evaluations.

Search 8: Radiolytic Gas

This collection of 154 abstracts is next in size to search 1, which contained 258 abstracts on hydrogen and response to NRC questions. The information contained in these abstracts, other than the large number directly relating to operation of PWR and BWR reactors, is concerned with the shipping of alpha-emitting materials, high-level radioactive waste storage in salt mines, vaults in crystalline rock or bedrock, and the permanent disposal of waste in tanks. Some information is included on gamma sources and radiolytic gas release and experiences in shipping and processing spent fuel elements. A few items are related to radiolytic gas production by accelerator facilities.

Safety procedures and hazards of decommissioned reactors must be considered due to the radiolytic production of hydrogen and oxygen. Heavy-water reactors are included in this search. The pressure buildup in the sealed shipping containers containing plutonium solutions is considered. The description of spontaneous combustion, oxidation, and pyrolysis of combustible solid wastes should be noted as unique in this group of abstracts. A few papers relating the reaction of graphite and moisture to radiation appear in this collection as well as some descriptions of hydrogen-oxygen or radiolytic gas explosions.

Search 9: Recombiners

The key word recombiners calls forth 50 abstracts from computer storage. Since noble-metal catalysts are both expensive and easily poisoned, new catalysts consisting of nickel or nickel-chromium oxide have been developed that are several times greater in efficiency than

copper catalysts. Electric-resistance heaters to heat a continuous flow of containment atmosphere above the hydrogen-oxygen reaction temperature 1300°F are now being built and tested. Flame recombiner units have been built to engineered safety-feature standards and placed within the containment. Some catalytic recombiners are operated in series with charcoal adsorbers.

In considering recombiners for boiling-water reactors, the following factors have a significant effect on their design, performance, and cost: choice of diluent; condensing or noncondensing reaction; catalyst type selected - pelletized, honeycomb, or wire mesh; preheat temperature; effluent specification; air in-leakage specifications; pressure-drop specification; vessel materials selected; and number of recombiner stages used.

Search 10: Containment Inerting

There are 77 abstracts in search 10. It was first proposed in 1966 to use nitrogen as a containment atmosphere in boiling-water reactors to prevent hydrogen-oxygen reaction after a loss of coolant. The steam pressure was relieved by discharge into a pressure-suppression pool. All leakage was assumed to be collected by the building exhaust system, filtered by a standby system, and discharged up the stack. The primary oxygen concentration was to be measured twice a week. Technical specifications require that the primary containment atmosphere be less than 5% oxygen with nitrogen within 24 hr after the reactor is in run mode. A few reports pertaining to fuel cycles and fuel reprocessing in hot cells, dry boxes, and buildings appear in this group.

1. RESPONSE TO NRC QUESTIONS ON HYDROGEN

014619
 QUESTION 4 - REVISED-CALCULATION OF RADIOLYTIC HYDROGEN DURING LOSS OF COOLANT
 CONSOLIDATED EDISON COMPANY OF NEW YORK, INC., INDIAN POINT NUCLEAR GENERATING UNIT NO. 2
 11 PAGES, 4 REFERENCES, FOURTH SUPPLEMENT TO PRELIMINARY SAFETY ANALYSIS REPORT, JULY 1966, DOCKET NO. 50-247

(DURING BOILING) - THE EMERGENCY COOLING SYSTEM WILL TERMINATE BOILING IN ONE HOUR, BUT, IN ONE WEEK OF BOILING, THE 3.3 VOL % H₂ IN THE CONTAINMENT ATMOSPHERE IS STILL BELOW THE 4% FLAMMABILITY LIMIT. (NONBOILING) - AFTER BOILING CEASES, HYDROGEN WILL EQUILIBRATE (AT 2.16 X 10 TO THE MINUS 5TH MOLE/LITER) IN THE WATER, AND A 2.53 VOL % HYDROGEN CONCENTRATION IN THE CONTAINMENT ATMOSPHERE WILL RESULT.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + RADIOLYTIC GAS + INDIAN POINT 2 (PWR)

014599
 QUESTION G-4. CRITERION 17--MODEL, ASSUMPTIONS AND RESULTS OF METAL WATER REACTION FOLLOWING A LOSS-OF-COOLANT ACCIDENT WITHOUT CORE COOLING SYSTEMS
 TENNESSEE VALLEY AUTHORITY
 22 PAGES, 1 FIGURE, 14 REFERENCES, PAGES G-4.1 TO 22 OF BROWNS FERRY CONSTRUCTION PERMIT, AMENDMENT 3, ANSWERS TO AEC QUESTIONS, NOVEMBER 10, 1966, DOCKET NO. 50-259/260

DISCUSSION OF FUEL-ELEMENT-CLADDING TEMPERATURE, ENERGY RELEASE TO THE CONTAINMENT IN A STANDARDIZED FIGURE-OF-MERIT APPROACH, AND HYDROGEN EVOLUTION. REFUTES ANL-SUGGESTED ZIRCONIA-CRUCIBLE EFFECT BY NOTING THAT THE 9% VOLUME CHANGE AT 2201 F HAS PREVENTED DELIBERATE ATTEMPTS TO MAKE ZIRCONIA CRUCIBLES (UNLESS SIGNIFICANT AMOUNTS OF ADDITIVES ARE PRESENT). THIS CRACKING WOULD ALSO ALLOW LEAKAGE OF MOLTEN DROPS. BWR EXPERIENCE SHOWS HYDROGEN RELEASED AT 0.04 CU.FT/MIN-MWTH. THIS RATIO FOR THE SHUT-DOWN REACTOR SHOWS THAT RADIOLYTIC HYDROGEN IS ONLY 3% THAT PRODUCED BY METAL-WATER REACTIONS.

AVAILABILITY - USAEC-PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

REACTOR, BWR + CONTAINMENT DESIGN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + RADIOLYTIC GAS + FAILURE, CLADDING + REPORT, PSAR

015485
 QUESTION VII G - HYDROGEN FOLLOWING MCA
 CAROLINA POWER AND LIGHT COMPANY, RALEIGH, NORTH CAROLINA
 3 PAGES, PAGE G-1 TO G-3 OF THIRD SUPPLEMENT TO PRELIMINARY FACILITY DESCRIPTION AND SAFETY ANALYSIS REPORT, H.8. ROBINSON UNIT NUMBER 2, DECEMBER 1966, DOCKET 50-261

ASSUMING A LOSS OF COOLANT WITH NO CORE COOLING, HOW MUCH HYDROGEN COULD BE FORMED FROM (A) METAL-WATER REACTION, (B) DECOMPOSITION OF UO₂ TO U₃O₈ AND (C) RADIOLYTIC DECOMPOSITION OF WATER. (1) DISCUSS THE LOCAL EFFECTS DUE TO THE HYDROGEN BURNING UPON EXIT FROM THE PRIMARY PIPE. (2) WHAT WOULD CONTAINMENT PRESSURE BE IF THE HYDROGEN WERE RAPIDLY BURNED. (3) DISCUSS IN DETAIL THE MODEL USED FOR RADIOLYTIC DECOMPOSITION.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C. 20432

CONTAINMENT, HIGH PRESSURE + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + PRESSURE, INTERNAL + ROBINSON 2 (PWR) + REPORT, PSAR

018115
 QUESTION VII.B(3)--HYDROGEN CONCENTRATION TO GIVE CONTAINMENT DESIGN PRESSURE
 CAROLINA POWER AND LIGHT COMPANY
 1 PAGE, FOURTH SUPPLEMENT TO THE PRELIMINARY FACILITIES DESCRIPTION AND SAFETY ANALYSIS REPORT, CAROLINA POWER AND LIGHT COMPANY, H. 8. ROBINSON UNIT 2, JULY 12, 1966, DOCKET NO. 50-261, AMENDMENT 5

DISCUSS IN DETAIL THE MODE USED TO ESTIMATE THE AMOUNT OF RADIOLYTIC DECOMPOSITION LISTED ABOVE. (ANSWER ADDS TO SUPPLEMENT 3) ASSUMING THE HYDROGEN BURNS IN A SHORT INTERVAL, WITH CONTAINMENT AT 3 PSIG, A 6.4 MOLE PERCENT HYDROGEN ACCUMULATION YIELDS AN ADIABATIC PRESSURE RISE TO 42 PSIG.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

CONTAINMENT DESIGN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + COMBUSTION + PRESSURE, INTERNAL + ROBINSON 2 (PWR) + REPORT, PSAR

019070
 QUESTION D(2)--CONTAINMENT PRESSURE VS TIME CURVES FOR VARIOUS EMERGENCY COOLING ACTION
 ROCHESTER GAS AND ELECTRIC COMPANY
 4 PAGES, 2 FIGURES, FROM THE THIRD SUPPLEMENT TO THE PRELIMINARY FACILITY DESCRIPTION AND SAFETY ANALYSIS REPORT FOR THE ROCHESTER GAS AND ELECTRIC CO., GINNA (BROOKWOOD) NUCLEAR STATION UNIT 1, DOCKET 50-244, AMENDMENT 3, FEBRUARY 28, 1966

PROVIDE (1) THE NO-SAFEGUARDS AND (2) THE MINIMUM-SAFEGUARDS (WITHOUT CORE INJECTION) CONTAINMENT-PRESSURE-VERSUS-TIME CURVES FOR THE FOLLOWING CASES - VARIOUS AMOUNTS UP TO 70 PERCENT OF THE

019070 *CONTINUED*

ZIRCONIUM IS (A) REACTED IN 700 SEC, AND THE HYDROGEN BURNS AS IT LEAVES THE SYSTEM. (B) SAME AS (A) EXCEPT THAT HYDROGEN DOES NOT BURN BUT SUDDENLY IGNITES AFTER VARIOUS TIME DELAYS UP TO 700 SEC. (C) A EUTECTIC IS FORMED, LOWERING THE MELTING TEMP. OF UO₂ BELOW 3500 F. (D) NO WATER IS LEFT IN THE VESSEL AFTER BLOWDOWN. CALCULATE THE TIME FOR THE CORE TO MELT THROUGH ONE OF THE IN-CORE INSTRUMENTATION SLEEVES, AND PROCEED WITH THE CALCULATION, STATING YOUR ESTIMATES OF THE AMOUNT OF METAL-WATER REACTION TAKING PLACE AS THE MELT REACHES THE SUMP. (CRITERION 171).

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

CONTAINMENT, HIGH PRESSURE + METAL WATER REACTION + REACTOR, PWR + CORE MELTDOWN + PRESSURE, INTERNAL + BLOWDOWN + REPORT, PSAR + ENGINEERED SAFETY FEATURE

019708
QUESTION 1.5--CONTAINMENT CAPABILITY WITH ZIRCONIUM-WATER REACTION
WISCONSIN MICHIGAN POWER COMPANY

4 PAGES, 2 FIGURES, 1 TABLE, PAGES 1.5-1 THROUGH 1.5-2 OF THE SECOND SUPPLEMENT TO PRELIMINARY FACILITY DESCRIPTION AND SAFETY ANALYSIS REPORT FOR WISCONSIN MICHIGAN POWER COMPANY, POINT BEACH NUCLEAR PLANT, DOCKET 50-266, FEBRUARY 1967

TO EVALUATE ADEQUACY OF CONTAINMENT DESIGN FOR LOSS-OF-COOLANT ACCIDENT, ASSUMING THAT NO EMERGENCY CORE-COOLING SYSTEMS FUNCTION, CONSIDER PRESSURES THAT COULD RESULT FROM ENERGY ADDED IN A MANNER SOMEWHAT INDEPENDENT OF SPECIFIC MODEL. PREPARE A CONTAINMENT CAPABILITY CURVE PROVIDING AMOUNT OF ZIRCONIUM-WATER REACTION AS FUNCTION OF TIME THAT CAN OCCUR WITHOUT EXCEEDING 60 PSIG. ASSUME REACTION OCCURS LINEARLY WITH TIME, HYDROGEN PRODUCED IS BURNED AS PRODUCED, AND DELAYED IGNITION OCCURS. CURVES SHOULD BE DRAWN ASSUMING NO ENGINEERED SAFEGUARDS FUNCTION, ONLY FANCOOLERS OR CONTAINMENT SPRAYS OPERATE, AND BOTH FANCOOLERS AND CONTAINMENT SPRAYS OPERATE. ADDITIONAL INFORMATION SUCH AS MAJOR ENERGY SOURCES ASSUMED AND CONTAINMENT-ATMOSPHERE COMPOSITION AND TEMPERATURE SHOULD BE PRESENTED.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

CONTAINMENT DESIGN + CONTAINMENT SPRAY + FIRE + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + REPORT, SAR + ZIRCONIUM + HEAT SINK + PRESSURE, INTERNAL + POINT BEACH 1 (PWR) + EMERGENCY COOLING + ENGINEERED SAFETY FEATURE

019709
QUESTION 1.6--RADIOLYTIC DECOMPOSITION OF SAFETY INJECTION WATER
WISCONSIN MICHIGAN POWER COMPANY

15 PAGES, 1 FIGURE, 2 TABLES, 4 REFERENCES, PAGE 1.6-1 THROUGH 1.6(D)-1 OF THE SECOND SUPPLEMENT TO PRELIMINARY FACILITY DESCRIPTION AND SAFETY ANALYSIS REPORT FOR WISCONSIN MICHIGAN POWER COMPANY, POINT BEACH NUCLEAR PLANT, DOCKET 50-266, FEBRUARY 1967

A POTENTIAL SOURCE OF HYDROGEN FOLLOWING PRIMARY PIPING FAILURE COULD BE RADIOLYTIC DECOMPOSITION OF SAFETY-INJECTION WATER. DISCUSS QUANTITY OF GAS FORMED, AND DETERMINE POTENTIAL EFFECT ON CONTAINMENT PRESSURE AND TEMPERATURE IF HYDROGEN IS IGNITED. PROVIDE DETAILS, INCLUDING RESIDENCE TIME AND TEMPERATURE RISE OF WATER IN CORE REGION, EFFECT OF IMPURITIES AND INCREASE OF HYDROGEN PEROXIDE CONTENT ON HYDROGEN PRODUCTION RATE, PERCENT SATURATION WITH AIR OF WATER PASSING THROUGH CORE, AND PERCENT DEAERATION OF WATER AS IT PASSES THROUGH CORE.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

CONTAINMENT DESIGN + ENERGY SOURCE + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + REPORT, SAR + AIR + THERMAL CONSIDERATION + COOLANT CHEMISTRY + RADIOLYTIC GAS + POINT BEACH 1 (PWR) + EMERGENCY COOLING + CORE REFLOODING SYSTEM + ENGINEERED SAFETY FEATURE

021553
QUESTION VI.3--HYDROGEN EXPLOSION
PUBLIC SERVICE COMPANY OF COLORADO

1 PAGE, PAGE VI.3-1 OF AMENDMENT 2 TO APPLICATION CONSTRUCTION PERMIT AND LICENSE FOR FT. ST. VRAIN, MAY 24, 1967, DOCKET 50-267, TYPE--HTGR, MFG.--G.A., AE--G.A.

WHAT IS THE POSSIBILITY OF AN EXPLOSION INVOLVING THE REACTOR-PLANT-COOLING WATER HYDROGEN-COVER-GAS SYSTEMS. WHAT DESIGN PROVISIONS PRECLUDE THE POSSIBILITY OF AN EXPLOSION IN ONE LOOP FROM DISABLING BOTH COOLING WATER SYSTEMS. *** (ANSWER ON PAGE VI.3-1.)

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C. 20432

FIRE + REACTOR, GCR + REACTOR, GRAPHITE MODERATED + FT. ST. VRAIN (HTGR) + REPORT, PSAR + AUXILIARY COOLING SYSTEM

021725
QUESTION 4--RADIOLYTIC HYDROGEN FOLLOWING PRIMARY PIPING FAILURE
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.

1 PAGE OF SECOND SUPPLEMENT TO THE INDIAN POINT 2 PRELIMINARY SAFETY ANALYSIS REPORT (EXHIBIT B-2), MAY 1966, DOCKET 50-247, TYPE--PWR, MFG--WEST, AE--UNITED ENGR

A POTENTIAL SOURCE OF HYDROGEN AFTER A PRIMARY-PIPING FAILURE COULD BE RADIOLYTIC DECOMPOSITION OF THE SAFETY-INJECTION WATER. DISCUSS THE AMOUNT OF THE GASES FORMED BY THIS PROCESS AND THE

021725 *CONTINUED*

POTENTIAL EFFECT ON CONTAINMENT PRESSURE AND CONCENTRATION OF FREE HYDROGEN. *** (ANSWER)
 ASSUMING 1 MOLECULE OF HYDROGEN FORMED PER 100 MEV ENERGY ABSORBED, AT THE END OF TEN MONTHS, THE
 GAS PRESSURE IS LESS THAN 0.05 PSI. IT IS LESS THAN 5% OF THE LOWER COMBUSTIBLE LIMIT.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

CONTAINMENT, HIGH PRESSURE + FIRE + REACTOR, PWR + RADIOLYTIC GAS + PRESSURE, INTERNAL + INDIAN POINT 2 (PWR)
 + REPORT, PSAR

022055

QUESTION 6.2 -- AVERAGE GAS STRIPPING RATE AND AVERAGE ANNUAL LETDOWN FLOW RATE
 VIRGINIA ELECTRIC AND POWER COMPANY

2 PAGES, PAGES S6.2-1 THRU S6.2-2 OF AMENDMENT 4 (SUPPLEMENT VOLUME 1) TO THE LICENSE APPLICATION FOR SURRY 1
 AND 2, OCTOBER 6, 1967, DOCKETS 50-280/281, TYPE--PWR, MFG.--WEST, AE--STONE + WEBSTER

TO ASCERTAIN IF THE WASTE DISPOSAL SYSTEM IS ADEQUATELY SIZED, DISCUSS THE BASIS FOR THE
 ASSUMPTIONS MADE IN DETERMINING THE MAGNITUDE OF THE HYDROGEN STRIPPING RATE AND THE AVERAGE
 ANNUAL LETDOWN FLOW RATE. TO WHAT EXTENT HAVE THE LARGE VOLUMES OF LIQUID WASTE ASSOCIATED WITH
 BORON DILUTION OR COOLDOWN AND SUBSEQUENT HEATUP BEEN CONSIDERED.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

REACTOR, PWR + WASTE DISPOSAL + WASTE SOURCE AND TYPE + COOLANT PURIFICATION SYSTEM + REPORT, PSAR + SURRY 1
 (PWR)

022064

QUESTION 8.4 -- ENERGY RELEASE TO CONTAINMENT ATMOSPHERE
 VIRGINIA ELECTRIC AND POWER COMPANY

1 PAGE, PAGE S8.4-1 OF AMENDMENT 4 (SUPPLEMENT VOLUME 1) OF THE LICENSE APPLICATION FOR SURRY 1 AND 2, OCTOBER
 6, 1967, DOCKET 50-280/281, TYPE--PWR, MFG.--WEST, AE--STONE + WEBSTER

DESCRIBE MANNER IN WHICH ENERGY RELEASED TO CONTAINMENT ATMOSPHERE BY HYDROGEN OXIDATION AND BY
 TRANSFER FROM HOT METAL IS ASSUMED TO BE TRANSFERRED TO CONTAINMENT ATMOSPHERE. *** (ANSWER) THE
 HYDROGEN IS ASSUMED TO BURN IMMEDIATELY UPON FORMATION, AND ITS HEAT GOES DIRECTLY TO THE
 CONTAINMENT ATMOSPHERE. THE SENSIBLE HEAT IN THE HOT METAL IS TRANSFERRED TO THE COOLANT.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

CONTAINMENT DESIGN + FIRE + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + REPORT, PSAR +
 EMERGENCY COOLING + SURRY 1 (PWR)

022403

QUESTION 6.9--METAL-WATER REACTION

DUKE POWER COMPANY, CHARLOTTE, NORTH CAROLINA

2 PAGES, 1 FIGURE, PAGE 6.9-1 OF AMENDMENT 2 (SUPPLEMENT 2) TO THE OCONEE 1 AND 2 LICENSE APPLICATION, APRIL
 18, 1967, DOCKET 50-269/270, TYPE--PWR, MFG.--B+W, AE--DUKE

JUSTIFY THE ASSUMPTION THAT HYDROGEN EVOLVED IN A METAL-WATER REACTION WOULD BE ABOVE THE IGNITION
 TEMPERATURE IN ALL CASES. PARTICULARLY CONSIDER PARTIAL EFFECTIVENESS OF THE COOLING SYSTEMS.
 WHAT EFFECT WOULD DELAYED BURNING OF HYDROGEN HAVE ON CONTAINMENT DESIGN MARGINS. *** (ANSWER) A
 FINAL PRESSURE OF 67 PSIG IS CALCULATED AT 180 SEC.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

CONTAINMENT DESIGN + FIRE + METAL WATER REACTION + REACTOR, PWR + COMPARISON, THEORY AND EXPERIENCE +
 PRESSURE, INTERNAL + REPORT, PSAR + OCONEE 1 (PWR)

022594

QUESTION 1.9 - HYDROGEN HAZARD POTENTIAL

NORTHERN STATES POWER CO., MINNEAPOLIS, MINNESOTA

3 PAGES, 1 REFERENCE, PAGE 1.9-1 THRU 1.9-3 OF AMENDMENT 4 TO MONTICELLO CONSTRUCTION PERMIT APPLICATION, JAN.
 10, 1967, DOCKET NO. 50-263

ANALYZE THE LOSS-OF-COOLANT ACCIDENT WHERE THE CORE REMAINS COVERED WITH WATER AND RADIOLYTIC
 DECOMPOSITION OF THE WATER OCCURS. INCLUDE AN ANALYSIS OF THE POTENTIAL HYDROGEN AND OXYGEN
 BUILDUP AND A DISCUSSION OF ANY HAZARD THAT MIGHT RESULT. THIS ANALYSIS SHOULD INCLUDE
 JUSTIFICATION OF THE G VALUES USED. (ANSWER) RADIOLYSIS PRODUCES 0.21 CUBIC FT OF H IN 1000 HR,
 AND METAL-WATER REACTION PRODUCES 3300. THIS IS 1.4% OF TOTAL VOLUME AND IS NOT A HAZARD. NO G
 VALUES USED, BASED ON BWR OBSERVATIONS.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

REACTOR, BWR + CONTAINMENT DESIGN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + COMBUSTION + RADIOLYTIC
 GAS + MONTICELLO (BWR) + REPORT, PSAR

022738

022738 *CONTINUED*
 RESPONSE TO QUESTION 3.1--PRESSURE AND TEMPERATURE IN CONTAINMENT DURING DESIGN BASIS ACCIDENT
 OMAHA PUBLIC POWER DISTRICT
 10 PAGES, 6 FIGURES, 3 TABLES, PAGES 3.1-5 THROUGH -15 OF AMENDMENT 8 TO THE LICENSE APPLICATION (SUPPLEMENT 8
 TO THE FORT CALHOUN UNIT 1 FACILITY DESCRIPTION AND SAFETY ANALYSIS REPORT) OCTOBER 30, 1967, EXHIBIT F8 TO
 DOCKET 50-285, TYPE--PWR, MFG--C.E., AE--GIBBS + HILL

GIVE ENGINEERING ANALYSIS AND EVALUATION OF PRESSURE AND TEMPERATURE IN CONTAINMENT AS FUNCTION OF
 TIME DURING DESIGN-BASIS ACCIDENT, CONSIDERING ALL SIGNIFICANT HEAT SINKS AND SOURCES. IDENTIFY
 SENSITIVITY OF CURVES TO DEGREE OF OPERABILITY OF EACH ENGINEERED SAFEGUARD SYSTEM, ABOVE AND
 BELOW DESIGN REQUIREMENTS. PRESENT QUANTITATIVE DATA TO SHOW EFFECTS OF VARIATIONS FROM
 PREDICTED BEHAVIOR OF VARIOUS PHENOMENA CONTRIBUTING TO CURVES. THE ANALYSIS SHOULD FURTHER
 CONSIDER METAL-WATER REACTION, HYDROGEN GENERATED BUT BURNED AS RELEASED, AND GROSS FAILURE IN
 PRIMARY-TO-SECONDARY COOLING-SYSTEM BARRIER IN ONE STEAM GENERATOR. *** (ANSWER ON PAGES 3.1-5
 THROUGH 15, PLUS 6 FIGURES, ADDS TO THAT IN SUPPLEMENT 2. SEE ALSO ANSWERS TO QUESTIONS 3.1-4
 THROUGH 3.1.15, THIS SUPPLEMENT.)

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

CONTAINMENT DESIGN + CONTAINMENT VESSEL LOADING + FAILURE, EQUIPMENT + ACCIDENT, LOSS OF COOLANT + METAL WATER
 REACTION + REACTOR, PWR + THERMAL MECHANICAL EFFECT + PRESSURE, INTERNAL + FT. CALHOUN (PWR) + REPORT, PSAR +
 STEAM GENERATOR

022852
 QUESTION 6 - BURNING OF HYDROGEN FORMED IN METAL WATER REACTION
 SOUTHERN CALIFORNIA EDISON COMPANY + SAN DIEGO GAS AND ELECTRIC COMPANY
 3 PAGES, PAGES 47 THRU 50 OF SUPPLEMENT 2 TO THE FINAL SAFETY ANALYSIS REPORT FOR SAN ONOFRE NUCLEAR
 GENERATING STATION, MAY 31, 1966, DOCKET 50-206, TYPE--PWR, MFG--WEST, AE--BECHTEL

JUSTIFY THE ASSUMPTION THAT HYDROGEN BURNS AS IT IS PRODUCED. *** (ANSWER) THE THRESHOLD FOR
 METAL-WATER REACTION IN ZIRCONIUM IS ABOUT 1800 F. SPONTANEOUS IGNITION OF HYDROGEN DEPENDS ON
 FLOW VELOCITY AND VAPOR CONTENT, BUT A CONSERVATIVE ESTIMATE (AT LOW FLOW AND HIGH VAPOR CONTENT)
 IS 1250 F. FOR HYDROGEN TO BUILD UP, IT WOULD THEREFORE HAVE TO COOL AT LEAST 550 F IN TRAVELING
 FROM THE POINT OF FORMATION TO THE BREAK. ASSUMING CONSERVATIVE VALUES FOR PARAMETERS INVOLVED,
 IT WAS FOUND THAT THE HYDROGEN TEMP. AT ESCAPE WAS 1335 F, LEAVING A SAFETY MARGIN OF 85% TO A
 CONSERVATIVE VALUE OF SPONTANEOUS IGNITION TEMP. (EXPECTED VALUE IS 970 F).

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

CONTAINMENT DESIGN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + REPORT, SAR + SAN
 ONOFRE 1 (PWR) + IGNITION TEMPERATURE + COMBUSTION

023129
 QUESTION 5-3A-ENERGY SOURCES DURING LOSS OF COOLANT ACCIDENT
 SOUTHERN CALIFORNIA EDISON COMPANY + SAN DIEGO GAS AND ELECTRIC CO.
 1 PAGE, PAGE 5-10 OF SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1, SUPPL. 1 TO THE FINAL ENGINEERING REPORT
 AND SAFETY ANALYSIS, APRIL 13, 1966, DOCKET 50-206, TYPE--PWR, MFG--WEST, AE--BECHTEL

RELATE THE AVAILABLE ENERGY SOURCES BY SHOWING THE TOTAL ENERGY THAT COULD BE PROVIDED BY (1) A
 100% METAL-WATER REACTION, USING STAINLESS-STEEL CLADDING AND ZIRCALOY CLADDING, AND (2) THE
 HYDROGEN-AIR REACTION. WHAT IS THE TOTAL ENERGY AVAILABLE FROM SECONDARY SOURCES (E.G., STEAM
 GENERATORS AND HOT METAL SURFACES). *** (ANSWER ON PAGE 5-10.)

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C. 20432

CHEMICAL REACTION + ENERGY SOURCE + EXPLOSION + FIRE + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION +
 REACTOR, PWR + REPORT, SAR + SAN ONOFRE 1 (PWR) + COMBUSTION + IGNITION

023130
 QUESTION 5-3B-GRAPHS SHOWING ENERGY SOURCES DURING LOCA
 SOUTHERN CALIFORNIA EDISON COMPANY + SAN DIEGO GAS AND ELECTRIC CO.
 5 PAGES, 3 FIGURES, PAGES 5-1/5-5 OF SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 1, SUPPL. 1 TO THE FINAL
 ENGINEERING REPORT AND SAFETY ANALYSIS, APRIL 13, 1966, DOCKET 50-206, TYPE--PWR, MFG--WEST, AE--BECHTEL

PLOT UP THROUGH FOUR HOURS FOR YOUR ASSUMED MODEL OF POSTACCIDENT CONDITIONS WITH NO ENGINEERED
 SAFEGUARDS OPERATING (1) THE RATIO OF DECAY HEAT ENERGY IN THE CONTAINMENT ATMOSPHERE TO THE
 TOTAL AVAILABLE, (2) THE RATIO OF METAL-WATER ENERGY IN THE CONTAINMENT ATMOSPHERE TO THE TOTAL
 AVAILABLE, (3) THE RATIO OF H2 RECOMBINATION ENERGY TO THE CONTAINMENT ATMOSPHERE TO THE TOTAL
 AVAILABLE, AND (4) THE RATIO OF TOTAL ENERGY IN HEAT SINKS TO TOTAL AVAILABLE ENERGY. ***
 (ANSWER GIVEN ON PAGES 5-11 THROUGH 5-15.)

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C. 20432

ENERGY SOURCE + FIRE + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + REPORT, SAR + SAN
 ONOFRE 1 (PWR) + HEAT SINK

023632
 RESPONSE TO QUESTION 3.1 - ANALYSIS OF CONTAINMENT DURING DESIGN BASIS ACCIDENT
 OMAHA PUBLIC POWER DISTRICT

023632 *CONTINUED*
9 PAGES, 5 FIGURES, PAGE 3.1-1 THRU 3.1-4 OF AMENDMENT 2 TO FT. CALHOUN 1 LICENSE APPLICATION (SUPPLEMENT 2 TO FACILITY DESCRIPTION AND SAFETY ANALYSIS REPORT), SEPT. 11, 1967, EXHIBIT F2 OF DOCKET NO. 50-285, TYPE--PHR, MFG--C.E., AE--GIBBS + HILL

ANALYZE AND EVALUATE PRESSURE AND TEMPERATURE IN CONTAINMENT AS FUNCTION OF TIME DURING DESIGN-BASIS ACCIDENT, CONSIDERING HEAT SINKS AND SOURCES. IDENTIFY SENSITIVITY OF CURVES TO OPERABILITY OF ENGINEERED SAFEGUARD SYSTEMS ABOVE AND BELOW DESIGN REQUIREMENTS. PRESENT DATA SHOWING EFFECTS OF VARIATIONS FROM PREDICTED BEHAVIOR OF PHENOMENA CONTRIBUTING TO CURVES - (3.1.1) CORE METAL-WATER REACTION, ASSUMING EMERGENCY CORE-COOLING SYSTEM IS NOT OPERATING. (3.1.2) PROBABILITY AND EFFECT IF HYDROGEN GENERATED ACCUMULATES AND BURNS AT TIME OF HIGHEST PRESSURE. (3.1.3) GROSS FAILURE IN PRIMARY-TO-SECONDARY-COOLING-SYSTEM BARRIER IN STEAM GENERATOR IN CONJUNCTION WITH DESIGN-BASIS ACCIDENT. SHOW SENSITIVITY OF RESULTS TO TIME WHEN BLOWDOWN STARTS AND TO BLOWDOWN RATE. (ANSWER ON PAGES 3.1-1 THRU 3.1-4, PLUS 5 FIGURES.)

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

ACCIDENT, CONSEQUENCES + CONTAINMENT DESIGN + FAILURE, EQUIPMENT + INTEGRITY + METAL WATER REACTION + REACTOR, PHR + BLOWDOWN + FT. CALHOUN (PHR) + REPORT, PSAR + STEAM GENERATOR + ENGINEERED SAFETY FEATURE + PRESSURE TRANSIENT + THERMAL TRANSIENT

023645
RESPONSE TO QUESTION 4.9 - ACCUMULATION OF HYDROGEN IN CONTAINMENT BUILDING
OMAHA PUBLIC POWER DISTRICT
4 PAGES, 2 REFERENCES, PAGE 4.9-1 THRU 4.9-4 OF AMENDMENT 2 TO FT. CALHOUN 1 LICENSE APPLICATION (SUPPLEMENT 2 TO FACILITY DESCRIPTION AND SAFETY ANALYSIS REPORT), SEPT. 11, 1967, EXHIBIT F2 OF DOCKET NO. 50-285, TYPE--PHR, MFG--C.E., AE--GIBBS + HILL

(1) WHAT FRACTION OF HYDROGEN MAY ACCUMULATE IN CONTAINMENT BUILDING DURING DESIGN-BASIS ACCIDENT DUE TO RADIOLYTIC DECOMPOSITION OF COOLING WATER. EVALUATE POSSIBILITY HYDROGEN COULD BURN. (2) HOW LONG AFTER A DESIGN-BASIS ACCIDENT WOULD WATER BECOME SUBCOOLED WITH ONE, TWO, OR THREE HIGH-PRESSURE PUMPS OPERATIVE. (ANSWER) (1) ASSUMING CONTINUOUS H EVOLUTION FOR THE PERIOD IN WHICH BOILING IN THE CORE OCCURS, A 2.93% H CONCENTRATION IS CALCULATED. AFTER BOILING STOPS, 2.96% IS ATTAINED. (2) SUBCOOLING TIME FOR ONE PUMP IS 1833 HR, 2 - 861, AND 3 - 667 HR.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

CONTAINMENT, HIGH PRESSURE + ACCIDENT, LOSS OF COOLANT + REACTOR, PHR + RADIOLYTIC GAS + FT. CALHOUN (PHR) + REPORT, PSAR + CORE REFLOODING SYSTEM + SUBCOOLING

024546
RESPONSE TO QUESTION 1.4 - METAL-WATER REACTION
WISCONSIN ELECTRIC POWER CO. + WISCONSIN MICHIGAN POWER CO.
4 PAGES, 2 FIGURES, 1 TABLE, PAGE 1.4-1 AND 1.4-2 OF FIRST SUPPLEMENT TO POINT BEACH APPLICATION FOR LICENSE, JAN. 11, 1968, DOCKET NO. 50-301, TYPE--PHR, MFG--WEST., AE--BECHTEL

WITH REGARD TO POST LOSS-OF-COOLANT ACCIDENT ENERGY RELEASE TO THE CONTAINMENT, SUBMIT YOUR EVALUATION OF THE CAPABILITY OF THE CONTAINMENT TO DISSIPATE ENERGY RELEASE FROM ZR-H₂O REACTION WITHOUT EXCEEDING DESIGN PRESSURE. (ANSWER) A REACTION RATE OF 0.051/SEC WAS ASSUMED. ONE FIGURE SHOWS CONTAINMENT CAPABILITY WHERE H BURNS AS PRODUCED, AND ONE WHERE H ACCUMULATES AND IGNITES AT END OF PERIOD. WITH NO SAFEGUARDS. CONTAINMENT PRESSURE IS 60 PSIG IN 550 SEC. FOR DELAYED IGNITION, 350 SEC.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

CONTAINMENT DESIGN + CONTAINMENT, HIGH PRESSURE + ENERGY SOURCE + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PHR + WATER + ZIRCONIUM + IGNITION + REPORT, PSAR + SYSTEM CAPABILITY + POINT BEACH 2 (PHR)

024724
RESPONSE TO QUESTION 6.5 - CONTROL OF OXYGEN IN WASTE GAS
VIRGINIA ELECTRIC POWER CO.
2 PAGES, PAGE 6.5-1 AND -2 OF AMENDMENT 7 TO THE LICENSE APPLICATION FOR SURRY 1 AND 2, JAN. 4, 1968, DOCKET NO. 50-280/281, TYPE--PHR, MFG--WEST., AE--STONE + WEBSTER

DESCRIBE HOW THE OXYGEN CONTENT IN THE WASTE GASES WILL BE CONTROLLED. COULD A SINGLE FAILURE IN THE SYSTEM RESULT IN COMBUSTIBLE MIXTURES OF HYDROGEN AND OXYGEN IN THE WASTE GASES. (ANSWER) OXYGEN IS ADDED UPSTREAM OF RECOMBINERS AND REGULATED TO MAINTAIN SMALL PERCENTAGE IN EXIT GASES. NITROGEN ALSO ADDED TO DILUTE GAS FROM STRIPPER. IF H LEVEL APPROACHES SETPOINT, ADDITIONAL N WILL BE ADDED, VALVES SHUT OFF FROM STRIPPER, AND ALARMS IN CONTROL ROOM.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

EFFLUENT + OXYGEN + REACTOR, PHR + WASTE TREATMENT, GAS + RADIOLYTIC GAS + COOLANT PURIFICATION SYSTEM + REPORT, PSAR + SURRY 1 (PHR) + ADDITIVE + RECOMBINERS

024876
RESPONSE TO QUESTION 5.5--POST ACCIDENT HYDROGEN FORMATION
ARKANSAS POWER AND LIGHT COMPANY

026876 *CONTINUED*
3 PAGES, 1 FIGURE, 1 REFERENCE OF SUPPLEMENT 3 TO RUSSELLVILLE APPLICATION FOR LICENSES. (DOCKET 50-313).
MAY 3, 1968.

DISCUSS BOTH THE TIME-DEPENDENT RADIOLYTIC AND CHEMICAL HYDROGEN FORMATION UNDER POSTACCIDENT CONDITIONS FOR THE EMERGENCY CORE-COOLING SOLUTION. INCLUDE AN ESTIMATE OF TOTAL ACTIVITY IN BOTH THE CORE AND IN THE LIQUID, AND OF THE TOTAL EXPECTED IRRADIATION DOSE CHARACTERISTICS. INDICATE THE EXTENT OF HYDROGEN FORMATION BY CHEMICAL REACTION WITH EXPOSED REACTOR MATERIALS. *** (ANSWER) RADIOLYTIC HYDROGEN GENERATION WILL BE MEASURED. POSSIBILITY OF GENERATING HYDROGEN BY CHEMICAL ACTION IS BEING INVESTIGATED.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VIRGINIA, 22151.
\$3.00 COPY, \$0.65 MICROFICHE

CHEMICAL REACTION + REACTOR, PWR + COOLANT CHEMISTRY + RADIOLYTIC GAS + REPORT, PSAR + CORE REFLOODING SYSTEM + ARKANSAS NUCLEAR 1 (PWR)

027175
RESPONSE TO QUESTION III.11--PRIMARY COOLANT HYDROGEN INVENTORY
NIAGARA MOHAWK POWER CORPORATION
1 PAGE, PAGE III-25 OF FIRST SUPPLEMENT (ALTO AMENDMENT 5, EXHIBIT 0-3) TO THE NINE MILE POINT PSAR. (DOCKET 50-220) MAY 1968. TYPE--BWR, MFG--G.E., AE--NIAGARA MOHAWK

WHAT IS THE HYDROGEN INVENTORY IN THE PRIMARY COOLANT DURING NORMAL OPERATION. SPATIAL DISTRIBUTIONS SHOULD BE INDICATED, I.E., CONCENTRATION IN THE PRESSURE VESSEL, HOT WELL, RATE OF DISCHARGE OUT THE STACK. *** (ANSWER) AT 1779 MWTH, 22.24 LB/HR OF HYDROGEN IS GENERATED AND DISCHARGED UP THE STACK. COOLANT CONCENTRATION IS 0.0375 PPM, AND STEAM CONCENTRATION IN HOT WELL IS 3.18 PPM. INVENTORY IS 0.017 LB.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VIRGINIA, 22151.
\$3.00 COPY, \$0.65 MICROFICHE

REACTOR, BWR + NINE MILE POINT (BWR) + REPORT, SAR + RADIOLYTIC GAS + COOLANT QUALITY

020507
RESPONSE TO QUESTION 13.10 - RECOMBINER PERFORMANCE
INDIANA AND MICHIGAN ELECTRIC COMPANY
11 PAGES, 2 TABLES, 1 FIGURE, PP. 1-11 OF AMENDMENT 11 TO COOK 1 AND 2 LICENSE APPLICATION, NOVEMBER 27, 1968, DOCKET 50-315/316

PROVIDE DESIGN OF HYDROGEN-OXYGEN RECOMBINER WITH ANALYSIS OF PERFORMANCE. *** (ANSWER IS ALL NEW INFORMATION) AFTER LOCA HYDROGEN MAY BE GENERATED FROM RADIOLYSIS, 2R-WATER, REACTION, AND REACTION OF ALKALINE SPRAY SOLUTION WITH AL. RECOMBINER SHOULD MAINTAIN SAFE CORE OF H IN CONTAINMENT. BASIS OF DESIGN AND DESCRIPTION GIVEN.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (108 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

ALUMINUM + CHEMICAL REACTION + CONTAINMENT DESIGN + DESIGN CRITERIA + METAL WATER REACTION + REACTOR, PWR + ZIRCONIUM + RADIOLYTIC GAS + PRESSURE, INTERNAL + SYSTEM DESCRIPTION + REPORT, PSAR + SYSTEM OPERABILITY IN ACCIDENT + CONTAINMENT, ICE CONDENSER + ENGINEERED SAFETY FEATURE + COOK 1 (PWR) + COOK 2 (PWR) + RECOMBINERS

031666
REPLY TO QUESTION 7.13 - HYDROGEN FORMATION - RADIOLYTIC AND CHEMICAL
INDIANA AND MICHIGAN ELECTRIC COMPANY
5 PAGES, 1 FIGURE, PP. 7.13-1 THRU -5 OF AMENDMENT 2 (VOL. IV OF PSAR) TO COOK LICENSE APPLICATION, JUNE 6, 1968, DOCKETS 50-315/316, TYPE--PWR, MFG--WEST., AE--UTILITY

PROVIDE ANALYSIS OF HAZARD FROM RADIOLYTIC AND CHEMICAL HYDROGEN FORMATION UNDER POST-ACCIDENT CONDITIONS. DISCUSS EFFECT THAT INERTING MIGHT HAVE. INCLUDE ESTIMATE OF ALPHA, BETA, AND GAMMA DOSE IN BOTH CORE REGION AND LIQUID. INDICATE EXTENT OF HYDROGEN FORMATION BY CHEMICAL REACTION WITH EXPOSED REACTOR AND CONTAINMENT MATERIALS. DISCUSS SENSITIVITY OF CALCULATION TO LENGTH OF TIME THAT BOILING IS ASSUMED TO CONTINUE IN THE CORE. *** (ANSWER ON PP. 7.13-1 THRU -5.)

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00 COPY, \$0.65 MICROFICHE

CHEMICAL REACTION + ACCIDENT, CONSEQUENCES + REACTOR, PWR + REACTOR COOLANT + HAZARDS ANALYSIS + RADIOLYTIC GAS + REPORT, PSAR + COOK 1 (PWR) + BOILING + COOK 2 (PWR)

031934
RESPONSE TO QUESTION 1 - RADIOLYTIC GAS
NEW YORK STATE ELECTRIC AND GAS COMPANY
3 PAGES, PP. 1-1 THRU -3 OF AMENDMENT 4 TO BELL LICENSE APPLICATION, MARCH 3, 1969, DOCKET 50-319, TYPE--BWR, MFG--G.E., AE--UEAC

SUMMARIZE RESULTS OF ANALYTICAL AND EXPERIMENTAL WORK COMPLETED ON RADIOLYTIC DECOMPOSITION OF WATER, AND INDICATE AREAS WHICH ARE NOT YET COMPLETE. *** ANSWER ON PP. 1-1 THRU -3.

031934 *CONTINUED*
 AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151, \$3.00
 COPY, \$0.65 MICROFICHE

REACTOR, BWR + RADIOLYTIC GAS + BELL (BWR)

031935
 RESPONSE TO QUESTION 2 - R AND D ON RADIOLYTIC DECOMPOSITION OF WATER
 NEW YORK STATE ELECTRIC AND GAS COMPANY
 2 PAGES, PP. 2-1 AND 2-2 OF AMENDMENT 4 TO BELL LICENSE APPLICATION, MARCH 3, 1969, DOCKET 50-319, TYPE--BWR,
 MFG--G.E., AE--UE+C

DISCUSS R AND D AREAS NOT YET COMPLETED ON RADIOLYTIC DECOMPOSITION OF WATER. *** (ANSWER)
 RESULTS SHOULD BE AVAILABLE BY LATE 1969 OR EARLY 1970.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151, \$3.00
 COPY, \$0.65 MICROFICHE

REACTOR, BWR + RADIOLYTIC GAS + R AND D PROGRAM + BELL (BWR)

031937
 RESPONSE TO QUESTION 4 - RADIOLYTIC GAS-REMOVAL EQUIPMENT
 NEW YORK STATE ELECTRIC AND GAS COMPANY
 6 PAGES, PP. 4-1 THRU -6 OF AMENDMENT 4 TO BELL LICENSE APPLICATION, MARCH 3, 1969, DOCKET 50-319, TYPE--BWR,
 MFG--G.E., AE--UE+C

WILL EQUIPMENT BE NEEDED TO MITIGATE PRESENCE OF RADIOLYSIS PRODUCTS. *** ANSWER ON PP. 4-1 THRU -
 6. SEE ALSO REPORT APED-5654, WHICH GIVES REASONS WHY INERTING DOES NOT PROVIDE ANY ADDITIONAL
 ASSURANCE AGAINST A FLAMMABLE MIXTURE.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151, \$3.00
 COPY, \$0.65 MICROFICHE

REACTOR, BWR + RADIOLYTIC GAS + BELL (BWR)

033675
 RESPONSE TO QUESTION 2.2-A - RADIOLYTIC HYDROGEN HAZARD
 JERSEY CENTRAL POWER AND LIGHT + METROPOLITAN EDISON COMPANY
 8 PAGES, 7 FIGURES, PAGES 2.2-A-1 THRU -8 OF THREE MILE ISLAND 2, PSAR, VOL. 4, MARCH 10, 1969, DOCKET 50-320,
 TYPE--PWR, MFG--B&W, AE--BURNS + ROE

DESCRIBE RESULTS OF ANALYSIS OF POTENTIAL HAZARD THAT MIGHT RESULT FROM RADIOLYTIC AND CHEMICAL
 HYDROGEN FORMATION UNDER POSTACCIDENT CONDITIONS. DISCUSS EFFECT THAT INERTING MIGHT HAVE.
 INCLUDE ESTIMATE OF TOTAL ALPHA, BETA, AND GAMMA DOSE IN BOTH CORE REGION AND IN SPRAY WATER.
 INDICATE EXTENT OF HYDROGEN FORMATION BY CHEMICAL REACTION WITH EXPOSED REACTOR AND CONTAINMENT
 MATERIALS. ***ANSWER ON PAGES 2.2-A-1 THRU -8 PLUS 7 FIGURES.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151, \$3.00
 COPY, \$0.65 MICROFICHE

REACTOR, PWR + HAZARDS ANALYSIS + RADIOLYTIC GAS + REPORT, PSAR + THREE MILE ISLAND 2 (PWR)

033767
 RESPONSE TO AEC QUESTION 2.0 - RADIOLYTIC DECOMPOSITION OF WATER
 NIAGARA MOHAWK CORPORATION
 2 PAGES, PP. 2.0-RADIOLYTIC DECOMPOSITION -1 AND 2 OF SUPPLEMENT 2 TO EASTON PSAR, MARCH 1968, DOCKET 50-300,
 TYPE--BWR, MFG--G.E., AE--BURNS + ROE

DISCUSS RADIOLYTIC DECOMPOSITION AND HYDROGEN GENERATION FOLLOWING LOCA. *** ANSWER ON PAGE 2,
 RADIOLYTIC DECOMPOSITION 1 AND 2.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

REACTOR, BWR .CCIDENT, LOSS OF COOLANT + REACTOR COOLANT + RADIOLYTIC GAS + REPORT, PSAR + EASTON (BWR) +
 RADIATION EFFECT

035088
 RESPONSE TO QUESTION 6A-16 -- RADIOLYTIC HYDROGEN FROM LOCA
 SACRAMENTO MUNICIPAL UTILITY DISTRICT
 2 PAGES, PG. 6A-18 AND -19 OF AMENDMENT 2 TO RANCHO SECO PSAR, APRIL 15, 1968, DOCKET 50-312, TYPE--PWR, MFG--
 B&W, AE--BECHTEL

DISCUSS BOTH THE TIME-DEPENDENT RADIOLYTIC AND CHEMICAL HYDROGEN FORMATION UNDER POST-ACCIDENT
 CONDITIONS FOR THE CORE SPRAY SOLUTION. INCLUDE AN ESTIMATE OF TOTAL ACTIVITY IN BOTH THE CORE
 AND IN THE LIQUID, AND OF THE TOTAL EXPECTED IRRADIATION DOSE CHARACTERISTICS. INDICATE THE
 EXTENT OF HYDROGEN FORMATION BY CHEMICAL REACTION (CORROSION) WITH EXPOSED REACTOR MATERIALS.

035088 *CONTINUED*
 *** ANSWER ON PAGES 6A-18 THRU -21.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

ACTIVITY BUILDUP + ACCIDENT, CONSEQUENCES + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + CORROSION + RADIOLYTIC
 GAS + REPORT, PSAR + RANCHO SECO (PWR)

035297
 RESPONSE TO QUESTION 4.18 - FILTER FAILURE FROM HYDROGEN EXPLOSION
 NORTHERN STATES POWER COMPANY
 AMENDMENT 14 TO MONTICELLO LICENSE APPLICATION, MAY 15, 1969, DOCKET 50-263, TYPE--BWR, MFG--G.E., AE--BECHTEL

SINCE THE OFF-GAS, HIGH EFFICIENCY, PARTICULATE FILTERS MOST LIKELY WOULD NOT SURVIVE A HYDROGEN
 EXPLOSION, CALCULATE THE RADIOLOGICAL CONSEQUENCES. CONSIDER THE FILTERS TO HAVE ACCUMULATED THE
 MAXIMUM AMOUNT OF ACTIVATION PRODUCTS, I.E., FOR THE EXPECTED END OF FILTER-LIFE. ALSO, PROVIDE
 SUFFICIENT INFORMATION TO SUPPORT YOUR CHOICE OF THE SOURCE TERM FOR ACCUMULATED PRODUCTS ON THE
 FILTERS. *** ANALYSIS NOT YET COMPLETE - TO BE SUBMITTED LATER.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

REACTOR, BWR + DOSE + FAILURE, EQUIPMENT + EXPLOSION + FISSION PRODUCT RELEASE + REPORT, SAR + FILTER,
 ABSOLUTE + FILTER SAFETY EVALUATION + WASTE DISPOSAL, GAS + RADIOLYTIC GAS + OFF GAS + MONTICELLO (BWR) + OFF
 SITE

035298
 RESPONSE TO QUESTION 4.1C - HYDROGEN EXPLOSION OFF GAS SYSTEM
 NORTHERN STATES POWER COMPANY
 AMENDMENT 14 TO MONTICELLO LICENSE APPLICATION, MAY 15, 1969, DOCKET 50-263, TYPE--BWR, MFG--G.E., AE--BECHTEL

ALL SUBSYSTEMS OF THE OFF-GAS SYSTEM, INCLUDING THE STANDBY GAS TREATMENT SYSTEM, TERMINATE AT THE
 BASE OF THE PLANT STACK. BECAUSE OF THIS INTERCONNECTION, EVALUATE WHETHER A HYDROGEN EXPLOSION
 IN THE AIR EJECTOR SUBSYSTEM COULD CREATE SUFFICIENT BACK PRESSURE TO CAUSE ANY DAMAGE TO THE
 DILUTION FANS AND STANDBY GAS TREATMENT SYSTEM. *** ANALYSIS NOT YET COMPLETE - TO BE
 SUBMITTED LATER.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

REACTOR, BWR + EXPLOSION + REPORT, SAR + STACK + WASTE TREATMENT, GAS + RADIOLYTIC GAS + OFF GAS + MONTICELLO
 (BWR)

035910
 RESPONSE TO QUESTION 2-4 - RADIOLYTIC DECOMPOSITION OF COOLANT
 CONSOLIDATED EDISON CO. OF NEW YORK, INC.
 5 PAGES, 3 FIGURES, PAGES 2(2-4)-1 THRU -5 OF AMENDMENT 1 TO INDIAN POINT 3 LICENSE APPLICATION (PSAR
 SUPPLEMENT 1), AUGUST 29, 1968, DOCKET 50-286, TYPE--PWR, MFG--WEST., AE--UNITED ENGR.

A POTENTIAL SOURCE OF HYDROGEN FOLLOWING A PRIMARY PIPING FAILURE COULD BE RADIOLYTIC
 DECOMPOSITION OF THE SAFETY-INJECTION WATER INITIATED BY THE DECAY ENERGY OF THE CORE. DISCUSS
 THE MAGNITUDE OF THE GASES FORMED BY THIS PROCESS AND ITS POTENTIAL EFFECT ON CONTAINMENT
 PRESSURE AND CONCENTRATION OF FREE HYDROGEN IN THE CONTAINMENT VESSEL. ***ANSWER ON PAGES 2(2-4)-
 1 THRU -5.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151, \$3.00
 COPY, \$0.65 MICROFICHE

CORE SPRAY + REACTOR, PWR + RADIOLYTIC GAS + REPORT, PSAR + INDIAN POINT 3 (PWR)

036723
 RESPONSE TO QUESTION 3 - HYDROGEN GENERATION FROM LOCA
 CAROLINA POWER AND LIGHT COMPANY
 1 PAGE, PAGE 3-1 OF AMENDMENT 9 TO ROBINSON 2 LICENSE APPLICATION, AUGUST 26, 1969, DOCKET 50-261, TYPE--PWR,
 MFG--WEST., AE--EBASCO

ANALYZE THE EFFECTS OF RADIOLYTIC DECOMPOSITION OF WATER AND SUBSEQUENT HYDROGEN GENERATION
 FOLLOWING A LOSS-OF-COOLANT ACCIDENT. DESCRIBE ANY PROVISIONS THAT WILL BE MADE TO COPE WITH
 THIS EVENT. *** (ANSWER) AN EVALUATION HAS BEEN MADE TO DETERMINE THE AMOUNTS OF HYDROGEN THAT
 COULD EXIST IN THE CONTAINMENT FOLLOWING A LOSS OF COOLANT ACCIDENT AND TO DEVELOP A METHOD OF
 CONTROLLING THE HYDROGEN CONCENTRATION BY A CONTROLLED CONTAINMENT VENTING PROCEDURE.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

CHEMICAL REACTION + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + REPORT, SAR + RADIOLYTIC GAS + ROBINSON 2 (PWR)

037090
 RESPONSE TO QUESTION 14.5 - CONTAINMENT HYDROGEN ACCUMULATION
 CONSUMERS POWER COMPANY (PWR)
 50255-19 +. 7 PAGES, 3 FIGURES, PG 14.5-1 THROUGH -7 OF AMENDMENT 15 TO PALISADES POINT LICENSE APPLICATION,
 AUGUST 16, 1969, DOCKET 50-255, TYPE--PWR, MFG--COMB., AE--BECHTEL

PROVIDE YOUR ASSESSMENT OF THE PROBLEM OF HYDROGEN ACCUMULATION IN THE CONTAINMENT BUILDING
 FOLLOWING A LOSS-OF-COOLANT ACCIDENT DUE TO METAL-WATER REACTIONS AND THAT GENERATED BY THE
 RADIOLYTIC DECOMPOSITION OF COOLING WATER. HOW DO YOU PROPOSE TO CONTROL POST-ACCIDENT
 ACCUMULATION OF HYDROGEN IN THE PALISADES CONTAINMENT? *** ANSWER ON PG 14.5-1 THROUGH -7 PLUS
 3 FIGURES.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

CONTAINMENT, PRESSURE VENTING + DILUTION + METAL WATER REACTION + REACTOR, PWR + RADIOLYTIC GAS + PALISADES
 (PWR) + REPORT, PSAR

037666
 RESPONSE TO QUESTION 9.3 - HYDROGEN EXPLOSION IN OFF-GAS PIPING
 IOWA ELECTRIC LIGHT AND POWER
 2 PAGES, PG 9.3-1 AND -2 OF AMENDMENT 5 TO DUANE ARNOLD LICENSE APPLICATION, SEPT. 30, 1969, DOCKET 50-331,
 TYPE--BWR, MFG--G.E., AE--COMMONWEALTH ASSOC.

EVALUATE THE RADIOLOGICAL CONSEQUENCES OF A HYDROGEN EXPLOSION IN THE OFF-GAS PIPING AND THE
 RESULTING DAMAGE TO THE PARTICULATE FILTERS WITH SIMULTANEOUS FAILURE OF THE ISOLATION VALVE.
 *** ANSWER ON PG 9.3-1 AND -2.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

REACTOR, BWR + EXPLOSION + FISSION PRODUCT RELEASE + OFF GAS + REPORT, PSAR + ARNOLD (BWR) + PIPES AND PIPE
 FITTINGS

037724
 RESPONSE TO QUESTION 2.2-A - RADIOLYTIC AND CHEMICAL HYDROGEN FROM LOCA
 JERSEY CENTRAL POWER AND LIGHT
 1 PAGE, PG 2.2-A-1 OF AMENDMENT 5 TO OYSTER CREEK 2 LICENSE APPLICATION, DEC. 2, 1968, DOCKET 50-320, TYPE--
 PWR, MFG--B&W, AE--BURNS AND ROE

DESCRIBE THE RESULTS OF YOUR ANALYSIS OF THE POTENTIAL HAZARD THAT MIGHT RESULT FROM RADIOLYTIC
 AND CHEMICAL HYDROGEN FORMATION UNDER POST-ACCIDENT CONDITIONS. DISCUSS THE EFFECT THAT INERTING
 MIGHT HAVE ON THIS PROBLEM. INCLUDE AN ESTIMATE OF THE TOTAL ALPHA, BETA AND GAMMA DOSE IN BOTH
 THE CORE REGION AND IN THE SPRAY WATER. INDICATE THE EXTENT OF HYDROGEN FORMATION BY CHEMICAL
 REACTION WITH EXPOSED REACTOR AND CONTAINMENT MATERIALS. *** (ANSWER) THE AMOUNT OF HYDROGEN
 FORMED WITHIN THE REACTOR BUILDING FOLLOWING A LOSS OF COOLANT ACCIDENT IS PRESENTLY BEING
 ANALYZED. THIS ANALYSIS IS NOT YET COMPLETE AND WILL BE SUBMITTED AT A LATER DATE.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + RADIOLYTIC GAS + REPORT, PSAR + THREE MILE ISLAND 2 (PWR)

038447
 RESPONSE TO QUESTION 5.17 - HYDROGEN ACCUMULATION DURING LOCA
 LONG ISLAND LIGHTING COMPANY, HICKSVILLE, NEW YORK
 50322-8 +. 9 PAGES, PG A5-75 THRU -83 OF AMENDMENT 5 TO SHOREHAM 1 LICENSE APPLICATION, APRIL 18, 1969,
 DOCKET 50-322, TYPE--BWR, MFG--G.E., AE--STONE + WEBSTER

PROVIDE YOUR ASSESSMENT OF THE PROBLEM OF HYDROGEN ACCUMULATION IN THE PRIMARY CONTAINMENT
 FOLLOWING A LOSS-OF-COOLANT ACCIDENT DUE TO A METAL-WATER REACTION AND/OR THAT GENERATED BY THE
 RADIOLYTIC DECOMPOSITION OF COOLING WATER. *** ANSWER ON PG A5-75 THRU -83.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + RADIOLYTIC GAS + REPORT, PSAR + SHOREHAM
 (BWR)

038468
 RESPONSE TO QUESTION 7.9 - CONTAINMENT INERTING
 LONG ISLAND LIGHTING COMPANY, HICKSVILLE, NEW YORK
 50322-8 +. 1 PAGE, PG A5-127 OF AMENDMENT 5 TO SHOREHAM 1 LICENSE APPLICATION, APRIL 18, 1969, DOCKET 50-322,
 TYPE--BWR, MFG--G.E., AE--STONE + WEBSTER

YOU STATE THAT PURGING OF THE PRIMARY CONTAINMENT WILL BE PERFORMED UNTIL THE OXYGEN CONTENT IS
 REDUCED TO LESS THAN FIVE PERCENT. DESCRIBE AND EVALUATE THE INSTRUMENTATION TO BE PROVIDED TO
 MONITOR AND CONTROL THE INERTING SYSTEM. *** (ANSWER) THE NEED FOR THE INCORPORATION OF THE

038468 *CONTINUED*

PRIMARY CONTAINMENT ATMOSPHERIC CONTROL SYSTEM IN ORDER TO MAINTAIN AN ATMOSPHERE OF LOW OXYGEN CONTENT WITHIN THE PRIMARY CONTAINMENT IS NOT NECESSARY AS DESCRIBED IN GE TOPICAL REPORTS GE APED 5454 AND GE APED 5654.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

REACTOR, BWR + METAL WATER REACTION + INSTRUMENT, CONTROL + RADIOLYTIC GAS + CONTAINMENT ATMOSPHERE, INERT + REPORT, PSAR + SHOREHAM (BWR)

040150

RESPONSE TO QUESTION 14.2A - HYDROGEN GENERATION IN LOCA

IOWA ELECTRIC LIGHT AND POWER COMPANY

50331-10 +. 3 PAGES, 3 REFERENCES, PG 14.2A-1 THRU -3 OF AMENDMENT 4 TO DUANE ARNOLD LICENSE APPLICATION, AUGUST 18, 1969, DOCKET 50-331, TYPE--BWR, MFG--G.E., AE--COMMONWEALTH ASSOC.

PROVIDE A SUMMARY OF THE RESULTS OF APPLICABLE ANALYTICAL AND EXPERIMENTAL WORK COMPLETED TO DATE ON RADIOLYTIC DECOMPOSITION OF WATER, AND INDICATE AREAS WHICH ARE NOT YET COMPLETE. *** ANSWER ON PG 14.1A-1 THRU -3.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + RADIOLYTIC GAS + REPORT, PSAR + ARNOLD (BWR)

040151

RESPONSE TO QUESTION 14.2B - HYDROGEN GENERATION FROM LOCA

IOWA ELECTRIC LIGHT AND POWER COMPANY

50331-10 +. 2 PAGES, 14.2B-1 AND -2 OF AMENDMENT 4 TO DUANE ARNOLD LICENSE APPLICATION, AUGUST 18, 1969, DOCKET 50-331, TYPE--BWR, MFG--G.E., AE--COMMONWEALTH ASSOC.

PROVIDE A DISCUSSION OF THE R AND D EFFORT CONTEMPLATED WHICH WOULD PROVIDE INFORMATION ON THE AREAS WHICH ARE NOT YET COMPLETE CONCERNING RADIOLYSIS OF WATER DURING A LOSS-OF-COOLANT ACCIDENT. *** (ANSWER) AN ANALYTICAL EFFORT HAS BEEN UNDERWAY SINCE LATE 1968. THE EXPERIMENTAL PROGRAM HAS BEEN STARTED. RESULTS SHOULD BECOME AVAILABLE BY MIDDLE 1970.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + RADIOLYTIC GAS + REPORT, PSAR + R AND D PROGRAM + ARNOLD (BWR)

040152

RESPONSE TO QUESTION 14.2C - HYDROGEN GENERATION FROM LOCA

IOWA ELECTRIC LIGHT AND POWER COMPANY

50331-10 +. 3 PAGES, 1 FIGURE, PG 14.2C-1 THRU -3 OF AMENDMENT 4 TO DUANE ARNOLD LICENSE APPLICATION, AUGUST 18, 1969, DOCKET 50-331, TYPE--BWR, MFG--G.E., AE--COMMONWEALTH ASSOC.

PROVIDE AN EVALUATION OF THE SAFETY SIGNIFICANCE OF RADIOLYSIS PRODUCTS IN THE CONTAINMENT VESSEL AFTER AN ACCIDENT. INCLUDE THE BUILDUP OF RADIOLYSIS PRODUCTS AS A FUNCTION OF TIME, THE EFFECTS OF METAL-WATER REACTIONS, THE EFFECTS OF ADDITIVES TO THE SUPPRESSION POOL WATER. *** ANSWER ON PG 14.2C-1 THRU -3.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + RADIOLYTIC GAS + REPORT, PSAR + ARNOLD (BWR)

040153

RESPONSE TO QUESTION 14.2D - HYDROGEN GENERATOR FROM LOCA

IOWA ELECTRIC LIGHT AND POWER COMPANY

50331-10 +. 5 PAGES, 1 FIGURE, 2 REFERENCES, PG 14.2D-1 THRU -5 OF AMENDMENT 4 TO DUANE ARNOLD LICENSE APPLICATION, AUGUST 18, 1969, DOCKET 50-331, TYPE--BWR, MFG--G.E., AE--COMMONWEALTH ASSOC.

PROVIDE THE CRITERION WHICH WILL BE USED TO DETERMINE WHETHER EQUIPMENT TO MITIGATE THE PRESENCE OF RADIOLYSIS PRODUCTS WILL BE REQUIRED AND THE DESIGN OF THIS EQUIPMENT. *** (ANSWER) NO EQUIPMENT DESIGN HAS YET BEEN DETERMINED.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + RADIOLYTIC GAS + REPORT, PSAR + ARNOLD (BWR)

040561

RESPONSE TO QUESTION 13.10 - HYDROGEN RECOMBINER

INDIANA AND MICHIGAN ELECTRIC COMPANY

50315-9 +. 1 PAGE, PG 13.10 OF AMENDMENT 5 TO COOK 1 AND 3 LICENSE APPLICATION, AUGUST 28, 1968, DOCKETS 50-

040561 *CONTINUED*
315/316, TYPE--PWR, MFG--WEST., AE--UTILITY

PROVIDE A PRELIMINARY DESIGN OF THE HYDROGEN-OXYGEN RECOMBINER WITH ANALYSES TO SHOW THAT IT WILL PERFORM ITS INTENDED FUNCTION AND IT WILL NOT AGGRAVATE THE CONSEQUENCES OF ANY ACCIDENT. *** (ANSWER) THE PRELIMINARY DESIGN FOR APPLICATION TO THE ICE CONDENSER CONTAINMENT IS NOT SUFFICIENTLY ADVANCED TO PERMIT A PERFORMANCE ANALYSIS AT THIS TIME.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

REACTOR, PWR + REPORT, PSAR + COOK 1 (PWR) + COOK 2 (PWR) + RECOMBINERS

040875
RESPONSE TO QUESTION 17.7 - CONTAINMENT CAPABILITY FOR DELAYED RECOMBINATION OF HYDROGEN
INDIANA AND MICHIGAN ELECTRIC COMPANY
50315-10 +, 3 PAGES, PG 17.7-1 THRU -3 OF AMENDMENT 6 TO COOK 1 AND 2 LICENSE APPLICATION, SEPTEMBER 13, 1968,
DOCKET 50-315/316, TYPE--PWR, MFG--WEST., AE--UTILITY

AS REQUESTED BY OUR EARLIER QUESTION 9.1, AN ANALYSIS IS REQUIRED OF THE CONTAINMENT CAPABILITY UNDER CONDITIONS OF DELAYED RECOMBINATION OF HYDROGEN INCLUDING BOTH INERTED AND NON-INERTED CASES. *** ANSWER ON PG 17.7-1 THRU -3.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

CHEMICAL REACTION + EXPLOSION + FIRE + METAL WATER REACTION + REACTOR, PWR + CONTAINMENT INTEGRITY +
RADIOLYTIC GAS + CONTAINMENT ATMOSPHERE, INERT + REPORT, PSAR + COOK 1 (PWR) + COOK 2 (PWR)

040987
RESPONSE TO QUESTION 6.2.1 - RESULTS OF WORK ON THE RADIOLYSIS OF WATER
CAROLINA POWER AND LIGHT COMPANY
DOCKET 50324-9 +, 4 PAGES, 3 REFERENCES, PG 6.2.1-1 THRU -4 OF BRUNSWICK 1 AND 2 PSAR SUPPLEMENT 4, MARCH 7,
1969, DOCKET 50-324/325, TYPE--BWR, MFG--G.E., AE--UE+C

SUMMARIZE THE RESULTS OF APPLICABLE ANALYTICAL AND EXPERIMENTAL WORK COMPLETED TO DATE ON RADIOLYTIC DECOMPOSITION OF WATER, AND INDICATE AREAS WHICH ARE NOT YET COMPLETE. *** ANSWER ON PAGES 6.2.1-1 THRU -4.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

REACTOR, BWR + EXPLOSION + ACCIDENT, LOSS OF COOLANT + REACTOR COOLANT + RADIOLYTIC GAS + REPORT, PSAR +
BRUNSWICK 1 (BWR) + BRUNSWICK 2 (BWR)

040988
RESPONSE TO QUESTION 6.2.2 - R AND D WORK (CONTEMPLATED) ON RADIOLYSIS OF WATER
CAROLINA POWER AND LIGHT COMPANY
DOCKET 50324-9 +, 2 PAGES, PG 6.2.2-1 AND -2 OF BRUNSWICK 1 AND 2 PSAR SUPPLEMENT 4, MARCH 7, 1969, DOCKET 50-
324/325, TYPE--BWR, MFG--G.E., AE--UE+C

DISCUSS THE R-AND-D EFFORT CONTEMPLATED WHICH WOULD PROVIDE INFORMATION ON THE AREAS WHICH ARE NOT YET COMPLETED. INDICATE THE TIME SCHEDULE OF THIS WORK. *** ANSWER ON PG 6.2.2-1 THRU -3.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

REACTOR, BWR + EXPLOSION + ACCIDENT, LOSS OF COOLANT + REACTOR COOLANT + RADIOLYTIC GAS + REPORT, PSAR + R AND
D PROGRAM + BRUNSWICK 1 (BWR) + BRUNSWICK 2 (BWR)

040989
RESPONSE TO QUESTION 6.2.3(A) - SAFETY IMPLICATIONS OF RADIOLYSIS AFTER LOCA
CAROLINA POWER AND LIGHT COMPANY
DOCKET 50324-9 +, 3 PAGES, 1 FIGURE, PG 6.2.3(A)-1 THRU -3 OF BRUNSWICK 1 AND 2 PSAR SUPPLEMENT 4, MARCH 7,
1969, DOCKET 50-324/325, TYPE--BWR, MFG--G.E., AE--UE+C

BASED ON PRESENTLY AVAILABLE OR ANTICIPATED INFORMATION, PROVIDE AN EVALUATION OF THE SAFETY SIGNIFICANCE OF RADIOLYSIS PRODUCT IN THE BRUNSWICK CONTAINMENT VESSEL, AFTER AN ACCIDENT. INCLUDE BUILDUP OF RADIOLYSIS PRODUCTS AS A FUNCTION OF TIME, THE POTENTIAL FOR AND CONSEQUENCES OF RECOMBINATION, AND THE EFFECT OF CONTAINMENT INERTING. *** ANSWER ON PG 6.2.3(A)-1 THRU -3.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

REACTOR, BWR + EXPLOSION + ACCIDENT, LOSS OF COOLANT + REACTOR COOLANT + RADIOLYTIC GAS + CONTAINMENT
ATMOSPHERE, INERT + REPORT, PSAR + BRUNSWICK 1 (BWR) + BRUNSWICK 2 (BWR)

040990
 RESPONSE TO QUESTION 6.2.3(B) - LOWERING CONCENTRATION OF RADIOLYTIC GAS AFTER LOCA
 CAROLINA POWER AND LIGHT COMPANY
 DOCKET 50324-9 +. 6 PAGES, 1 FIGURE, 2 REFERENCES, PG 6.2.3(B)-1 THRU -6 OF BRUNSWICK 1 AND 2 PSAR SUPPLEMENT
 4, MARCH 7, 1969, DOCKET 50-324/325, TYPE--BWR, MFG--G.E., AE--UE+C

AS A RESULT OF THIS R-AND-D EFFORT YOU MAY DETERMINE THAT POST-ACCIDENT RADIOLYSIS WILL REQUIRE
 THAT YOU CONSIDER THE INSTALLATION OF EQUIPMENT TO LOWER THE CONCENTRATION OF RADIOLYSIS
 PRODUCTS. SHOULD THIS BE THE CASE, WE WOULD BE INTERESTED IN ANY PRELIMINARY THOUGHTS YOU MAY
 HAVE ON THE CRITERION WHICH WILL BE USED TO DETERMINE WHETHER SUCH EQUIPMENT WILL BE REQUIRED.
 *** ANSWER ON PAGES 6.2.3(B)-1 THRU -6.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + WATER + RADIOLYTIC GAS + REPORT, PSAR + BRUNSWICK 1 (BWR) +
 BRUNSWICK 2 (BWR) + RECOMBINER

041273
 RESPONSE TO QUESTION 6.10 - CONTROL OF COMBUSTIBLE GASES
 CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
 2 PAGES, PG. 6.10-1 AND -2 OF AMENDMENT 14 TO INDIAN POINT 2 LICENSE APPLICATION, JANUARY 27, 1970, DOCKET 50-
 247, TYPE--PWR, MFG--WEST., AE--UNITED ENGR

WE UNDERSTAND THAT IN SELECTING A PROPOSED COMBUSTIBLE GAS CONTROL SYSTEM, ALTERNATIVE MEASURES
 WERE STUDIED FOR FEASIBILITY. PROVIDE A DISCUSSION OF THOSE ALTERNATIVES STUDIED AND THE
 FAVORABLE/UNFAVORABLE FEATURES AND TECHNICAL CONSIDERATIONS WHICH LED TO THE FINAL SELECTION OF
 THE FLAME RECOMBINER SYSTEM. *** ANSWER ON PG 6.10-1 AND -2.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + REPORT, SAR + RADIOLYTIC GAS + INDIAN POINT 2 (PWR) + CATALYST +
 RECOMBINERS

041378
 RESPONSES TO AEC QUESTIONS
 THE HILLSTONE POINT COMPANY
 40 PAGES, FIGURES, TABLES, AMENDMENT 3 TO HILLSTONE 2 LICENSE APPLICATION, JANUARY 6, 1970, DOCKET 50-336,
 TYPE--PWR, MFG--COMB., AE--BECHTEL

CONTAINS RESPONSES TO 46 QUESTIONS CONCERNING PIPE SYSTEM DESIGN, HYDROGEN ACCUMULATION IN LOCA, R
 AND D PROGRAMS, VENTILATION SYSTEM, COOLANT SYSTEM, SEISMIC DESIGN, INSTRUMENTATION, AND
 EMERGENCY SYSTEMS.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

DESIGN CRITERIA + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + VENTILATION SYSTEM + INSTRUMENT, CONTROL +
 EMERGENCY SYSTEM + REPORT, PSAR + MAIN COOLING SYSTEM + R AND D PROGRAM + HILLSTONE POINT 2 (PWR) + SEISMIC
 DESIGN + PIPES AND PIPE FITTINGS

041380
 RESPONSE TO QUESTION 1.7 - ACCUMULATION OF H2 IN CONTAINMENT AFTER LOCA
 THE HILLSTONE POINT COMPANY
 15 PAGES, 7 FIGURES, 10 REFERENCES, PAGE 1.7 OF HILLSTONE 2 PSAR AMENDMENT 3, JANUARY 6, 1970, DOCKET 50-336,
 TYPE--PWR, MFG--COMB., AE--BECHTEL

WITH REGARD TO HYDROGEN ACCUMULATION IN THE CONTAINMENT FOLLOWING A LOSS-OF-COOLANT ACCIDENT, ON
 PAGE 14.10-12 OF THE PSAR IT IS STATED THAT STUDIES ARE UNDERWAY TO BETTER DEFINE THE RATE OF
 HYDROGEN ACCUMULATION (IN THE CONTAINMENT) AND THE METHODS TO BE PROVIDED FOR OUR REVIEW. ALSO,
 THE CRITERIA THAT WILL BE USED IN THE SELECTION OF AN ACCEPTABLE METHOD(S) FOR CONTROL OF
 HYDROGEN ACCUMULATION. **** ANSWER ON PAGE 1.7.

ACCIDENT, CONSEQUENCES + FISSION PRODUCT RELEASE + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR,
 PWR + ZIRCONIUM + CONTAINMENT STRUCTURE + REPORT, PSAR + ACCIDENT, DESIGN BASIS + HILLSTONE POINT 2 (PWR)

041545
 RESPONSE TO QUESTION 6 - EFFECTS OF FABRICATION AND INSTALLATION VARIABLES ON WEDGES AND ANCHOR HEADS
 SACRAMENTO MUNICIPAL UTILITY DISTRICT
 50312-15 +. 3 PAGES, PG 13 THRU 15 OF RANCHO SECO 1 PSAR SUPPLEMENT, JANUARY 28, 1970, DOCKET 50-312, TYPE--
 PWR, MFG--B+W, AE--BECHTEL

EVALUATE THE POTENTIAL DELETERIOUS EFFECTS THAT MANUFACTURING AND FIELD INDUCED VARIABLES MAY HAVE
 ON THE PERFORMANCE OF THIS SYSTEM AS DETERMINED BY LABORATORY TESTING. CONSIDER SERVICE
 CONDITION OF WEDGES AND BEARING BLOCK (DRY, LUBRICATED, DUSTY, GRITTY), CORROSION AT WEDGE-STRAND
 AND WEDGE-BEARING BLOCK INTERFACE, HYDROGEN EMBRITTLEMENT, OUT OF TOLERANCE OR AT TOLERANCE
 DIMENSIONS OF WEDGE GRIP AND BEARING BLOCK PARTS, AND OUT OF TOLERANCE OR AT TOLERANCE HARDNESS

041545 *CONTINUED*
PROPERTIES OF WEDGES. *** ANSWER ON PG 13-15.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

CONCRETE + REACTOR, PWR + STEEL + CONTAINMENT CONSTRUCTION + EMBRITTLEMENT + FASTENER + CORROSION + REPORT,
PSAR + QUALITY ASSURANCE + LUBRICATION + RANCHO SECO (PWR)

041781
RESPONSE TO QUESTION 14.4 - LOCA - POTENTIAL EVOLUTION OF HYDROGEN
WISCONSIN ELECTRIC POWER COMPANY + WISCONSIN MICHIGAN ELECTRIC POWER COMPANY
6 PAGES, 2 FIGURES, PG Q 14.4-1 THRU -3 PLUS 2 FIGURES OF AMENDMENT 2 TO POINT BEACH 1 AND 2 LICENSE
APPLICATION, JANUARY 19, 1970, DOCKETS 50-266/301, TYPE--PWR, MFG--WEST., AE--BECHTEL

YOUR ANALYSES OF THE POTENTIAL HYDROGEN EVOLUTION OVER THE POST LOSS-OF-COOLANT PERIOD NEGLECTS
CERTAIN POTENTIAL HYDROGEN SOURCES SUCH AS THE CLAD-WATER REACTION AND THE CHEMICAL REACTION OF
MATERIALS SUBJECT TO CORROSIVE ATTACK IN THE POST-ACCIDENT ENVIRONMENT. IN ADDITION, WE
UNDERSTAND THAT MORE REFINED CALCULATIONS REGARDING COOLANT ENERGY DEPOSITION WOULD INDICATE
THAT THE PREDICTED EVOLUTION OF HYDROGEN BY COOLANT RADIOLYSIS, AS SHOWN IN THE PSAR, MAY BE
CONSERVATIVE. UPDATE YOUR PSAR ANALYSES TO INCLUDE ALL POTENTIAL HYDROGEN SOURCES AND TO FACTOR
IN THE MORE REFINED CALCULATIONS FOR COOLANT RADIOLYSIS. *** ANSWER ON PG 14.4-1 THRU -3, PLUS 2
CURVES.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

ALUMINUM + KRYPTON + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + REPORT, SAR + XENON +
ZIRCONIUM + HALOGEN + RADIOLYTIC GAS + POINT BEACH 1 (PWR) + POINT BEACH 2 (PWR)

041782
RESPONSE TO QUESTION 14.6 - CONTROLLING THE CONCENTRATION OF HYDROGEN
WISCONSIN ELECTRIC POWER COMPANY + WISCONSIN MICHIGAN ELECTRIC POWER COMPANY
50266-16 +, 1 PAGE, PG Q 14.6-1 OF AMENDMENT 2 TO POINT BEACH 1 AND 2 LICENSE APPLICATION, JANUARY 19, 1970,
DOCKETS 50-266/301, TYPE--PWR, MFG--WEST., AE--BECHTEL

WHAT CRITERION IS USED TO DETERMINE WHETHER EQUIPMENT TO CONTROL HYDROGEN WILL BE REQUIRED,
SINCE PURGING MAY NOT BE ACCEPTABLE AS THE PRIMARY MEANS OF LIMITING ACCUMULATION OF HYDROGEN,
PROVIDE INFORMATION ON THE DESIGN OF OTHER SYSTEMS THAT COULD BE USED TO CONTROL HYDROGEN
ACCUMULATION. *** (ANSWER) THE CONCENTRATION OF HYDROGEN MUST NOT REACH THE LOWER FLAMMABLE
LIMIT OF 4.1, VOL PERCENT. PURGING IS ACCEPTABLE MEANS OF CONTROLLING THE CONCENTRATION OF
HYDROGEN. OTHER SYSTEMS THAT HAVE BEEN STUDIED INCLUDE THE HYDROGEN RECOMBINER.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

DILUTION + EXPLOSION + FIRE + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + REPORT, SAR + RADIOLYTIC GAS + POINT
BEACH 1 (PWR) + POINT BEACH 2 (PWR) + RECOMBINERS

042234
RESPONSE TO QUESTION 9.2 - HYDROGEN AS ADDITIVE TO COOLANT FOR MAIN GENERATORS
VIRGINIA ELECTRIC AND POWER COMPANY
50338-11 +, 4 PAGES, PG S9.2-1 THRU -4 OF NORTH ANNA 1 AND 2 PSAR SUPPLEMENT, VOL. 2 OF AMENDMENT 4, JANUARY
26, 1970, DOCKETS 50-338/339, TYPE--PWR, MFG--WEST., AE--STONE + WEBSTER

HYDROGEN IS USED AS AN ADDITIVE IN THE CHEMICAL AND VOLUME CONTROL SYSTEM AND AS A COOLANT FOR THE
MAIN GENERATORS. DISCUSS THE INVENTORIES, CONSUMPTION RATES, AND HANDLING MECHANISMS AND
EVALUATE THE POTENTIAL FOR FIRES AND EXPLOSIONS AND ASSOCIATED CONSEQUENCES. *** ANSWER ON PG
S9.2-1 THRU -4.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

EXPLOSION + FIRE + REACTOR, PWR + REPORT, PSAR + ADDITIVE + COOLING + NORTH ANNA 1 (PWR) + NORTH ANNA 2 (PWR)

042655
RESPONSE TO QUESTION 2.10 - INSTRUMENTS REQUIRED FOR RECOVERY FROM ACCIDENTS
PUBLIC SERVICE ELECTRIC AND GAS COMPANY
50272-3 +, 2 PAGES, PG 2.10-1 AND -2 OF PART B, VOLUME 3 OF THE SALEM 1 AND 2 PRELIMINARY FACILITY
DESCRIPTION AND SAFETY ANALYSIS REPORT, JANUARY 22, 1968, DOCKETS 50-272/311, TYPE--PWR, MFG--WEST., AE--
PUBLIC SERVICE OF N.J.

WHAT INSTRUMENTATION IS REQUIRED FOR POST-ACCIDENT RECOVERY OPERATIONS? WHAT PROVISION IS MADE
FOR INDICATING TO THE OPERATOR THE REACTIVITY STATUS OF THE REACTOR - AND THE PRESSURE,
TEMPERATURE, WATER LEVELS, HYDROGEN AND BORON CONCENTRATION IN THE CONTAINMENT FOLLOWING AN
ACCIDENT. *** ANSWER ON PG 2.10-1 AND -2.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

042655 *CONTINUED*
 REACTOR, PWR + INSTRUMENT, AIR SAMPLING + INSTRUMENT, LIQUID LEVEL + INSTRUMENT, TEMPERATURE + REPORT, PSAR + INSTRUMENT, COOLANT QUALITY + INSTRUMENT, PRESSURE + SALEM 1 (PWR) + SALEM 2 (PWR) + RADIATION MONITORS

045277
 RESPONSE TO QUESTION 7.10 - VULNERABILITY OF PROTECTION SYSTEMS TO FIRE
 FLORIDA POWER AND LIGHT COMPANY
 DOCKET-50250-25 +. 1 PAGE, PG. 7.10 OF TURKEY POINT 3 AND 4 LICENSE APPLICATION, MAY 1, 1970, DOCKET 50-250/251, TYPE--PWR, MFG--WEST., AE--BECHTEL

TO WHAT EXTENT ARE THE PROTECTION SYSTEM AND EMERGENCY POWER SYSTEM CIRCUITS VULNERABLE TO THE POTENTIAL ADVERSE EFFECTS OF FIRE RESULTING FROM IGNITION OF STORED HYDROGEN; E.G., THAT USED TO COOL THE MAIN GENERATOR OR TO MAINTAIN THE HYDROGEN PARTIAL PRESSURE AT THE VOLUME CONTROL TANK.
 ANSWER - REFER TO FSAR FIGURE 1.1-2. HYDROGEN STORAGE BUILDINGS ARE REMOTE ISOLATED STRUCTURES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

EMERGENCY POWER, ELECTRIC + FIRE + REACTOR, PWR + REPORT, SAR + PLANT PROTECTIVE SYSTEM + EMERGENCY SYSTEM + TURKEY POINT 3 (PWR) + AUXILIARY COOLING SYSTEM + TURKEY POINT 4 (PWR)

045324
 RESPONSE TO QUESTION 14.5 - HYDROGEN EVOLUTION IN CONTAINMENT AFTER LOCA
 FLORIDA POWER AND LIGHT COMPANY
 50250-25 +. 1 PAGE, PG 8-50 OF TURKEY POINT 3 AND 4 LICENSE APPLICATION, MAY 1, 1970, DOCKETS 50-250/251, TYPE--PWR, MFG--WEST., AE--BECHTEL

PROVIDE ANALYSES OF THE POTENTIAL HYDROGEN EVOLUTION IN THE CONTAINMENT VOLUME FOLLOWING A LOCA, AS A RESULT OF RADIOLYSIS OF EMERGENCY COOLANT, CLAD-WATER REACTION, AND CHEMICAL REACTIONS OF MATERIALS SUBJECT TO CORROSIVE ATTACK IN THE POST-ACCIDENT ENVIRONMENT. *** (ANSWER) LATER.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00 COPY, \$0.65 MICROFICHE

ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + REPORT, SAR + HAZARDS ANALYSIS + CONTAINMENT STRUCTURE + RADIOLYTIC GAS + TURKEY POINT 3 (PWR) + TURKEY POINT 4 (PWR)

045636
 RESPONSE TO QUESTION 4.1 - OFF-GAS FILTER
 NORTHERN STATES POWER COMPANY
 DOCKET-50263-24 +. 5 PAGES, PG 4.1-1 AND -2 PLUS THREE TABLES, OF AMENOMENT 17 TO MONTICELLO LICENSE APPLICATION, SEPTEMBER 12, 1969, DOCKET 50-263, TYPE--BWR, MFG--G.E., AE--BECHTEL

THE MAIN CONDENSER AIR EJECTOR OFF-GAS SUBSYSTEM, FROM THE AIR EJECTOR OUTLET TO THE STACK INLET AND INCLUDING THE 30-MINUTE HOLDUP LINE, IS DESIGNED FOR A PRESSURE OF 250 PSI. WE UNDERSTAND THAT WITH THIS DESIGN, THE AIR EJECTOR SUBSYSTEM SHOULD BE CAPABLE OF CONTAINING A POSSIBLE EXPLOSION RESULTING FROM THE HYDROGEN AND OXYGEN NORMALLY PRESENT IN THE AIR EJECTOR AFFLUENT (EXPECTED COMPOSITION -- ABOUT 50 PERCENT HYDROGEN, 25 PERCENT OXYGEN, 10 PERCENT AIR, AND 15 PERCENT WATER VAPOR.) TO ASSIST IN THE EVALUATION OF THIS SUBSYSTEM, ADDITIONAL INFORMATION IS REQUIRED. *** ANSWER ON PAGE 4.1-1 AND -2, PLUS THREE TABLES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + DESIGN CRITERIA + EXPLOSION + FILTER, HIGH EFFICIENCY + OFF GAS + PRESSURE, INTERNAL + MONTICELLO (BWR) + FILTERS

045668
 RESPONSE TO QUESTION 6 - TENDONS - EFFECTS OF MANUFACTURING AND FABRICATING
 SACRAMENTO MUNICIPAL UTILITY DISTRICT
 50312-10 +. 2 PAGES, ATTACHMENT A TO LETTER - SHUD TO DIVISION OF REACTOR LICENSING (AEC) - SEPTEMBER 15, 1969, DOCKET 50-312, TYPE--PWR, MFG--B&W, AE--BECHTEL

EVALUATE THE POTENTIAL DELETERIOUS EFFECTS THAT MANUFACTURING AND FIELD INDUCED VARIABLES MAY HAVE ON THE PERFORMANCE OF THIS SYSTEM AS DETERMINED BY LABORATORY TESTING. *** (ANSWER) ALTHOUGH THE EFFECTS OF VARIATION IN SURFACE FINISH IS NOT A DETERMINING FACTOR IN PERFORMANCE, IT IS CLOSELY CONTROLLED TO PREVENT LAXITY IN MANUFACTURE AND FIELD APPLICATION. IT IS TRUE THAT EXCESSIVE DIRT OR LUBRICATION IS DETRIMENTAL TO THE FUNCTIONING OF THE VSL SYSTEM. FOR THIS REASON, THE WEDGES WILL BE SHOP-INSTALLED IN THE ANCHOR HEAD AND KEPT IN PLACE WITH A RETAINER PLATE. PROVISIONS FOR ENSURING PROPER INTERFACE SURFACE CONDITIONS FOR WEDGE AND ANCHOR HEAD ARE CONTAINED IN SECTION VII OF ATTACHMENT B, MANUFACTURING QUALITY ASSURANCE PROGRAM.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00 COPY, \$0.65 MICROFICHE

FABRICATION + REACTOR, PWR + STEEL + EMBRITTLEMENT + CORROSION + CONTAINMENT STRUCTURE + REPORT, PSAR + SUPPORT STRUCTURE + ON SITE + RANCHO SECO (PWR)

045745

045745 *CONTINUED*
 RESPONSE TO QUESTION 14.5 - POSTACCIDENT RADIOLYSIS OF COOLANT
 WISCONSIN ELECTRIC POWER COMPANY + WISCONSIN MICHIGAN ELECTRIC POWER COMPANY
 50266-17 +. 2 PAGES, PG Q 14.5-1 AND -2 OF POINT BEACH 1 AND 2 LICENSE APPLICATION, FEBRUARY 11, 1970,
 DOCKETS 50-266-301, TYPE--PWR, MFG--WEST., AE--BECHTEL

WE UNDERSTAND THAT WESTINGHOUSE HAS CONDUCTED DYNAMIC LOOP TESTING IN ORDER TO SIMULATE AND
 EXPLORE THE INFLUENCE THAT CERTAIN POSTACCIDENT FACTORS (E.G., CORE COOLANT FLOW, COOLANT
 TEMPERATURE, RADIATION DOSES) MAY HAVE ON COOLANT RADIOLYSIS. DISCUSS THE RESULTS FROM THESE
 TESTS SO THAT WE MAY BETTER UNDERSTAND THE DEGREE OF CONSERVATISM INCLUDED IN YOUR ANALYSES OF
 THE POSTACCIDENT HYDROGEN EVOLUTION. *** ANSWER ON PG Q 14.5-1 AND -2.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, CONSEQUENCES + REACTOR, PWR + REPORT, SAR + RADIOLYTIC GAS + POINT BEACH 1 (PWR) + SAFETY MARGIN +
 ACCIDENT, DESIGN BASIS + POINT BEACH 2 (PWR)

045749
 RESPONSE TO QUESTION 1-1A - CONTROL OF HYDROGEN CONCENTRATION AFTER LOCA
 CAROLINA POWER AND LIGHT COMPANY
 DOCKET 50261-18 +. 1 PAGE, PG. 1-1A OF AMENDMENT 12 TO ROBINSON 2 LICENSE APPLICATION, DECEMBER 8, 1969, TYPE-
 -PWR, MFG--WEST., AE--EBASCO

YOU HAVE NOT SUBMITTED SUFFICIENT INFORMATION REGARDING MATTERS THAT HAVE BEEN REFERENCED IN THE
 FINAL SAFETY ANALYSIS REPORT (FSAR) AND AMENDMENT 9. *** ANSWER - SEE WESTINGHOUSE TOPICAL REPORT
 WCAP-7372 (CONTROL OF HYDROGEN CONCENTRATION FOLLOWING A LOSS-OF-COOLANT ACCIDENT BY CONTAINMENT
 VENTING FOR THE M. B. ROBINSON PLANT), SUBMITTED DECEMBER 1969.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + VENTILATION SYSTEM + ROBINSON 2 (PWR) + CONCENTRATION

045751
 RESPONSE TO QUESTION 1-1E - RESULTS OF R AND D WORK ON RECOMBINING HYDROGEN
 CAROLINA POWER AND LIGHT COMPANY
 DOCKET 50261-18 +. 1 PAGE, PG. 1-1E OF AMENDMENT 12 TO ROBINSON 2 LICENSE APPLICATION, DECEMBER 8, 1969, TYPE-
 -PWR, MFG--WEST., AE--EBASCO

YOU HAVE NOT SUBMITTED SUFFICIENT INFORMATION REGARDING MATTERS THAT HAVE BEEN REFERENCED IN THE
 FINAL SAFETY ANALYSIS REPORT (FSAR) AND AMENDMENT 9. SPECIFICALLY, RESULTS OF THE HYDROGEN
 RECOMBINER PROGRAM. *** ANSWER - HYDROGEN RECOMBINERS ARE NOT CONSIDERED NECESSARY FOR THIS
 PLANT, SINCE VENTING OF THE M. B. ROBINSON CONTAINMENT WOULD BE USED TO LIMIT HYDROGEN
 ACCUMULATION IN EVENT OF SUCH NEED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + ROBINSON 2 (PWR) + R AND D PROGRAM + RECOMBINERS

045839
 RESPONSE TO QUESTION 11D1 - CEMENT - CHEMICAL SPECIFICATIONS
 CAROLINA POWER AND LIGHT COMPANY
 50261-19 +. 2 PAGES, PG 11D1-1 AND -2 OF AMENDMENT 13 TO ROBINSON 2 LICENSE APPLICATION, DECEMBER 15, 1969,
 DOCKET 50-261, TYPE--PWR, MFG--WEST., AE--EBASCO

PROVIDE THE CRITERIA FOR CHEMICAL ANALYSIS, WITH QUANTITATIVE CHEMICAL LIMITS, WHICH WILL BE USED
 TO DEMONSTRATE THAT THERE WILL BE NO OBJECTIONABLE CONTENT OF CHLORIDES, NITROGEN OR HYDROGEN IN
 THE CEMENT, WATER AND ADMIXTURES USED IN THE STRUCTURE, ESPECIALLY IN THE GROUT MATERIAL. ***
 ANSWER ON PG 11D1-1 AND -2.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

CONCRETE + REACTOR, PWR + NITROGEN + ROBINSON 2 (PWR) + CHLORIDE + PROPERTY, CHEMICAL

046017
 RESPONSE TO QUESTION 9.2.1 - LEAKAGE OF HYDROGEN FROM MAKEUP TANK
 CONSUMERS POWER COMPANY
 50329-7 +. 1 PAGE, PG 9.2.1-1 OF MIDLAND 1 AND 2 PSAR, NOVEMBER 7, 1969, DOCKETS 50-329/330, TYPE--PWR, MFG--
 B+W, AE--BECHTEL

DISCUSS THE POSSIBILITY OF THE LEAKAGE OF HYDROGEN FROM THE MAKEUP TANK. IF LOCAL CONCENTRATIONS
 OF HYDROGEN IN EXCESS OF TWO VOLUME PERCENT CAN OCCUR IN THE AUXILIARY BUILDING EXTERNAL TO THE
 MAKEUP TANK, DESCRIBE THE MEANS TAKEN TO PREVENT IGNITION OF THE HYDROGEN. *** (ANSWER) THE
 TANK AND CONNECTED PIPING WILL BE HYDROSTATICALLY TESTED TO DEMONSTRATE LEAKTIGHTNESS DURING
 PREOPERATIONAL TESTING. THEREAFTER, THE ONLY LIKELY SOURCE OF LEAKAGE WILL BE AT THE SAFETY
 VALVE, WHICH IS DIRECTED TOWARDS THE RADWASTE SYSTEM.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

046017 *CONTINUED*
 REACTOR, PWR + STORAGE CONTAINER + IGNITION + LEAK + PROBABILITY + MIDLAND 1 (PWR) + MIDLAND 2 (PWR)

046057
 RESPONSE TO QUESTION 13.6.3 - ADEQUACY OF VENTILATION SYSTEMS (CONTAINMENT AND AUXILIARY BUILDINGS)
 CONSUMERS POWER COMPANY
 50329-7 +. 2 PAGES, PG 13.6.3-1 AND -2 OF MIDLAND 1 AND 2 PSAR, NOVEMBER 7, 1969, DOCKETS 50-329/330, TYPE--
 PWR, MFG--B+W, AE--BECHTEL

SO THAT WE MAY DETERMINE THE ADEQUACY OF THE AUXILIARY AND CONTAINMENT BUILDING VENTILATION SYSTEMS WHICH MAY BE NECESSARY TO REDUCE THE POTENTIAL DOSES FROM SEVERAL CLASSES OF ACCIDENTS, PROVIDE (1) THE RADIATION SOURCE TERMS AND HEAT LOADS USED FOR THE DESIGN OF AIR CLEANING EQUIPMENT IN THE SYSTEMS, (2) A DISCUSSION OF THE ABILITY OF THE FILTER AND CHARCOAL UNITS TO WITHSTAND DESORPTION AND/OR IGNITION WITH LOSS OF AIR FLOW, (3) THE ANTICIPATED ACCIDENT ATMOSPHERIC CONDITIONS TO WHICH THESE SYSTEMS WOULD BE EXPOSED, (4) A DESCRIPTION OF THE DESIGN OF THE EQUIPMENT TO WITHSTAND THESE CONDITIONS, AND (5) THE METHOD OF TESTING THE EQUIPMENT TO DEMONSTRATE THAT IT WILL FUNCTION AS DESIGNED UNDER ACCIDENT CONDITIONS. *** ANSWER ON PG 13.6.3-1 AND -2.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

DESIGN CRITERIA + REACTOR, PWR + TESTING + VENTILATION SYSTEM + CHARCOAL ADSORBER + THERMAL CONSIDERATION + SYSTEM DESCRIPTION + SYSTEM OPERABILITY IN ACCIDENT + MIDLAND 1 (PWR) + MIDLAND 2 (PWR) + FILTERS

046583
 RESPONSE TO QUESTION 14.5 - HYDROGEN EVOLUTION FOLLOWING LOSS OF COOLANT ACCIDENT
 FLORIDA POWER AND LIGHT COMPANY
 1 PAGE, PG. B-5B OF SUPPLEMENT 20 TO TURKEY POINT 3 AND 4 LICENSE APPLICATION, JUNE 26, 1970, DOCKETS 50-250/251, TYPE--PWR, MFG--WEST., AE--BECHTEL

PROVIDE ANALYSES OF HYDROGEN EVOLUTION IN THE CONTAINMENT VOLUME AFTER A LOCA. EVALUATE THE POTENTIAL HAZARDS TO CONTAINMENT AND OTHER ENGINEERED SAFETY FEATURES ASSOCIATED WITH ACCUMULATION OF COMBUSTIBLE GASES. DESCRIBE PROVISIONS FOR CONTROLLING THE CONCENTRATION. *** REFER TO FSAR SECTION 14.3.6 (NEW.).

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + TESTING + HAZARDS ANALYSIS + RADIOLYTIC GAS + TURKEY POINT 3 (PWR) + TURKEY POINT 4 (PWR) + CONCENTRATION

046660
 RESPONSE TO QUESTION VS - SAFETY OF HYDROGEN COOLING SUPPLY
 CAROLINA POWER AND LIGHT COMPANY
 DOCKET 50261+, 2 PAGES, PG. VS-1 THRU VS-2 OF AMENDMENT 4 TO ROBINSON 2 LICENSE APPLICATION, DECEMBER 2, 1969, TYPE--PWR, MFG--WEST., AE--EBASCO

SUBMIT AN ANALYSIS TO SHOW THAT THE HYDROGEN COOLING SUPPLY FOR THE MAIN GENERATOR IN NO WAY POSES A HAZARD TO THE SAFE OPERATION OF THE STATION. *** ANSWER ON PAGES VS-1 AND VS-2.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + REPORT, SAR + ROBINSON 2 (PWR) + SAFETY ANALYSIS + TURBINE + COOLING

046915
 RESPONSE TO QUESTION 9.2.1 - LEAKAGE OF HYDROGEN FROM MAKEUP TANK
 TOLEDO EDISON COMPANY
 50346-7 +. 1 PAGE, PG 9.2.1-1 OF DAVIS-BESSE PSAR, APRIL 26, DOCKET 50-346, TYPE--PWR, MFG--B+W, AE--BECHTEL

IF LOCAL CONCENTRATIONS OF HYDROGEN IN EXCESS OF TWO VOLUME PERCENT CAN OCCUR IN THE AUXILIARY BUILDING EXTERNAL TO THE MAKEUP TANK, DESCRIBE THE MEANS TAKEN TO PREVENT IGNITION OF THE HYDROGEN. *** (ANSWER) THE TANK AND PIPING WILL BE HYDROSTATICALLY TESTED TO DEMONSTRATE LEAKTIGHTNESS DURING PREOPERATIONAL TESTING. THEREAFTER, THE ONLY LIKELY SOURCE OF LEAKAGE WILL BE AT THE SAFETY VALVE, WHICH IS PIPED TO THE RADWASTE SYSTEM.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

EXPLOSION + FIRE + REACTOR, PWR + WATER + STORAGE CONTAINER + REPORT, PSAR + LEAK

046921
 RESPONSE TO QUESTION 9.6 - SAMPLING OF LIQUIDS AND GASES AFTER A LOCA (HYDROGEN)
 TOLEDO EDISON COMPANY
 50346-7 +. 1 PAGE, PG 9.6-1 OF DAVIS-BESSE PSAR, APRIL 26, 1970, DOCKET 50-346, TYPE--PWR, MFG--B+W, AE--BECHTEL

046921 *CONTINUED*

IN SECTION 9.7.2 THE NORMAL LIQUID- AND GAS-SAMPLING CAPACITY IS DESCRIBED. PROVIDE A DISCUSSION AND SIMILAR LISTING OF THE SAMPLING CAPABILITY FOLLOWING A LOSS-OF-COOLANT ACCIDENT. INCLUDE THE CAPABILITY TO MONITOR HYDROGEN-GAS CONCENTRATIONS THROUGHOUT THE FACILITY. *** ANSWER ON PG 9.6-1.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

EXPLOSION + FIRE + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + SAMPLING + REPORT, PSAR

046954

RESPONSE TO QUESTION 12.6.9 - HYDROGEN EVOLUTION AFTER LOCA
TOLEDO EDISON COMPANY

50346-7 +. 3 PAGES, 1 FIGURE, 1 TABLE OF DAVIS-BESSE PSAR, APRIL 26, 1970, DOCKET 50-346, TYPE--PWR, MFG--B+W, AE--BECHTEL

ANALYZE THE POTENTIAL HYDROGEN EVOLUTION TO CONTAINMENT DURING THE PERIOD FOLLOWING THE POST-LOSS-OF-COOLANT ACCIDENT. CLEARLY STATE YOUR ASSUMPTIONS. DESCRIBE YOUR PLANS REGARDING USE OF COMBUSTIBLE GAS CONTROL MEASURES, INCLUDING CONSIDERATION OF MEASURES WHICH DO NOT ENTAIL THE INTENTIONAL RELEASE OF FISSION PRODUCTS FROM THE CONTAINMENT TO THE ATMOSPHERE. *** ANSWER ON PG 12.6.9-1 AND -2, PLUS ONE FIGURE.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

EXPLOSION + FIRE + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + CONTAINMENT STRUCTURE + RADIOLYTIC GAS + REPORT, PSAR

047370

RESPONSE TO QUESTION 6.5 - RADIOLYSIS OF WATER DURING LOCA

DUQUESNE LIGHT COMPANY

50334-12 +. 2 PAGES, PG. 5 THRU 6 OF AMENDMENT 10 TO BEAVER VALLEY 1 LICENSE APPLICATION, DECEMBER 10, 1969, DOCKET 50-334, TYPE--PWR, MFG--WEST., AE--STONE + WEBSTER

DISCUSS THE EFFECTS OF RADIOLYSIS OF WATER DURING A LOSS-OF-COOLANT ACCIDENT. *** ANSWER ON PAGES 5 AND 6.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + RADIOLYTIC GAS + BEAVER VALLEY 1 (PWR)

047429

RESPONSE TO QUESTION 2.6 (SUPPLEMENT 7) - DESIGN BASIS FOR HOLDUP-PIPING VALVE AND AIR-EJECTOR PIPING
POWER AUTHORITY OF THE STATE OF NEW YORK

DOCKET 50333-11 +. 1 PAGE, PG. 2.6 OF AMENDMENT 8 TO FITZPATRICK LICENSE APPLICATION, NOVEMBER 5, 1969, TYPE--PWR, MFG--GE., AE--STONE + WEBSTER

IN REFERENCE TO THE MAIN CONDENSER AIR EJECTOR OFF-GAS SUBSYSTEM, THE STATEMENT IS MADE ON PAGES 10.3-3 OF THE PSAR THAT THE HOLDUP PIPING VALVE PROVIDES FOR ISOLATION OF THE WHOLE SYSTEM IN THE EVENT OF A HYDROGEN EXPLOSION OR HIGH RADIATION IN THE LINE. IN THIS REGARD, PROVIDE THE DESIGN BASIS FOR THE HOLDUP PIPING VALVE AND AIR EJECTOR PIPING SYSTEM AS RELATED TO THE POTENTIAL FOR A HYDROGEN EXPLOSION. *** ANSWER - THE DESIGN BASIS IS THAT THEY REMAIN INTACT IN THE UNLIKELY EVENT OF A HYDROGEN EXPLOSION IN THE OFF-GAS SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + DESIGN CRITERIA + EXPLOSION + FITZPATRICK (BWR) + HIGH RADIATION + OFF GAS + VALVES

047497

RESPONSE TO QUESTION 4.10 (SUPP. 6) - EQUIPMENT TO LESSEN HAZARD TO HYDROGEN
POWER AUTHORITY OF THE STATE OF NEW YORK

DOCKET 50333-10 OF 1 PAGE, PG. 4.12 OF AMENDMENT 7 TO FITZPATRICK LICENSE APPLICATION, OCTOBER 27, 1969, DOCKET 50-333, TYPE--BWR, MFG--GE., AE--STONE + WEBSTER

FOR CURRENT GENERATION WATER-COOLED POWER REACTORS, RADIOLYTIC DECOMPOSITION OF WATER FOLLOWING A LOSS-OF-COOLANT ACCIDENT MAY RESULT IN A FLAMMABLE CONCENTRATION OF HYDROGEN AND OXYGEN WITHIN THE CONTAINMENT VESSEL. IN THIS REGARD, STATE THE CRITERION WHICH WILL BE USED TO DETERMINE WHETHER EQUIPMENT TO MITIGATE THE PRESENCE OF RADIOLYSIS PRODUCTS WILL BE REQUIRED. IF SUCH EQUIPMENT IS REQUIRED, DESCRIBE THE APPLICABLE EXPERIMENTAL WORK WHICH YOU PLAN TO CONDUCT TO VERIFY THE DESIGN. *** SEE AMENDMENT 3 TO THE HATCH PLANT DOCKET 50-321

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + EXPLOSION + FIRE + ACCIDENT, LOSS OF COOLANT + FITZPATRICK (BWR) + RADIOLYTIC GAS

047685

047685 *CONTINUE*
 RESPONSE TO QUESTION 6.1 - COPING WITH HYDROGEN GENERATION
 TENNESSEE VALLEY AUTHORITY
 DOCKET 50327-7 +. 4 PAGES, 1 FIGURE, PG. Q 6.1-1 THRU Q 6.1-4 OF AMENDMENT 4 TO SEQUOYAH 1 AND 2 LICENSE APPLICATION, SEPTEMBER 4, 1969, TYPE--PWR, MFG--WEST., AE--TVA

PROVIDE INFORMATION ON THE NEED FOR SOME MEANS OF COPING WITH HYDROGEN GENERATION. *** ANSWER ON PAGE 6.1-1 THRU 6.1-4, PLUS 1 FIGURE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + RADIOLYTIC GAS + R AND D PROGRAM + ACCIDENT, DESIGN BASIS + SEQUOYAH 1 (PWR) + SEQUOYAH 2 (PWR)

047686
 RESPONSE TO QUESTION 6.2.1 - ACTIVATION OF EMERGENCY GAS-TREATMENT SYSTEM
 TENNESSEE VALLEY AUTHORITY
 DOCKET 50327-7 +. 1 PAGE, PG. Q 6.2.1-1 OF AMENDMENT 4 TO SEQUOYAH 1 AND 2 LICENSE APPLICATION, SEPTEMBER 4, 1969, TYPE--PWR, MFG--WEST., AE--TVA

BASED ON ITEM 20 OF PSAR TABLE 7.2-1, IT APPEARS THAT DIVERSE MEANS WILL BE PROVIDED (ANY OF THE SAFETY INJECTION SIGNALS OR CONTAINMENT HIGH PRESSURE) TO AUTOMATICALLY ACTIVATE THE EMERGENCY GAS TREATMENT SYSTEM. THE DISCUSSION ON PAGES 5.6-1 AND 5.6-4, HOWEVER, DOES NOT REFLECT THIS DIVERSITY. PLEASE CLARIFY. *** ANSWER - ANY OF THE SIGNALS THAT INITIATE SAFETY INJECTION OR HIGH-HIGH CONTAINMENT PRESSURE INITIATE OPERATION OF THE EMERGENCY GAS TREATMENT SYSTEM. OPERATION MAY BE INITIATED MANUALLY FROM THE MAIN CONTROL ROOM. BOTH SUBSYSTEMS OF THE EMERGENCY GAS TREATMENT SYSTEM START UPON ACTUATION SIGNAL.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + RADIOLYTIC GAS + SEQUOYAH 1 (PWR) + SEQUOYAH 2 (PWR) + INSTRUMENTS, MISC.

047736
 RESPONSE TO QUESTION 11.3 - OXYGEN AND HYDROGEN HAZARD IN GAS DECAY TANK
 TENNESSEE VALLEY AUTHORITY
 DOCKET 50327-7 +. 1 PAGE, PG. Q 11.3-1 OF AMENDMENT 4 TO SEQUOYAH 1 AND 2 LICENSE APPLICATION, SEPTEMBER 4, 1969, TYPE--PWR, MFG--WEST., AE--TVA

EXPAND THE STATEMENT IN THE THIRD PARAGRAPH ON PAGE 11.1-9 TO DESCRIBE WHAT ACTION WILL BE TAKEN IN THE EVENT OXYGEN IN THE GAS DECAY TANK EXCEEDS A PREDETERMINED LIMIT. ALSO, INDICATE WHAT DESIGN PROVISIONS WILL BE INCORPORATED TO PREVENT OR ACCOMMODATE THE CONSEQUENCES OF HYDROGEN IGNITION AT LOCATIONS WHERE GASES CONTAINING HYDROGEN ARE EXHAUSTED TO THE ATMOSPHERE. *** ANSWER ON PAGE Q 11.3-1.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 OXYGEN + REACTOR, PWR + WASTE DISPOSAL, GAS + STORAGE CONTAINER + SEQUOYAH 1 (PWR) + SEQUOYAH 2 (PWR)

047737
 RESPONSE TO QUESTION 11.4 - SAFETY CODES RELATED TO HYDROGEN MANIFOLD SYSTEM
 TENNESSEE VALLEY AUTHORITY
 DOCKET 50327-7 +. 1 PAGE, PG. Q 11.4-1 OF AMENDMENT 4 TO SEQUOYAH 1 AND 2 LICENSE APPLICATION, SEPTEMBER 4, 1969, TYPE--PWR, MFG--WEST., AE--TVA

IDENTIFY THE INDUSTRIAL SAFETY CODES AND STANDARDS THAT WILL BE APPLIED TO THE HYDROGEN MANIFOLD SYSTEM DESCRIBED ON PAGE 11.1-13. *** ANSWER - THE SYSTEM CONFORMS TO THE NATIONAL FIRE PROTECTION ASSOCIATION STANDARD FOR GASEOUS HYDROGEN SYSTEMS AT CONSUMER SITES, NFPA NO. 567-1963.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 CODES AND STANDARDS + EXPLOSION + FIRE + REACTOR, PWR + RADIOLYTIC GAS + SEQUOYAH 1 (PWR) + SEQUOYAH 2 (PWR)

047784
 RESPONSE TO QUESTION 6.8B(3) - FUEL SUPPLY FOR FLAME RECOMBINER
 CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
 DOCKET 50-247, 1 PAGE, PG. A 6.8B(3)-1 OF SUPPLEMENT 7 TO INDIAN POINT 2 LICENSE APPLICATION, MARCH 30, 1970, DOCKET 50-247, TYPE--PWR, MFG--WEST., AE--UNITD ENGR

DISCUSS THE DESIGN BASES FOR OPERATION OF THE RECOMBINER SYSTEM, FUEL SYSTEM SUPPLY, THE HANDLING ARRANGEMENTS, LOGISTICS, AND AVAILABILITY REQUIREMENTS. *** (ANSWER) HYDROGEN FUEL FOR THE RECOMBINERS IS STORED IN STANDARD GAS CYLINDERS SUFFICIENT FOR PERIODIC TESTING AND IS CONNECTED TO THE FUEL SUPPLY HEADERS ONLY DURING THE TEST AND IN ACCORDANCE WITH TEST PROCEDURES. IN THE EVENT OF ITS NEED FOLLOWING AN ACCIDENT, HYDROGEN FUEL WOULD BE BROUGHT TO THE SITE TO PERMIT STARTING THE PROCESS BY THE THIRTEENTH DAY TO PREVENT H₂ FROM EXCEEDING 2 V/O IN THE CONTAINMENT. SUBSEQUENT OPERATION WILL REQUIRE AN AVERAGE FUEL CONSUMPTION OF 15,000 SCF PER DAY OVER THE NEXT 90 DAYS. BULK GAS WOULD BE DELIVERED IN TRAILER MOUNTED TUBES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 CYLINDER + OXYGEN + REACTOR, PWR + STORAGE CONTAINER + INDIAN POINT 2 (PWR) + GAS + RECOMBINERS

049779
 RESPONSE TO QUESTION 2.6.4 - HYDROGEN AND TRITIUM IN AIR EJECTOR EXHAUST
 COMMONWEALTH EDISON COMPANY + IOWA-ILLINOIS GAS AND ELECTRIC COMPANY
 DOCKET-50254-16 +. 1 PAGE, PG. 9-2 OF QUAD CITIES 1 AND 2 LICENSE APPLICATION, JUNE 11, 1970, DOCKETS 50-
 254/265, TYPE--BWR, MFG--G.E., AE--SGT + LUNDY

PROVIDE THE ASSUMPTIONS USED TO CALCULATE THE AMOUNTS OF HYDROGEN GAS AND TRITIUM IN THE AIR-
 EJECTOR EXHAUST. *** (ANSWER) THIS QUESTION IS ANSWERED IN SECTION 9.2.3 OF THE FSAR.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, BWR + TRITIUM + WASTE DISPOSAL, GAS + OFF GAS + QUAD CITIES 1 (BWR) + QUAD CITIES 2 (BWR)

049862
 RESPONSE TO QUESTION 6.8D - FLAME-RECOMBINER SYSTEM AS AN ENGINEERED SAFETY FEATURE
 CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
 DOCKET-50247-18 + 1 PAGE, PG Q 6.8(D)-1 OF AMENDMENT 15 TO INDIAN POINT 2 LICENSE APPLICATION, MARCH 2, 1970
 50-247, TYPE--PWR, MFG--WEST., AE--UNITD ENGR

HOW SOON AFTER THE LOSS-OF-COOLANT ACCIDENT MIGHT THE FLAME-RECOMBINER SYSTEM BE CAPABLE OF BEING
 INITIATED, GIVEN THE UNLIKELY OCCURRENCE OF GREATER THAN PREDICTED HYDROGEN LEVELS IN THE
 CONTAINMENT? DISCUSS THOSE FEATURES AND/OR OPERATING CHARACTERISTICS OF THE RECOMBINER SYSTEM
 WHICH FORM THE LIMITING TIME-TO-INITIATE CONSIDERATIONS. *** (ANSWER) THE ONLY LIMITATION OF
 THE RECOMBINER SYSTEM WOULD BE THE BLOWER MOTOR RATING. THE MOTOR IS SITED FOR CONTINUOUS
 OPERATION IN AN ENVIRONMENT OF 5 PSIG. THIS SHOULD NOT BE OF CONCERN AS THE PRESSURE IN THE
 CONTAINMENT FOLLOWING AN ACCIDENT SHOULD BE DOWN TO 5 PSIG WITHIN LESS THAN 5 DAYS, AND WITH
 CONSERVATIVE CALCULATIONS, THE HYDROGEN CONTENT WITHIN THE CONTAINMENT WILL NOT REACH 2 PERCENT
 BY VOLUME UNTIL 13 DAYS AFTER AN ACCIDENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + RADIOLYTIC GAS + INDIAN POINT 2 (PWR) + SYSTEM OPERABILITY IN
 ACCIDENT + ENGINEERED SAFETY FEATURE + RECOMBINERS

049864
 RESPONSE TO QUESTION 6.11 - EVALUATION OF CONTROLLED PURGING (BACKUP FOR FLAME RECOMBINER)
 CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
 DOCKET-50247-18 +. 1 PAGE, PG Q 6.11-1 OF AMENDMENT 15 TO INDIAN POINT 2 LICENSE APPLICATION, MARCH 2, 1970
 DOCKET 50-247, TYPE--PWR, MFG--WEST., AE--UNITD ENGR

SINCE CONTROLLED CONTAINMENT PURGING COULD PROVIDE A BACKUP TO THE FLAME RECOMBINER SYSTEM,
 PROVIDE AN EVALUATION OF CONTROLLED PURGING FOR THE INDIAN POINT 11 PLANT. **** (ANSWER)
 ADEQUATE BACKUP FOR THE FLAME RECOMBINER SYSTEM HAS ALREADY BEEN PROVIDED IN THE FORM OF A
 SECOND, COMPLETELY INDEPENDENT FLAME RECOMBINER SYSTEM. CONSEQUENTLY, CONTROLLED CONTAINMENT
 PURGING IS NOT CONSIDERED NECESSARY FOR THE INDIAN POINT UNIT 2 PLANT, AND NO EQUIPMENT HAS
 BEEN PROVIDED TO PERMIT SUCH OPERATIONS TO BE PERFORMED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + RADIOLYTIC GAS + INDIAN POINT 2 (PWR) +
 RECOMBINERS

049868
 RESPONSE TO QUESTION 14.8 - SOURCES OF HYDROGEN AFTER A LOCA
 CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
 DOCKET-50247-18 + 4 PAGES, PGS Q 14.8-1 THRU -4, 2 GRAPHS OF AMENDMENT 15 TO INDIAN POINT 2 LICENSE
 APPLICATION, MARCH 2, 1970 DOCKET 50-247, TYPE--PWR, MFG--WEST., AE--UNITD ENGR

YOUR ANALYSES OF THE POTENTIAL HYDROGEN EVOLUTION OVER THE POST LOSS-OF-COOLANT PERIOD NEGLECTS
 CERTAIN POTENTIAL HYDROGEN SOURCES SUCH AS THE CLAD-WATER REACTION AND THE CHEMICAL REACTION OF
 MATERIALS SUBJECT TO CORROSIVE ATTACK IN THE POST ACCIDENT ENVIRONMENT. IN ADDITION, WE
 UNDERSTAND THAT MORE REFINED CALCULATIONS REGARDING COOLANT ENERGY DEPOSITION WOULD INDICATE
 THAT THE PREDICTED EVOLUTION OF HYDROGEN BY COOLANT RADIOLYSIS, AS SHOWN IN THE FSAR, MAY BE
 CONSERVATIVE. PLEASE UPDATE YOUR FSAR ANALYSES TO INCLUDE ALL POTENTIAL HYDROGEN SOURCES AND TO
 FACTOR IN THE MORE REFINED CALCULATIONS FOR COOLANT RADIOLYSIS. *** ANSWER ON PAGE Q 14.8-1
 THRU -4, PLUS 2 GRAPHS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ALUMINUM + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + WATER + ZIRCONIUM + RADIOLYTIC
 GAS + INDIAN POINT 2 (PWR)

049869
 RESPONSE TO QUESTION 14.9 - EFFECT OF POSTACCIDENT CONDITIONS ON EXTENT OF RADIOLYSIS OF COOLANT
 CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
 DOCKET-50247-18 + 1 PAGE, PG Q 14.9-1 OF AMENDMENT 15 TO INDIAN POINT 2 LICENSE APPLICATION, MARCH 2, 1970
 DOCKET 50-247, TYPE--PWR, MFG--WEST., AE--UNITD ENGR

049869 *CONTINUED*

WE UNDERSTAND THAT WESTINGHOUSE HAS CONDUCTED DYNAMIC LOOP TESTING IN ORDER TO SIMULATE AND EXPLORE THE INFLUENCE THAT CERTAIN POSTACCIDENT CONDITIONS (E.G., CORE COOLANT FLOW, COOLANT TEMPERATURE, RADIATION DOSES) MAY HAVE ON COOLANT RADIOLYSIS. PROVIDE A DISCUSSION OF THE RESULTS FROM THESE TESTS IN ORDER THAT WE MAY ACQUIRE A BETTER UNDERSTANDING OF THE DEGREE OF CONSERVATION INCLUDED IN YOUR ANALYSES OF THE POSTACCIDENT HYDROGEN EVOLUTION. *** ANSWER ON PAGE 0 14.9-1.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + COMPARISON, THEORY AND EXPERIENCE + RADIOLYTIC GAS + INDIAN POINT 2 (PWR)

049914

RESPONSE TO QUESTION 1.8(A) - CONTROL OF HYDROGEN CONCENTRATION AFTER A LOSS-OF-COOLANT ACCIDENT
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50338-17 +. 2 PAGES, PG. 51.8(A)-1 THRU -2 OF AMENDMENT 3 TO NORTH ANNA 1 AND 2 LICENSE APPLICATION, JUNE 26, 1970, DOCKETS 50-338/339, TYPE--PWR, MFG--WEST., AE--STONE + WEBSTER

SINCE HYDROGEN BUILD-UP IN THE CONTAINMENT SUBSEQUENT TO A LOCA MAY BE SIGNIFICANT, PROVIDE INFORMATION ON YOUR ANALYSIS OF THE BUILD-UP AND INDICATE THE METHODS THAT WILL BE USED FOR CONTROL. *** ANSWER ON PG. 51.8(A)-1 AND 2.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

ACCIDENT, CONSEQUENCES + CONTROL SYSTEM + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + ANALYTICAL TECHNIQUE + MATHEMATICAL TREATMENT + R AND D PROGRAM + NORTH ANNA 1 (PWR) + NORTH ANNA 2 (PWR) + COMPUTER PROGRAM, DIGITAL

055066

RESPONSE TO QUESTION 14.14 - HYDROGEN EVOLUTION FROM CONTAINMENT PAINT
INDIANA AND MICHIGAN ELECTRIC COMPANY
DOCKET-50315-46 +. 1 PAGE, PG. Q14.14-1, OF AMENDMENT 16 TO COOK 1 AND 2 LICENSE APPLICATION, AUGUST 25, 1971, DOCKETS 50-315/316, TYPE--PWR, MFG--WEST., AE--UTILITY

SUMMARIZES THE EVALUATION OF THE POSSIBLE RELEASE OF HYDROGEN FROM ZINC-BEARING PAINT PRIMERS AND TOP COATING IN THE CONTAINMENT FOLLOWING THE LOSS-OF-COOLANT ACCIDENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + ZINC + CONTAINMENT PAINT + COOK 1 (PWR) + COOK 2 (PWR) + SURFACE TREATMENT

055067

RESPONSE TO QUESTION 14.23.7 - HYDROGEN RECOMBINER OPERATION
INDIANA AND MICHIGAN ELECTRIC COMPANY
DOCKET-50315-46 +. 1 PAGE, PG. Q14.23-7, OF AMENDMENT 16 TO COOK 1 AND 2 LICENSE APPLICATION, AUGUST 25, 1971, DOCKETS 50-315/316, TYPE--PWR, MFG--WEST., AE--UTILITY

DISCUSSES THE STARTING-TIME REQUIREMENTS OF THE ELECTRIC AND FLAME-TYPE RECOMBINERS. INCLUDES DISCUSSION OF OPERATION, DESIGN CRITERIA, AND HYDROGEN GENERATION RATES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + SYSTEM DESCRIPTION + COOK 1 (PWR) + COOK 2 (PWR) + RECOMBINERS

055068

RESPONSE TO QUESTION 14.24 - TESTING OF HYDROGEN RECOMBINER
INDIANA AND MICHIGAN ELECTRIC COMPANY
DOCKET-50315-46 +. 3 PAGES, PG. Q14.24-1-2-3, OF AMENDMENT 16 TO COOK 1 AND 2 LICENSE APPLICATION, AUGUST 25, 1971, DOCKETS 50-315/316, TYPE--PWR, MFG--WEST., AE--UTILITY

DISCUSSES THE TEST PROGRAM TO SUPPORT ADEQUACY OF THE RECOMBINER DESIGN.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + TESTING + SYSTEM DESCRIPTION + COOK 1 (PWR) + COOK 2 (PWR) + RECOMBINERS

055258

RESPONSE TO QUESTION 14.7 - HYDROGEN CONTROL SYSTEM
ARKANSAS POWER AND LIGHT COMPANY
DOCKET-50368-10 +. 1 PAGE, PG. 14.7 OF AMENDMENT 5 TO ARKANSAS NUCLEAR 2 LICENSE APPLICATION, MAY 12, 1971, DOCKET 50-368, TYPE--PWR, MFG--COMB., AE--BECHTEL

BRIEFLY DESCRIBES THE HYDROGEN CONTROL SYSTEM, WHICH CONSISTS OF TWO SEPARATE PURGE SYSTEMS. PURGING IS STARTED AT 1810 SCF PER HOUR AT 7 DAYS FOLLOWING DBA OR WHEN CONCENTRATION OF 3% BY VOLUME OCCURS. COMBINED DOSE DUE TO PURGING AND CONTAINMENT LEAKAGE FOLLOWING THE ACCIDENT ARE

055250 *CONTINUED*
CONSIDERABLY LESS THAN LIMITS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, PWR + RADIOLYTIC GAS + ARKANSAS NUCLEAR 2 (PWR)

055380
RESPONSE TO QUESTION 5.3.9 - HYDROGEN CONTROL SYSTEM
DUKE POWER COMPANY
DOCKET-50369-9 +. 3 PAGES, PG. 5-9 THRU 5-11 OF AMENDMENT 5 TO MCGUIRE LICENSE APPLICATION, MAY 25, 1971,
DOCKETS 50-369, TYPE--PWR, MFG--WEST., AE--DUKE

DESCRIBES THE ELECTRIC HYDROGEN RECOMBINER SYSTEM AND GIVES THE CALCULATED RATES AND QUANTITIES OF
HYDROGEN GENERATED IN THE CONTAINMENT AFTER THE LOCA

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
ACCIDENT, LOSS OF COOLANT + MCGUIRE 2 (PWR) + MCGUIRE 1 (PWR) + RECOMBINERS

055499
RESPONSE TO QUESTION 11.3 - HYDROGEN RECOMBINER
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50280-36 +. 1 PAGE OF AMENDMENT 20 TO SURRY 1 AND 2 LICENSE APPLICATION, APRIL 1, 1971, DOCKET 50-280,
TYPE--PWR, MFG--WEST., AE--STONE + WEBSTER

BRIEF DISCUSSION OF THE HYDROGEN RECOMBINER INCLUDING TESTABILITY, FAILURE ANALYSIS, HYDROGEN
BUILDUP, AND THE ACTIVITY IN THE RECYCLE LINE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
RADIOLYTIC GAS + SURRY 1 (PWR) + SURRY 2 (PWR) + RECOMBINERS

055627
RESPONSE TO QUESTION 8 - HYDROGEN EMBRITTLEMENT OF STEEL
METROPOLITAN EDISON COMPANY
DOCKET-50320-23 +. 1 PAGE, PG. 58-8-1 OF AMENDMENT 12 TO THREE MILE ISLAND LICENSE APPLICATION, OCTOBER 27,
1971, DOCKET 50-320, TYPE--PWR, MFG--B+W, AE--BURNS + ROE

DISCUSSES THE SUSCEPTIBILITY OF PRESTRESSING STEEL TO HYDROGEN IN HIGHLY ALKALINE WITH
CONSIDERATION OF THE EFFECTS OF SULPHIDES AND OF CRACKS IN THE CONCRETE AND GROUT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, PWR + STEEL + CONTAINMENT CONSTRUCTION + CONCRETE, PRESTRESSED + EMBRITTLEMENT + THREE MILE ISLAND 2
(PWR)

055701
RESPONSE TO QUESTION 5.10 - POST-ACCIDENT HYDROGEN CONTROL
TENNESSEE VALLEY AUTHORITY
DOCKET-50259-30 +. 1 PAGE, PG. Q5.10-1/Q5.10-2 OF AMENDMENT 15 TO BROWNS FERRY 1-2-3 LICENSE APPLICATION,
NOVEMBER 5, 1971, DOCKETS 50-259/260/296, TYPE--BWR, MFG--G.E., AE--TVA

INDICATE THE DESIGN BASES AND CONCEPTUAL DESIGNS OF SYSTEMS WHICH CONTROL THE CONCENTRATION OF
HYDROGEN GENERATED FOLLOWING A LOCA. *** RESPONSE - CONTROL WILL BE ACCOMPLISHED BY CONTROLLED
VENTING OF THE PRIMARY CONTAINMENT ATMOSPHERE THROUGH THE STANDBY GAS TREATMENT SYSTEM AND THE
PLANT STACK. THE ABILITY TO SAMPLE WILL BE PROVIDED AT BROWNS FERRY BY THE INSTALLATION OF A
POST-ACCIDENT CONTAINMENT ATMOSPHERE MONITORING SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + CONTROL + BROWNS FERRY 2 (BWR) + BROWNS FERRY 3 (BWR) + BROWNS
FERRY 1 (BWR) + STANDBY GAS TREATMENT

055711
RESPONSE TO QUESTION 9.5 - STACK DILUTION FANS
TENNESSEE VALLEY AUTHORITY
DOCKET-50259-30 +. 1 PAGE, PG. Q9.5-1/Q9.5-2 OF AMENDMENT 15 TO BROWNS FERRY 1-2-3 LICENSE APPLICATION,
NOVEMBER 5, 1971, DOCKETS 50-259/260/296, TYPE--BWR, MFG--G.E., AE--TVA

OFFGAS SYSTEM SHOWS 3 SETS OF DILUTION FANS IN THE BASE OF THE OFFGAS STACK. DESCRIBE THE
FUNCTION OF THESE FANS AND INDICATE THEIR METHOD OF OPERATION WITH EMERGENCY POWER. *** RESPONSE -
THE FANS DILUTE THE HYDROGEN EJECTED FROM THE CONDENSERS TO A CONCENTRATION OF LESS THAN 4% BY
VOLUME. THE FANS ARE SUPPLIED WITH EMERGENCY POWER, BUT THEIR USE FOLLOWING LOSS OF NORMAL
AUXILIARY POWER IS OPTIONAL.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

055711 *CONTINUED*
 REACTOR, BWR + STACK + OFF GAS + BROWNS FERRY 2 (BWR) + BROWNS FERRY 3 (BWR) + CONCENTRATION + BROWNS FERRY 1 (BWR)

055881
 RESPONSE TO QUESTION 5.35 - HYDROGEN CONTROL SYSTEM
 PHILADELPHIA ELECTRIC COMPANY
 DOCKET 50352/353-12 +. 2 PAGES, PG. 16 THRU 17 OF SUPPLEMENT 5 TO LIMERICK 1 AND 2 LICENSE APPLICATION, MAY 3, 1971, DOCKETS 50-352/353, TYPE--BWR, MFG--G.E., AE--BECHTEL

DESCRIBES THE DESIGN CRITERIA FOR THE LOSS-OF-COOLANT-ACCIDENT HYDROGEN-CONTROL SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

DESIGN CRITERIA + RADIOLYTIC GAS + CONTAINMENT ATMOSPHERE, INERT + LIMERICK 2 (BWR) + LIMERICK 1 (BWR)

056383
 RESPONSE TO QUESTION 12.3.1 - RESOLUTION OF CONCERNS ABOUT RADIOLYSIS OF COOLANT
 THE DETROIT EDISON COMPANY
 DOCKET 50341-15 +. 2 PAGES, 2 FIGURES, PG. EF-2 OF AMENDMENT 7 TO FERMI-2 LICENSE APPLICATION, AUGUST 24, 1970, DOCKET 50-341, TYPE--BWR, MFG--G.E., AE--SGT + LUNDY

PROVIDE A STATUS SUMMARY OF THOSE EXPERIMENTAL PROGRAMS UNDERTAKEN BY THE GENERAL ELECTRIC COMPANY TO BETTER RESOLVE THE POSSIBLE CONCERNS ABOUT COOLANT RADIOLYSIS. WE UNDERSTAND THAT RESULTS WERE EXPECTED IN LATE 1969. DISCUSS THE CONCLUSIONS TO DATE REGARDING GAS EVOLUTION RATES, GAS EQUILIBRIUM CONDITIONS AND THE INFLUENCE OF VARIOUS COOLANT TEMPERATURE AND CHEMISTRY CONDITIONS. *** RESPONSE CONSISTS OF 2 PAGES OF NARRATIVE PLUS TWO FIGURES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + FIRE + REACTOR COOLANT + CONTAINMENT STRUCTURE + REPORT, PSAR + R AND D PROGRAM + RADIOLOGY + FERMI 2 (BWR)

056384
 RESPONSE TO QUESTION 12.3.2 - CONTROLLING AND PREVENTING THE ACCUMULATION OF HYDROGEN AFTER A LOCA
 THE DETROIT EDISON COMPANY
 DOCKET 50341-15 +. 4 PAGES, OF AMENDMENT 7 TO FERMI-2 LICENSE APPLICATION, AUGUST 24, 1970, DOCKET 50-341, TYPE--BWR, MFG--G.E., AE--SGT + LUNDY

DESCRIBE YOUR PLANS FOR DEVELOPING MEASURES TO CONTROL AND PRECLUDE SIGNIFICANT ACCUMULATIONS OF COMBUSTIBLE GASES IN CONTAINMENT OVER THE POST-LOCA PERIOD. *** RESPONSE CONSISTS OF 4 PAGES OF NARRATIVE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + FIRE + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + CONTAINMENT STRUCTURE + RADIOLYTIC GAS + REPORT, PSAR + FERMI 2 (BWR)

056385
 RESPONSE TO QUESTION 12.3.3 - ESTIMATE OF HEAT ABSORBED FROM CORE BY COOLANT AFTER A LOCA
 THE DETROIT EDISON COMPANY
 DOCKET 50341-15 + 1 PAGE OF AMENDMENT 7 TO FERMI-2 LICENSE APPLICATION, AUGUST 24, 1970, DOCKET 50-341, TYPE--BWR, MFG--G.E., AE--SGT + LUNDY

DESCRIBE YOUR PHYSICS CALCULATIONS AND THE MODELING ASSUMPTIONS MADE TO ESTIMATE THE CORE REGION COOLANT ENERGY ABSORPTION OVER THE POST-LOCA PERIOD. PROVIDE THE ESTIMATED FRACTIONAL CORE GAMMA AND CORE BETA ENERGY ABSORBED BY COOLANT AS A FUNCTION OF TIME. *** RESPONSE CONSISTS OF 4 PAGES OF NARRATIVE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + DECAY HEAT + FIRE + BETA EMITTER + REACTOR COOLANT + CONTAINMENT STRUCTURE + RADIOLYTIC GAS + GAMMA EMITTER + REPORT, PSAR + COOLING + FERMI 2 (BWR)

056387
 RESPONSE TO QUESTION 12.3.5 - PIPE RUPTURE - ANALYSIS OF RADIOLYTIC GAS RELEASED TO CONTAINMENT
 THE DETROIT EDISON COMPANY
 DOCKET 50341-15 + 2 PAGES, 2 FIGURES OF AMENDMENT 7 TO FERMI-2 LICENSE APPLICATION, AUGUST 24, 1970, DOCKET 50-341, TYPE--PWR, MFG--G.E., AE--SGT + LUNDY

GIVEN A RUPTURE IN THE BOUNDARY OF THE PRIMARY SYSTEM COOLANT WITHIN PRIMARY CONTAINMENT THAT IS OF A LESSER SIZE THAN THE LARGEST PIPE AND ONE THAT MAY NOT RESULT IN SIGNIFICANT FISSION PRODUCT ESCAPE FROM THE CORE, PROVIDE ANALYSES OF THE GASES EVOLVED TO CONTAINMENT BY RADIOLYSIS. INCLUDE AN ASSESSMENT OF THE GAS DISPERSION BETWEEN THE TWO REGIONS OF CONTAINMENT AND THE GAS ACCUMULATIONS ULTIMATELY ATTAINED IN EACH. SPECIFY FOR WHAT BREAK SIZE(S) THE CONDITION OF NO CLAD DAMAGE WOULD BE PREDICTED. DISCUSS HOW THE BREAK SIZE AND LOCATION MIGHT INFLUENCE THE COMBUSTIBLE GAS EVOLUTION TO CONTAINMENT. *** RESPONSE CONSISTS OF 2 PAGES OF

056387 *CONTINUED*
NARRATIVE PLUS 2 FIGURES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + FIRE + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + FAILURE, PIPE + CONTAINMENT STRUCTURE + RADIOLYTIC GAS + REPORT, PSAR + FERMI 2 (BWR)

057687
RESPONSE TO QUESTION 6.4 - HYDROGEN EVOLUTION AFTER LOCA
PORTLAND GENERAL ELECTRIC COMPANY
DOCKET-50344-8 +. 1 PAGE, PG D-101 OF AMENDMENT 5 TO TROJAN LICENSE APPLICATION, FEBRUARY 19, 1970, DOCKET 50-344, TYPE--PWR, MFG--WEST., AE--BECHTEL

ANALYZE THE POTENTIAL HYDROGEN EVOLUTION TO THE CONTAINMENT AFTER A LOSS-OF-COOLANT ACCIDENT.
INCLUDE COMPLETE STATEMENTS OF THE ASSUMPTIONS EMPLOYED AND THE SOURCES OF HYDROGEN CONSIDERED.
DESCRIBE THE PLANS YOU HAVE REGARDING THE USE OF COMBUSTIBLE GAS CONTROL MEASURES. *** (ANSWER)
SEE APPENDIX 14C SUBMITTED IN AMENDMENT 5.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

EXPLOSION + FIRE + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + RADIOLYTIC GAS + REPORT, PSAR + TROJAN (PWR)

057888
RESPONSE TO QUESTION 12.3.6 - POTENTIAL ACCUMULATION OF COMBUSTIBLE GASES
THE DETROIT EDISON COMPANY
DOCKET 50341-9 +. 1 PAGE, PG. 12.3.6 OF AMENDMENT 3 TO FERMI-2 LICENSE APPLICATION, MAY 11, 1970, TYPE--BWR, MFG--G.E., AE--SGT + LUNDY

FOR CASES DISCUSSED IN 12.3.3 AND 12.3.4 ABOVE PROVIDE ANALYSES TO SHOW HOW THE POTENTIAL COMBUSTIBLE GAS ACCUMULATION BY COOLANT RADIOLYSIS WOULD BE INFLUENCED BY HYDROGEN INITIALLY EVOLVED FROM VARIOUS LEVELS OF ZIRCONIUM CLAD-WATER REACTIONS. SELECT ARBITRARY CLAD REACTION VALUES THROUGH 10 PERCENT FOR THE PURPOSE OF THIS ANALYSIS. *** ANSWER TO BE SUBMITTED IN A LETTER TO THE AEC BY MAY 15, 1970.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + FIRE + METAL WATER REACTION + WATER + RADIOLYTIC GAS + ZIRCALOY + FERMI 2 (BWR)

057908
RESPONSE TO QUESTION 9 - STATUS OF ITEMS REQUIRING FURTHER ACTION
NIAGARA MOHAWK POWER CORPORATION
DOCKET 50220-44 +. 11 PAGES OF AMENDMENT 1 TO NINE MILE POINT LICENSE APPLICATION, OCTOBER 12, 1970, DOCKET 50-220, TYPE--BWR, MFG--G.E., AE--NIAGARA MOHAWK

YOUR LETTER OF SEPTEMBER 24, 1969, REPORTED ON THE STATUS OF THE ITEMS IDENTIFIED BY THE ACRS FOR FURTHER ACTION. DESCRIBE THE CURRENT STATUS OF ALL OF THESE ITEMS EXCEPT THE ITEMS, ENTITLED PERIODIC INSPECTION OF THE HIGH PRESSURE COOLANT SYSTEM, PRIMARY SYSTEM LEAK DETECTION STUDIES, AND SAFETY REVIEW AND AUDIT BOARD. IN VIEW OF THE PROPOSED INCREASE IN POWER, DESCRIBE IN DETAIL YOUR PLANS FOR MONITORING PRIMARY COOLANT SYSTEM INTERNAL VIBRATION DURING THE ESCALATION IN POWER. *** ANSWER ON PAGES 16 THRU 27. SEE KEYWORDS FOR ITEMS DISCUSSED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + NINE MILE POINT (BWR) + PRESSURE VESSELS + REACTOR SAFETY SYSTEM + STEAM + CORROSION + MONITOR + RADIOLYTIC GAS + VIBRATION + CORE COMPONENTS + SURVEILLANCE PROGRAM + PIPES AND PIPE FITTINGS

058074
RESPONSE TO QUESTION 5.11 - CONTROLLING THE CONCENTRATION OF HYDROGEN
PHILADELPHIA ELECTRIC COMPANY
DOCKET 50352-9 +. 1 PAGE, PG. 47 OF AMENDMENT 2 TO LIMERICK 1 AND 2 LICENSE APPLICATION, NOVEMBER 24, 1970, TYPE--BWR, MFG--G.E., AE--BECHTEL

PROVIDE A DESCRIPTION OF YOUR PROPOSED MEANS FOR HYDROGEN CONTROL FOR THE LIMERICK UNITS AND GIVE THE DESIGN BASIS FOR THE HYDROGEN GENERATION SOURCE TERMS. *** ANSWER - THE SUBJECT IS BEING INVESTIGATED, AND ANSWER WILL BE SUBMITTED LATER.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + CONTROL + RADIOLYTIC GAS + LIMERICK 2 (BWR) + CONCENTRATION + LIMERICK 1 (BWR)

058157
RESPONSE TO QUESTION 1.8-153C - ALUMINUM IN CONTAINMENT BUILDING
SOUTHERN CALIFORNIA GAS AND ELECTRIC COMPANY + SAN DIEGO GAS AND ELECTRIC COMPANY
DOCKET 50361-11 +. 1 PAGE, PG. 1.8.154C OF AMENDMENT 3 TO SAN ONOFRE 2-3 LICENSE APPLICATION, NOVEMBER 24,

058159 *CONTINUED*
1970, TYPE--PWR, MFG--C.E., AE--BECHTEL

THE QUANTITY OF ALUMINUM WITHIN THE CONTAINMENT BUILDING. *** ANSWER - BASED ON DATA FROM PREVIOUSLY CONSTRUCTED PLANTS, IT IS CONSIDERED THAT THE AMOUNT OF EXPOSED ALUMINUM IN THE CONTAINMENT BUILDING CAN BE LIMITED TO LESS THAN THE 200 POUNDS ASSUMED IN THE HYDROGEN GENERATION CALCULATIONS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ALUMINUM + METAL WATER REACTION + REACTOR, PWR + CONTAINMENT STRUCTURE + SAN ONOFRE 2 (PWR) + SAN ONOFRE 3 (PWR)

058287
RESPONSE TO QUESTION 8.8 - BATTERIES - HYDROGEN AND FIRE
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50280-31 +. 1 PAGE, PG 58.8-1 OF SURRY FINAL SAFETY ANALYSIS REPORT, DECEMBER 1, 1970, DOCKET 50-280, TYPE--PWR, MFG--WEST., AE--STONE + WEBSTER

FROM FIGURE 14.1-16 OF THE FSAR IT APPEARS THAT THE REDUNDANT STATION BATTERIES OF EACH UNIT ARE LOCATED IN PROXIMITY TO EACH OTHER AND THEIR ASSOCIATED BATTERY CHARGERS, AND THAT THEY ARE SERVED BY A SINGLE VENTILATION SYSTEM. DISCUSS THE ADEQUACY OF YOUR DESIGN IN THIS REGARD. *** (ANSWER) EACH BATTERY ROOM IS ENCLOSED BY FIRE PARTITIONS. THE FIRE POTENTIAL IN A BATTERY ENCLOSURE IS VIRTUALLY NEGLIGIBLE BECAUSE BATTERY HYDROGEN GENERATION IS NEGLIGIBLE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

EXPLOSION + FIRE + REACTOR, PWR + SURRY 1 (PWR) + SURRY 2 (PWR) + BATTERIES & CHARGERS

058288
RESPONSE TO QUESTION 8.9 - COOLANT HYDROGEN - EXPLOSION
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50280-31 +. 2 PAGES, PG 58.9-1 AND -2 OF SURRY FINAL SAFETY ANALYSIS REPORT, DECEMBER 1, 1970, DOCKET 50-280, TYPE--PWR, MFG--WEST., AE--STONE + WEBSTER

DISCUSS THE POTENTIAL FOR AND CONSEQUENCES OF AN EXPLOSION OCCURRING AS A RESULT OF A MALFUNCTION OF THE MAIN-GENERATOR HYDROGEN COOLING SURVEY. *** (ANSWER) THE DESIGN OF THE MACHINE AND THE SPECIFIED OPERATING PROCEDURES ARE SUCH THAT EXPLOSIVE MIXTURES ARE NOT POSSIBLE UNDER NORMAL OPERATING CONDITIONS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, CONSEQUENCES + EXPLOSION + REACTOR, PWR + SURRY 1 (PWR) + TURBINE + COOLING + SURRY 2 (PWR)

058308
RESPONSE TO QUESTION 11.3 - DESCRIPTION OF HYDROGEN RECOMBINER
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50280-31 +. 4 PAGES, PG 511.3-1 THRU -4 OF SURRY FINAL SAFETY ANALYSIS REPORT, DECEMBER 1, 1970, DOCKET 50-280, TYPE--PWR, MFG--WEST., AE--STONE + WEBSTER

DESCRIBE IN DETAIL THE HYDROGEN RECOMBINER USED IN THE GASEOUS WASTE DISPOSAL SYSTEM. DISCUSS THE POTENTIAL FOR POISONING OF THE CATALYTIC RECOMBINER AND PROVIDE EXPERIMENTAL VERIFICATION OF PERFORMANCE, IF POSSIBLE. *** ANSWER ON PG 511.3-1 THRU -4.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + WASTE DISPOSAL, GAS + SYSTEM DESCRIPTION + SURRY 1 (PWR) + SURRY 2 (PWR) + RECOMBINERS

058432
RESPONSE TO QUESTION 8.6 - INDEPENDENCE OF REDUNDANT POWER-DISTRIBUTION BRANCHES
VERMONT YANKEE NUCLEAR POWER CORPORATION
DOCKET-50271-34 +. 1 PAGE, PG. 1.2-56 OF VERMONT YANKEE LICENSE APPLICATION, OCTOBER 21, 1970, DOCKET 50-271, TYPE--DWR, MFG--G.E., AE--EBASCO

PROVIDE AN ANALYSIS TO SHOW THAT THE REDUNDANT DISTRIBUTION BRANCHES OF BOTH THE 125-VOLT AND 24-VOLT D-C SYSTEMS SATISFY THE STATED CRITERIA FOR PHYSICAL INDEPENDENCE. THE ANALYSIS SHOULD INCLUDE CONSIDERATION OF THE CONSEQUENCES OF FAILURE OF THE VENTILATION SYSTEMS, AND THE CONSEQUENCES OF DESIGN BASIS EVENTS SUCH AS FIRE AND EXPLOSION IN EACH OF THESE BATTERY SYSTEMS. *** (ANSWER) THE REDUNDANT DISTRIBUTION BRANCHES OF THE 125-VOLT D-C SYSTEM ARE DESIGNATED AS THE DC-1 AND DC-2 SYSTEMS, WITH DISTRIBUTION PANELS DC-1, DC-1A, DC-1C CONNECTED TO ONE BATTERY AND DISTRIBUTION PANELS DC-2, DC-2A, DC-2B, DC-2C, AND DC-2D CONNECTED TO THE OTHER BATTERY. PANEL DC-3 IS NORMALLY FED FROM PANEL DC-2. THESE SYSTEMS ARE SHOWN ON FIGURE 8.6-1.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, DWR + EXPLOSION + FIRE + ELECTRIC POWER, NORMAL + REDUNDANCE + VERMONT YANKEE (DWR) + INDEPENDENCE + ELECTRIC POWER, UNINTERRUPTED + CABLES AND CONNECTORS

058628
 RESPONSE TO QUESTION 5.2 - CONTROLLING THE CONCENTRATION OF HYDROGEN (LOCA)
 COMMONWEALTH EDISON COMPANY
 DOCKET-50254-22 +. 1 PAGE, PG 5.2-1 OF AMENDMENT 13 TO QUAD CITIES 1-2 LICENSE APPLICATION, NOVEMBER 6, 1970,
 DOCKETS 50-254/265, TYPE--BWR, MFG--G.E., AE--SGT + LUNDY

MEANS SHOULD BE PROVIDED TO CONTROL THE CONCENTRATION OF HYDROGEN BELOW THE EXPLOSIVE LIMIT IN THE PRIMARY CONTAINMENT FOLLOWING A LOSS-OF-COOLANT ACCIDENT. DESCRIBE YOUR PROPOSED MEANS FOR HYDROGEN CONTROL AND GIVE THE DESIGN BASIS FOR THE HYDROGEN GENERATION SOURCE TERMS. *** AMENDMENT 23 FOR DRESDEN 3 PRESENTED A DISCUSSION ON THE EXPERIMENTAL RESULTS MADE ON HYDROGEN GENERATION DURING THE SHORT TERM DUE TO METAL-WATER REACTION AND OVER THE LONG TERM DUE TO RADIOLYSIS EFFECTS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + EXPLOSION + ACCIDENT, LOSS OF COOLANT + CONTROL + CONTAINMENT STRUCTURE + QUAD CITIES 1 (BWR) + QUAD CITIES 2 (BWR) + CONCENTRATION

058946
 RESPONSE TO QUESTION 9.13 - PRODUCTION RATE OF H2 AND O2 BY RADIOLYSIS
 PUBLIC SERVICE COMPANY OF COLORADO
 DOCKET-50267-24 +. 1 PAGE, PG 9.13-1 OF AMENDMENT 17 TO FT. ST. VRAIN LICENSE APPLICATION, DECEMBER 21, 1970,
 DOCKET 50-267, TYPE--HTGR, MFG--G.A., AE--G.A.

THE WATER IN THE PCRV COOLING SYSTEM TUBES WILL BE EXPOSED TO A RADIATION FLUX SUFFICIENT TO CAUSE SOME DISSOCIATION OF WATER (PAGE 9.7-1). PROVIDE YOUR ANALYSIS OF THIS SITUATION INDICATING THE RATE AT WHICH THE DISSOCIATION WILL OCCUR AND DISCUSS THE POTENTIAL SAFETY CONSIDERATIONS OF THE DISSOCIATION RELATIVE TO ACCUMULATION OF HYDROGEN AND OXYGEN. *** (ANSWER) PREDICTED LINER-COOLING SYSTEM IS BASED ON THE RESULTS OF WATER-IRRADIATION STUDIES PERFORMED WITH THE ORNL X-10 REACTOR.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, GRAPHITE MODERATED + OXYGEN + WATER + STEEL LINER + RADIOLYTIC GAS + FT. ST. VRAIN (HTGR) + REACTOR, HTGR + TUBING + COOLING + RADIATION EFFECT + PRODUCTION, RATE

059097
 RESPONSE TO QUESTION 5.2.3.6-1 - HYDROGEN CONTROL
 CINCINNATI GAS AND ELECTRIC COMPANY
 DOCKET-50358-10 +. 3 PAGES, PG 5.2.3.6-1 THRU -3 OF AMENDMENT 4 TO ZIMMER 1 LICENSE APPLICATION, JANUARY 6, 1971, DOCKET 50-358, TYPE--BWR, MFG--G.E., AE--SGT + LUNDY

DESCRIBE YOUR PROPOSED MEANS FOR HYDROGEN CONTROL FOR THE ZIMMER UNITS AND GIVE THE DESIGN BASIS FOR THE HYDROGEN-GENERATION SOURCE TERMS. *** ANSWER ON PG 5.2.3.6-1 THRU -3.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + FIRE + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + RADIOLYTIC GAS + SYSTEM DESCRIPTION + ZIMMER 1 (BWR) + CONCENTRATION

059146
 RESPONSE TO QUESTION 4.2.3 - CONTROLLING H2 CONCENTRATION IN CONTAINMENT AFTER LOCA
 SOUTHERN CALIFORNIA EDISON COMPANY + SAN DIEGO GAS AND ELECTRIC COMPANY
 DOCKET 50361-12 +. 1 PAGE, PG. 1.8-2AY OF AMENDMENT 4 TO SAN ONOFRE 2-3 LICENSE APPLICATION, DECEMBER 18, 1970, TYPE--PWR, MFG--G.E., AE--BECHTEL

IT IS INDICATED ON PAGE 14.4.2-14 OF THE PSAR THAT ABOUT 13 DAYS AFTER A LOSS-OF-COOLANT ACCIDENT, THE HYDROGEN CONCENTRATION IN THE CONTAINMENT MAY BE CONTROLLED BY VENTING AT A RATE OF LESS THAN 2 PERCENT PER DAY AND THAT SUCH VENTING WOULD RESULT IN A MAXIMUM OFFSITE THROID DOSE OF LESS THAN 20.4 RADS. WHAT WHOLE BODY DOSE WOULD RESULT FROM THE VENTING OPERATION. WOULD THE RELEASE BE VENTED FROM GROUND LEVEL OR FROM A STACK. IF IT IS FROM A STACK, INDICATE THE STACK HEIGHT IN RELATION TO ADJACENT BUILDINGS. WHAT METEOROLOGICAL CONDITIONS WERE ASSUMED IN CALCULATING THE DOSES AND WHAT X/Q VALUE WAS USED. *** ANSWER - THE PROPER RESPONSES TO THESE QUESTIONS REQUIRED THAT SEVERAL ANALYTICAL STUDIES, PRESENTLY UNDER WAY, FIRST BE COMPLETED. THESE STUDIES WILL BE COMPLETED AND RESPONSES TO THE QUESTIONS SUBMITTED ABOUT MID-JANUARY 1971.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

AIRBORNE RELEASE + DOSE + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + STACK + POPULATION EXPOSURE + CONTAINMENT STRUCTURE + CONCENTRATION + SAN ONOFRE 2 (PWR) + SAN ONOFRE 3 (PWR)

059650
 RESPONSE TO QUESTION 5.1 - CONTROLLING THE CONCENTRATION OF HYDROGEN
 COMMONWEALTH EDISON COMPANY + IOWA-ILLINOIS GAS AND ELECTRIC COMPANY
 DOCKET-50254-27 +. 1 PAGE, PG 5.1-1 OF AMENDMENT 16 TO LICENSE APPLICATION FOR QUAD CITIES 1-2, FEBRUARY 8, 1971, DOCKETS 50-254/265, TYPE--BWR, MFG--G.E., AE--SGT + LUNDY

YOUR RESPONSE TO QUESTION 5.2, AMENDMENT 13, REGARDING THE CONTROL OF THE CONCENTRATION OF

059650 *CONTINUED*

HYDROGEN BELOW THE FLAMMABLE LIMIT FOLLOWING A LOSS-OF-COOLANT ACCIDENT IN THE QUAD-CITIES STATION, REFERENCES THE POSITION YOU STATED FOR DRESDEN 3 IN DRESDEN 3 SAR AMENDMENTS 23 AND 24. THE REFERENCED DRESDEN STATION INFORMATION SHOULD BE UP-DATED AND SUBMITTED FOR OUR REVIEW IN THE AREAS APPLICABLE TO THE QUAD-CITIES STATION SITE INCLUDING RADIOLOGICAL RELEASE ASPECTS OF THE MATTER. OUR REQUEST FOR ADDITIONAL INFORMATION ON POST-ACCIDENT COMBUSTIBLE GAS CONTROL FOR DRESDEN 3, DATED DECEMBER 22, 1970, SHOULD ALSO BE CONSIDERED IN YOUR RESPONSE. *** ANSWER ON PG 5.1-1.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + EXPLOSION + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + RADIOLYTIC GAS + QUAD CITIES 1 (BWR) + QUAD CITIES 2 (BWR) + CONCENTRATION + PRODUCTION, RATE

060780

RESPONSE TO QUESTION 4-14.9 - HYDROGEN-CONTROL SYSTEM
SOUTHERN CALIFORNIA EDISON COMPANY + SAN DIEGO GAS AND ELECTRIC COMPANY
DOCKET-50361-15 +. 6 PAGES, 1 TABLE, PG 1.8-154K THRU -154D OF AMENDMENT 7 TO LICENSE APPLICATION FOR SAN ONOFRE 2-3, FEBRUARY 12, 1970, DOCKETS 50-361/362, TYPE--PWR, MFG--COMB., AE--BECHTEL

PROVIDE A DETAILED JUSTIFICATION FOR EACH INSTANCE WHERE YOU PROPOSE TO USE A LESS CONSERVATIVE ASSUMPTION THAN THAT LISTED IN THE TABLE, AND AN ANALYSIS OF THE RESULTING DECREASE IN TIME TO ATTAIN THE CONTROL LIMIT ESTABLISHED FOR THE HYDROGEN CONCENTRATION IN THE CONTAINMENT ATMOSPHERE. PROVIDE A CURVE OF HYDROGEN CONCENTRATION IN THE CONTAINMENT AS A FUNCTION OF TIME FOR THE ASSUMPTIONS LISTED IN THE TABLE AND FOR THOSE YOU INTEND TO USE AS A DESIGN BASIS. THE ASSUMED AMOUNTS, SURFACE AREAS, AND CORROSION RATES FOR MATERIALS GENERATING HYDROGEN AS A RESULT OF CORROSION SHOULD BE IDENTIFIED. *** ANSWER ON PG 1.8-154K THRU -154D.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT + CONTROL SYSTEM + EXPLOSION + FIRE + METAL WATER REACTION + REACTOR, PWR + RADIOLYTIC GAS + ACCIDENT, DESIGN BASIS + CONCENTRATION + SAN ONOFRE 2 (PWR) + SAN ONOFRE 3 (PWR)

060803

RESPONSE TO QUESTION 6.14 - DESIGN CRITERIA
MAINE YANKEE ATOMIC POWER COMPANY
DOCKET-50309-28 +. 1 PAGE OF AMENDMENT 19 TO LICENSE APPLICATION TO MAINE YANKEE, FEBRUARY 22, 1971, DOCKET 50-309, TYPE--PWR, MFG--COMB., AE--STONE + WEBSTER

WHAT DESIGN CRITERIA WILL BE APPLICABLE TO THE CONTAINMENT HYDROGEN PURGE SYSTEM SUCH AS ENVIRONMENTAL CONDITIONS (TEMPERATURE, PRESSURE, HUMIDITY, AND RADIATION), REDUNDANCY, CAPABILITY TO WITHSTAND FAILURES AND TESTABILITY? WHAT MEANS WILL BE PROVIDED TO MIX THE CONTAINMENT ATMOSPHERE AND MEASURE THE HYDROGEN CONCENTRATION FOLLOWING A LOSS-OF-COOLANT ACCIDENT AND TO MONITOR THE RADIOACTIVITY RELEASED DURING PURGING? *** ANSWER ON PAGE 6.14-1 AND -2 PLUS 1 SKETCH.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA 22151 \$3.00 COPY, \$0.65 MICROFICHE

CONTAINMENT + CONTROL SYSTEM + DESIGN CRITERIA + ACCIDENT, LOSS OF COOLANT + MEASUREMENT + REACTOR, PWR + MONITOR + SYSTEM OPERABILITY IN ACCIDENT + MAINE YANKEE (PWR) + CONCENTRATION

060847

RESPONSE TO QUESTION 5.11 - PURGING OF CONTAINMENT
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
DOCKET-50247-43 +. 1 PAGE, PG 0 6.11-1 OF AMENDMENT 25 TO INDIAN POINT 2 LICENSE APPLICATION, NOVEMBER 12, 1970, DOCKET 50-247, TYPE--PWR, MFG--WEST., AE--UNITED ENGR

SINCE CONTROLLED CONTAINMENT PURGING COULD PROVIDE A BACKUP TO THE FLAME RECOMBINER SYSTEM, EVALUATE CONTROLLED PURGING FOR THE PLANT. *** (ANSWER) A CONTROLLED CONTAINMENT PURGING SYSTEM WILL BE DESIGNED USING EXISTING SPARE PENETRATIONS AND WILL BE PROVIDED IN A MANNER SATISFACTORY TO THE REGULATORY STAFF DURING THE FIRST TWO YEARS OF POWER OPERATION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT + EXPLOSION + FIRE + REACTOR, PWR + VENTILATION SYSTEM + CONTAINMENT STRUCTURE + INDIAN POINT 2 (PWR) + CONCENTRATION + RECOMBINERS

061145

RESPONSE TO QUESTION 4-2.3 - EFFECTS OF VENTING THE HYDROGEN AFTER A LOCA
SOUTHERN CALIFORNIA EDISON COMPANY + SAN DIEGO GAS AND ELECTRIC COMPANY
DOCKET-50361-16 +. 1 PAGE, PG 1.8-2 OF AMENDMENT 8 TO LICENSE APPLICATION FOR SAN ONOFRE 2-3, MARCH 4, 1971, DOCKETS 50-361/362, TYPE--PWR, MFG--C.E., AE--BECHTEL

IT IS INDICATED ON PAGE 10.4.2-14 OF THE PSAR, THAT APPROXIMATELY 13 DAYS FOLLOWING A LOSS-OF-COOLANT ACCIDENT THE HYDROGEN CONCENTRATION IN THE CONTAINMENT MAY BE CONTROLLED BY VENTING AT A RATE OF LESS THAN 2 PERCENT PER DAY AND THAT SUCH VENTING WOULD RESULT IN A MAXIMUM OFFSITE THYROID DOSE OF LESS THAN 2 PERCENT PER DAY AND THAT SUCH VENTING WOULD RESULT IN A MAXIMUM OFFSITE THYROID DOSE OF LESS THAN 20.4 RADS. WHAT WHOLE BODY DOSE WOULD RESULT FROM THE VENTING

061145 *CONTINUED*
OPERATION. WOULD THE RELEASE BE VENTED FROM GROUND LEVEL OR FROM STACK. IF IT IS FROM A STACK, INDICATE THE STACK HEIGHT IN RELATION TO ADJACENT BUILDINGS. WHAT METEOROLOGICAL CONDITIONS WERE ASSUMED IN CALCULATING THE DOSES AND WHAT X/Q VALUE WAS USED. *** ANSWER ON PG 1.8-2AY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

AIRBORNE RELEASE + DOSE + IODINE + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + STACK + POPULATION EXPOSURE + WIND STATISTICS + WHOLE BODY + SAN ONOFRE 2 (PWR) + SAN ONOFRE 3 (PWR)

061286
RESPONSE TO QUESTION 5.2.3.9-1 - CONTROLLING THE CONCENTRATION OF HYDROGEN AFTER A LOCA
NORTHERN INDIANA PUBLIC SERVICE COMPANY
DOCKET-50367-10 +. 1 PAGE OF AMENDMENT 3 TO LICENSE APPLICATION FOR BAILLY 1, MARCH 18, 1971, DOCKET 50-367,
TYPE--BWR, MFG--G.E., AE--SGT + LUNDY

INDICATE THE DESIGN BASES AND CONCEPTUAL DESIGNS OF SYSTEMS INTENDED TO CONTROL THE CONCENTRATION OF HYDROGEN GENERATED FOLLOWING A LOCA AS A RESULT OF METAL WATER REACTION, RADIOLYTIC DECOMPOSITION OF WATER, AND CORROSION. THE PROPOSED SYSTEMS SHOULD MEET THE DESIGN, QUALITY ASSURANCE, REDUNDANCY, ENERGY SOURCE AND INSTRUMENTATION REQUIREMENTS FOR AN ENGINEERED SAFETY FEATURE. *** ANSWER ON PG 5.2.3.9-2.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + CONTROL + SYSTEM DESCRIPTION + CONCENTRATION + BAILLY 1 (BWR)

069141
RESPONSE TO QUESTION 6.29 - HYDROGEN POCKETING PREVENTION
LOUISIANA POWER AND LIGHT COMPANY
DOCKET-50382-11 +. 1 PAGE OF AMENDMENT 6 TO WATERFORD LICENSE APPLICATION, OCTOBER 8, 1971, DOCKET 50-382,
TYPE--PWR, MFG--COMB., AE--E8ASCO

DESCRIBE THE DESIGN FEATURES OF THE CONTAINMENT COOLING DUCT SYSTEM THAT ASSURE ADEQUATE MIXING TO PREVENT CONCENTRATED POCKETS OF HYDROGEN FROM EXISTING IN THE CONTAINMENT IN THE EVENT OF A LOCA. *** (ANSWER) - TO ASSURE ADEQUATE MIXING IN THE CONTAINMENT, THE CONTAINMENT COOLING DUCT SYSTEM IS PROVIDED WITH HIGH VELOCITY DRUM TYPE AIR OUTLETS WITH ADJUSTABLE VANE SETTINGS WHICH DISTRIBUTE THE AIR TO ALL COMPARTMENTS. THE LOUVRES WILL BE POSITIONED TO OPTIMIZE MIXING WITHIN THE CONTAINMENT. THE DUCTS ARE PROVIDED WITH PRESSURE RELIEF DEVICES TO MAKE THE DUCT SYSTEM CAPABLE OF WITHSTANDING THE PRESSURE TRANSIENT AFTER A LOCI.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + VENTILATION SYSTEM + CONTAINMENT AIR COOLING + WATERFORD 3 (PWR) + WATERFORD 4 (PWR)

065572
RESPONSE TO QUESTION 11.13 - HYDROGEN CONTROL
COMMONWEALTH EDISON COMPANY
DOCKET-50295-31 +. 7 PAGES, PGS. Q11.13-1 THRU -7 OF AMENDMENT 16 TO ZION 1 AND 2 LICENSE APPLICATION, OCTOBER 21, 1971, DOCKET 50-295, TYPE--PWR, MFG--WEST., AE--STONE + WEBSTER

DISCUSSES THE CONTROL OF HYDROGEN AND THE PROCESSING OF GASEOUS WASTES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + WASTE TREATMENT, GAS + ZION 1 (PWR) + ZION 2 (PWR)

069992
RESPONSE TO QUESTION 14.3 - CONTAINMENT PAINT
COMMONWEALTH EDISON COMPANY, CHICAGO, ILLINOIS
DOCKET-50295-35 +. 1 PAGE, PG. Q14.3-1 OF AMENDMENT 17 TO ZION 1 AND 2 LICENSE APPLICATION, DOCKET 50-295/304, DECEMBER 10, 1971, TYPE--PWR, MFG--WEST., AE--SGT + LUNDY

PROVIDE AN EVALUATION FOR HYDROGEN EVOLUTION FROM PAINT PRIMERS AND TOP COATINGS. *** ANSWER - EVOLUTION FROM THE COATING SYSTEM COULD CONTRIBUTE AS MUCH AS 12,000 CU FT OF HYDROGEN. THE EVOLUTION WOULD NOT CONTINUE THROUGHOUT THE ENTIRE POST-LOCA PERIOD, BUT WOULD TERMINATE AFTER ALL AVAILABLE MATERIAL HAS REACTED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + CONTAINMENT PAINT + ZION 1 (PWR) + ZION 2 (PWR)

070523
RESPONSE TO QUESTION 6.25 - HYDROGEN CONTROL
PUERTO RICO WATER RESOURCES AUTHORITY
DOCKET-50376-19 +. 2 PAGES, PG. 6.25-1 THRU 6.25-2 OF AMENDMENT 8 TO AGUIRRE LICENSE APPLICATION, AUGUST 2, 1971, DOCKET 50-376, TYPE--PWR, MFG--WEST., AE--GIBBS + HILL

070523 *CONTINUED*

BRIEF DISCUSSION OF THE PROVISIONS IN THE DESIGN OF THE DUCT SYSTEM THAT ENSURE ADEQUATE MIXING TO PREVENT CONCENTRATED POCKETS OF HYDROGEN FROM EXISTING IN THE CONTAINMENT IN THE EVENT OF A LOCA.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + REPORT, PSAR + AGUIRRE 1 (PWR)

071080

RESPONSE TO QUESTION 6.25 - HYDROGEN CONTROL FOR LOCA

PUERTO RICO WATER RESOURCES AUTHORITY

DOCKET-50376-18 +, 2 PAGES, PG. 6.25-1 THRU 6.25-2 OF AMENDMENT 4 TO AGUIRRE 1 LICENSE APPLICATION, MAY 4, 1971, DOCKET 50-376, TYPE--PWR, MFG--WEST., AE--GIBBS + HILL

STATES THAT THE DUCT-DISTRIBUTION SYSTEM IS DESIGNED TO PROMOTE GOOD MIXING OF THE CONTAINMENT AIR AND ENSURES THAT THE RECIRCULATED AIR WILL REACH ALL AREAS. THE SYSTEM INCLUDES A RING HEADER AND BRANCH DUCTS TO THE PRIMARY COMPARTMENTS FOR DISTRIBUTION OF AIR FROM THE FAN-COOLER DISCHARGE. THE AIR IS CIRCULATED UPWARD FROM THE LOWER PRIMARY COMPARTMENTS, THROUGH THE STEAM-GENERATOR COMPARTMENTS TO THE OPERATING FLOOR LEVEL. THE RING HEADER ALSO DISCHARGES AIR TO THE CONTAINMENT ABOVE THE OPERATING FLOOR LEVEL.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + VENTILATION SYSTEM + REPORT, PSAR + AGUIRRE 1 (PWR)

071095

RESPONSE TO QUESTION 6.42 - HYDROGEN CONTROL SYSTEM

PUERTO RICO WATER RESOURCES AUTHORITY

DOCKET-50376-18 +, 8 PAGES, 2 TABLES, PG. 6.42-1 THRU 6.42-8 OF AMENDMENT 4 TO AGUIRRE LICENSE APPLICATION, MAY 4, 1971, DOCKET 50-376, TYPE--PWR, MFG--WEST., AE--GIBBS + HILL

GOOD DISCUSSION OF THE CONTAINMENT HYDROGEN-CONTROL SYSTEM FOR POSTACCIDENT CONDITIONS, INCLUDING SAMPLING AND PURGING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + REPORT, PSAR + AGUIRRE 1 (PWR)

071232

RESPONSE TO QUESTION 6.42 - HYDROGEN CONTROL

PUERTO RICO WATER RESOURCES AUTHORITY

DOCKET-50376-22 +, 14 PAGES, 2 FIGURES, PG. 6.42-1 THRU -14 OF AMENDMENT 11 TO AGUIRRE LICENSE APPLICATION, NOVEMBER 4, 1971, DOCKET 50-376, TYPE--PWR, MFG--WEST., AE--GIBBS + HILL

GOOD DISCUSSION OF THE HYDROGEN CONTROL SYSTEM FOR POSTACCIDENT CONTROL IN THE CONTAINMENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + REPORT, PSAR + AGUIRRE 1 (PWR)

072864

RESPONSE TO QUESTION 4.3 - CONTAINMENT PURGING AFTER LOCA

SOUTHERN CALIFORNIA EDISON COMPANY + SAN DIEGO GAS AND ELECTRIC COMPANY

DOCKET-50-206-157 +, 1 PAGE, PG. 4-7 OF AMENDMENT 25 TO SAN ONOFRE LICENSE APPLICATION, JUNE 28, 1972, DOCKET 50-206, TYPE--PWR, MFG--WEST., AE--BECHTEL

STATES THAT PURGING WOULD BE INITIATED AT 40 DAYS FOLLOWING A LOSS-OF-COOLANT ACCIDENT TO PREVENT THE HYDROGEN CONCENTRATION FROM EXCEEDING 4 VOLUME PERCENT. AT THE TIME OF INITIATION OF PURGING THE CONTINUOUS PURGE RATE REQUIRED WOULD BE 0.60 PERCENT PER DAY OF THE CONTAINMENT VOLUME. THIS PURGE RATE WAS ASSUMED TO REMAIN CONSTANT ONCE INITIATED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + REPORT, SAR + VENTILATION SYSTEM + SAN ONOFRE 1 (PWR) + RADIOLOGIC GAS

072865

RESPONSE TO QUESTION 4.4 - POPULATION EXPOSURE DUE TO CONTAINMENT PURGING

SOUTHERN CALIFORNIA EDISON COMPANY + SAN DIEGO GAS AND ELECTRIC COMPANY

DOCKET-50206-157 +, 1 PAGE, PG. 4-8 OF AMENDMENT 25 TO SAN ONOFRE LICENSE APPLICATION, JUNE 28, 1972, DOCKET 50-206, TYPE--PWR, MFG--WEST., AE--BECHTEL

BRIEF DISCUSSION OF THE THYROID AND WHOLE-BODY DOSES DUE TO CONTAINMENT PURGING FOLLOWING A LOSS-OF-COOLANT ACCIDENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

072665 *CONTINUED*
CONTAINMENT + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + REPORT, SAR + VENTILATION SYSTEM + SAN ONOFRE 1 (PWR)
+ POPULATION EXPOSURE

072874
RESPONSE TO QUESTION 6.9 - BATTERY-ROOM VENT SYSTEM
SOUTHERN CALIFORNIA EDISON COMPANY + SAN DIEGO GAS AND ELECTRIC COMPANY
DOCKET-50206-157 +. 1 PAGE OF AMENDMENT 25 TO SAN ONOFRE LICENSE APPLICATION, JUNE 28, 1972, DOCKET 50-206,
TYPE--PWR, MFG--WEST., AE--BECHTEL

STATES THAT THE BATTERY ROOM VENTILATOR FAN IS POWERED FROM THE STATION SERVICE TRANSFORMER WHICH
IS NOT CONNECTED TO AN EMERGENCY BUS. ASSUMING NO VENTILATION IS AVAILABLE TO THE BATTERY ROOM
AND THE MAXIMUM HYDROGEN GENERATION RATE, THE TIME REQUIRED FOR A CRITICAL HYDROGEN ACCUMULATION
IS IN EXCESS OF 200 HRS, ASSUMING A FACTOR OF SAFETY ON HYDROGEN CONCENTRATION EQUAL TO 2.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
EMERGENCY POWER, ELECTRIC + REACTOR, PWR + REPORT, SAR + VENTILATION SYSTEM + SAN ONOFRE 1 (PWR) + GENERATOR,
DIESEL

072920
RESPONSE TO QUESTION 5.32 - HYDROGEN FROM ZINC CORROSION
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
DOCKET-50286-47 +. 1 PAGE, PG. 5.32.5-1 OF AMENDMENT 19 TO INDIAN POINT 3 LICENSE APPLICATION, JULY 20, 1972,
DOCKET 50-286, TYPE--PWR, MFG--WEST., AE--UNITED ENGR

PROVIDE THE EXTENT TO WHICH THE CORROSION OF ZINC HAS BEEN CONSIDERED IN YOUR HYDROGEN EVOLUTION
ANALYSIS. *** (ANSWER) THE CORROSION OF ZINC HAS BEEN FOUND TO BE RELATIVELY INSIGNIFICANT. THE
AMOUNT OF ZINC EXPOSED TO SPRAY INSIDE THE UNIT 3 CONTAINMENT IS SMALL WHEN ONE CONSIDERS ITS LOW
CORROSION RATE IN ALKALINE SOLUTIONS. THE ONLY ZINC AVAILABLE FOR CORROSION IS THAT ASSOCIATED
WITH MISCELLANEOUS STRUCTURAL EQUIPMENT, LIGHTING CABLES, CABLE TRAYS, ETC.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
METAL WATER REACTION + REACTOR, PWR + ZINC + CORROSION + INDIAN POINT 3 (PWR) + RECOMBINERS

072939
RESPONSE TO QUESTION 11.15 - GAS-HOLDUP PERIOD
WISCONSIN PUBLIC SERVICE CORPORATION
DOCKET-50365-33 +. 2 PAGES, PG. 11.15-1 THRU 11.15-2 OF AMENDMENT 15 TO KEWAUNEE LICENSE APPLICATION,
JANUARY 28, 1972, DOCKET 50-305, TYPE--PWR, MFG--WEST., AE--PIONEER SERV.

PROVIDE ESTIMATES OF GAS-ACCUMULATION RATES WHICH, WHEN USED WITH THE DECAY-TANK VOLUME PROVIDED,
SHOW THAT A 45-DAY HOLDUP PERIOD CAN BE EXPECTED. *** (ANSWER) THE PRIMARY GAS WHICH WILL
ACCUMULATE IS HYDROGEN. WITH A NORMAL LETDOWN FLOWRATE OF 40 GPM, THE ACCUMULATION RATE WILL BE
13 SCF OF HYDROGEN PER HOUR. THE LIMITING CONDITION ON GAS BUILDUP IS THE STORAGE VOLUME
AVAILABLE IN THE UNISOLATED GAS DECAY TANKS. 4500 SCF OF HYDROGEN COULD BE ACCUMULATED BEFORE
DISCHARGE WOULD BE REQUIRED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, PWR + STORAGE CONTAINER + OFF GAS + FISSION PRODUCT RETENTION + KEWAUNEE (PWR)

073153
RESPONSE TO QUESTION 6.3.2 - HYDROGEN MONITORING
BALTIMORE GAS AND ELECTRIC COMPANY
DOCKET-50317-36 + 50318-35 +. 2 PAGES, PG. 6.3.2-1 THRU 6.3.2-2 OF AMENDMENT 17 TO CALVERT CLIFFS 1 AND 2
LICENSE APPLICATION, JANUARY 28, 1972, DOCKETS 50-317/318, TYPE--PWR, MFG--COMB., AE--BECHTEL

DESCRIBES THE MEANS PROVIDED TO MEASURE HYDROGEN AND RADIOACTIVITY CONCENTRATIONS IN THE
CONTAINMENT ATMOSPHERE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, PWR + MONITOR + MONITORING SYSTEM, RADIATION + CALVERT CLIFFS 1 (PWR) + CALVERT CLIFFS 2 (PWR)

073157
RESPONSE TO QUESTION 6.15 - CONTAINMENT SPRAY PH EFFECT
BALTIMORE GAS AND ELECTRIC COMPANY
DOCKET-50317-36 + 50318-35 +. 2 PAGES, PG. 6.15-1 THRU 6.15-2 OF AMENDMENT 17 TO CALVERT CLIFFS 1 AND 2
LICENSE APPLICATION, JANUARY 28, 1972, DOCKETS 50-317/318, TYPE--PWR, MFG--COMB., AE--BECHTEL

BRIEFLY DISCUSSES THE EFFECT OF THE PH OF THE CONTAINMENT SPRAY ON HYDROGEN PRODUCTION AND
CORROSION FOLLOWING A LOSS-OF-COOLANT ACCIDENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

073157 *CONTINUED*
CONTAINMENT SPRAY + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + CORROSION + COOLANT CHEMISTRY + CALVERT CLIFFS 1 (PWR) + CALVERT CLIFFS 2 (PWR)

073521
RESPONSE TO QUESTION 5.32.3 - HYDROGEN RECOMBINER
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
DOCKET-50286-49 +. 2 PAGES, PG. 05.32.3-1 AND -2 OF AMENDMENT 21 TO INDIAN POINT 3 LICENSE APPLICATION, SUPPLEMENT 7 TO FSAR, AUGUST 1, 1972, DOCKET 50-286, TYPE--PWR, MFG--WEST., AE--UNITO ENGR

BRIEF DISCUSSION OF THE PERSONNEL DOSES AND POTENTIAL FOR AIRBORNE ACTIVITY AT THE HYDROGEN-RECOMBINER CONTROL PANEL DURING EQUIPMENT MAINTENANCE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
MAINTENANCE AND REPAIR + REACTOR, PWR + PERSONNEL EXPOSURE, RADIATION + INDIAN POINT 3 (PWR) + RECOMBINERS

073522
RESPONSE TO QUESTION 5.32.4 - HYDROGEN SAMPLING OF CONTAINMENT ATMOSPHERE
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
DOCKET-50286-49 +. 1 PAGE, PG. 05.32.4-1 OF AMENDMENT 21 TO INDIAN POINT 3 LICENSE APPLICATION, SUPPLEMENT 7 TO FSAR, AUGUST 1, 1972, DOCKET 50-286, TYPE--PWR, MFG--WEST., AE--UNITO ENGR.

STATES THAT SAMPLING SHOULD BEGIN 24 TO 48 HR POSTACCIDENT, DEPENDING ON OTHER, MORE CRITICAL, DEMANDS FOR OPERATOR ATTENTION. THERE ARE FIVE HYDROGEN SAMPLE POINTS TO BE TAKEN. NEARLY 1-1/2 HR WILL BE REQUIRED TO TAKE SAMPLES AND PERFORM ANALYSIS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
CONTAINMENT + REACTOR, PWR + SAMPLING + INDIAN POINT 3 (PWR)

073532
RESPONSE TO QUESTION 6.14 - HYDROGEN RECOMBINER - SURFACE PROTECTION
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
DOCKET-50286-49 +. 1 PAGE, PG. 06.14-1 OF AMENDMENT 21 TO INDIAN POINT 3 LICENSE APPLICATION, SUPPLEMENT 7 TO FSAR, AUGUST 1, 1972, DOCKET 50-286, TYPE--PWR, MFG--WEST., AE--UNITO ENGR.

STATES THAT THE BLOWER SURFACES EXPOSED TO CONTAINMENT SPRAY ARE PAINTED WITH CARBOLINE COMPANY'S PHENOLINE 305 OVER CZ-11 PRIMER TO PROVIDE RESISTANCE AGAINST ANY CORROSIVE ENVIRONMENT. THIS IS TRUE ALSO FOR THE EXPOSED SURFACES OF THE COMBUSTOR UNIT. THIS PROTECTIVE COATING SYSTEM HAS BEEN DEMONSTRATED TO WITHSTAND THE DESIGN BASIS ACCIDENT ENVIRONMENT AND MEETS THE CRITERIA GIVEN IN PROTECTIVE COATINGS (PAINTS) FOR LIGHT WATER NUCLEAR REACTOR CONTAINMENT FACILITIES - ANSI N-101.5.7 - 1971 PROPOSED STANDARD (AMERICAN NATIONAL STANDARDS INSTITUTE, INC.).

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, PWR + SURFACE, PAINTED + INDIAN POINT 3 (PWR) + SURFACE TREATMENT + RECOMBINERS

073544
RESPONSE TO QUESTION 9.3 - HYDROGEN LEAKAGE FROM SUPPLY MAINIFOLD
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
DOCKET-50286-49 +. 1 PAGE, PG. 9.3-1 OF AMENDMENT 21 TO INDIAN POINT 3 LICENSE APPLICATION, SUPPLEMENT 7 TO FSAR, AUGUST 1, 1972, DOCKET 50-286, TYPE--PWR, MFG--WEST., AE--UNITO ENGR.

DISCUSSES THE POTENTIAL FOR AND THE CONSEQUENCES OF AN EXPLOSION AS A RESULT OF A MALFUNCTION OF THE HYDROGEN-SUPPLY MANIFOLD CONNECTED TO THE VOLUME-CONTROL TANK IN THE CHEMICAL VOLUME CONTROL SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
EXPLOSION + REACTOR, PWR + LEAK + INDIAN POINT 3 (PWR) + CYLINDER GAS + PIPES AND PIPE FITTINGS

073610
RESPONSE TO QUESTION 7.32 - HYDROGEN PURGE SYSTEM
ARKANSAS POWER AND LIGHT COMPANY
DOCKET-50313-46 +. 1 PAGE, PG. 7.32 OF AMENDMENT 27 TO ARKANSAS NUCLEAR 1 LICENSE APPLICATION, AUGUST 4, 1972, DOCKET 50-313, TYPE--PWR, MFG--B+W, AE--BECHTEL

STATES THAT THE HYDROGEN PURGE SYSTEM CONSISTS OF TWO FULLY REDUNDANT AND SEPARATED TRAINS. THE SYSTEM IS UNDER MANUAL CONTROL ONLY, ACTUATED AND MONITORED FROM THE CONTROL ROOM. THE INITIATION AND CONTROL CIRCUITS CONFORM TO IEEE-279 REQUIREMENTS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
CONTROL SYSTEM + OPERATION + REACTOR, PWR + VENTILATION SYSTEM + ARKANSAS NUCLEAR 1 (PWR)

073899
 RESPONSE TO QUESTION 6.14 - HYDROGEN FROM LOCA
 PUBLIC SERVICE ELECTRIC AND GAS COMPANY
 DOCKET-50272-30, 31, 32 +. 2 PAGES, 1 TABLE, 2 FIGURES, PG. Q6.14-1 THRU Q5.14-2 OF AMENDMENT 13 TO SALEM 1
 AND 2 LICENSE APPLICATION, JULY 1972, DOCKETS 50-272/311, TYPE--PWR, MFG--WEST., AE--PUBLIC SERVICE OF NY

PROVIDES FIGURES AND A DISCUSSION OF THE CALCULATED QUANTITIES OF HYDROGEN PRODUCTION AND
 ACCUMULATION IN THE CONTAINMENT FOR THE FIRST 100 DAYS AFTER A LOSS-OF-COOLANT ACCIDENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + SALEM 1 (PWR) + SALEM 2 (PWR)

074476
 RESPONSE TO QUESTION 10.8 - BULK HYDROGEN STORAGE
 PUBLIC SERVICE ELECTRIC AND GAS CO.
 DOCKET-50272-35 +. 1 PAGE, PG. 10.8-1 OF AMENDMENT 14 TO SALEM 1 AND 2 FSAR, SEPT. 6, 1972, DOCKETS 50-
 272/311, TYPE--PWR, MFG--WEST., AE--PUBLIC SERVICE ELECTRIC AND GAS CO.

DESCRIBES, WITH THE AID OF A DRAWING, THE BULK HYDROGEN STORAGE FACILITY INCLUDING ITS LOCATION
 AND DISTRIBUTION SYSTEM. INCLUDES THE PROTECTIVE MEASURES TAKEN TO PREVENT FIRES AND EXPLOSIONS
 DURING OPERATIONS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + REPORT, SAR + STORAGE CONTAINER + SYSTEM DESCRIPTION + SALEM 1 (PWR) + SALEM 2 (PWR)

074681
 RESPONSE TO QUESTION 6.19 - PREVENTION OF HYDROGEN STRATIFICATION
 DUQUESNE LIGHT CO.
 DOCKET-50334-60 +. 1 PAGE, PG. 6.19-1 OF AMENDMENT 1 FOR BEAVER VALLEY 1 FSAR, APRIL 16, 1973, DOCKET 50-334,
 TYPE--PWR, MFG--WEST., AE--STONE+WEBSTER

THE INTERNAL DESIGN OF THE CONTAINMENT STRUCTURES ALLOWS AIR TO CIRCULATE FREELY. ALL CUBICLES
 AND COMPARTMENTS WITHIN THE CONTAINMENT ARE OPEN AT THE TOP AND ALLOW AIR CIRCULATION.
 CONVECTIVE MIXING IN CONJUNCTION WITH CONTAINMENT SPRAY ASSURES A UNIFORM MIXTURE OF HYDROGEN IN
 THE CONTAINMENT. CONTAINMENT SYSTEM EXPERIMENT TESTS HAVE VERIFIED THAT ADEQUATE MIXING OF THE
 CONTAINMENT ATMOSPHERE IS ACHIEVED BY THE CONTAINMENT SPRAY SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 CONTAINMENT SPRAY + REACTOR, PWR + CONTROL + CONTAINMENT STRUCTURE + FLOW, MIXING + FLOW, CONVECTION + BEAVER
 VALLEY 1 (PWR)

074682
 RESPONSE TO QUESTION 6.21 - HYDROGEN CONTROL FOR BOTH UNITS
 DUQUESNE LIGHT CO.
 DOCKET-50334-60 +. 1 PAGE, PG. 6.21-1 OF AMENDMENT 1 FOR BEAVER VALLEY 1 FSAR, APRIL 16, 1973, DOCKET 50-334,
 TYPE--PWR, MFG--WEST., AE--STONE+WEBSTER

TWO HYDROGEN RECOMBINERS AND A PURGE SYSTEM ARE TO BE INSTALLED IN UNIT 1. WHEN UNIT 2 IS BUILT,
 ONE OF THE RECOMBINERS WILL BE MOVED FROM UNIT 1 TO UNIT 2. IN THE EVENT OF A DBA, THE SECOND
 RECOMBINER WILL BE MOVED FROM THE UNAFFECTED UNIT TO THE UNIT WHICH HAS UNDERGONE THE DBA. IN
 THE EVENT OF A MALFUNCTION OF A RECOMBINER, THE BACKUP RECOMBINER WILL BE PLACED IN SERVICE.
 UNIT 2 WILL HAVE ITS OWN BACKUP PURGE SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + CONTROL + SYSTEM OPERABILITY IN ACCIDENT + SHARED COMPONENTS + BEAVER VALLEY 1 (PWR) +
 RECOMBINERS

074683
 RESPONSE TO QUESTION 6.24 - MAKEUP AIR DURING PURGING
 DUQUESNE LIGHT CO.
 DOCKET-50334-60 +. 1 PAGE, PG. 6.24-1 OF AMENDMENT 1 FOR BEAVER VALLEY 1 FSAR, APRIL 16, 1973, DOCKET 50-334,
 TYPE--PWR, MFG--WEST., AE--STONE+WEBSTER

WHEN THE HYDROGEN CONTROL SYSTEM IS OPERATED IN THE PURGE MODE, APPROXIMATELY 50 SCFM OF
 ATMOSPHERIC AIR WILL BE SUPPLIED TO THE CONTAINMENT. AN ATMOSPHERIC PRESSURE AIR LINE WILL BE
 CONNECTED TO THE RETURN LINE FROM THE RECOMBINER. FLOW OF AIR WILL BE REDUCED DURING PURGE
 BLOWER OPERATION AND MEASURED BY MEANS OF A FLOW INDICATOR LOCATED IN THE VICINITY OF THE PURGE
 EQUIPMENT OR BY A FLOW RECORDER.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 OPERATION + REACTOR, PWR + CONTROL + AIR + PRESSURE, SUBATMOSPHERIC + BEAVER VALLEY 1 (PWR) + CONTAINMENT,
 SUBATMOSPHERIC + RECOMBINERS

074684
 RESPONSE TO QUESTION 6.27 - HYDROGEN ANALYZER
 DUQUESNE LIGHT CO.
 DOCKET-50334-60 +. 1 PAGE, PG. 6.27-1 OF AMENDMENT 1 FOR BEAVER VALLEY 1 FSAR, APRIL 16, 1973, DOCKET 50-334,
 TYPE--PWR, MFG--WEST., AE--STONE+WEBSTER

AFTER THE THERMAL CONDUCTIVITY HYDROGEN ANALYZERS ARE FABRICATED AND ASSEMBLED, THEY WILL BE FACTORY TESTED. WITHIN 30 DAYS AFTER INSTALLATION AND PERIODICALLY THEREAFTER, THE ANALYZERS WILL BE TESTED WITH SEPARATE RUNS USING LOW HYDROGEN CONCENTRATION BOTTLE, AND A NITROGEN BOTTLE FOR ZEROING THE ANALYZERS. ACCURACY OF THE HYDROGEN ANALYZER IS PLUS OR MINUS 2 PERCENT OF THE FULL SCALE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + AIR + CHEMICAL ANALYSIS + INSTRUMENT CALIBRATION + CONTAINMENT STRUCTURE + TEST, SYSTEM OPERABILITY + CONTAINMENT ATMOSPHERE, INERT + BEAVER VALLEY 1 (PWR)

074841
 RESPONSE TO QUESTION 6.14 - POSTACCIDENT HYDROGEN
 PUBLIC SERVICE ELECTRIC AND GAS CO.
 DOCKET-50272-46 +. 4 PAGES, 1 TABLE, AMENDMENT 17 TO SALEM FSAR, DEC. 18, 1972, DOCKETS 50-272/311, TYPE--PWR,
 MFG--WEST., AE--PUBLIC SERVICE OF NY

BRIEFLY DISCUSSES POSTACCIDENT HYDROGEN PRODUCTION AND ACCUMULATION AND HYDROGEN CONTROL.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

METAL WATER REACTION + REACTOR, PWR + RADIOLYTIC GAS + SALEM 1 (PWR) + SALEM 2 (PWR) + RECOMBINERS

078665
 RESPONSE TO QUESTION 5.6 - POST-LOCA HYDROGEN CONTROL
 PACIFIC GAS AND ELECTRIC CO.
 DOCKET-50398-16 +. 1 PAGE, AMENDMENT 10 TO PSAR FOR MENDOCINO POWER PLANT, UNITS 1 AND 2, AUG. 2, 1972,
 DOCKETS 50-398/399, TYPE--BWR, MFG--G.E., AE--BECHTEL

THE PROPOSED METHOD FOR CONTROLLING THE FLAMMABILITY OF THE POST-LOSS-OF-COOLANT-ACCIDENT CONTAINMENT ATMOSPHERE IS BY CONTAINMENT-ATMOSPHERE DILUTION. THE CONTAINMENT IS INERTED WITH NITROGEN DURING NORMAL OPERATION TO KEEP THE OXYGEN CONCENTRATION TO LESS THAN THE 5% FLAMMABILITY LIMIT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + CONTROL + RADIOLYTIC GAS + CONTAINMENT ATMOSPHERE, INERT + CONCENTRATION + MENDOCINO 1 (BWR) + MENDOCINO 2 (BWR)

079022
 RESPONSE TO QUESTION 5 - GAS CONCENTRATION IN DRYWELL AFTER LOCA
 TENNESSEE VALLEY AUTHORITY
 DOCKET-50259-66 +. 1 PAGE, 3 FIGURES, P. W5-1 OF AMENDMENT 41 TO FSAR FOR BROWNS FERRY 1, 2, AND 3, SEPT. 27, 1972, DOCKETS 50-259/260/296, TYPE--BWR, MFG--G.E., AE--TVA

CURVES OF HYDROGEN, OXYGEN, AND STEAM CONCENTRATION IN THE DRYWELL AND SUPPRESSION CHAMBER ARE ATTACHED. (FIGURES W5-1 THRU W5-3). NO ATTEMPT IS MADE TO PREDICT WHEN HOMOGENEITY OCCURS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + OXYGEN + STEAM + CONTAINMENT ATMOSPHERE, INERT + BROWNS FERRY 2 (BWR) + BROWNS FERRY 3 (BWR) + CONCENTRATION + BROWNS FERRY 1 (BWR)

079033
 RESPONSE TO QUESTION 13 - HYDROGEN RELEASE FROM METAL-WATER REACTIONS
 TENNESSEE VALLEY AUTHORITY
 DOCKET-50259-66 +. 1 PAGE, PG. W13-1 OF AMENDMENT 41 TO FSAR FOR BROWNS FERRY 1, 2, AND 3, SEPT. 27, 1972,
 DOCKETS 50-259/260/296, TYPE--BWR, MFG--G.E., AE--TVA

STATES THAT ON THE BASIS OF THE REALISTIC ASSUMPTIONS, THE HYDROGEN CONCENTRATION WILL REMAIN BELOW 4% UP TO ABOUT 20 DAYS. AT THIS TIME, THE CONTAINMENT PRESSURE WILL BE ABOUT 2 PSIG. NITROGEN WILL BE ADDED AS REQUIRED TO KEEP HYDROGEN BELOW 4% OR OXYGEN BELOW 5%. PERIODIC VENTING WILL BE CARRIED OUT SO AS TO GRADUALLY REDUCE CONTAINMENT PRESSURE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + RADIOLYTIC GAS + BROWNS FERRY 2 (BWR) + BROWNS FERRY 3 (BWR) + BROWNS FERRY 1 (BWR)

079034

079034 *CONTINUED*
 RESPONSE TO QUESTION 14 - HYDROGEN LEAKAGE FROM DRYWELL
 TENNESSEE VALLEY AUTHORITY
 DOCKET-50259-66 +. 1 PAGE, PG. W14-1 OF AMENDMENT 4 TO FSAR FOR BROWNS FERRY 1, 2, AND 3, SEPT. 27, 1972, DOCKETS 50-259/260/296, TYPE--BWR, MFG--G.E., AE--TVA

DISCUSSES THE POTENTIAL FOR STRATIFICATION OF HYDROGEN LEAKAGE FROM THE DRYWELL INTO THE REACTOR BUILDING OR COMPARTMENTS, AND THE NEED FOR POSITIVE MIXING OF THE ATMOSPHERE OF COMPARTMENTS IN THE REACTOR BUILDING TO PREVENT THE FORMATION OF LOCALIZED COMBUSTIBLE GAS MIXTURES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + CONTAINMENT + ACCIDENT, LOSS OF COOLANT + VENTILATION SYSTEM + BROWNS FERRY 2 (BWR) + LEAK + BROWNS FERRY 3 (BWR) + BROWNS FERRY 1 (BWR)

079164
 RESPONSE TO QUESTION 11.1 - BULK HYDROGEN STORAGE
 NIAGARA MOHAWK POWER CORP.
 DOCKET-50410-16 +. 1 PAGE, PG. 11.1-1, AMENDMENT 4 TO PSAR FOR NINE MILE POINT, UNIT 2, DEC. 7, 1972, DOCKET 50-410, TYPE--BWR, MFG--G.E., AE--STONE AND WEBSTER

FIGURE 11.1-1 SHOWS THE LOCATION AND DISTRIBUTION OF THE BULK HYDROGEN STORAGE FACILITY. THE SYSTEM WILL CONSIST OF SEVERAL PREASSEMBLED MODULES. THE STORAGE BANK WILL BE COMPOSED OF ASME-CODED STORAGE UNITS MANIFOLDED IN ACTIVE AND RESERVE BANKS. THE BULK STORAGE AREA WILL BE COMPLETELY ENCLOSED BY PROTECTIVE FENCING. ADMINISTRATIVE AND SAFETY PROCEDURES WILL BE ENFORCED TO PREVENT FIRES OR EXPLOSIONS. A SAFETY VALVE WITHIN THE CABINET, VENTED TO ATMOSPHERE WITHIN THE FENCED AREA WILL PROTECT LOW PRESSURE PIPING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + STORAGE CONTAINER + TURBINE + INDUSTRIAL SAFETY + NINE MILE POINT 2 (BWR) + PIPES AND PIPE FITTINGS

080766
 RESPONSE TO QUESTION 6.29 - CONTROL OF THE HYDROGEN CONCENTRATION
 LOUISIANA POWER AND LIGHT CO.
 DOCKET-50382-26 +. 1 PAGE, PG. 6.29-1 OF AMENDMENT 18 TO WATERFORD PSAR, JULY 24, 1972, DOCKET 50-382, TYPE--PWR, MFG--COMB., AE--EBASCO

TO ENSURE ADEQUATE MIXING IN THE CONTAINMENT, THE CONTAINMENT COOLING DUCT SYSTEM IS PROVIDED WITH HIGH VELOCITY DRUM TYPE AIR OUTLETS WITH ADJUSTABLE VANE SETTINGS WHICH DISTRIBUTE THE AIR TO ALL COMPARTMENTS. THE LOUVRES WILL BE POSITIONED TO PROJECT AIR INTO THE DOME AREA WITH THE CENTERLINE OF THE AIR JETS INTERSECTING THE APEX OF THE DOME TO OPTIMIZE MIXING WITHIN THE CONTAINMENT. THE DUCTS ARE PROVIDED WITH PRESSURE RELIEF DEVICES TO MAKE THE DUCT SYSTEM CAPABLE OF WITHSTANDING THE PRESSURE TRANSIENT AFTER A LOCA.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + CONTAINMENT AIR COOLING + AIR + CONTAINMENT STRUCTURE + FLOW, MIXING + CONCENTRATION + WATERFORD 3 (PWR)

080878
 RESPONSE TO QUESTION 6.28 - OPERATION OF CONTROLLED-ATMOSPHERIC-RELEASE SYSTEM
 LOUISIANA POWER AND LIGHT COMPANY
 DOCKET-50382-22 +. 1 PAGE, P. Q6.28-1, AMENDMENT 14 TO WATERFORD PSAR, MAY 5, 1972, DOCKET 50-382, TYPE--PWR, MFG--COMB., AE--EBASCO

THE CONTROLLED ATMOSPHERIC RELEASE SYSTEM PROVIDES THE MEANS FOR CONTROL OF COMBUSTIBLE GAS CONCENTRATIONS. THE CONTAINMENT FAN COOLERS PROVIDE THE NECESSARY AIR DISTRIBUTION TO ASSURE A WELL MIXED ATMOSPHERE IN THE CONTAINMENT. A CONTAINMENT ATMOSPHERE SAMPLING SYSTEM IS PROVIDED FOR MEASURING THE CONCENTRATION OF HYDROGEN WITHIN THE CONTAINMENT FOLLOWING A LOCA.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + CONTROL + CONTAINMENT AIR COOLING + RADIOLYTIC GAS + CONCENTRATION + WATERFORD 3 (PWR)

080884
 RESPONSE TO QUESTION 6.54 - PROVISION FOR A RECOMBINER SYSTEM
 LOUISIANA POWER AND LIGHT COMPANY
 DOCKET-50382-22 +. 1 PAGE, P. Q6.54-1, AMENDMENT 14 TO WATERFORD PSAR, MAY 5, 1972, DOCKET 50-382, TYPE--PWR, MFG--COMB., AE--EBASCO

THE CONTROLLED ATMOSPHERIC RELEASE SYSTEM, AS INTEGRATED WITHIN OUR CONTAINMENT SYSTEM DESIGN, PROVIDES THE APPROPRIATE MEANS FOR POST-LOCA COMBUSTIBLE GAS CONTROL. ALLOTMENT OF SPACE AND APPROPRIATE CONNECTIONS FOR THE EVENTUAL INCLUSION OF A RECOMBINER SYSTEM WILL BE MADE. IF A RECOMBINER SYSTEM IS A REQUIREMENT AT THE TIME OF PLANT OPERATION, A SYSTEM WILL BE MADE AVAILABLE FOR THE WATERFORD SITE.

080884 *CONTINUED*
 AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 CONTAINMENT + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + CONTROL + WATERFORD 3 (PWR) + RECOMBINERS

081147
 RESPONSE TO QUESTION 5.24 - CONTAINMENT ATMOSPHERIC DILUTION SYSTEM
 NIAGARA MOHAWK POWER CORP.
 DOCKET-50410-19+. 1 PAGE, PG. 5.24-1 OF AMENDMENT 5 TO NINE MILE POINT PSAR, JAN. 10, 1973, DOCKET 50-410,
 TYPE--BWR, MFG--G.E., AE--STONE AND WEBSTER

PROVIDES DETAIL ON EVALUATION OF THE ADEQUACY OF THE CAD SYSTEM TO FUNCTION AS A BACKUP SYSTEM
 FOR THE CONTROL OF COMBUSTIBLE GASES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, BWR + CONTAINMENT SPRAY + CONTROL + CONTAINMENT ATMOSPHERE, INERT + SYSTEM OPERABILITY IN ACCIDENT +
 FLOW, MIXING + CONCENTRATION + NINE MILE POINT 2 (BWR)

081386
 RESPONSE TO QUESTION 7.32 - HYDROGEN-SKIMMER-SYSTEM VALVES
 INDIANA AND MICHIGAN POWER CO.
 DOCKET-50315-72 +. 1 PAGE, PG. 7.32-1 OF AMENDMENT 27 TO DONALD C. COOK PSAR, AUG. 17, 1972, DOCKETS 50-
 315/316, TYPE--PWR, MFG--WEST., AE--UTILITY

THE NORMALLY CLOSED VALVES ARE PERIODICALLY TESTED IN CONJUNCTION WITH THEIR ASSOCIATED
 CONTAINMENT AIR RECIRCULATION/HYDROGEN SKIMMER SYSTEM FANS. THIS TEST WILL CONFIRM THAT THE
 VALVES WILL REMAIN CLOSED FOR TWO MINUTES FOLLOWING THE HI-HI PRESSURE ACTUATION SIGNAL. THESE
 VALVES ARE SEISMIC CLASS 1 VALVES AND HAVE BEEN HYDROSTATICALLY TESTED TO ASSURE THEY ARE CAPABLE
 OF MEETING THEIR DESIGN FUNCTION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + CONTROL + CONTAINMENT FILTERING SYSTEM + COOK 1 (PWR) + COOK 2 (PWR) + CONCENTRATION + VALVES

081421
 RESPONSE TO QUESTION 5.117.1 - DELAYED ACTUATION OF CONTAINMENT-AIR FANS AND VALVES
 INDIANA AND MICHIGAN POWER CO.
 DOCKET-50315-95 +. 1 PAGE, PG. 5.117-2 OF AMENDMENT 36 TO DONALD C. COOK PSAR, JAN. 30, 1973, DOCKETS 50-
 315/316, TYPE--PWR, MFG--WEST., AE--UTILITY

THE ONLY IMPACT ON THE CONTAINMENT LONG TERM PRESSURE RESPONSE TO THE 10 MINUTE DELAY IN THE AIR
 RECIRCULATION SYSTEM FAN ACTIVATION IS TO REDUCE THE RATE OF PRESSURE DECAY FOLLOWING THE REACTOR
 COOLANT SYSTEM BLOWDOWN. ICE CONDENSER TESTS HAVE SHOWN THAT PRESSURE DECAY WILL OCCUR BY
 NATURAL CONVECTION EFFECTS WITHOUT THE AIR RECIRCULATION FANS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + CONTROL + CONTAINMENT AIR COOLING + FLOW, RECIRCULATION + COOK 1 (PWR) + COOK 2 (PWR) +
 CONCENTRATION + VALVES

081769
 RESPONSE TO QUESTION 6.10.1 - HYDROGEN EVOLUTION FROM PAINT
 THE MILLSTONE POINT COMPANY
 DOCKET-50-336-51 +. 1 PAGE, AMENDMENT 15 TO MILLSTONE FSAR, FEBRUARY 16, 1973, DOCKET 50-336, TYPE--PWR, MFG--
 COMB., AE--BECHTEL

THE HYDROGEN EVOLUTION RATES FROM ZINC BEARING PAINTS WERE $5 \times 10^{(EXP -3)}$ MG (H₂)/IN. SQ-HR FOR
 THE FIRST 24 HOURS AND $1.6 \times 10^{(EXP -3)}$ MG (H₂)/IN. SQ-HR THEREAFTER. CURRENT LITERATURE
 INDICATES THAT YIELDS OF 1 TO 3 CC OF HYDROGEN PER SQUARE CENTIMETER OF AREA EXPOSED CAN BE
 EXPECTED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + RELEASE RATE + CONTAINMENT PAINT + SURFACE, PAINTED + MILLSTONE POINT 2 (PWR)

081770
 RESPONSE TO QUESTION 6.10.2 - HYDROGEN RECOMBINER
 THE MILLSTONE POINT COMPANY
 DOCKET-50-336-51 +. 1 PAGE, AMENDMENT 15 TO MILLSTONE FSAR, FEBRUARY 16, 1973, DOCKET 50-336, TYPE--PWR, MFG--
 COMB., AE--BECHTEL

THE HYDROGEN RECOMBINERS CONSIST OF TWO 100% CAPACITY RECOMBINERS, THERMAL (ELECTRIC) TYPE, OF
 COMPLETELY PASSIVE DESIGN WITH NO MOVING PARTS AND WITH OPERATING CONTROLS MOUNTED ON CONTROL
 BOARDS LOCATED IN THE MAIN CONTROL ROOM. THE CONTAINMENT ATMOSPHERE SAMPLES ARE CHILLED TO
 REDUCE MOISTURE CONTENT, THEN WARMED BEFORE ENTERING THE ANALYZER.

081770 *CONTINUED*
 AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + CONTROL + SYSTEM DESCRIPTION + MILLSTONE POINT 2 (PWR) + RECOMBINERS

081771
 RESPONSE TO QUESTION 6.10.3 - HYDROGEN MONITORING
 THE MILLSTONE POINT COMPANY
 DOCKET-50-336-51 +. 1 PAGE, AMENDMENT 15 TO MILLSTONE FSAR, FEBRUARY 16, 1973, DOCKET 50-336, TYPE--PWR, MFG--
 COMB., AE--BECHTEL

THE HYDROGEN MONITORING ANALYZER CABINETS ARE LOCATED IN THE EAST ELECTRICAL PENETRATION ROOM. AN INDICATOR ON EACH ANALYZER PANEL PROVIDES MEANS FOR READING HYDROGEN CONCENTRATION LOCALLY. RECORDERS IN THE MAIN CONTROL ROOM (CABINET RC 14 E) PROVIDE A PERMANENT RECORD OF HYDROGEN CONCENTRATION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + MONITOR, GAS + CONTAINMENT ATMOSPHERE, INERT + MILLSTONE POINT 2 (PWR) + INDICATORS + RECORDERS

081772
 RESPONSE TO QUESTION 6.10.4 - HYDROGEN ANALYZER
 THE MILLSTONE POINT COMPANY
 DOCKET-50-336-51 +. 1 PAGE, AMENDMENT 15 TO MILLSTONE FSAR, FEBRUARY 16, 1973, DOCKET 50-336, TYPE--PWR, MFG--
 COMB., AE--BECHTEL

THE HYDROGEN ANALYZERS USE THE THERMAL CONDUCTIVITY PRINCIPLE OF MEASUREMENT. IN THIS APPLICATION, THE THERMAL CONDUCTIVITY OF THE CONTAINMENT ATMOSPHERE WILL BE COMPARED WITH THE THERMAL CONDUCTIVITY OF AIR. SINCE THE CONTAINMENT ATMOSPHERE MAY BE SATURATED WITH MOISTURE, A CHILLER IN THE SAMPLE STREAM CONDENSES MOISTURE FOR EXTRACTION FROM THE SAMPLE STREAM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + INSTRUMENT, AIR SAMPLING + CONTAINMENT ATMOSPHERE, INERT + MILLSTONE POINT 2 (PWR)

081773
 RESPONSE TO QUESTION 6.10.5 - MAKEUP-AIR SUPPLY
 THE MILLSTONE POINT COMPANY
 DOCKET-50-336-51 +. 1 PAGE, AMENDMENT 15 TO MILLSTONE FSAR, FEBRUARY 16, 1973, DOCKET 50-336, TYPE--PWR, MFG--
 COMB., AE--BECHTEL

MAKEUP AIR CAN BE PROVIDED BY THE INSTRUMENT OR STATION AIR COMPRESSORS FOR THE CONTAINMENT HYDROGEN PURGE OPERATIONS. FOLLOWING A LOCI THERE IS A PERIOD OF 12 DAYS BEFORE THE HYDROGEN CONCENTRATION REACHES 3 VOLUME PERCENT. THEREFORE, IF THE AIR COMPRESSORS ARE NOT AVAILABLE AFTER A LOCI, THERE IS ADEQUATE TIME TO RESTORE THE SYSTEM TO SERVICE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + CONTROL + CONTAINMENT ATMOSPHERE, INERT + PNEUMATIC SYSTEM + MILLSTONE POINT 2 (PWR)

081774
 RESPONSE TO QUESTION 6.10.6 - HYDROGEN PURGE-VALVE OPERATIONS
 THE MILLSTONE POINT COMPANY
 DOCKET-50-336-51 +. 1 PAGE, AMENDMENT 15 TO MILLSTONE FSAR, FEBRUARY 16, 1973, DOCKET 50-336, TYPE--PWR, MFG--
 COMB., AE--BECHTEL

THE HYDROGEN PURGE CONTAINMENT ISOLATION VALVES INSIDE CONTAINMENT ARE DESIGNED TO FAIL IN THEIR LAST POSITION. THESE VALVES ARE NORMALLY CLOSED AND ARE THEREFORE EXPECTED TO BE CLOSED DURING THE LOCI CONDITION. FOR POST-INCIDENT SERVICE, ACCUMULATOR TANKS ARE PROVIDED TO ASSURE INSTRUMENT AIR FOR VALVE ACTUATION. INTERMITTENT SYSTEM OPERATION OR SYSTEM ISOLATION CAN BE CONTROLLED BY THE OUTSIDE CONTAINMENT ISOLATION VALVE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 CONTAINMENT ISOLATION + REACTOR, PWR + CONTROL + CONTAINMENT ATMOSPHERE, INERT + MILLSTONE POINT 2 (PWR) + VALVES

081775
 RESPONSE TO QUESTION 6.10.9 - MINIMUM HYDROGEN CONCENTRATION FOR PURGING
 THE MILLSTONE POINT COMPANY
 DOCKET-50-336-51 +. 1 PAGE, AMENDMENT 15 TO MILLSTONE FSAR, FEBRUARY 16, 1973, DOCKET 50-336, TYPE--PWR, MFG--
 COMB., AE--BECHTEL

THE HYDROGEN PURGE SYSTEM FUNCTIONS ONLY AS BACKUP TO THE HYDROGEN RECOMBINERS AND IS OPERATED ONLY TO MAINTAIN THE CONTAINMENT HYDROGEN CONCENTRATION BELOW 3 VOLUME PERCENT. THE HYDROGEN PURGE SYSTEM IS NOT OPERATED BELOW A CONTAINMENT HYDROGEN CONCENTRATION OF 2.5 VOLUME PERCENT.

081775 *CONTINUED*
 AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

DESIGN CRITERIA + REACTOR, PWR + CONTROL + CONTAINMENT ATMOSPHERE, INERT + HILLSTONE POINT 2 (PWR) + CONCENTRATION

081781
 RESPONSE TO QUESTION 7.7 - CONTROL-SYSTEM INSTRUMENTATION
 THE HILLSTONE POINT COMPANY
 DOCKET-50-336-51 +. 1 PAGE, AMENDMENT 15 TO HILLSTONE FSAR, FEBRUARY 16, 1973, DOCKET 50-336, TYPE--PWR, MFG--
 COMB., AE--BECHTEL

THE HYDROGEN CONTROL SYSTEM INSTRUMENTATION AND CONTROLS PROVIDE THE OPERATOR WITH A VISUAL PRESENTATION OF RECOMBINATION CHAMBER TEMPERATURE AND OF POWER INPUT FOR EACH RECOMBINER HEATER. BY MEANS OF A RHEOSTAT CONTROL, THE OPERATOR CAN ADJUST THE HEATER POWER INPUT TO MAINTAIN RECOMBINER TEMPERATURE WITHIN THE OPTIMUM RANGE OF 1150 TO 1400 F.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTROL SYSTEM + REACTOR, PWR + INSTRUMENT, CONTROL + HILLSTONE POINT 2 (PWR) + RECOMBINERS

081800
 RESPONSE TO QUESTION 9.2 - HYDROGEN CONTROL IN THE WASTE GAS
 THE HILLSTONE POINT COMPANY
 DOCKET-50-336-51 +. 1 PAGE, AMENDMENT 15 TO HILLSTONE FSAR, FEBRUARY 16, 1973, DOCKET 50-336, TYPE--PWR, MFG--
 COMB., AE--BECHTEL

INSTEAD OF CONTROLLING THE BUILDUP OF HYDROGEN IN THE WASTE GASES, OXYGEN IS MINIMIZED IN THE GASES VENTED TO THE WASTE PROCESSING SYSTEM. ALL SYSTEMS AND COMPONENTS CONTAINING HYDROGEN ARE MAINTAINED UNDER SLIGHTLY POSITIVE PRESSURE, WITH NITROGEN IF REQUIRED, TO PREVENT THE LEAKAGE OF AIR INTO THESE SYSTEMS AND TO PRECLUDE THE FORMATION OF A POTENTIALLY DANGEROUS MIXTURE OF H₂-O₂.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

EXPLOSION + REACTOR, PWR + CONTROL + WASTE TREATMENT, GAS + HILLSTONE POINT 2 (PWR)

081835
 RESPONSE TO QUESTION 10.9 - BULK HYDROGEN STORAGE FACILITY
 THE HILLSTONE POINT CO.
 DOCKET-50-336-51 +. 1 PAGE, AMENDMENT 15 TO HILLSTONE FSAR, FEBRUARY 16, 1973, DOCKET 50-336, TYPE--PWR, MFG--
 COMB., AE--BECHTEL

THE BULK HYDROGEN STORAGE FACILITY IS LOCATED OUTSIDE THE STATION APPROXIMATELY 100 FT. SOUTH OF UNIT 1 TURBINE BUILDING. THE CYLINDERS ARE ISOLATED FROM PERSONNEL BY A CHAIN LINK FENCE. NO SMOKING SIGNS AND DANGER REGULATING STATION SIGNS ARE POSTED. THE H₂ BULK SUPPLY HEADER WILL BE RUN UNDERGROUND FROM THE BULK STORAGE AREA TO UNIT 2, AND THE UNDERGROUND PIPING WILL BE PROTECTED WITH A GUARD PIPE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + STORAGE CONTAINER + HILLSTONE POINT 2 (PWR) + IDENTIFICATION + PIPES AND PIPE FITTINGS

081943
 RESPONSE TO QUESTION 8.7 - EXHAUST FAN FOR BATTERY ROOMS
 CONSOLIDATED EDISON CO.
 DOCKET-50286-51 +. PG. 08.7-1 OF AMENDMENT 22 TO INDIAN POINT FSAR, AUGUST 25, 1972, DOCKET 50-286, TYPE--PWR,
 MFG--WEST., AE--UNITD. ENGR

THE BATTERY SYSTEM CONSISTS OF TWO BATTERIES EACH OF WHICH WILL GENERATE HYDROGEN DURING A FLOATING CHARGE OR AN EQUALIZING CHARGE. FOR THE WORST CASE ASSUMPTIONS OF THE EXHAUST FAN OUT OF SERVICE, NO NATURAL VENTILATION IN THE BATTERY ROOMS AND TEMPERATURES AS HIGH AS 140 F, THE TIME FOR HYDROGEN TO BUILD TO 4% UNDER VARIOUS CHARGING CONDITIONS IS: FOR FLOATING CHARGE, 23 HOURS; AND FOR EQUALIZING CHARGE, 3 HOURS. SUPERVISORY PERSONNEL OBSERVATIONS AND/OR NORMAL OPERATING MAINTENANCE PROCEDURES ARE CONSIDERED SUFFICIENT TO PRECLUDE THE BATTERY ROOM EXHAUST FAN OUT-OF-SERVICE CONDITION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + VENTILATION SYSTEM + CONTROL + INDIAN POINT 3 (PWR) + CONCENTRATION + COMPARTMENT + BATTERIES & CHARGERS

081945
 RESPONSE TO QUESTION 9.11.2 - HYDROGEN SUPPLY FOR THE CVC TANK
 CONSOLIDATED EDISON CO.
 DOCKET-50286-51 +. PG. 09.11.2-1 OF AMENDMENT 22 TO INDIAN POINT FSAR, AUGUST 25, 1972, DOCKET 50-286, TYPE--
 PWR, MFG--WEST., AE--UNITD ENGR

081945 *CONTINUED*

HYDROGEN IS SUPPLIED TO THE VOLUME CONTROL TANK FOR THE PURPOSE OF MAINTAINING THE REACTOR COOLANT HYDROGEN CONCENTRATION AT 15-35 CC/KG AT STP. NORMAL CONSUMPTION IS ESTIMATED TO BE 100 SCF/DAY; STARTUP FROM COLD CONDITIONS WILL REQUIRE 600-800 SCF. THE SOURCE OF HYDROGEN FOR THE VOLUME CONTROL TANK IS THE HYDROGEN SUPPLY MANIFOLD. A PRESSURE REDUCING VALVE AT THE MANIFOLD REDUCES THE HYDROGEN PRESSURE TO 100 PSIG IN THE SUPPLY HEADER. THE SUPPLY HEADER TO THE VOLUME CONTROL TANK IS ALSO EQUIPPED WITH A PRESSURE REGULATOR TO CONTROL DOWN STREAM PRESSURE TO 15 PSIG.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTROL SYSTEM + REACTOR, PWR + COVER GAS + STORAGE CONTAINER + COOLANT PURIFICATION SYSTEM + INDIAN POINT 3 (PWR)

081946

RESPONSE TO QUESTION 9.11.3 - CONTROL OF FLAMMABLE CONCENTRATIONS OF GAS IN CVCS

CONSOLIDATED EDISON CO.

DOCKET-50286-51 +. 1 PAGE, PG. 9.11.3-1 OF AMENDMENT 22 TO INDIAN POINT FSAR, AUGUST 25, 1972, DOCKET 50-286, TYPE--PWR, MFG--WEST., AE--UNITD ENGR

DURING NORMAL OPERATION, THE VOLUME CONTROL TANK GAS SPACE WILL CONTAIN 85-96 VOLUME % H₂ (REMAINDER WATER VAPOR) AND THE HOLDUP TANK GAS SPACE FROM 0 TO 100 VOLUME % H₂. THE CVCS VOLUME CONTROL TANK, CVCS HOLD UP TANKS, AND ASSOCIATED PIPING ARE ALL DESIGNED TO ACCOMMODATE UP TO 100% HYDROGEN IN THE VAPOR SPACE. FLAMMABLE MIXTURES ARE PRECLUDED BY EXCLUDING OXYGEN.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

FIRE + REACTOR, PWR + CONTROL + COVER GAS + STORAGE CONTAINER + COOLANT PURIFICATION SYSTEM + INDIAN POINT 3 (PWR) + PIPES AND PIPE FITTINGS

081947

RESPONSE TO QUESTION 9.11.4 - CONTROL OF HYDROGEN IN GAS VENTED FROM THE CVCS

CONSOLIDATED EDISON CO.

DOCKET-50286-51 +. 1 PAGE, PG. 9.11.4-1 OF AMENDMENT 22 TO INDIAN POINT FSAR, AUGUST 25, 1972, DOCKET 50-286, TYPE--PWR, MFG--WEST., AE--UNITD ENGR

THERE ARE THREE IDENTICAL CVCS HOLDUP TANKS. THE LIQUID CONTENTS OF ONE TANK ARE NORMALLY BEING PROCESSED BY THE GAS STRIPPER AND EVAPORATOR TRAIN WHILE ANOTHER TANK IS BEING FILLED. THE THIRD TANK IS NORMALLY KEPT EMPTY TO PROVIDE ADDITIONAL STORAGE CAPACITY WHEN NEEDED. VALVES ON ALL TANKS LEADING TO A COMMON HEADER ARE NORMALLY LOCKED OPEN TO INSURE CONTINUOUS VENTING. NO PROVISION IS MADE TO CONTROL THE PERCENTAGE OF GASES EVOLVING FROM THE LIQUID SOLUTION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + CONTROL + COVER GAS + STORAGE CONTAINER + COOLANT PURIFICATION SYSTEM + INDIAN POINT 3 (PWR) + DISCHARGE

081985

RESPONSE TO QUESTION 10.15 - BULK-HYDROGEN STORAGE FACILITY

CONSOLIDATED EDISON CO.

DOCKET-50286-51 +. 6 PAGES, 3 FIGURES, AMENDMENT 22 TO INDIAN POINT FSAR, AUGUST 25, 1972, DOCKET 50-286, TYPE--PWR, MFG--WEST., AE--UNITD ENGR

THE SITE HYDROGEN STORAGE SYSTEM PROVIDES HYDROGEN GAS AS THE COOLING MEDIUM FOR THE ROTOR AND STATOR OF EACH UNIT WITH SUFFICIENT ACTIVE STORAGE BOTTLES TO LAST ONE WEEK WITH MAXIMUM GUARANTEED GENERATOR LEAKAGE. THE SYSTEM PROVIDES ACTIVE RESERVE BOTTLES FOR EACH UNIT IN EQUAL NUMBER TO THE ACTIVE BOTTLES AND A CROSS-TIE BETWEEN UNIT NO. 2 AND UNIT NO. 3 IS PROVIDED FOR EMERGENCY REFILLING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + STORAGE CONTAINER + INDIAN POINT 3 (PWR) + TURBINE + COOLING + SYSTEM CAPACITY

081998

RESPONSE TO QUESTION 6.17 - POST-ACCIDENT CONTAINMENT-VENTING SYSTEM

CONSOLIDATED EDISON CO.

DOCKET-50286-64 +. 3 PAGES, 4 TABLES, PP. 6.17-1 THRU 6.17-4 OF AMENDMENT 26 TO INDIAN POINT 3 FSAR, FEBRUARY 16, 1973, DOCKET 50-286, TYPE--PWR, MFG--WEST., AE--UNITD ENGR

POST LOSS-OF-COOLANT ACCIDENT PURGING PROVIDES A BACKUP METHOD TO CONTAINMENT RECOMBINERS FOR CONTROLLING THE POTENTIAL HYDROGEN ACCUMULATION IN THE CONTAINMENT. THIS ANALYSIS OF OFF-SITE DOSES FOR PURGING TO CONTROL HYDROGEN IS BASED ON THE WESTINGHOUSE MODEL FOR HYDROGEN PRODUCTION AND ACCUMULATION DISCUSSED IN SECTION 14.3.6 OF THE FSAR. THE PURGING SYSTEM REQUIRES A DIFFERENTIAL PRESSURE BETWEEN THE CONTAINMENT AND THE OUTSIDE ATMOSPHERE IN ORDER TO PERMIT PURGING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT, PRESSURE VENTING + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + CONTROL + DOSE CALCULATION,

081998 *CONTINUED*
INTERNAL + POPULATION EXPOSURE + INDIAN POINT 3 (PWR)

082090
RESPONSE TO QUESTION 10.16 - HYDROGEN CONTROL IN BATTERY ROOM
NEBRASKA PUBLIC POWER DISTRICT, COLUMBUS
DOCKET-50298-51 +. 1 PAGE, P. 10.16.1, AMENDMENT 14 TO COOPER FSAR, SEPTEMBER 8, 1972, DOCKET 50-298, TYPE--
BWR, MFG--G.E., AE--BURNS & ROE

A STANDBY FAN IS PROVIDED TO AUTOMATICALLY START UPON FAILURE OF THE FAN IN THE OPERATING MODE, ELIMINATING POSSIBLE ACCUMULATION OF AN EXPLOSIVE MIXTURE OF HYDROGEN. THE BATTERY EXHAUST SYSTEM (DUCTWORK, FAN AND ACCESSORIES) WILL BE RELOCATED FROM BOTH THE CONTROL AND CABLE SPREADING ROOMS, TO A NEW LOCATION IN THE CHANGE AREA, EXHAUSTING TO ATMOSPHERE (VIA DUCTWORK) THROUGH THE ROOF OF THE CORRIDOR WHICH IS LOCATED BETWEEN THE REACTOR AND CONTROL BUILDING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + VENTILATION SYSTEM + CONTROL + COOPER (BWR) + COMPARTMENT + BATTERIES & CHARGERS

082129
RESPONSE TO QUESTION 14.55 - CORE CLAD/WATER REACTION
WESTINGHOUSE ELECTRIC CORP.
DOCKET-50315-97 +. 4 PAGES, 2 FIGURES, AMENDMENT 37 TO COOK 1 AND 2 LICENSE APPLICATION, FEBRUARY 23, 1973, DOCKET 50-315, TYPE--PWR, MFG--WEST., AE--UTILITY

AN ANALYSIS HAS BEEN DONE TO DEFINE CORE CLAD/WATER REACTION AS A FUNCTION OF TIME FOLLOWING A LOSS-OF-COOLANT ACCIDENT. THE EMERGENCY CORE COOLING SYSTEM LIMITS THE AMOUNT OF CORE CLAD/WATER REACTION TO A VERY SMALL FRACTION OF THE CLAD MATERIAL IN THE CORE. FIGURE Q14.55-1 SHOWS THE CALCULATED TOTAL AMOUNT OF CORE CLAD/WATER REACTION AS A FUNCTION OF TIME FOLLOWING A LOCA. FIGURE Q14.55-2 GIVES THE HYDROGEN CONCENTRATION AS A FUNCTION OF TIME IN THE LOWER COMPARTMENT. THIS ANALYSIS WAS DONE ASSUMING THAT THE HYDROGEN IS UNIFORMLY MIXED THROUGHOUT THE CONTAINMENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT ANALYSIS + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + CONTROL + SYSTEM CAPABILITY + COOK 1 (PWR) + COOK 2 (PWR) + EMERGENCY COOLING SYSTEM

082570
RESPONSE TO QUESTION 6A.11 - MIXING OF CONTAINMENT ATMOSPHERE
SACRAMENTO MUNICIPAL UTILITY DISTRICT
DOCKET-50312-51 +. 1 PAGE, PAGE 6A-7 OF AMENDMENT 15 TO RANCHO SECO 1 FSAR, SEPTEMBER 11, 1972, DOCKET 50-312, TYPE--PWR, MFG--B&W, AE--BECHTEL

THE UPPER DOME AIR CIRCULATORS AND THE REACTOR BUILDING EMERGENCY COOLING UNITS HAVE BEEN LOCATED TO PROVIDE A THOROUGH AND POSITIVE CIRCULATION OF AIR THROUGHOUT THE CONTAINMENT FOLLOWING A DBA. THE UPPER DOME AIR CIRCULATORS TAKE SUCTION FROM THE TOP OF THE REACTOR BUILDING AND DIRECT A 100,000 CFM AIR FLOW AT THE DECKS WHERE THE INLETS TO THE EMERGENCY AIR COOLERS ARE LOCATED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + VENTILATION SYSTEM + CONTROL + CONTAINMENT AIR COOLING + FLOW, MIXING + RANCHO SECO (PWR)

082596
RESPONSE TO QUESTION 10A.9 - BULK HYDROGEN STORAGE
SACRAMENTO MUNICIPAL UTILITY DISTRICT
DOCKET-50312-51 +. 1 PAGE, PG. 10A-13 OF AMENDMENT 15 TO RANCHO SECO 1 FSAR, SEPTEMBER 11, 1972, DOCKET 50-312, TYPE--PWR, MFG--B&W, AE--BECHTEL

THE BULK-HYDROGEN STORAGE FACILITY CONSISTS OF TWO BANKS OF PERMANENTLY MOUNTED VESSELS LOCATED NORTH AND WEST OF THE TURBINE BUILDING AS SHOWN ON FIGURE 1.1-6. THERE ARE NO SAFETY RELATED SYSTEMS NEARBY. EACH STORAGE BANK HAS FOUR ASME SECTION VIII CARBON STEEL PRESSURE VESSELS WHICH ARE MOUNTED ON A CONCRETE SLAB. THE VESSELS ARE EACH 24 INCHES IN DIAMETER AND TWENTY FEET LONG. THE DESIGN PRESSURE FOR THESE CODE VESSELS IS 2450 PSIG.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + STORAGE CONTAINER + SYSTEM DESCRIPTION + RANCHO SECO (PWR)

082613
RESPONSE TO QUESTION 14A.14 - HYDROGEN ANALYZER
SACRAMENTO MUNICIPAL UTILITY DISTRICT
DOCKET-50312-51 +. 1 PAGE, PG. 14A-28 OF AMENDMENT 15 TO RANCHO SECO 1 FSAR, SEPTEMBER 11, 1972, DOCKET 50-312, TYPE--PWR, MFG--B&W, AE--BECHTEL

THE HYDROGEN ANALYZER (WITH ITS INTEGRAL SAMPLE BLOWER) CAN TAKE SUCTION FROM THE DISCHARGE OF EITHER OF THE HYDROGEN PURGE EXHAUST BLOWERS. IT UTILIZES THE THERMAL CONDUCTIVITY PRINCIPLE OF MEASUREMENT TO PROVIDE TRACE ANALYSES OF HYDROGEN GAS CONCENTRATION.

082613 *CONTINUED*
 AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + SYSTEM DESCRIPTION + RANCHO SECO (PWR) + CONCENTRATION + INSTRUMENTS, MISC.

082614
 RESPONSE TO QUESTION 14A.15 - HYDROGEN PURGE SYSTEM
 SACRAMENTO MUNICIPAL UTILITY DISTRICT
 DOCKET-50312-51 +. 4 PAGE, PG 14A-29 THRU 14D-20 OF AMENDMENT 15 TO RANCHO SECO 1 FSAR, SEPTEMBER 11, 1972,
 DOCKET 50-312, TYPE--PWR, MFG--B+W, AE--BECHTEL

A PURGE RATE OF 28.2 SCFM WOULD BE REQUIRED TO MAINTAIN A HYDROGEN CONCENTRATION OF 3.5 V/O IN THE CONTAINMENT FOLLOWING AN MHA. THIS CONCENTRATION WOULD BE REACHED 329 HOURS POST-ACCIDENT. THE INCREMENTAL WHOLE BODY DOSE AT THE SITE BOUNDARY RESULTING FROM CONTAINMENT PURGE FOR HYDROGEN CONTROL WOULD BE 4.9 REMS. TWO REDUNDANT SYSTEMS COMPLETE WITH SEPARATE INLET LINES, PURGE BLOWERS AND DISCHARGE LINES TO THE PLANT VENT HAVE BEEN PROVIDED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 CONTAINMENT + REACTOR, PWR + CONTROL + POPULATION EXPOSURE + RADIOACTIVITY RELEASE + FLOW + RANCHO SECO (PWR) + CONCENTRATION

082942
 RESPONSE TO QUESTION 5.23 - CONTAINMENT ATMOSPHERIC DILUTION SYSTEM
 NEBRASKA PUBLIC POWER DISTRICT, COLUMBUS
 DOCKET-50298-71 +. 2 PAGES, 2 FIGURES, PP. 5.23-1 & 5.23-2 OF AMENDMENT 19 TO COOPER LICENSE APPLICATION, MARCH 23, 1973, DOCKET 50-298, TYPE--BWR, MFG--G.E., AE--BURNS & ROE

THE VENTILATION WITHIN THE DRYWELL IS COMPRISED OF EXTENSIVE DUCTWORK SUPPLYING AND EXHAUSTING THE ATMOSPHERE AT VARIOUS LEVELS TO INSURE A CONSTANT MOVEMENT OVER ALL EQUIPMENT, STRUCTURAL MEMBER, PIPING, ETC., TO PICK UP RETAINED OR TRANSFERRED HEAT BY VARIOUS EQUIPMENT AND CONSTRUCTION MATERIALS. IN DESIGNING THE SUPPLY AND EXHAUST DUCTWORK OUTLETS AND INLETS, A PATTERN WAS USED WHICH WILL ACHIEVE A COMPLETE MIXTURE OF GASES AT ALL LEVELS OF THE DRYWELL. THE FAN COOLERS CAN BE ENERGIZED BY THE CONTROL ROOM OPERATOR FOR POST LOCA OPERATION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, BWR + VENTILATION SYSTEM + CONTROL + SYSTEM DESCRIPTION + CONTAINMENT ATMOSPHERE, INERT + COOPER (BWR)

083317
 RESPONSE TO QUESTION 6.20 - RECOMBINER FOR HYDROGEN CONTROL
 DUQUESNE LIGHT COMPANY
 DOCKET-50412--6 +. 3 PAGE, PG. 6.10-1 THRU 6.10-3 OF AMENDMENT 3 TO BEAVER VALLEY 2 LICENSE APPLICATION, MARCH 14, 1973, DOCKET 50-412, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

ONE 100% EXTERNAL, SKID-MOUNTED, THERMAL RECOMBINER AND ONE 100% PURGE SYSTEM IS PROVIDED ON UNIT 2 TO MAINTAIN THE HYDROGEN CONCENTRATION AT A SAFE LEVEL FOLLOWING A DESIGN BASIS ACCIDENT. ADDITIONALLY, THERE IS A SECOND 100% SKID-MOUNTED RECOMBINER LOCATED ON BVPS UNIT 1, WHICH CAN REPLACE THE UNIT 2 RECOMBINER IF IT SHOULD FAIL. EACH RECOMBINER IS EQUIPPED WITH ITS OWN BLOWER AND HYDROGEN ANALYZER.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 CONTAINMENT + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + CONTROL + COMPONENT DESCRIPTION + BEAVER VALLEY 2 (PWR) + RECOMBINERS

083320
 RESPONSE TO QUESTION 6.24 - MAKEUP-AIR SUPPLY
 DUQUESNE LIGHT COMPANY
 DOCKET-50412--6 +. 1 PAGE, PG. 6.24-1 OF AMENDMENT 3 TO BEAVER VALLEY 2 LICENSE APPLICATION, MARCH 14, 1973, DOCKET 50-412, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

WHEN THE HYDROGEN CONTROL SYSTEM IS OPERATED IN THE PURGE MODE, ABOUT 50 SCFM OF AIR WILL BE SUPPLIED TO THE CONTAINMENT. THE AIR LINE WILL BE CONNECTED TO THE RETURN LINE FROM THE RECOMBINER. FLOW OF AIR WILL BE MEASURED BY MEANS OF A FLOW INDICATOR LOCATED IN THE VICINITY OF THE PURGE EQUIPMENT OR BY A FLOW RECORDER.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 CONTAINMENT + REACTOR, PWR + VENTILATION SYSTEM + CONTROL + AIR + BEAVER VALLEY 2 (PWR)

083331
 RESPONSE TO QUESTION 15.8 - HYDROGEN PRODUCTION AND CONTROL
 DUQUESNE LIGHT COMPANY
 DOCKET-50412--6 +. 2 PAGES, PP. 15.8-1 THRU 15.8-2 OF AMENDMENT 3 TO BEAVER VALLEY 2 LICENSE APPLICATION, MARCH 14, 1973, DOCKET 50-412, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

083331 *CONTINUED*

A PLOT OF CORROSION RATE OF ALUMINUM VS TIME AFTER THE ACCIDENT IS SHOWN IN FIG. 14.3-618 OF THE PSAR. A CONSTANT VALUE OF 0.04267 MG/SQ. CM-HR IS USED FOR THE CORROSION RATE OF ZINC. THE AMOUNT OF ZINC GIVEN IN TABLE 14.3-9 OF THE PSAR INCLUDES THE ZINC IN THE PROTECTIVE COATINGS. THE QUANTITY OF HYDROGEN IN THE PRESSURIZER GAS SPACE IS 950 SCF. THE CONCENTRATION OF HYDROGEN IN THE PRIMARY COOLANT IS ASSUMED TO BE ZERO.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT + REACTOR, PWR + CONTROL + AIR + CORROSION + BEAVER VALLEY 2 (PWR) + RECOMBINERS

083583

RESPONSE TO QUESTION 6.23 - HYDROGEN MONITORS

PUBLIC SERVICE ELECTRIC AND GAS COMPANY

DOCKET-50272--60 +. 3 PAGES, PP. Q6.23-1 THRU Q6.23-3 OF AMENDMENT 21 TO SALEM 1 AND 2 LICENSE APPLICATION, APRIL 12, 1973, 50-272, TYPE--PWR, MFG--WEST., AE--PUBLIC SERVICE OF NY

TWO HYDROGEN ANALYZERS WILL BE INSTALLED INSIDE THE CONTAINMENT TO MEASURE THE COMBUSTIBLE LEVEL OF HYDROGEN OR OTHER GASES INSIDE THE CONTAINMENT ATMOSPHERE. FREE HYDROGEN WOULD BE THE PRIMARY SOURCE OF ANY CONTAINMENT ATMOSPHERE COMBUSTIBILITY. THE TWO ANALYZERS ARE EXPLOSION-PROOF AND EQUIPPED WITH FLAME ARRESTORS ON THE INLET AND OUTLET CONNECTIONS. TWO SEPARATE INDICATIONS WILL BE PROVIDED NEAR THE HYDROGEN RECOMBINER CONTROL PANEL (LOCATED IN THE AUXILIARY EQUIPMENT ROOM) FOR CONTINUOUS INDICATION OF THE EQUIVALENT FREE HYDROGEN LEVEL INSIDE THE CONTAINMENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT INSTRUMENTATION + REACTOR, PWR + CONTAINMENT STRUCTURE + MONITOR + SYSTEM DESCRIPTION + REDUNDANCE + SALEM 1 (PWR) + SALEM 2 (PWR)

083584

RESPONSE TO QUESTION 6.25 - IRRADIATION TESTING FOR HYDROGEN PRODUCTION

PUBLIC SERVICE ELECTRIC AND GAS CO.

DOCKET-50272--60 +. 1 PAGE, P. Q6.25-1 OF AMENDMENT 21 TO SALEM 1 AND 2 LICENSE APPLICATION, APRIL 12, 1973, 50-272, TYPE--PWR, MFG--WEST., AE--PUBLIC SERVICE OF NY

TESTING WAS PERFORMED IN A GAMMA IRRADIATED ENVIRONMENT WITH SIMULATED POST ACCIDENT CHEMISTRY AND TEMPERATURE CONDITIONS. THE AMOUNT OF HYDROGEN PRODUCED USING THIS TEST SETUP WAS THE SAME IRRESPECTIVE OF WHETHER THE PHENOLINE 305 SAMPLE WAS IN OR OUT OF THE TEST CHAMBER.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + CONTAINMENT PAINT + IRRADIATION TESTING + RADIOLYTIC GAS + SALEM 1 (PWR) + SALEM 2 (PWR) + PRODUCTION, RATE

083629

RESPONSE TO QUESTION 3.6 - GETTER FOR FUEL ROD

NIAGARA MOHAWK POWER CORP.

DOCKET-50410-26 +. 1 PAGE, PG. 3.6-1 OF SUPPLEMENT 10 TO NINE MILE POINT 2 LICENSE APPLICATION, APRIL 17, DOCKET 50-410, TYPE--BWR, MFG--G.E., AE--STONE+WEBSTER

GETTERS ARE ZIRCONIUM ALLOY CHIPS LOOSELY PACKED IN A STAINLESS STEEL TUBE. ONE END OF THE TUBE IS CAPPED AND THE OTHER END IS COVERED BY WIRE SCREENING. THE GETTER IS LOCATED IN THE PLENUM AREA OF A FUEL ROD, THEREFORE, ITS OPERATING CONDITIONS ARE DEFINED BY THE COOLANT TEMPERATURE AT THE PLENUM AREA OF A ROD. UNDER NORMAL OPERATING CONDITIONS THIS TEMPERATURE IS 550 F TO 600 F AND UNDER ABNORMAL TRANSIENT AND ACCIDENT CONDITIONS, 300 TO 600 F.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + CONTROL + FUEL ROD + COMPONENT DESCRIPTION + NINE MILE POINT 2 (BWR)

083651

RESPONSE TO QUESTION 2.23 - EXPLOSION OF STORED HYDROGEN

NIAGARA MOHAWK POWER CORP.

DOCKET-50410-25 +. 1 PAGE, PG. R2.23-1 OF AMENDMENT 9 TO NINE MILE POINT 2 LICENSE APPLICATION, APRIL 5, 1973, DOCKET 50-410, TYPE--BWR, MFG--G.E., AE--STONE & WEBSTER

THERE WILL BE NO EFFECT ON ENGINEERED SAFETY FEATURES FROM A POSTULATED EXPLOSION ORIGINATING FROM HYDROGEN STORED AT THE PLANT. DESIGN OF THE HYDROGEN STORAGE FACILITY TO PRECLUDE EXPLOSIONS IS DISCUSSED IN RESPONSES R11.1 AND R10.41. THE HYDROGEN STORAGE FACILITY IS LOCATED IN AN AREA NORTHWEST OF THE TURBINE BUILDING AND OVER 400 FT NORTHWEST OF THE REACTOR BUILDING AND ABOUT 280 FT WEST OF THE SERVICE WATER SUBSTRUCTURE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + EXPLOSION + STORAGE CONTAINER + DAMAGE + ENGINEERED SAFETY FEATURE + NINE MILE POINT 2 (BWR)

083668

083668 *CONTINUED*
 RESPONSE TO QUESTION 5.47 - STEAM DILUTION OF COMBUSTIBLE GAS CONCENTRATION
 NIAGARA MOHAWK POWER CORP.
 DOCKET-50410-25 +. 1 PAGE, PG. 5.47-1 OF SUPPLEMENT 9 TO NINE MILE POINT 2 LICENSE APPLICATION, APRIL 5, 1973, DOCKET 50-410, TYPE--BWR, MFG--G.E., AE--STONE & WEBSTER

THE ASSUMPTIONS REGARDING THE STEAM DILUTION EFFECT ON COMBUSTIBLE GAS CONCENTRATION ARE PRESENTED IN SECTION 5.4-10. THE MINIMUM REACTOR BUILDING TEMPERATURE IS 65 F UNDER WINTER CONDITIONS. THUS, THE LOWEST POSSIBLE INITIAL POOL WATER TEMPERATURE WOULD BE 65 F. THE LOWEST POSSIBLE STEAM CONCENTRATIONS WOULD THUS OCCUR WITH AN ASSUMED INITIAL PCOL TEMPERATURE OF 65 F, A SERVICE WATER TEMPERATURE OF 32 F, AND BOTH CONTAINMENT SPRAY SYSTEMS OPERATING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, BWR + STEAM + RADIOLYTIC GAS + CONTAINMENT ATMOSPHERE, INERT + CONCENTRATION + SOLUTION + NINE MILE POINT 2 (BWR)

083869
 RESPONSE TO QUESTION 3.8 - PERFORMANCE OF CONTROL-ROD GETTER
 CAROLINA POWER & LIGHT CO.
 DOCKET-50324-71 +. 1 PAGE, PG. 3.8-1 OF AMENDMENT 16 TO BRUNSWICK 1 AND 2 LICENSE APPLICATION, APRIL 2, 1973, DOCKET 50-324/325, TYPE--BWR, MFG--G.E., AE--UE+C

THE GETTERS ARE ZIRCONIUM ALLOY CHIPS OF A MINIMUM AND MAXIMUM PARTICLE SIZE THAT ARE USED TO ADSORB AND RETAIN HYDROGEN. A PRESCRIBED WEIGHT OF CHIPS IS LOOSELY PACKED IN A STAINLESS STEEL TUBE OF WHICH ONE END OF THE TUBE IS CAPPED AND THE OTHER END OF THE TUBE IS COVERED BY WIRE SCREENING. THE GETTER IS IN THE PLENUM AREA OF A FUEL ROD; THEREFORE, ITS OPERATING CONDITIONS ARE DEFINED BY THE COOLANT TEMPERATURE AT THE PLENUM AREA OF A ROD. UNDER NORMAL OPERATING CONDITIONS, THIS TEMPERATURE IS 550 F TO 600 F AND UNDER ABNORMAL CONDITIONS 300 F TO 600 F.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, BWR + ZIRCONIUM + CONTROL + BRUNSWICK 1 (BWR) + BRUNSWICK 2 (BWR) + CONTROL RODS

083890
 RESPONSE TO QUESTION 5.39 - CCNTAINMENT-ATMOSPHERE DILUTION SYSTEM
 CAROLINA POWER & LIGHT CO.
 DOCKET-50324-71 +. 3 PAGE, PP. 5.39-1 THRU 5.39-3 OF AMENDMENT 16 TO BRUNSWICK 1 AND 2 LICENSE APPLICATION, APRIL 2, 1973, DOCKET 50-324/325, TYPE--BWR, MFG--G.E., AE--UE+C

THE CONCENTRATION OF STEAM AT ANY TIME FOLLOWING THE LOCA WAS CALCULATED BASED ON THE ASSUMPTION THAT THE DRYWELL AND SUPPRESSION CHAMBER GAS SPACES WERE AT 100 PERCENT RELATIVE HUMIDITY. THEREFORE, THE CONCENTRATION OF STEAM WAS SIMPLY THE RATIO OF THE PARTIAL PRESSURE OF THE WATER VAPOR TO THE TOTAL PRESSURE OF THE CONTAINMENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + STEAM + CONTROL + CONTAINMENT ATMOSPHERE, INERT + BRUNSWICK 1 (BWR) + BRUNSWICK 2 (BWR) + CONCENTRATION

083892
 RESPONSE TO QUESTION 5.41 - ANALYSIS OF CAD SYSTEM
 CAROLINA POWER & LIGHT CO.
 DOCKET-50324-71 +. 3 PAGES, PP. 5.41-1 THRU 5.41-3 OF AMENDMENT 16 TO BRUNSWICK 1 AND 2 LICENSE APPLICATION, APRIL 2, 1973, DOCKET 50-324/325, TYPE--BWR, MFG--G.E., AE--UE+C

PROVIDES DISCUSSION AND ANALYSES IN DETAIL TO SUPPORT THE ADEQUACY OF THE DESIGN BASES FOR THE ADEQUACY OF THE CONTAINMENT-AIR DILUTION SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, BWR + DESIGN CRITERIA + TESTING + CONTROL + SYSTEM DESCRIPTION + CONTAINMENT ATMOSPHERE, INERT + BRUNSWICK 1 (BWR) + BRUNSWICK 2 (BWR)

083893
 RESPONSE TO QUESTION 5.42 - HYDROGEN PRODUCTION
 CAROLINA POWER & LIGHT CO.
 DOCKET-50324-71 +. 3 PAGES, PP. 5.42-1 THRU 5.42-3 OF AMENDMENT 16 TO BRUNSWICK 1 AND 2 LICENSE APPLICATION, APRIL 2, 1973, DOCKET 50-324/325, TYPE--BWR, MFG--G.E., AE--UE+C

THE ANALYSES DONE FOR BSEP WERE IN ACCORDANCE WITH SAFETY GUIDE 7. THEREFORE, THE ENTRAINED FISSION PRODUCTS ARE ACCOUNTED FOR IN THE ASSUMPTION THAT 50 PERCENT OF THE CORE HALOGENS AND ONE PERCENT OF THE SOLIDS ARE INTIMATELY MIXED WITH THE COOLANT WATER. THE REACTOR CORE WAS TREATED AS A SEPARATE RADIOLYSIS SOURCE. THE RADIOLYSIS RATES FROM EACH OF THESE SOURCES, I.E., ENTRAINED FISSION PRODUCTS AND THE REACTOR CORE REGION, WERE CALCULATED PER THE RECOMMENDED ASSUMPTIONS IN SAFETY GUIDE. THE TOTAL MASS OF ZIRCONIUM INVOLVED IN THE METAL-WATER REACTION IS 48,900 POUNDS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

089893 *CONTINUED*
 REACTOR, BWR + CONTAINMENT + METAL WATER REACTION + RADIOLYTIC GAS + BRUNSWICK 1 (BWR) + BRUNSWICK 2 (BWR) + PRODUCTION

083894
 RESPONSE TO QUESTION 5.44 - HYDROGEN STRATIFICATION
 CAROLINA POWER & LIGHT CO.
 DOCKET-50324-71 +. 2 PAGES, PP. 5.44-1 THRU 5.44-2 OF AMENDMENT 16 TO BRUNSWICK 1 AND 2 LICENSE APPLICATION, APRIL 2, 1973, DOCKET 50-324/325, TYPE--BWR, MFG--G.E., AE--UE+C

THE POTENTIAL FOR STRATIFICATION OF HYDROGEN AND/OR FORMATION OF LOCALIZED COMBUSTIBLE GAS MIXTURES WITHIN THE REACTOR BUILDING (AS A RESULT OF CONTAINMENT LEAKAGE) HAS BEEN INVESTIGATED. THE RESULTS DO NOT REQUIRE THAT ANY SPECIAL PROVISIONS BE MADE IN THE PRESENT DESIGN OF BSEP. DURING THE POST-LOCA TIME PERIOD, THE REACTOR BUILDING VENTILATION SYSTEM WILL BE SECURED AND THE STANDBY GAS TREATMENT SYSTEM WILL BE OPERATING AT APPROXIMATELY 3000 CFM IN ORDER TO KEEP THE REACTOR BUILDING UNDER A SLIGHT NEGATIVE PRESSURE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + VENTILATION SYSTEM + BUILDING + FLOW, MIXING + BRUNSWICK 1 (BWR) + BRUNSWICK 2 (BWR)

084105
 REVISION TO THE SAR AND RESPONSES TO AEC QUESTIONS
 ARKANSAS POWER AND LIGHT COMPANY
 DOCKET-50313-47 + 346 PAGES, AMENDMENT 28 TO ARKANSAS NUCLEAR 1 LICENSE APPLICATION, AUGUST 18, 1972, DOCKET 50-313, TYPE--PWR, MFG--B&W, AE--BECHTEL

CONTAINS NEW AND REVISED PAGES TO THE FINAL SAR CONCERNING CONTAINMENT SEISMIC DESIGN, HYDROGEN CONTROL FOLLOWING A LOCA, CABLE INSTALLATION, WASTE TREATMENT, AND LOADS COMMON TO ALL STRUCTURES. INCLUDES RESPONSES TO AEC QUESTIONS CONCERNING WEATHER DATA, QUALITY-ASSURANCE PROGRAM, STRESS ANALYSIS OF PUMP FLYWHEEL, CONTAINMENT DESIGN, VENTILATION SYSTEM, INSTRUMENTATION, WATER SYSTEMS, FUEL STORAGE, REFUELING, WASTE TREATMENT, AND EMERGENCY PROCEDURES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 MRC QUESTION + CONTAINMENT DESIGN + REACTOR, PWR + REPORT, SAR + VENTILATION SYSTEM + WASTE TREATMENT + CONTROL + STRESS ANALYSIS + EMERGENCY PROCEDURE + QUALITY ASSURANCE + ARKANSAS NUCLEAR 1 (PWR) + SEISMIC DESIGN + WEATHER DATA + PUMPS

084124
 RESPONSE TO QUESTION 6.12 - CONTAINMENT ATMOSPHERE MONITORING SYSTEM
 ARKANSAS POWER AND LIGHT CO.
 DOCKET-50313-47 +. 1 PAGE, PG. 6.12 OF AMENDMENT 28 TO ARKANSAS NUCLEAR 1 LICENSE APPLICATION, AUGUST 18, 1972, DOCKET 50-313, TYPE--PWR, MFG--B&W, AE--BECHTEL

A SAMPLE LINE IS CONNECTED TO EACH HYDROGEN PURGE LINE WHICH TAKES SUCTION IN THE UPPER PART OF THE REACTOR BUILDING. EACH IS LOCATED BETWEEN ISOLATING VALVES. ELECTRICAL HEATERS, AN HEPA FILTER AND AN ACTIVATED CHARCOAL FILTER ARE PROVIDED UPSTREAM OF THE EXHAUST FANS IN ORDER TO DRY AND FILTER THE PURGE AIR. THE HYDROGEN MONITORING EQUIPMENT USES A NON COMBUSTION METHOD AND READOUTS ARE AVAILABLE LOCALLY AND REPEATED IN THE CONTROL ROOM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 CONTAINMENT INSTRUMENTATION + REACTOR, PWR + INSTRUMENT, AIR SAMPLING + CONTROL + MONITOR, AIR + SAMPLING + CONTAINMENT STRUCTURE + ARKANSAS NUCLEAR 1 (PWR)

084126
 RESPONSE TO QUESTION 6.17 - MIXING OF THE REACTOR-BUILDING ATMOSPHERE
 ARKANSAS POWER AND LIGHT CO.
 DOCKET-50313-47 +. 1 PAGE, PG. 6.17 OF AMENDMENT 28 TO ARKANSAS NUCLEAR 1 LICENSE APPLICATION, AUGUST 18, 1972, DOCKET 50-313, TYPE--PWR, MFG--B&W, AE--BECHTEL

THE DISTRIBUTION OF THE SUPPLY AIR TO THE COMPARTMENTS AND AREAS IN THE REACTOR BUILDING IS BASED ON THE HEAT GAINS IN THE RESPECTIVE COMPARTMENTS/AREAS. THE MAJOR AIR SUPPLY IS AT THE LOWER LEVELS AND IS DUCTED INTO THE COMPARTMENTS AND DISTRIBUTED WITHIN THESE COMPARTMENTS IN SUCH A MANNER AS TO THOROUGHLY MIX THE AIR. AIR IS RETURNED AT HIGHER ELEVATIONS BY THE RETURN AIR DUCTS SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, PWR + CONTROL + CONTAINMENT AIR COOLING + FLOW, MIXING + ARKANSAS NUCLEAR 1 (PWR) + COOLING + COMPARTMENT

084998
 RESPONSE TO QUESTION 9.22 - BATTERY ROOMS

08498 "CONTINUED"
DUQUESNE LIGHT COMPANY
DOCKET-50336-22 2. 2 PAGES, PP. 50.22-1 THRU 50.22-2 OF AMENDMENT 2 TO BEAVER VALLEY 1 LICENSE APPLICATION, MAY 7, 1973, DOCKET 50-336, TYPE--PWR, MFG--WEST., AE--STONENWEBSTER

THE DESIGN OF THE SWITCHGEAR ROOM HAS BEEN REVISED TO COMPLETELY ENCLOSE EACH OF THE FOUR BATTERIES IN A SEPARATE BATTERY ROOM. THE ENCLOSURE WALLS ARE SEISMICALLY DESIGNED. THUS, THE BATTERY ROOMS HAVE BEEN ISOLATED FROM POSSIBLE IGNITION SOURCES. TO PREVENT THE BUILDUP OF EXPLOSIVE MIXTURES OF HYDROGEN AND OXYGEN, EACH BATTERY ROOM HAS BEEN PROVIDED WITH REDUNDANT EMERGENCY FORWARD VENTILATION EQUIPMENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTION, PWR + VENTILATION SYSTEM + CONTROL + SEPARATE + BEAVER VALLEY 1 (PWR) + COMPARTMENT + BATTERIES & CHARGERS

08504
RESPONSE TO QUESTION 5.19.1 - SYSTEM TO CONTROL COMBUSTIBLE GASES
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50404-21 2. 1 PAGE, PG. 5.19.1-1 OF AMENDMENT 7 TO NORTH ANNA 3 AND 4 LICENSE APPLICATION, AUGUST 19, 1972, DOCKET 50-404/405, TYPE--PWR, MFG--B&W, AE--STONENWEBSTER

THE SYSTEM TO CONTROL COMBUSTIBLE GASES WHICH MAY BE GENERATED FOLLOWING A LOCA IS PRESENTLY UNDERGOING REVIEW. AT THE PRESENT TIME IT IS NOT KNOWN WHAT INTERFACES WILL EXIST WITH PRESENT SYSTEMS; HOWEVER, EFFORTS WILL BE MADE TO MINIMIZE THESE INTERFACES. TWO SYSTEMS ARE PRESENTLY BEING GIVEN CONSIDERATION - CATALYTIC AND ELECTRIC RECOMBINERS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT + ACCIDENT, LOSS OF COOLANT + REACTION, PWR + CONTROL + NORTH ANNA 3 (PWR) + NORTH ANNA 4 (PWR) + RECOMBINERS

08589
RESPONSE TO QUESTION 5.19.2 - HYDROGEN ACCUMULATION VERSUS TIME
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50404-21 2. 5 PAGES, 1 TABLE, 1 FIGURE, PP. 5.19.2-1 THRU 5.19.2-5 OF AMENDMENT 7 TO NORTH ANNA 3 AND 4 LICENSE APPLICATION, AUGUST 19, 1972, DOCKET 50-404/405, TYPE--PWR, MFG--B&W, AE--STONENWEBSTER

FIGURE 5.19.2-1 GIVES THE HYDROGEN CONCENTRATION FOLLOWING A LOCA AS A FUNCTION OF TIME. THE RECOMBINER WILL BE PLACED IN OPERATION TWO DAYS AFTER THE LOCA. SAMPLING OF THE CONTAINMENT ATMOSPHERE WOULD COMMENCE AS SOON AS IT IS PRACTICABLE BASED ON THE ACCESSIBILITY OF THE SAMPLING POINT OUTSIDE OF THE CONTAINMENT AS DETERMINED BY RADIATION LEVELS. THE HYDROGEN CONCENTRATION IS NOT EXPECTED TO REACH THE UPPER FLAMMABILITY LIMIT OF 4 PERCENT H₂ UNTIL 6 DAYS AFTER THE ACCIDENT ASSUMING NO RECOMBINER IS OPERATING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTION, PWR + CONTROL + RESPONSE TIME + CONCENTRATION + NORTH ANNA 3 (PWR) + NORTH ANNA 4 (PWR)

08580
RESPONSE TO QUESTION 5.19.3 - HYDROGEN FROM PAINT
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50404-21 2. 1 PAGE, PG. 5.19.3-1 OF AMENDMENT 7 TO NORTH ANNA 3 AND 4 LICENSE APPLICATION, AUGUST 19, 1972, DOCKET 50-404/405, TYPE--PWR, MFG--B&W, AE--STONENWEBSTER

HYDROGEN OFF-GASSING FROM ZINC BEARING PAINT PRIMERS AND TOP COATINGS HAS BEEN CONSIDERED IN THE ANALYSIS OF HYDROGEN GENERATION FOLLOWING A LOCA AND ITS EFFECT IS CONSIDERED TO BE NEGLIGIBLE. IT WAS CONSERVATIVELY ASSUMED THAT ALL THE ZINC IN THE PROTECTIVE COATINGS REACTED. BASED ON THE ESTIMATED CONTENT OF THE ZINC IN THE PAINT IT WAS CONSERVATIVELY ASSUMED THAT THE UPPER LIMIT WILL BE APPROXIMATELY 2000 LBS AND 100 PERCENT REACTION, THE HYDROGEN CONCENTRATION WOULD ONLY INCREASE BY 0.5 PERCENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + REACTION, PWR + ZINC + CONTAINMENT PAINT + SURFACE, PAINTED + CONCENTRATION + NORTH ANNA 3 (PWR) + NORTH ANNA 4 (PWR)

08581
RESPONSE TO QUESTION 5.19.4 - PREVENTION OF GAS STRATIFICATION
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50404-21 2. 1 PAGE, PG. 5.19.4-1 OF AMENDMENT 7 TO NORTH ANNA 3 AND 4 LICENSE APPLICATION, AUGUST 19, 1972, DOCKET 50-404/405, TYPE--PWR, MFG--B&W, AE--STONENWEBSTER

THE INTERNAL DESIGN OF THE CONTAINMENT STRUCTURES ALLOWS AIR TO CIRCULATE FREELY. ALL CUBICLES AND COMPARTMENTS WITHIN THE CONTAINMENT ARE OPEN AT THE TOP AND ALLOW AIR CIRCULATION. CONVECTIVE MIXING IN CONJUNCTION WITH CONTAINMENT SPRAY ASSURES A UNIFORM MIXTURE OF HYDROGEN IN THE CONTAINMENT.

085803
 CONTINUATION
 AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22104
 CONTAINMENT = CONTAINMENT SPILL = REACTION, PWR = CONTROL = FLOW, MIXING = FLOW, CONVECTION = NORTH ANNA 3
 (PWR) = NORTH ANNA 4 (PWR)

085812
 RESPONSE TO QUESTION 3.13 - BULK HYDROGEN STORAGE
 VIRGINIA ELECTRIC AND POWER COMPANY
 DOCKET-30404-73 = 3 PAGES, PG. 3.13-1 OF AMENDMENT 7 TO NORTH ANNA 3 AND A LICENSE APPLICATION, AUGUST 15, 1972, DOCKET 30-404/403, TYPE-PWR, NRC-BPW, AT-STONE & WEBSTER

THE BULK HYDROGEN STORAGE FACILITY WILL BE LOCATED IN THE YARD, ON THE NORTH SIDE OF THE TURBINE BUILDING. THE FACILITY WILL SERVE COIL UNIT 3 AND UNIT 4, TWO GROUPS OF COMMERCIAL HYDROGEN CYLINDERS, DESIGNATED OPERATIONAL AND RESERVE, WILL PROVIDE HYDROGEN FOR THE GENERATOR COOLING SYSTEM. A HOSE CONNECTION WILL ALLOW INTRODUCTION OF HYDROGEN FROM A TEMPORARY SOURCE FOR INITIALLY FILLING THE GENERATOR. THE RESERVE HYDROGEN SUPPLY WILL MAINTAIN 42% A SHORT PERIOD OF TIME. SYSTEM PRESSURE WHEN THE OPERATIONAL SUPPLY IS LOW.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22104
 REACTION, PWR = STORAGE CONTAINMENT = SYSTEM DESCRIPTION = TURBINE = NORTH ANNA 3 (PWR) = NORTH ANNA 4 (PWR)

085977
 RESPONSE TO QUESTION 3.14 - RADIOLOGICAL CONSEQUENCES OF USING BACKUP PURGE SYSTEM
 VIRGINIA ELECTRIC AND POWER COMPANY
 DOCKET-30404-73 = 3 PAGES, PG. 3.14-1 OF AMENDMENT 7 TO NORTH 3 AND A LICENSE APPLICATION, NOVEMBER 15, 1972, DOCKET 30-404/403, TYPE-PWR, NRC-BPW, AT-STONE & WEBSTER

THE THIRTY-ONE DAY DOSES RESULTING FROM THE USE OF THE BACKUP PURGE SYSTEM ARE AS FOLLOWS: WHOLE BODY DOSE = 0.7 REM; INHALED DOSE = 3.0 REM. THESE DOSES ARE WELL WITHIN THE LIMITS OF 100MRADS. THIS ANALYSIS ASSUMES THAT ONE OF THE REDUNDANT RECOMBINERS IS INITIATED AT SIX DAYS AFTER THE GDS AND OPERATES UNTIL THE 37TH DAY, REDUCING THE HYDROGEN CONCENTRATION TO A LEVEL SUCH THAT THE BACKUP PURGE SYSTEM NEED NOT BE STARTED UNTIL AFTER THE 37TH DAY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22104
 ACCIDENT, LOSS OF COOLANT = CONTAINMENT SYSTEM, OPERATION = REACTION, PWR = CONTROL = DOSE CALCULATION, INTERNAL = POPULATION EXPOSURE = NORTH ANNA 3 (PWR) = NORTH ANNA 4 (PWR)

085978
 RESPONSE TO QUESTION 3.15 - ELECTRIC RECOMBINERS
 VIRGINIA ELECTRIC AND POWER COMPANY
 DOCKET-30404-73 = 3 PAGES, PG. 3.15-1 OF AMENDMENT 7 TO NORTH ANNA 3 AND A LICENSE APPLICATION, NOVEMBER 15, 1972, DOCKET 30-404/403, TYPE-PWR, NRC-BPW, AT-STONE & WEBSTER

AT THE PRESENT TIME, APPLICANT INTENDS TO USE ELECTRIC RECOMBINERS SIMILAR IN DESIGN TO THOSE INSTALLED AT THE SURRY POWER STATION. DOCKET NO. 30-280 AND 30-281. THE DETAILS OF THE DESIGN OF THE SURRY RECOMBINERS HAVE BEEN DISCUSSED WITH THE AEC AS A PART OF THAT APPLICATION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22104
 ACCIDENT, LOSS OF COOLANT = REACTION, PWR = CONTROL = NORTH ANNA 3 (PWR) = NORTH ANNA 4 (PWR) = RECOMBINERS

085979
 RESPONSE TO QUESTION 3.16 - HYDROGEN GENERATED FROM PAINT
 VIRGINIA ELECTRIC AND POWER COMPANY
 DOCKET-30404-73 = 3 PAGES, PG. 3.16-1 OF AMENDMENT 7 TO NORTH ANNA 3 AND A LICENSE APPLICATION, NOVEMBER 15, 1972, DOCKET 30-404/403, TYPE-PWR, NRC-BPW, AT-STONE & WEBSTER

BASED ON THE ESTIMATED CONTENT OF ZINC IN THE PAINT AND 100 PERCENT REACTION, THE HYDROGEN GENERATION WOULD ONLY INCREASE BY 0.5 PERCENT. THIS MAXIMUM OF 0.5 PERCENT IS THE TOTAL HYDROGEN GENERATED BY ZINC CORROSION IN THE PRIMER DURING THE 90 DAYS FOLLOWING A LOSS-OF-COOLANT ACCIDENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22104
 ACCIDENT, LOSS OF COOLANT = REACTION, PWR = RELEASE RATE = ZINC = CONTAINMENT PAINT = SURFACE, PAINTED = NORTH ANNA 3 (PWR) = NORTH ANNA 4 (PWR)

086021
 RESPONSE TO QUESTION 3.18 - HYDROGEN CONTROL WITHIN SUBCOMPARTMENTS
 VIRGINIA ELECTRIC AND POWER COMPANY
 DOCKET-30404-73 = 3 PAGES, PG. 3.18-1 OF AMENDMENT 7 TO NORTH ANNA 3 AND A LICENSE APPLICATION, DECEMBER 15, 1972, DOCKET 30-404/403, TYPE-PWR, NRC-BPW, AT-STONE & WEBSTER

ALL SUBCOMPARTMENTS WILL BE PROVIDED WITH VENTS AT THE TOP AND WITH DRAINS AT THE BOTTOM. THE TOP VENTS WILL PROVIDE FOR THE RELEASE, DUE TO BUOYANCY, OF ANY HYDROGEN GENERATED WITHIN OR BETWEEN

004022 *CONTINUED*
THE SUBCOMPARTMENT. THE NORTH DRAINS PREVENT THE ACCUMULATION OF WATER WITHIN A SUBCOMPARTMENT, THUS PREVENTING SUBSTANTIAL GENERATION OF HYDROGEN BY RADIOLYSIS WITHIN THAT SUBCOMPARTMENT. THEREFORE THE HYDROGEN CONCENTRATION WITHIN THE SUBCOMPARTMENTS WILL NOT BE SUBSTANTIALLY DIFFERENT FROM BULK CONDITIONS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT - REACTION, PHR - CONTROL - COMPARTMENT - NORTH ANNA 3 (PHR) - NORTH ANNA 4 (PHR)

004033
RESPONSE TO QUESTION 4.14 - HYDROGEN GENERATION
ARKANSAS POWER AND LIGHT COMPANY
DOCKET-50312-14 - 2 PAGES, 2 FIGURES, PP. 4.14 THRU 4.14A OF AMENDMENT 12 TO ARKANSAS NUCLEAR 1 LICENSE APPLICATION, NOVEMBER 10, 1972, DOCKET 50-312, TYPE--PHR, NRC--BOM, AE--BICHEL

THE INTEGRATED ENERGY RELEASED AS A FUNCTION OF TIME IN THE CORE AND SUMP SOLUTION FOR RADIOLYTIC DECOMPOSITION OF WATER IS GIVEN IN FIGURES 4.14.1-1 AND 4.14.1-2. ZINC BASE PAINT WAS USED INSIDE THE REACTOR BUILDING. A TOTAL MASS OF 37,900 LB OF ZINC WAS ASSUMED TO CORRODE AT A RATE OF 4.7 MIL/YR. NO ICF OF HYDROGEN WAS ASSUMED IN THE REACTOR COOLANT AND PRESSURE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT - REACTION, PHR - CONTAINMENT PAINT - RADIOLYTIC GAS - ARKANSAS NUCLEAR 1 (PHR) - PRODUCTION

004047
RESPONSE TO QUESTION 4.9 - CONSEQUENCES OF ACCIDENT INVOLVING GASEOUS WASTE SYSTEM
PENNSYLVANIA POWER AND LIGHT COMPANY
DOCKET-50387-14 - 2 PAGES, PP. 10-1A OF AMENDMENT 7 TO SUSQUEHANNA 1 AND 2 LICENSE APPLICATION, MARCH 5, 1972, DOCKET 50-387/389, TYPE--PHR, NRC--G.E., AE--BICHEL

THE GASEOUS WASTE SYSTEM IS DESIGNED TO BE FAIL SAFE AND IS SUITABLY ALARMED TO PROVIDE AUDIBLE AND VISUAL WARNINGS IN CASE OF MALFUNCTION. AUTOMATIC AND MANUAL INITIATION OF SHUTDOWN IS PROVIDED. IN GENERAL, IF FAILURE IS RESTRICTED TO A SINGLE TRAIN, THE GAS STREAM CAN BE TRANSFERRED TO A STANDBY TRAIN.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT ANALYSIS - ACCIDENT - REACTION, PHR - ACCIDENT, CONSEQUENCES - ELECTRIC POWER - WASTE TREATMENT, GAS - COOLING - PNEUMATIC SYSTEM - SUSQUEHANNA 2 (PHR) - SUSQUEHANNA 1 (PHR)

007010
RESPONSE TO QUESTION - 15.30 HYDROGEN ANALYZER
DUQUESNE LIGHT COMPANY
DOCKET-50412-14 - 1 PAGE, PAGE 015.30 THROUGH 015.37 OF AMENDMENT 7 TO BEAVER VALLEY 2 LICENSE APPLICATION, JULY 2, 1973, DOCKET 50-412, TYPE--PHR, NRC--WEST., AE--STONE AND WEBSTER

THE HYDROGEN ANALYZER IS PIPED SO THAT IT CAN BE OPERATED INDEPENDENT OF THE RECOMBINER OR PURGE SYSTEM. THERE IS NO EQUIPMENT FOR EITHER THE RECOMBINER OR PURGE BLOWER TO BE CONNECTED TO TEST THE CONTAINMENT ATMOSPHERE. IT IS EQUIPPED WITH ITS OWN BLOWER AND CAN BE VALVED OFF FROM THE RECOMBINER AND BLOWER.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

EQUIPMENT - REACTION, PHR - CHEMICAL ANALYSIS - BEAVER VALLEY 2 (PHR) - PIPES AND PIPE FITTINGS

007019
RESPONSE TO QUESTION - 15.30 HYDROGEN RECOMBINER
DUQUESNE LIGHT COMPANY
DOCKET-50412-14 - 1 PAGE, 015.30-1 OF AMENDMENT 7 TO BEAVER VALLEY 2 LICENSE APPLICATION, JULY 2, 1973, DOCKET 50-412, TYPE--PHR, NRC--WEST., AE--STONE AND WEBSTER

SPECIFIES THE HYDROGEN RECOMBINER MANUFACTURER AND DESCRIBES IN DETAIL THE RECOMBINER DESIGN. ALSO, DISCUSSES THE RECOMBINER TEST PROGRAM AND PERFORMANCE SPECIFICATIONS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

OPERATION - REACTION, PHR - TESTING - COMPONENT DESCRIPTION - BEAVER VALLEY 2 (PHR) - RECOMBINERS

007020
RESPONSE TO QUESTION - 15.30 HYDROGEN CONCENTRATION IN CONTAINMENT ATMOSPHERE
DUQUESNE LIGHT COMPANY
DOCKET-50412-14 - 1 PAGE, 015.30-1 OF AMENDMENT 7 TO BEAVER VALLEY 2 LICENSE APPLICATION, JULY 2, 1973, DOCKET 50-412, TYPE--PHR, NRC--WEST., AE--STONE AND WEBSTER

087620 *CONTINUED*

CONSIDERING THE UNCERTAINTY IN MEASUREMENT OF HYDROGEN CONCENTRATION, THE MAXIMUM ALLOWABLE HYDROGEN CONCENTRATION BEFORE INITIATION OF THE PURGE SYSTEM WOULD BE 3.9 VOLUME PERCENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT * REACTOR, PWR * CONTROL * CONCENTRATION * BEAVER VALLEY 2 (PWR)

087860

RESPONSE TO QUESTION 7-22 - POST-DBA HYDROGEN CONTROL

DUQUESNE LIGHT COMPANY

DOCKET-50412-27 *. 1 PAGE, PG. 07-22-1 OF AMENDMENT 9 TO BEAVER VALLEY 2 LICENSE APPLICATION, AUGUST 2, 1973, DOCKET 50-412, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

THE INSTRUMENTATION, CONTROL, AND ELECTRICAL EQUIPMENT OF THE POST-DBA HYDROGEN CONTROL SYSTEM WILL COMPLY WITH THE REQUIREMENTS OF IEEE 279-1971 AND IEEE 308-1971. THE REASON THAT TWO ITEMS DO NOT COMPLY IS BECAUSE THEY ARE NOT CONSIDERED A PART OF THE ENGINEERED SAFETY FEATURE AND THEIR OPERATION IS NOT REQUIRED DURING POST-DBA CONDITION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT * REACTOR, PWR * CONTROL * BEAVER VALLEY 2 (PWR)

088187

RESPONSE TO QUESTION 6-21 - HYDROGEN CONTROL SYSTEM

MILLSTONE POINT COMPANY

DOCKET-50336-69 *. 1 PAGE OF AMENDMENT 18 TO MILLSTONE 2 LICENSE APPLICATION, JULY 16, 1973, DOCKET 50-336, TYPE--PWR, MFG--COMB., AE--BECHTEL

BRIEF DISCUSSION OF THE ADEQUACY OF THE CONTAINMENT POSTINCIDENT HYDROGEN CONTROL SYSTEM FANS AND MOTORS FOR PERFORMING THEIR DESIGN FUNCTION IN AN ACCIDENT ENVIRONMENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTROL SYSTEM * ACCIDENT, LOSS OF COOLANT * REACTOR, PWR * ENGINEERED SAFETY FEATURE * MILLSTONE POINT 2 (PWR) * PERFORMANCE

088249

RESPONSE TO QUESTION 6-40 - HYDROGEN RECOMBINER

DUQUESNE LIGHT COMPANY

DOCKET-50334-84 *. 1 PAGE, PG. 6-40-1 OF AMENDMENT 4 TO BEAVER VALLEY 1 LICENSE APPLICATION, SEPTEMBER 4, 1973, DOCKET 50-334, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

SPECIFIES THE HYDROGEN RECOMBINER MANUFACTURER AND DESCRIBES IN DETAIL THE RECOMBINER DESIGN.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

DESIGN CRITERIA * REACTOR, PWR * BEAVER VALLEY 1 (PWR) * COMPONENT DESCRIPTION * RECOMBINERS

088258

RESPONSE TO QUESTION 6-61 - HYDROGEN ANALYZER

DUQUESNE LIGHT COMPANY

DOCKET-50334-84 *. 1 PAGE, PG. 6-61-1 OF AMENDMENT 4 TO BEAVER VALLEY 1 LICENSE APPLICATION, SEPTEMBER 4, 1973, DOCKET 50-334, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

THE HYDROGEN ANALYZER IS PIPED SO THAT IT CAN BE OPERATED INDEPENDENTLY OF THE RECOMBINER OR PURGE SYSTEM. THERE IS NO REQUIREMENT FOR EITHER THE RECOMBINER OR PURGE BLOWER TO BE CONNECTED TO TEST THE CONTAINMENT ATMOSPHERE. IT IS EQUIPPED WITH ITS OWN BLOWER AND CAN BE VALVED OFF FROM THE RECOMBINER AND BLOWER. THE ANALYZER EFFLUENT CAN BE RETURNED TO CONTAINMENT OR EXHAUSTED TO ATMOSPHERE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR * CHEMICAL ANALYSIS * SYSTEM CAPABILITY * BEAVER VALLEY 1 (PWR) * PIPES AND PIPE FITTINGS

088294

RESPONSE TO QUESTION 7-28 - CONTROL SYSTEM FOR HYDROGEN CONTROL SYSTEM

DUQUESNE LIGHT COMPANY

DOCKET-50334-84 *. 1 PAGE, PG. 7-28-1 OF AMENDMENT 4 TO BEAVER VALLEY 1 LICENSE APPLICATION, SEPTEMBER 4, 1973, DOCKET 50-334, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

THE DESIGN OF THE INSTRUMENTATION, CONTROL, AND ELECTRICAL EQUIPMENT OF THE POST DBA HYDROGEN CONTROL SYSTEM IS IN ACCORDANCE WITH IEEE 279-1971 AND IEEE 308-1971. THE INSTRUMENTATION, CONTROL, AND ELECTRICAL EQUIPMENT OF THE SUPPLEMENTAL LEAK COLLECTION SYSTEM ARE IN ACCORDANCE WITH IEEE 279-1971 AND IEEE 308-1971 WITH ONE EXCEPTION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

088254 *CONTINUED*
CODES AND STANDARDS + CONTROL SYSTEM + DESIGN CRITERIA + REACTOR, PWR + CONTROL + BEAVER VALLEY 1 (PWR)

088278
RESPONSE TO QUESTION 15.40 - MAXIMUM HYDROGEN CONCENTRATION
DUQUESNE LIGHT COMPANY
DOCKET-50434-84 +. 1 PAGE, PG. 15.40-2 OF AMENDMENT 4 TO BEAVER VALLEY 1 LICENSE APPLICATION, SEPTEMBER 4, 1973, DOCKET 50-434, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

CONSIDERING THE UNCERTAINTY IN MEASUREMENT OF HYDROGEN CONCENTRATION, THE MAXIMUM ALLOWABLE HYDROGEN CONCENTRATION BEFORE INITIATION OF THE PURGE SYSTEM WOULD BE 3.9 VOLUME PERCENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
CONTAINMENT + CONTROL SYSTEM + REACTOR, PWR + VENTILATION SYSTEM + BEAVER VALLEY 1 (PWR) + CONCENTRATION

088876
RESPONSE TO QUESTION 6.44 - HYDROGEN GAS ANALYZERS
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50434-12 +. 1 PAGE, PG. 6.44-1 OF AMENDMENT 3 TO SURRY 3 AND 4 LICENSE APPLICATION, SEPTEMBER 18, 1973, DOCKET 50-434/435, TYPE--PWR, MFG--BOW, AE--STONE+WEBSTER

THE TWO REDUNDANT H2 GAS ANALYZERS OF THE THERMAL CONDUCTIVITY TYPE WILL BE CAPABLE OF ANALYZING THE CONTAINMENT HYDROGEN CONCENTRATION WITHIN AN ACCURACY OF 0.1 PERCENT BY VOLUME.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, PWR + CHEMICAL ANALYSIS + MONITOR + SURRY 3 (PWR) + SURRY 4 (PWR)

088877
RESPONSE TO QUESTION 6.45 - MAXIMUM HYDROGEN CONCENTRATION
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50434-12 +. 1 PAGE, PG. 6.45-1 OF AMENDMENT 3 TO SURRY 3 AND 4 LICENSE APPLICATION, SEPTEMBER 18, 1973, DOCKET 50-434/435, TYPE--PWR, MFG--BOW, AE--STONE+WEBSTER

A MAXIMUM HYDROGEN CONCENTRATION OF 3.9 VOLUME PERCENT WILL BE ALLOWED BEFORE INITIATION OF THE PURGE SYSTEM FOLLOWING A DEA.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + CONCENTRATION + SURRY 3 (PWR) + SURRY 4 (PWR)

088878
RESPONSE TO QUESTION 6.46 - MAKEUP AIR SUPPLY
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50434-12 +. 1 PAGE, PG. 6.46-1 OF AMENDMENT 3 TO SURRY 3 AND 4 LICENSE APPLICATION, SEPTEMBER 18, 1973, DOCKET 50-434/435, TYPE--PWR, MFG--BOW, AE--STONE+WEBSTER

A BLOWER WILL BE INSTALLED TO SUPPLY DILUTION AIR TO THE CONTAINMENT WHILE THE SYSTEM IS OPERATED IN THE PURGE MODE. THIS BLOWER WILL BE A DUPLICATE OF THE PURGE BLOWER AND BOTH BLOWERS WILL BE PIPED SO THEY MAY BE USED TO PULL AIR FROM THE CONTAINMENT OR SUPPLY AIR TO THE CONTAINMENT. A SINGLE BLOWER COULD BE CYCLED TO SUPPLY DILUTION AIR TO THE CONTAINMENT OR TO REMOVE CONTAMINATED ATMOSPHERE FROM THE CONTAINMENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
CONTAINMENT + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + CONTROL + SURRY 3 (PWR) + SURRY 4 (PWR)

088879
RESPONSE TO QUESTION 6.48 - HYDROGEN ANALYZER
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50434-12 +. 1 PAGE, PG. 6.48-1 OF AMENDMENT 3 TO SURRY 3 AND 4 LICENSE APPLICATION, SEPTEMBER 18, 1973, DOCKET 50-434/435, TYPE--PWR, MFG--BOW, AE--STONE+WEBSTER

STANDARD SAMPLES OF GAS CORRESPONDING TO THOSE EXPECTED IN THE CONTAINMENT ARE PREPARED IN SAMPLE BOTTLES. THESE ARE RUN THROUGH THE ANALYZER AND THE RESULTS ARE CHECKED AGAINST THE KNOWN VOLUME. EACH ANALYZER HAS A SELF-CONTAINED COMPRESSOR (BELLONS OR SIMILAR TYPE) TO PUMP THE GAS FROM THE CONTAINMENT THROUGH THE ANALYZER AND BACK TO THE CONTAINMENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, PWR + CHEMICAL ANALYSIS + INSTRUMENT CALIBRATION + MONITOR + CONCENTRATION + SURRY 3 (PWR) + SURRY 4 (PWR)

089724

089724 *CONTINUED*
 RESPONSE TO QUESTION 9.3.7 - HYDROGEN ADDITION SYSTEM
 GEORGIA POWER COMPANY
 DOCKET-50424-19 %. 1 PAGE, PG. 9.3.7 OF AMENDMENT 4 TO VOGTLE 1, 2, 3, AND 4 LICENSE APPLICATION, JULY 13, 1973, DOCKET 50-424/425/426/427, TYPE--PNR, MFG--WEST., AE--BECHTEL

THE WASTE GAS COMPRESSOR SUCTION HEADER COLLECTS HYDROGEN AND FISSION GASES FROM DEAERATED WATER THAT HAS BEEN COLLECTED IN VARIOUS TANKS. THE GASEOUS WASTE SYSTEM IS FLUSHED FREE OF AIR AND FILLED WITH NITROGEN PRIOR TO BEING PUT INTO OPERATION. AIR WILL NOT BE PRESENT IN THE GASEOUS WASTE SYSTEM FROM THE SOURCE OF GASEOUS WASTES TO THE WASTE GAS HYDROGEN RECOMBINER. THUS, THE POSSIBILITY OF HYDROGEN EXPLOSION IN THIS SYSTEM IS ELIMINATED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + WASTE TREATMENT, GAS + SYSTEM DESCRIPTION + SAFETY EVALUATION + VOGTLE 4 (PNR) + VOGTLE 3 (PNR) + VOGTLE 2 (PNR) + VOGTLE 1 (PNR) + RECOMBINERS

089779
 RESPONSE TO QUESTION 6.2.39 - HYDROGEN RECIRCULATION SYSTEM
 MISSISSIPPI POWER AND LIGHT COMPANY
 DOCKET-50416-50 %. 4 PAGES, 1 FIGURE, PP. 6.2.39-1 THRU 6.2.39-4 OF AMENDMENT 11 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, AUGUST 24, 1973, DOCKET 50-416/417, TYPE--BWR, MFG--G.E., AE--BECHTEL

PROVIDES THE RESULTS OF AN ANALYSIS OF THE PLANT'S CAPABILITY TO ALLOW INITIATION OF THE HYDROGEN RECIRCULATION SYSTEM AT 10 MINUTES FOLLOWING A LOSS-OF-COOLANT ACCIDENT. DEFINES THE SPECTRUM OF PRIMARY SYSTEM BREAK SIZES FOR WHICH THIS CAPABILITY MAY EXIST AND DISCUSSES THE SPECIFIC LIMITATIONS WHICH DETERMINE THE UNACCEPTABLE BREAK RANGES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + SYSTEM OPERABILITY IN ACCIDENT + FLOW, RECIRCULATION + GRAND GULF 2 (BWR) + GRAND GULF 1 (BWR)

089780
 RESPONSE TO QUESTION 6.2.40 - HYDROGEN CONCENTRATION INSTRUMENTATION
 MISSISSIPPI POWER AND LIGHT COMPANY
 DOCKET-50416-50 %. 1 PAGE, PG. 6.2.40-1 OF AMENDMENT 11 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, AUGUST 24, 1973, DOCKET 50-416/417, TYPE--BWR, MFG--G.E., AE--BECHTEL

THE CONCENTRATION OF HYDROGEN GAS IN THE DRYWELL AND CONTAINMENT IS DISPLAYED IN THE CONTROL ROOM BY FOUR INDICATORS CONNECTED TO SEPARATE ANALYZERS. TWO SYSTEMS ARE USED TO MONITOR THE DRYWELL AND TWO SYSTEMS ARE USED TO MONITOR THE CONTAINMENT. ALARMS ARE OPERATED FROM EACH ANALYZER TO BE ACTIVATED ON A HIGH CONCENTRATION OF HYDROGEN.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + CONTAINMENT + CONTROL PANEL/ROOM + CONCENTRATION + GRAND GULF 2 (BWR) + GRAND GULF 1 (BWR) + INDICATORS + INSTRUMENTS, MISC.

090089
 RESPONSE TO QUESTION 6.30 - CATALYTIC HYDROGEN AND RECOMBINER
 THE HILLSTONE POINT COMPANY
 DOCKET-50423-22 %. 1 PAGE, PG. 6.30-1 OF AMENDMENT 7 TO HILLSTONE 3 LICENSE APPLICATION, TYPE--PNR, MFG--WEST., AE--STONE & WEBSTER

DISCUSSES A CATALYTIC RECOMBINER FOR USE IN THE HYDROGEN CONTROL SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTROL SYSTEM + REACTOR, PWR + CATALYST + HILLSTONE POINT 3 (PNR) + RECOMBINERS

090090
 RESPONSE TO QUESTION 6.32 - HYDROGEN CONCENTRATION MONITOR
 THE HILLSTONE POINT COMPANY
 DOCKET-50423-22 %. 1 PAGE, PG. 6.32-1 OF AMENDMENT 7 TO HILLSTONE 3 LICENSE APPLICATION, TYPE--PNR, MFG--WEST., AE--STONE & WEBSTER

TWO REDUNDANT HYDROGEN ANALYZERS WILL BE PROVIDED. EACH HYDROGEN ANALYZER WILL INCLUDE ITS OWN SAMPLING PUMP TO ALLOW ANALYSIS OF THE CONTAINMENT ATMOSPHERE WITHOUT OPERATION OF THE DBA HYDROGEN RECOMBINER BLOWERS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + MONITOR, GAS + MONITOR + CONCENTRATION + HILLSTONE POINT 3 (PNR)

090091
 RESPONSE TO QUESTION 6.33 - HYDROGEN CONCENTRATION

090091 *CONTINUED*
THE HILLSTONE POINT COMPANY
DOCKET-50423-22 +. 1 PAGE, PG. 6.33-1 OF AMENDMENT 7 TO HILLSTONE 3 LICENSE APPLICATION, TYPE--PWR, MFG--
WEST., AE--STONE & WEBSTER

THE PURGE MODE OF POST ACCIDENT HYDROGEN CONTROL WILL ONLY BE USED IN THE UNLIKELY EVENT THAT BOTH DBA HYDROGEN RECOMBINERS FAIL. THE HYDROGEN ANALYSIS WILL HAVE A RANGE OF 0-10% HYDROGEN-IN-AIR AND A PLUS OR MINUS 1% FULL SCALE ACCURACY. THEREFORE, DUE TO THE UNCERTAINTY OF MEASUREMENT, PURGE OPERATION, IF REQUIRED, WILL BE INITIATED BEFORE THE ANALYZER INDICATES 3.9% HYDROGEN IN ORDER TO MAINTAIN THE ACTUAL HYDROGEN CONCENTRATION IN THE CONTAINMENT ATMOSPHERE BELOW 4%.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, PWR + CONCENTRATION + HILLSTONE POINT 3 (PWR)

090092
RESPONSE TO QUESTION 6.34 - CONTAINMENT MAKEUP AIR
THE HILLSTONE POINT COMPANY
DOCKET-50423-22 +. 1 PAGE, PG. 6.34-1 OF AMENDMENT 7 TO HILLSTONE 3 LICENSE APPLICATION, TYPE--PWR, MFG--
WEST., AE--STONE & WEBSTER

THE CONTAINMENT VACUUM SYSTEM DESIGN WILL BE CHANGED TO ENABLE THE SYSTEM TO PERFORM AS A BACKUP HYDROGEN CONTROL SYSTEM. IN THE UNLIKELY EVENT THAT BOTH REDUNDANT DBA HYDROGEN RECOMBINER UNITS FAIL AFTER A LOSS-OF-COOLANT ACCIDENT, THE CONTAINMENT VACUUM PUMPS WILL BE ALIGNED TO SIMULTANEOUSLY DILUTE THE CONTAINMENT ATMOSPHERE WITH EXTERNAL AIR AND PURGE THE CONTAINMENT TO THE ATMOSPHERE AFTER FILTRATION. THE CONTAINMENT VACUUM PUMPS CAPACITY WILL BE INCREASED TO 50 SCF/M.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
DILUTION + REACTOR, PWR + AIR + CONTAINMENT ATMOSPHERE, INERT + ADDITIVE + HILLSTONE POINT 3 (PWR)

090093
RESPONSE TO QUESTION 6.35 - LOCATION OF HYDROGEN CONTROL SYSTEM
THE HILLSTONE POINT COMPANY
DOCKET-50423-22 +. 1 PAGE, PG. 6.35-1 OF AMENDMENT 7 TO HILLSTONE 3 LICENSE APPLICATION, TYPE--PWR, MFG--
WEST., AE--STONE & WEBSTER

THE HYDROGEN CONTROL SYSTEM EQUIPMENT (HYDROGEN ANALYSIS CONTROL PANEL AND SAMPLE SYSTEM) WILL BE LOCATED IN THE HYDROGEN RECOMBINER BUILDING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
CONTROL SYSTEM + REACTOR, PWR + HILLSTONE POINT 3 (PWR)

090094
RESPONSE TO QUESTION 6.36 - HYDROGEN ANALYZER
THE HILLSTONE POINT COMPANY
DOCKET-50423-22 +. 1 PAGE, PG. 6.36-1 OF AMENDMENT 7 TO HILLSTONE 3 LICENSE APPLICATION, TYPE--PWR, MFG--
WEST., AE--STONE & WEBSTER

ALL PRESSURE RETAINING BOUNDARIES OF THE ANALYZER AND ITS SAMPLE SYSTEM WILL BE SUBJECTED TO CERTIFIED MATERIAL QUALIFICATIONS. THE ANALYZER, ITS SAMPLE SYSTEM AND MOUNTING CABINET WILL BE SUBJECTED TO A SEISMIC VIBRATION TEST AND OBSERVED FOR PHYSICAL INTEGRITY AND FUNCTIONAL OPERABILITY DURING THE PLANT OPERATION. THE ANALYZER WILL HAVE AN ACCURACY OF PLUS OR MINUS 1% FULL SCALE; THE INSTRUMENT RANGE WILL BE 0-10% HYDROGEN-IN-AIR. THE GAS SAMPLES FROM THE CONTAINMENT AND FROM THE CATALYTIC COMBINER WILL BE PULLED THROUGH THE ANALYZER BY A SEALED PUMP AND THEN DISCHARGED BACK INTO THE CONTAINMENT. PRIOR TO ENTERING THE ANALYZER THE GAS SAMPLES WILL BE SUITABLY CONDITIONED WITH A PRESSURE REDUCING VALVE, COOLER, FILTER AND FLOW INDICATOR.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
INSTRUMENT, PROCESS + REACTOR, PWR + MONITOR + HILLSTONE POINT 3 (PWR)

090120
RESPONSE TO QUESTION 6.2.20 - HYDROGEN CONCENTRATION
MISSISSIPPI POWER AND LIGHT COMPANY
DOCKET-50416-39 +. 14 PAGES, 7 FIGURES, 8 REFERENCES, PP. 6.2.20-1 THRU 6.2.20-14 OF AMENDMENT 9 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, JUNE 28, 1973, DOCKET 50-416/417, TYPE--BWR, MFG--G.E., AE--BECHTEL

THE ACCURACY OF THE HYDROGEN CONCENTRATION ANALYZERS WILL BE $\pm 2\%$ OF FULL SCALE. THE RANGE OF THE INSTRUMENT WILL BE 0 TO 5 % HYDROGEN. A DISCUSSION ATTEMPTING TO DEFINE THE UNCERTAINTIES IN DETERMINING THE HYDROGEN CONCENTRATION IN THE DRYWELL MUST IDENTIFY THE MECHANISM WHICH PRODUCES THE HYDROGEN. A NONMECHANISTIC MODEL WAS USED TO EFFECT A 5% METAL-WATER REACTION SINCE NO REALISTIC MECHANISM TO ACHIEVE SUCH A CONDITION HAS BEEN IDENTIFIED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + ANALYTICAL MODEL + CONTROL + CONCENTRATION +

090128 *CONTINUED*
GRAND GULF 2 (BWR) + GRAND GULF 1 (BWR) + INSTRUMENTS, MISC.

090129
RESPONSE TO QUESTION 6.2.29 - HYDROGEN MIXING SYSTEM
MISSISSIPPI POWER AND LIGHT COMPANY
DOCKET-50416-39 +. 3 PAGES, PP. 6.2.29-1 THRU 6.2.29-3 OF AMENDMENT 9 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, JUNE 28, 1973, DOCKET 50-416/417, TYPE--BWR, MFG--G.E., AE--BECHTEL

THE MIXING SYSTEM INLET VALVES WILL BE AUTOMATICALLY ACTUATED VALVES, DESIGNED TO OPEN WHEN THE DRYWELL PRESSURE IS 0.5 PSI LESS THAN THE CONTAINMENT PRESSURE, AND CLOSE WHEN THE DRYWELL PRESSURE IS 0.25 PSI LESS THAN THE CONTAINMENT PRESSURE. SINCE THESE VALVES WILL BE SERVING A SAFETY-RELATED FUNCTION, THEY WILL MEET THE DESIGN, QUALITY ASSURANCE, REDUNDANCY, ENERGY SOURCE, AND INSTRUMENTATION REQUIREMENTS FOR AN ENGINEERED SAFETY FEATURE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + DESIGN CRITERIA + CONTROL + FLOW, MIXING + SYSTEM CAPABILITY + GRAND GULF 2 (BWR) + GRAND GULF 1 (BWR) + VALVES

090130
RESPONSE TO QUESTION 2.30 - CONTAINMENT AIR MIXING
MISSISSIPPI POWER AND LIGHT COMPANY
DOCKET-50416-39 +. 3 PAGES, PP. 2.30-1 THRU 2.30-3 OF AMENDMENT 9 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, JUNE 28, 1973, DOCKET 50-416/417, TYPE--BWR, MFG--G.E., AE--BECHTEL

THE RECIRCULATION FANS ARE SIZED TO PROVIDE ONE AIR CHANGE IN THE DRYWELL EVERY 7 MINUTES AND ONE AIR CHANGE IN THE CONTAINMENT EVERY 35 MINUTES BY OPERATING 2 FANS AT 20,000 CFM EACH. THIS PROVIDES A CONSERVATIVE BASIS TO ENSURE THAT A FLOW PATTERN IS SET UP IN THE DRYWELL AND CONTAINMENT TO MIX THESE ATMOSPHERES COMPLETELY. THERE ARE SEVERAL MECHANISMS TO ENSURE HYDROGEN MIXING IN THE BULK CONTAINMENT ATMOSPHERE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + CONTROL + CONTAINMENT ATMOSPHERE, INERT + FLOW, MIXING + SYSTEM CAPABILITY + GRAND GULF 2 (BWR) + GRAND GULF 1 (BWR) + BLOWERS

090135
RESPONSE TO QUESTION 6.2.35 - PURGING FOR HYDROGEN CONTROL
MISSISSIPPI POWER AND LIGHT COMPANY
DOCKET-50416-39 +. 2 PAGES, PP. 6.2.35-1 THRU 6.2.35-2 OF AMENDMENT 9 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, JUNE 28, 1973, DOCKET 50-416/417, TYPE--BWR, MFG--G.E., AE--BECHTEL

THE GRAND GULF DESIGN INCORPORATES A COMPLETELY REDUNDANT HYDROGEN RECOMBINER, DESIGNED AND CONSTRUCTED TO THE APPLICABLE CODES FOR ENGINEERED SAFETY FEATURE DESIGN. THEREFORE, NO SINGLE EVENT COULD RESULT IN THE LOSS OF THE REDUNDANT FEATURES. THEREFORE, PURGING OF THE CONTAINMENT FOLLOWING THE POSTULATED LOCA WILL NOT BE REQUIRED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT + AIRBORNE RELEASE + REACTOR, BWR + CONTROL + CONTAINMENT ATMOSPHERE, INERT + GRAND GULF 2 (BWR) + GRAND GULF 1 (BWR) + RECOMBINERS

090152
RESPONSE TO QUESTION 6.31 - HYDROGEN GENERATION
THE HILLSTONE POINT COMPANY
DOCKET-50423-36 +. 2 PAGES, PP. 6.31-1 THRU 6.31-2 OF AMENDMENT 9 TO HILLSTONE 3 LICENSE APPLICATION, OCTOBER 12, 1973, DOCKET 50-423, TYPE--PHR, MFG--WEST., AE--STONE & WEBSTER

PROVIDES ADDITIONAL INFORMATION REGARDING THE GENERATION OF HYDROGEN, BASED ON THE GUIDELINES OF REGULATORY GUIDE 1.7, "CONTROL OF COMBUSTIBLE GAS CONCENTRATIONS IN CONTAINMENT FOLLOWING A LOSS-OF-COOLANT ACCIDENT."

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CHEMICAL REACTION + ENERGY SOURCE + REACTOR, PHR + PRODUCTION + HILLSTONE POINT 3 (PHR)

090208
RESPONSE TO QUESTION 6.9 - MIXING OF COMBUSTIBLE GASES
POTOMAC ELECTRIC POWER CO.
DOCKET-50448-20 +. 2 PAGES, PP. 6.9-1 THRU 6.9-2 OF AMENDMENT 2 TO DOUGLAS POINT 1 AND 2 LICENSE APPLICATION, SEPTEMBER 21, 1973, DOCKET 50-448/449, TYPE--BWR, MFG--G.E., AE--EBASCO

BEFORE THE START OF THE RECIRCULATION MIXING SYSTEM THERE IS EFFECTIVE MIXING OF COMBUSTIBLE GASES IN THE DRYWELL AND CONTAINMENT. INITIATION OF THE MIXING SYSTEM ONLY AIDS IN THE PROMOTION OF MIXING THROUGH TURBULENCE. ANALYSES HAVE BEEN DONE SHOWING THAT ONLY SMALL DEVIATIONS FROM AVERAGE CONCENTRATIONS WOULD OCCUR FOR THE HYDROGEN RELEASE RATES ASSOCIATED WITH REGULATORY

000700 *CONTINUED*

GUIDE FOR METAL-WATER REACTION ASSUMPTIONS. NON-HOMOGENEITY IS AN UNSTABLE, HENCE, TEMPORARY, SITUATION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, HWR + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + CONTROL + CONTAINMENT ATMOSPHERE, INERT + DUCRET-50447-55 + 1 PAGE + PG. 04-15-1 OF AMENDMENT 9 TO GREENWOOD 2 AND 3 LICENSE APPLICATION, DECEMBER 28, 1971, DUCRET 50-447-55, TYPE--BWR, MFG--BWR, AE--BECHTEL

003101

RESPONSE TO QUESTION 6.12 - CONTAINMENT PURGE

MISSISSIPPI POWER & LIGHT COMPANY

DUCRET-50447-55 + 1 PAGE + PG. 04-15-1 OF AMENDMENT 9 TO GREENWOOD 2 AND 3 LICENSE APPLICATION, DECEMBER 28, 1971, DUCRET 50-447-55, TYPE--BWR, MFG--BWR, AE--BECHTEL

A MAKEUP IS PROVIDED TO SUPPLY MAKEUP AIR TO THE CONTAINMENT + IN HYDROGEN CONTROL. THE MAKEUP AIR IS IN EQUILIBRIUM TO THE HYDROGEN PLANT WATER.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT + REACTOR, HWR + CONTAINMENT + AIR + GREENWOOD 2 (BWR) + GREENWOOD 3 (BWR) + ALOWERS

003745

RESPONSE TO QUESTION 6.14 - COMBUSTIBLE GAS CONTROL

MISSISSIPPI POWER & LIGHT COMPANY

DUCRET-50447-55 + 1 PAGE + PG. 04-15-1 OF AMENDMENT 4 TO BELLEFONTE 1 AND 2 LICENSE APPLICATION, OCTOBER 5, 1971, DUCRET 50-447-55, TYPE--BWR, MFG--BWR, AE--TVA

CALCULATIONS, BASED ON H₂ DATA FROM Q-25-11 SHOW THAT THE CONCENTRATION OF HYDROGEN IN THE CONTAINMENT, 20 DAYS AFTER A LOCA, IS 3.2% ASSUMING NO PROCESSING OF ANY KIND AND THAT A PURGE RATE OF 22 SCFM WILL PREVENT ANY FURTHER INCREASE IN THE CONCENTRATION OF HYDROGEN.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + REACTOR, HWR + CONTROL + CONTAINMENT STRUCTURE + BELLEFONTE 1 (BWR) + BELLEFONTE 2 (BWR)

007548

RESPONSE TO QUESTION 6.14 - COMPRESSED HYDROGEN STORAGE VESSELS

MISSISSIPPI POWER & LIGHT COMPANY

DUCRET-50447-55 + 1 PAGE + PG. 04-15-1 OF AMENDMENT 14 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, NOVEMBER 2, 1971, DUCRET 50-447-55, TYPE--BWR, MFG--GULF, AE--BECHTEL

EIGHT HYDROGEN CYLINDERS, EACH CONTAINING 32,560,000 BTU-H OF ENERGY, HAVE BEEN RELOCATED IN AN UPRIGHT CONCRETE PIT, AFEW FEET AND APPROXIMATELY 500 FEET FROM THE ENGINEERED SAFETY FEATURE TRANSFORMERS. NONE OF THESE TRANSFORMERS WILL BE WITHIN LINE OF SIGHT OF THE HYDROGEN STORAGE CONTAINERS AREA. DUE TO THE ABOVE PROVISIONS, THE CLASS II A-C POWER SYSTEM COMPONENTS WILL REMAIN FUNCTIONAL FOLLOWING ALL POTENTIAL FIRES AND EXPLOSIONS INVOLVING THE HYDROGEN IN THESE EIGHT STORAGE CYLINDERS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, HWR + STORAGE CONTAINER + GRAND GULF 2 (BWR) + GRAND GULF 1 (BWR)

007546

RESPONSE TO QUESTION 10.5 - HYDROGEN & COISUR 20 STORAGE VESSEL PROTECTIVE MEASURES

MISSISSIPPI POWER & LIGHT COMPANY

DUCRET-50447-55 + 4 PAGES, 1 FIGURE, PP. 110-5-1 THRU 110-5-4 OF AMENDMENT 15 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, NOVEMBER 2, 1971, DUCRET 50-447-55, TYPE--BWR, MFG--GULF, AE--BECHTEL

DESCRIBES AND DISCUSSES THE EXTENT OF THE PROTECTIVE MEASURES THAT WILL BE TAKEN TO ASSURE THAT COMBUSTIBLE MIXTURES WILL NOT EXIST IN THE GENERATOR BEFORE IT IS OPENED FOR MAINTENANCE OR BEFORE HYDROGEN IS RE-INTRODUCED FOLLOWING MAINTENANCE. DESCRIBES THE SYSTEMS USED TO PURGE AND FILL THE GENERATOR. INDICATES THE CODES AND STANDARDS THAT WILL BE COMPLIED WITH DURING THE DESIGN, FABRICATION, INSTALLATION AND CHECK OUT OF THE SYSTEMS FOR PURGING AND FILLING THE GENERATOR.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, HWR + CODES AND STANDARDS + CARBON DIOXIDE + PLANT PROTECTIVE SYSTEM + GRAND GULF 2 (BWR) + GRAND GULF 1 (BWR) + GENERATORS

002045

RESPONSE TO QUESTION 00-2.50 - HYDROGEN RECIRCULATORS VALVES

MISSISSIPPI POWER & LIGHT COMPANY

DUCRET-50447-55 + 1 PAGE, PAGE 00-2.50-1 OF AMENDMENT 16 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, NOVEMBER 12, 1971, DUCRET 50-447-55, TYPE--BWR, MFG--GULF, AE--BECHTEL

092895 *CONTINUED*

THE TWELVE MIXING SYSTEM INLET VALVES WILL OPERATE SIMULTANEOUSLY AS AUTOMATIC RELIEF VALVES. WHEN THE VACUUM RELIEF FUNCTION IS INITIATED, A MINIMUM OF SIX AND A MAXIMUM OF TWELVE INLET VALVES WILL OPEN.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, BWR + PRESSURE RELIEF + GRAND GULF 2 (BWR) + GRAND GULF 1 (HWR) + VALVES

093769

RESPONSE TO QUESTION 9.20 - CHEMICAL AND VOLUME CONTROL SYSTEMS

THE MILLSTONE POINT COMPANY

DOCKET-50423-20 +. 3 PAGES, PP. 9.20-1 THROUGH -3 OF AMENDMENT 6 TO MILLSTONE 3 LICENSE APPLICATION, JULY 20, 1973, DOCKET 50-423, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

DISCUSSES ALLOWABLE TEMPERATURES AND SYSTEM CAPABILITIES FOR THE CVCS MIXED BED AND CATION BED RESIN.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
BORON + CONTROL SYSTEM + REACTOR, PWR + SYSTEM CAPABILITY + MILLSTONE POINT 3 (PWR) + DEMINERALIZERS

093875

RESPONSE TO QUESTION 6.76 - HYDROGEN RECOMBINEK OPERATION

TENNESSEE VALLEY AUTHORITY, CHATTANOOGA

DOCKET-50439-19 +. 1 PAGE, PG. 6.76-1 OF AMENDMENT 7 TO BELLEFONTE 1 AND 2 LICENSE APPLICATION, NOVEMBER 21, 1973, DOCKETS 50-438/439, TYPE--PWR, MFG--B&W, AE--TVA

OPERATION OF THE HYDROGEN RECOMBINERS IS BASED ON THE CONCENTRATION OF HYDROGEN IN THE CONTAINMENT ATMOSPHERE FOLLOWING A LOCA. THE RECOMBINERS WILL BE PLACED IN OPERATION WHEN THE CONCENTRATION OF HYDROGEN IS 2.5 VOL %. WITH ONE RECOMBINER IN OPERATION, THE CONCENTRATION OF HYDROGEN WOULD INCREASE TO A MINIMUM OF 3 VOL % ASSUMING SAFETY GUIDE VII HYDROGEN GENERATION RATES. THIS CONCENTRATION IS CONSERVATIVELY BELOW THE 4.0 VOL % FLAMMABILITY LIMIT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
OPERATION + REACTOR, PWR + BELLEFONTE 1 (PWR) + BELLEFONTE 2 (PWR) + RECOMBINERS

094293

RESPONSE TO QUESTION 6.65 - HYDROGEN GENERATION

VIRGINIA ELECTRIC AND POWER COMPANY

DOCKET 50338-103 +. 2 PAGES, PP 56.65-1 THRU 2 OF AMENDMENT 23 TO NORTH ANNA 1 AND 2 LICENSE APPLICATION, DECEMBER 6, 1973, DOCKETS 50-338/339, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

PROVIDES ADDITIONAL INFORMATION REGARDING THE GENERATION OF HYDROGEN, BASED ON THE GUIDELINES OF REGULATORY GUIDE 1.7, "CONTROL OF COMBUSTIBLE GAS CONCENTRATIONS IN CONTAINMENT FOLLOWING A LOSS-OF-COOLANT ACCIDENT."

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, PWR + COOLANT CHEMISTRY + NORTH ANNA 1 (PWR) + NORTH ANNA 2 (PWR)

094294

RESPONSE TO QUESTION 6.66 - HYDROGEN CONCENTRATION

VIRGINIA ELECTRIC AND POWER COMPANY

DOCKET 50338-103 +. 1 PAGE, PG 56.66-1 OF AMENDMENT 23 TO NORTH ANNA 1 AND 2 LICENSE APPLICATION, DECEMBER 6, 1973, DOCKETS 50-338/339, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

IT IS UNLIKELY THAT THE PURGE MODE OF POST ACCIDENT HYDROGEN CONTROL WILL EVER BE USED TO CONTROL HYDROGEN. THE 100 PERCENT CAPACITY, REDUNDANT, POST DBA HYDROGEN RECOMBINERS WILL BE USED TO LIMIT HYDROGEN CONCENTRATION BELOW 3.9 PERCENT. THE PURGE WOULD ONLY BE STARTED IF A 3.9 PERCENT HYDROGEN READING WAS REACHED. THE ACCURACY OF THE HYDROGEN ANALYZERS WHICH PERMITS THIS APPROACH IS DISCUSSED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, PWR + NORTH ANNA 1 (PWR) + NORTH ANNA 2 (PWR) + CONCENTRATION

094295

RESPONSE TO QUESTION 6.67 - HYDROGEN ANALYZER

VIRGINIA ELECTRIC AND POWER COMPANY

DOCKET 50338-103 +. 1 PAGE, PG 56.67-1 OF AMENDMENT 23 TO NORTH ANNA 1 AND 2 LICENSE APPLICATION, DECEMBER 6, 1973, DOCKETS 50-338/339, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

ALL PRESSURE RETAINING BOUNDARIES OF THE ANALYZER AND ITS SAMPLE SYSTEM ARE CONSTRUCTED OF CERTIFIED MATERIAL. THE ANALYZER, ITS SAMPLE SYSTEM AND MOUNTING CABINET HAVE BEEN QUALIFIED BY SEISMIC TESTING AND WILL BE OBSERVED FOR PHYSICAL INTEGRITY AND FUNCTIONAL OPERABILITY DURING

094295 *CONTINUED*

PLANT OPERATION. THE ANALYZER HAS AN ACCURACY OF PLUS OR MINUS 1 PERCENT FULL SCALE; THE INSTRUMENT RANGE IS 0-10 PERCENT HYDROGEN-IN-AIR. THE GAS SAMPLES FROM THE CONTAINMENT AND FROM THE CATALYTIC COMBINEK WILL BE PULLED THROUGH THE ANALYZER BY A SEALED PUMP AND THEN DISCHARGED BACK INTO THE CONTAINMENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + INSTRUMENT, AIR SAMPLING + MONITOR, SAMPLING + SAMPLING + INSTRUMENT, SURVEILLANCE + MONITOR + NORTH ANNA 1 (PWR) + NORTH ANNA 2 (PWR)

095242

RESPONSE TO QUESTION 8 - ACTUATION OF COMBUSTIBLE GAS CONTROL SYSTEM

MISSISSIPPI POWER & LIGHT COMPANY

DOCKET 50416-71 +. 4 PAGES, 2 FIGURES, PP. 8-1 THRU 8-4 OF AMENDMENT 18 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, MARCH 4, 1974, DOCKETS 50-416/417, TYPE--BWR, MFG--G.E., AE--BECHTEL

THE HYDROGEN MIXING CONTROL SYSTEM SHALL BE DESIGNED TO PROVIDE AUTOMATIC OR MANUAL INITIATION OF THE MIXING VALVES AND FANS, UPON THE OCCURENCE OF A LOSS-OF-COOLANT ACCIDENT (LOCA), AS MONITORED BY THE CONTAINMENT AND DRYWELL ISOLATION CONTROL SYSTEM (LOW REACTOR WATER LEVEL AND/OR HIGH DRYWELL PRESSURE), THE HYDROGEN MIXING CONTROL SYSTEMS SHALL BE DESIGNED TO INITIATE AUTOMATIC CLOSURE OF THE MIXING VALVES. TO REDUCE THE PROBABILITY OF COMMON MODE FAILURE, THE SIGNAL TO INITIATE CLOSURE OF THE OUTBOARD HYDROGEN MIXING VALVES SHALL BE DERIVED FROM SENSORS WHICH ARE PHYSICALLY AND ELECTRICALLY SEPARATE FROM THE SENSORS WHICH INITIATE CLOSURE OF THE INBOARD HYDROGEN MIXING VALVES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + CONTROL SYSTEM + COMBUSTION + SYSTEM DESCRIPTION + GAS + GRAND GULF 2 (BWR) + GRAND GULF 1 (BWR)

095794

RESPONSE TO QUESTION 6.68 - HYDROGEN MIXING SYSTEMS

CLEVELAND ELECTRIC ILLUMINATING COMPANY, OHIO

DOCKET-50440-60 +. 1 PAGE, PG. 6-20 OF AMENDMENT 13 TO PERRY 1 AND 2 LICENSE APPLICATION, MARCH 28, 1974, DOCKETS 50-440/441, TYPE--BWR, MFG--G.E., AE--GILBERT ASSOC.

DISCUSSES THE PROPOSED DESIGN FEATURES WHICH PROVIDE ASSURANCE THAT THE HYDROGEN MIXING SYSTEM DUCTWORK WILL REMAIN INTACT FOLLOWING THE DESIGN BASIS ACCIDENT.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

REACTOR, BWR + PERRY 2 (BWR) + PERRY 1 (BWR) + PIPES AND PIPE FITTINGS + RECOMBINERS

095811

RESPONSE TO QUESTION 6.13 - HYDROGEN MIXING SYSTEM

CLEVELAND ELECTRIC ILLUMINATING CO., OHIO

DOCKET-50440-60 +. 1 PAGE, PG. 6-5 OF AMENDMENT 13 TO PERRY 1 AND 2 LICENSE APPLICATION, MARCH 28, 1974, DOCKETS 50-440/441, TYPE--BWR, MFG--G.E., AE--GILBERT ASSOC.

PROVIDES PLAN AND ELEVATION DRAWINGS WHICH SHOW THE PHYSICAL LOCATIONS OF THE MIXING SYSTEM INLETS AND EXHAUSTS. DISCUSSES THE BASIS FOR THE CONCLUSION THAT THE INLETS AND EXHAUSTS OF THE HYDROGEN MIXING SYSTEM ARE AT A SUFFICIENT DISTANCE FROM EACH OTHER TO PRECLUDE THE POTENTIAL FOR 'SHORT-CIRCUITING.' DISCUSSES THE BASIS FOR THE CONCLUSION THAT THE HOMOGENEOUS MIXTURE IS ACHIEVED THROUGHOUT THE CONTAINMENT AND DRYWELL.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

REACTOR, BWR + PERRY 2 (BWR) + PERRY 1 (BWR) + MIXING ZONE + RECOMBINERS

095812

RESPONSE TO QUESTION 6.14 - HYDROGEN ANALYZER

CLEVELAND ELECTRIC ILLUMINATING CO., OHIO

DOCKET-50440-60 +. 1 PAGE, PG. 6-6 OF AMENDMENT 13 TO PERRY 1 AND 2 LICENSE APPLICATION, MARCH 28, 1974, DOCKETS 50-440/441, TYPE--BWR, MFG--G.E., AE--GILBERT ASSOC.

THE SINGLE HYDROGEN ANALYZER AVAILABLE IN THE DRYWELL, FOLLOWING A SINGLE FAILURE, IS CAPABLE OF DETECTING NON-UNIFORM HYDROGEN CONCENTRATIONS. EACH REDUNDANT HYDROGEN ANALYZER TRAIN HAS THE CAPABILITY TO SAMPLE A MINIMUM OF TWO LOCATIONS WITHIN THE DRYWELL.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

REACTOR, BWR + INSTRUMENT, SURVEILLANCE + PERRY 2 (BWR) + PERRY 1 (BWR)

096000

RESPONSE TO QUESTION 6.43 - HYDROGEN MIXING SYSTEM

POTOMAC ELECTRIC POWER CO., WASHINGTON, D.C.

DOCKET-50448-29 +. 2 PAGES, PP. E-6-43 THRU E-6-43A OF AMENDMENT 5 TO DOUGLAS POINT 1 AND 2 LICENSE

096000 *CONTINUED*
APPLICATION, JANUARY 16, 1974, DOCKETS 50-448/449, TYPE--BWR, MFG--G.E., AE--EBASCO

THE MIXING SYSTEM INLET VALVES WILL BE AUTOMATICALLY ACTUATED VALVES, DESIGNED TO OPEN WHEN THE DRYWELL PRESSURE IS 0.5 PSI LESS THAN THE CONTAINMENT PRESSURE, AND CLOSE WHEN THE DRYWELL PRESSURE IS 0.25 PSI LESS THAN THE CONTAINMENT PRESSURE. SINCE THESE VALVES WILL BE SERVING A SAFETY-RELATED FUNCTION, THEY WILL MEET THE DESIGN, QUALITY ASSURANCE, REDUNDANCY, ENERGY SOURCE, AND INSTRUMENTATION REQUIREMENTS FOR AN ENGINEERED SAFETY FEATURE. THE VALVES WILL PERFORM THE VACUUM RELIEF FUNCTION DURING FOUR POSTULATED PLANT CONDITIONS.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

REACTOR, BWR + CONTAINMENT + CONTROL + SYSTEM DESCRIPTION + DOUGLAS POINT 1 (BWR) + DOUGLAS POINT 2 (BWR)

096010
RESPONSE TO QUESTION 6.70 - DRYWELL CONTAINMENT MIXING SYSTEM
POTOMAC ELECTRIC POWER CO., WASHINGTON, D.C.
DOCKET-50448-29 +. 15 PAGES, 3 FIGURES, PP. E.6-70 THRU E.6-72 OF AMENDMENT 5 TO DOUGLAS POINT 1 AND 2 LICENSE APPLICATION, JANUARY 16, 1974, DOCKETS 50-448/449, TYPE--BWR, MFG--G.E., AE--EBASCO

PROVIDES INFORMATION WITH RESPECT TO THE DRYWELL CONTAINMENT MIXING SYSTEM. DISCUSSES LIMITATIONS ON THE INITIATION OF THE MIXING SYSTEM DUE TO PRESSURE DIFFERENTIALS BETWEEN THE DRYWELL AND CONTAINMENT.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

REACTOR, BWR + CONTAINMENT + CONTROL + FLOW, MIXING + SYSTEM CAPABILITY + DOUGLAS POINT 1 (BWR) + DOUGLAS POINT 2 (BWR)

096011
RESPONSE TO QUESTION 6.74 - HYDROGEN MONITORS
POTOMAC ELECTRIC POWER CO., WASHINGTON, D.C.
DOCKET-50448/29 +. 49 PAGES, PP. E.6-73 THRU E.7-18 OF AMENDMENT 5 TO DOUGLAS POINT 1 AND 2 LICENSE APPLICATION, JANUARY 16, 1974, DOCKETS 50-448/449, TYPE--BWR, MFG--G.E., AE--EBASCO

THE CONCENTRATION OF HYDROGEN GAS IN THE DRYWELL AND CONTAINMENT IS DISPLAYED IN THE CONTROL ROOM BY FOUR INDICATORS CONNECTED TO SEPARATE ANALYZERS. TWO SYSTEMS ARE USED TO MONITOR THE DRYWELL AND TWO SYSTEMS ARE USED TO MONITOR THE CONTAINMENT. ALARMS ARE OPERATED FROM EACH ANALYZER TO BE ACTIVATED ON A HIGH CONCENTRATION OF HYDROGEN. WHEN THE CONCENTRATION OF HYDROGEN APPROACHES 4% THE OPERATOR WILL PLACE THE HYDROGEN MIXING SYSTEM IN SERVICE BY MANUAL OPERATION OF TWO PUSHBUTTON SWITCHES FOR SYSTEM INITIATION OR OPERATION OF INDIVIDUAL SWITCHES FOR EACH COMPONENT.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

REACTOR, BWR + CONTAINMENT + MONITOR + CONTROL PANEL/ROOM + CONCENTRATION + DOUGLAS POINT 1 (BWR) + DOUGLAS POINT 2 (BWR) + ANNUNCIATORS

096626
RESPONSE TO QUESTION 6.58 - HYDROGEN ACCUMULATION IN COMPARTMENT
PUBLIC SERVICE CO. OF NEW HAMPSHIRE, MANCHESTER
DOCKET-50443-27 +. 1 PAGE, PG. 56-54 OF AMENDMENT 5 TO SEABROOK 1 AND 2 LICENSE APPLICATION, JANUARY 25, 1974, DOCKETS 50-443/444, TYPE--PWR, MFG--WEST., AE--UNITED ENGR

PROVISIONS ARE MADE IN THE CONSTRUCTION OF THE CONTAINMENT SUBCOMPARTMENTS THAT WILL NOT PERMIT THE ACCUMULATION OR POCKETING OF HYDROGEN WITHIN THESE AREAS SHOULD THE EVOLUTION OF HYDROGEN RESULT FROM RADIOLYSIS IN THE CORE. SOME SUCH CONSTRUCTION PROVISIONS ARE VENTS, SLOTTED OPENINGS, GRATED OPENINGS, CEILING HIGH DOORWAYS OR ACCESSES AND ANNULUS OPENINGS AROUND PENETRATING PIPING OR EQUIPMENT. THESE PROVISIONS WILL BE AT THE TOP OF THE SUBCOMPARTMENTS.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

REACTOR, PWR + CONTROL + CONTAINMENT STRUCTURE + SEABROOK 1 (PWR) + COMPARTMENT + SEABROOK 2 (PWR)

096782
RESPONSE TO QUESTION 6.82 - DRYWELL-CONTAINMENT MIXING SYSTEM
GENERAL ELECTRIC COMPANY
DOCKET-STN-50447-19 +. 1 PAGE, PAGE Q6.82 OF AMENDMENT 10 TO GESSAR, JANUARY 18, 1974, DOCKET-STN-50-447, TYPE--BWR, MFG--G.E., AE--NOT GIVEN

THE DESIGN BASES ARE LISTED. OF PARTICULAR IMPORTANCE IS DESIGN BASIS (2) WHICH DEFINES THE METAL WATER REACTION RATE, HENCE, THE HYDROGEN GENERATION RATE DUE TO METAL WATER REACTIONS. THE REQUIRED FLOW RATE OF THE MIXING SYSTEM WAS DETERMINED BY SOLVING THE DIFFERENTIAL EQUATIONS WHICH DESCRIBE THE TRANSIENT HYDROGEN CONCENTRATION IN THE DRYWELL AND CONTAINMENT UNTIL THE MINIMUM FLOW RATE WHICH MAINTAINED THE MAXIMUM CONCENTRATION TO LESS THAN 4% WAS FOUND.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

REACTOR, BWR + CONTAINMENT DESIGN + CONTAINMENT SYSTEM, OPERATION + CONCENTRATION + MIXING ZONE

096783
RESPONSE TO QUESTION 6.84 - HYDROGEN RECIRCULATION SYSTEM
GENERAL ELECTRIC COMPANY
DOCKET-STN-50447-19 +. 1 PAGE, PAGE 66.84 OF AMENDMENT 10 TO GESSAR, JANUARY 18, 1974, DOCKET-STN-50-447, TYPE-
-BWR, MFG--G.E., AE--NOT GIVEN

PROVIDES THE RESULTS OF AN ANALYSIS OF THE PLANT'S CAPABILITY TO ALLOW INITIATION OF THE HYDROGEN
RECIRCULATION SYSTEM AT 10 MINUTES FOLLOWING A LOSS-OF-COOLANT ACCIDENT. DEFINES THE SPECTRUM OF
PRIMARY SYSTEM BREAK SIZES FOR WHICH THIS CAPABILITY MAY EXIST AND DISCUSSES THE SPECIFIC
LIMITATIONS WHICH DETERMINE THE UNACCEPTABLE BREAK RANGES.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

REACTOR, BWR + CONTAINMENT SPRAY + ACCIDENT, LOSS OF COOLANT + SYSTEM CAPABILITY

A COLLECTION OF KEYWORDS IS USED TO DENOTE THE MAIN SAFETY RELATED POINTS COVERED IN EACH ARTICLE. THE FOLLOWING INDEX IS AN ALPHABETICAL LISTING OF THE KEYWORDS GIVING REFERENCES TO EACH ARTICLE WHICH WAS KEYED TO IT.

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2. LOSS-OF-COOLANT ACCIDENT

003717
 DISCUSSION TO LOSS OF COOLANT
 THE WILSONVILLE NUCLEAR COMPANY
 50346-17 +, 23 PAGES, FIGURES, TABLES, REFERENCES, AMENDMENT 11 TO WILSONVILLE NUCLEAR LICENSE APPLICATION,
 JUNE 12, 1970, DOCKET 50-374, TYPE--PWR, MFG--COM, AE--BECHTEL

CONCERNS TO ACPS CONCERNS (1) POTENTIAL RELEASES OF RADIOACTIVITY, (2) QUALITY ASSURANCE
 MONITORING, (3) CONTROL OF HYDROGEN BUILDUP, (4) COMMON FAILURE MODE ANALYSIS, (5) THERMAL GENERATION
 WASTE DAMAGE, AND (6) OTHER PROBLEMS RELATED TO LARGE WATER REACTORS.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22161 \$1.00
 COPY, \$0.65 MICROFILM

MISSILE GENERATION AND PURIFICATION + REACTOR, PWR + ACPS + RADIOACTIVITY RELEASE + QUALITY ASSURANCE + FAILURE
 MODE ANALYSIS + WILSONVILLE NUCLEAR 2 (PWR)

002474
 SUMMARY OF A DISCUSSION TO
 HYDROGEN FLAMMABILITY DATA AND APPLICATION TO PWR LOSS-OF-COOLANT ACCIDENT
 AT STINGHOUSE ELECTRIC CO., HEYTS PLANT, PITTSBURGH, PA.
 WAPD-SC-443 +, 23 PAGES, 10 FIGURES, SEPTEMBER 1967

INCORPORATED AS PART OF THE HAZARDS SUMMARY REPORT, THE PURPOSE OF THIS REPORT IS TO SUMMARIZE
 GENERALIZED DATA ON THE INFLAMMABILITY OF HYDROGEN IN STEAM-AIR MIXTURES AND TO APPLY THE DATA TO
 THE POSTULATED PWR LOSS-OF-COOLANT ACCIDENT TO DETERMINE THE POTENTIAL PRESSURE EFFECTS ON THE
 PLANT CONTAINER. THE HYDROGEN WOULD PROBABLY BE EVOLVED AT SUCH A HIGH TEMPERATURE THAT
 SPONTANEOUS IGNITION SHOULD OCCUR, PREVENTING A LARGE AMOUNT OF UNBURNED HYDROGEN FROM
 ACCUMULATING. THE EVOLUTION OF HYDROGEN IS SUFFICIENTLY SLOW SO THAT IF THE HYDROGEN IS BURNED
 AS EVOLVED, THE PRESSURE WITHIN THE PLANT CONTAINER WOULD BE RAISED BY ONLY A FEW PSI, AT A TIME
 WHEN THE TOTAL PRESSURE WOULD BE CONSIDERABLY LESS THAN THE PLANT CONTAINER DESIGN PRESSURE. IF
 HYDROGEN DOES NOT BURN AS EVOLVED (FOR EXAMPLE IF IT SHOULD ESCAPE FROM THE REACTOR VESSEL
 THROUGH A WATER TRAP WITH RESULTANT COOLING OF THE GAS), IT IS UNLIKELY THAT DETONATION WOULD
 OCCUR. IF A UNIFORM MIXTURE OF STEAM, AIR, AND HYDROGEN IS OBTAINED IN THE PLANT CONTAINER, THE
 MAXIMUM HYDROGEN CONCENTRATION WOULD BE BELOW THAT REQUIRED FOR DETONATION. THEREFORE, NO
 DETONATION SHOULD OCCUR UNLESS LOCALIZED POCKETS OF HYDROGEN OCCUR. EVEN SHOULD SUCH A POCKET
 DETONATE, IT IS BELIEVED THE PEAK PRESSURE WOULD NOT EXCEED THE PLANT CONTAINER DESIGN PRESSURE.

CONTAINMENT DESIGN + EXPLOSION + METAL WATER REACTION + REACTOR, PWR + REPORT, SAR

003119
 HYDROGEN GENERATION IN A BOILING WATER REACTOR
 COMMONWEALTH EDISON COMPANY
 50249-39 +, 42 PAGES, 23 FIGURES, 12 TABLES, 11 REFERENCES, AMENDMENT 23 TO DRESSEN'S LICENSE APPLICATION,
 AUGUST 24, 1970, DOCKET 50-249

EVALUATES THE POTENTIAL HYDROGEN GENERATION AND ITS SUBSEQUENT ACCUMULATION IN THE PRIMARY
 CONTAINMENT OF A LARGE BWR FOLLOWING A POSTULATED LOSS-OF-COOLANT ACCIDENT. THE REPORT INCLUDES
 THE APPLICATION OF EXPERIMENTAL TEST DATA TO A TYPICAL 3440-MWT NUCLEAR POWER PLANT AND A GENERIC
 EVALUATION OF THE EFFECTS OF THE PERTINENT PARAMETERS SUCH AS METAL-WATER REACTION, BREAK AREA,
 AND RADIOLYTIC DECOMPOSITION RATE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT ANALYSIS + AIRBORNE RELEASE + METAL WATER REACTION + VENTILATION SYSTEM + ZIRCONIUM + DRESSEN 3 (BWR)
 + RADIOLYTIC GAS + THEORETICAL INVESTIGATION + CONTAINMENT ATMOSPHERE, INERT + GAS

006044
 REVISIONS TO PRELIMINARY SAR, DAVIS-BESSE
 THE TOLEDO Edison COMPANY
 50346-17 +, 11 PAGES, AMENDMENT 11 TO DAVIS-BESSE LICENSE APPLICATION, SEPTEMBER 11, 1970, DOCKET 50-346,
 TYPE--PWR, MFG--BWR, AE--BECHTEL

TRANSMITS ADDITIONAL PAGES TO PSAR, CONCERNS INFO RELATED TO ACPS INTERESTS (VIBRATION TESTING
 OF PRIMARY SYSTEM, MAX. PRESSURE DURING A LOCA, DESIGN BASES FOR CONTAINMENT PENETRATIONS,
 HYDROGEN BUILDUP AFTER A LOCA, EVALUATION OF ECCS DESIGN, MONITORING FOR GROSS FAILURE OF A FUEL
 ELEMENT, AND MANAGEMENT OF LIQUID WASTES).

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22161 \$1.00
 COPY, \$0.65 MICROFILM

DESIGN CRITERIA + REACTOR, PWR + TESTING + WASTE DISPOSAL, LIQUID + INSTRUMENT, DETECTION FAILED FUEL ELEMENT
 + PRESSURE, INTERNAL + VIBRATION + REPORT, PSAR + MAIN COOLING SYSTEM + EMERGENCY COOLING SYSTEM +
 PENETRATIONS, PRIMARY CONTAINMENT

006559
 MISHIMA Y + KATSURA I + TANAKA H + ONO K + WAKISAKA S + KOSAKI M + TAKAO Z + TOYODA M + YOKOSUKA M
 AN EXPERIMENTAL STUDY ON THE BURST STRENGTH OF FUEL CLADDING TUBES UNDER LOSS OF COOLANT ACCIDENT CONDITIONS
 IN WATER COOLED POWER REACTORS

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036549 *CONTINUED*
UNIVERSITY OF TOKYO • TOKYO SHIMADU ELECTRIC CO., LTD. • FURUKAWA ELECTRIC CO., LTD. • HISATSU, LTD. • TOSHI
ELECTRIC POWER CO., INC. • SUMITOMO METAL INDUSTRIES, LTD. • KONE STEEL WORKS, LTD. • JAPAN STEEL POWER CO.
• MITSUBISHI ATOMIC POWER INDUSTRIES, INC.
19 PAGES, 27 FIGURES, 14 TABLES, 6 REFERENCES—NUCLEAR STRUCTURAL ENGINEERING, 1(4)— 670-417 (1968) 14-5

EXPERIMENTAL STUDY HAS BEEN CONDUCTED ON THE BURST STRENGTH OF PIPE CLADDING TUBES OF STAINLESS
STEEL AND ZIRCALOY UNDER SIMULATED LOSS-OF-COOLANT ACCIDENTS IN WATER-COOLANT REACTORS. THE
RESULTS OF HIGH-TEMPERATURE TENSILE TESTS AND HIGH-TEMPERATURE BURST TESTS CONDUCTED UNDER STATIC
AND DYNAMIC LOADING CONDITIONS ARE ANALYSED. THE EFFECT OF ABSORBED HYDROGEN ON THE MECHANICAL
PROPERTIES OF THE TUBES IS INVESTIGATED.

ALLOY • BRITTLE FRACTURE • FAILURE, FUEL ELEMENT • FUEL INTEGRITY • ZIRCONIUM • STEEL, STAINLESS

004102
CHEMICAL AND ASSOCIATED ENERGY-TRANSFER PROBLEMS IN REACTOR SAFETY
ARGONNE NATIONAL LABORATORY
1 PAGES, 1 FIGURE, 1 TABLE—NOVEMBER 23, 1966, ANL-7715, DO, 41-41, REACTOR DEVELOPMENT PROGRAM PROJECT
REPORT, OCTOBER 1965—CFSTI, \$7.00 CY, \$0.75 MF

EXPERIMENTS ON URANIUM DIOXIDE STEAM REACTORS WERE PERFORMED WITH CORE DIETERS, HALF INCH
DIAMETER AND HEIGHT, 95 PERCENT THEORETICAL DENSITY AT 1500 DEGREE C AND AMBIENT PRESSURE IN THE
ABSENCE OF AIR. BY FOUR INDEPENDENT METHODS IT WAS FOUND THAT THE DIETTER WAS CONTAINED BY A SMALL
OXYGEN TO URANIUM RATIO OF 2:17 MOSTLY DURING THE FIRST 75 MINUTES. THE REACTION WOULD PROBABLY
NOT CONTRIBUTE MUCH TO FOLLOWING A LOSS OF COOLANT ACCIDENT BUT NOTHING IS SAID ABOUT ITS
INFLUENCE ON FISSION FRAGMENT RELEASE.

REACTION, GRAPHITE MODERATED • METAL WATER REACTION • TREAT (WATER)

008907
JENSEN SE • FINNEGAN LJ
THE INFLUENCE OF ZIRCONIUM CLADDING ON THE LOSS-OF-COOLANT TEST
PHILLIPS PETROLEUM COMPANY
2 PAGES, 2 REFERENCES, AND TRANSACTIONS 9(2), PAGES 540-41, 1968 WINTER MEETING OF THE AMERICAN NUCLEAR
SOCIETY, WASHINGTON, D. C., NOVEMBER 15-18, 1968

CONSIDERATIONS EMPLOYED IN THE ANALYSIS ARE DESCRIBED AND THE DIFFERENCES BETWEEN STAINLESS STEEL
CLAD AND ZIRCONIUM WITH RESPECT TO SAFETY ARE POINTED OUT. THE LOSS OF COOLANT ACCIDENT WILL
PROVIDE THE NECESSARY ENVIRONMENT FOR THE METAL WATER REACTION TO OCCUR. CONTAINMENT PRESSURE
VERSUS TIME BEHAVIOR AND PRESSURE REDUCTION BY SPRAY WERE ALSO INVESTIGATED.

CONTAINMENT SPRAY • CONTAINMENT VESSEL LOADING • METAL WATER REACTION • ZIRCONIUM • LOSS (COOLANT) • HIGH-TEMPERATURE •
PRESSURE TRANSIENT

024509
COOPER CONTAINMENT ATMOSPHERIC CONTROL SYSTEM
CONSUMERS PUBLIC POWER DISTRICT
2 PAGES, 1 FIGURE, PAGES VI-6-1 AND VI-6-2 OF VOLUME I OF COOPER NUCLEAR STATION PRELIMINARY SAFETY ANALYSIS
REPORT, JULY 27, 1967, DOCKET 50-249, TYPE—RNR, MFG.—G.P., 15—HURNS • RNE

(SECTION VI-6) — LIQUID NITROGEN WILL BE CONVERTED TO THE GASEOUS FORM AND BE FORCED INTO THE
SUPPRESSION CHAMBER DURING CONTINUOUS OPERATION. IT WILL BE FORCED INTO THE DRY WELL THROUGH THE
VACUUM BREAKERS AND MIXED BY THE VENTILATION FANS. ANALYSIS OF METAL-WATER REACTION FOLLOWING A
LOSS-OF-COOLANT ACCIDENT SHOWS THAT THE RESULTANT HYDROGEN WOULD BE ONLY 1.8% IN AIR, BELOW THE
FLAMMABILITY LIMIT OF 5%. (SECTION V-2.3.4) — THE MAKEUP OF THE CONTAINMENT INERT ATMOSPHERE IS
MONITORED AS A FURTHER INDICATION THAT ALL PENETRATIONS ARE SEALED DURING OPERATION.

AVAILABILITY — CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VIRGINIA: \$7.00
COPY, \$0.65 MICROFICHE

REACTOR, BWR • CONTAINMENT DESIGN • CONTAINMENT ATMOSPHERE, INERT • REPORT, PSA • CONTAINMENT LEAK MONITOR •
COOPER (BWR)

029094
MCLAIN MA
POTENTIAL METAL-WATER REACTIONS IN LIGHT-WATER-COOLED POWER REACTORS
OAK RIDGE NATIONAL LAB., TENN.
ORNL-NSIC-23 •, 201 PAGES, FIGURES, TABLES, 206 REFERENCES, AUGUST 1968

A STATE-OF-THE-ART REVIEW OF THE ROLE OF CHEMICAL REACTIONS IN AN UNLIKELY EVENT OF A LIGHT-WATER
POWER REACTOR ACCIDENT. THE STUDY CONCLUDED THAT THESE REACTIONS COULD BE ASSESSED REALISTICALLY
ONLY BY CONSIDERING AN INTEGRAL MODEL OF THE ACCIDENT. COMPARED WITH THE SITUATION REGARDING THE
DEFINITION AND THE MATHEMATICAL SIMULATION OF AN ACCIDENT, THE BASIC KINETICS OF THE CHEMICAL
REACTIONS ARE WELL UNDERSTOOD. THERE ARE STILL SOME QUESTIONS ABOUT THE EFFECT OF LIMITED METAL-
WATER REACTION ON POSSIBLE FUEL-PI, FRAGMENTATION IN LOSS-OF-COOLANT ACCIDENTS AND ABOUT THE
DETONATION LIMITS OF HYDROGEN-AIR-STEAM MIXTURES, HOWEVER.

AVAILABILITY — CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151, \$7.00
COPY, \$0.65 MICROFICHE

[illegible]

THE TYPE OF METAL-METAL REACTIONS IN A HOT PRESSURE-CONTAINING ACCIDENT IS DISCUSSED. IF THE DESIGN OPERATOR, IF THE ENGINEERING-ANALYSIS SYSTEMS ARE APPROPRIATE, CALCULATIONS AND EXPERIMENTAL TESTS CAN INDICATE THAT THE AMOUNT OF METAL-METAL REACTION IS SIGNIFICANT. ALSO IT WAS CONCLUDED THAT THE MASSIVE SUPPRESSION OF REACTION CAN EASILY ACCOMMODATE ANY HYDROGEN RELEASED BY THE METAL-METAL REACTION, AND THERE IS NO NET INCREASE. THEREFORE, THESE REACTIONS ARE NOT THE DETERMINING FACTOR IN DESIGNING THE FUEL-ELEMENT-CORE-CLADDING SYSTEMS.

AVAILABILITY - P. NO. 14791, GENERAL ELECTRIC CO., ATOMIC POWER EQUIPMENT DEPARTMENT, SAN JOSE, CALIF.

SELECTION, USE & CHEMICAL REACTION & CONTAINMENT DESIGN & METAL WATER REACTIVITY & STEAM & AIR & ZIRCALOY & HYDROGEN REACTION

024-49
HYDROGEN CHLORIDE EQUIPMENT AT DEFENSE 2 AND 3
COMMERCIAL EQUIPMENT COMPANY
OFFICE 424-44 - 4. 14 4416. LETTER - COMMERCIAL EQUIPMENT COMPANY TO DIVISION OF REACTOR LICENSING (AEC) -
February 22, 1972. SUBJECT 40-249, TYPE-RRR, WFO-RRRST, AF-SGT & LUNDY

PROPOSES A SOLUTION TO CONTROLLING THE COMBUSTIBLE GASES WITHIN THE CONTAINMENT FOLLOWING A LOSS-OF-COOLANT ACCIDENT. METHOD CONSISTS OF SIMPLY ADDING NITROGEN TO DILUTE THE OXYGEN CONCENTRATION BELOW THE FLAMMABILITY LIMIT. THE CONTAINMENT PRESSURE WILL INCREASE DUE TO THE NITROGEN ADDITION BUT WILL BE LIMITED OR CONTROLLED BY LEAKAGE.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 10¢ CENTS/PAGE -- MINIMUM \$1.00

WATER, HYDROLYTIC REACTION + PRESENCE 3 (HWR) + PRESENCE 2 (HWR) + RADIOLYTIC GAS + CONTAINMENT
ATMOSPHERE - INTER

DISPOSITIONS PERTAINING TO CONFINEMENT INETING
GENERAL ELECTRIC COMPANY, SAN JOSE, CALIFORNIA
APRIL-1944 to 1944 PAGES, FIGURES, TABLES, REFERENCES, AUGUST 15, 1944

REPORT CONTAINS EVALUATION OF CONTAINMENT INERTING FOR RWR. BASED ON THIS EVALUATION, GENERAL ELECTRIC SAYS INERTING IS UNNECESSARY. ADVERSE EFFECTS OF INERTING ON PERSONNEL, STABILITY AND INSPECTED INSERVICE INSPECTIONS FOR RWR CONTAINMENT JUDGED IMPERIAL TO OVERALL PLANT SAFETY. INERTING REQUIREMENT ORIGINATED FROM EARLY DEMANDS THAT CONTAINMENT BE DESIGNED TO WITHSTAND METAL-WATER REACTION RESULTING FROM ASSUMED REACTOR CORE MELTDOWN. BECAUSE OF MAJOR IMPROVEMENTS IN CORE STABILITY COOLING, CONTAINMENT WITHOUT INERTING CAN HAVE SUBSTANTIAL MARGIN REMAINING WITHIN ITS PRESSURE RATING FOR THE WORST EXPECTED METAL-WATER REACTION. WHETHER HYDROGEN BURNS DO NOT. PRE-ASSESSMENT WAS DEMONSTRATED THAT CONTAINMENT INERTING IS UNNECESSARY.

AVAILABILITY - A.P. RAY, GENERAL ELECTRIC COMPANY, ATOMIC POWER EQUIPMENT DEPARTMENT, SAN JOSE, CALIFORNIA

DEACTOR, RBC + CONTAINMENT, PRESSURE SUPPRESSION + ATMOSPHERIC DIFFUSION + FIRE + METAL WATER REACTION +
ENGINEERED SAFETY FEATURES

Q16581
ACRS REPORT ON THREE WIFE ISLAND-2 CONSTRUCTION PERMIT APPLICATION
U.S. ATOMIC ENERGY COMMISSION
AEC PRESS RELEASE N-173 +. 3 PAGES, JULY 25, 1960. DOCKET 50-320, TYPE--PWR, MFG--P+W, AE--BURNS + BFE

ACES DISCOMPARSED THAT THE FOLLOWING ITEMS WARRANT ADDITIONAL CONSIDERATION - (1) MATTERS PREVIOUSLY IDENTIFIED FOR ALL LARGE WATER-COOLED REACTORS, (2) THE ESTIMATE OF MAXIMUM FLOOD DISCHARGE FROM THE SUSQUEHANNA RIVER, (3) GROUTING AND TESTING OF CONTAINMENT TENDONS, (4) R-AND-C PROGRAM FOR USE OF SODIUM THIOSULFATE ADDITIVE TO CONTAINMENT SPRAY, (5) A PURGE SYSTEM TO COPE WITH HYDROGEN BUILDUP IN EVENT OF LOCA, (6) SYSTEMATIC, NONRANDOM, CONCURRENT FAILURES IN REDUNDANT DEVICES, (7) STUDY OF HYPOTHESIZED FAILURES DURING TRANSIENTS, AND ACTION NEEDED, (8) VIBRATION MONITORING OF CORE COMPONENTS, (9) POSTACCIDENT COPLING INTEGRITY, AND (10) IN-SERVICE INSPECTION.

AVAILABILITY - USAEC DIVISION OF PUBLIC INFORMATION, WASHINGTON, D.C. 20545

CONTAINMENT SPRAY + REACTOR, DWR + ACRS + CONSTRUCTION PERMIT PROCESS + FASTENER + FAILURE, INSTRUMENT +
CONTAINMENT STRUCTURE + VIBRATION + COPE COMPONENTS + A AND B PROGRAM + SURVEILLANCE PROGRAM + FLOOD + THREE
MILE ISLAND 2 (PWR)

037324
SUPPLEMENT 4 TO PRELIMINARY SAFETY ANALYSIS REPORT
CONSOLIDATED EDISON COMPANY OF NEW YORK
AMENDMENT 5 TO INDIAN POINT 3 LICENSE APPLICATION, OCT. 30, 1968, DOCKET 50-786, TYPE--PWR, MFG--WEST., AF--
UNITED ENGR.

CONSISTS OF REPLACEMENT PAGES FOR SUPPLEMENT 1 AND RESPONSES TO QUESTIONS POSED BY ORL AT A
MEETING ON OCT. 11, 1968. SUPPLEMENTAL INFORMATION CONCERNS IMPROVEMENTS TO ECCS, INITIAL
TESTING PROGRAM, QUALITY ASSURANCE, DESCRIPTION OF HYDROGEN PRODUCTION AND RECOMBINER OPERATION,
CONTAINMENT-SPRAY PROGRAM, LOCA PROTECTION, OFF-SITE-DOSE-EVALUATION MODEL, THERMAL SHOCK TO
PRESSURE VESSEL, AND INSTRUMENTS.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$7.00
COPY, \$0.65 MICROFICHE

NRC QUESTION + DOSE + PRESSURE VESSELS + REACTOR, PWR + THERMAL MECHANICAL EFFECT + ANALYTICAL MODEL +
INSTRUMENT, CONTROL + HAZARDOUS ANALYSIS + TEST, PREOPERATIONAL + REPORT, PSAR + QUALITY ASSURANCE + INDIAN
POINT 3 (PWR) + OFF SITE + EMERGENCY COOLING SYSTEM + RECOMBINERS

078866
WCLAIN MA
POTENTIAL METAL-WATER REACTIONS IN LIGHT-WATER-COOLED POWER REACTORS
OAK RIDGE NATIONAL LABORATORY
13 PAGES, 4 FIGURES, 55 REFERENCES, NUCLEAR SAFETY, 10(5), PG 392-404 (SEPTEMBER-OCTOBER 1969)

THE AVAILABLE DATA ON THE ROLE OF CHEMICAL REACTIONS IN THE UNLIKELY EVENT OF A LIGHT-WATER-COOLED
POWER-REACTOR ACCIDENT WERE COLLATED AND STUDIED. USE OF THE ENGINEERED SAFETY FEATURES IN
NUCLEAR POWER PLANTS WOULD LIMIT THE EXTENT OF ANY METAL-WATER REACTION IN A DESIGN-BASIS
ACCIDENT TO A NEGLIGIBLE VALUE. HOWEVER, FOR THE DEGENERATE CASES WHERE THE ENGINEERED SAFETY
FEATURES DO NOT OPERATE PROPERLY WHEN REQUIRED, THERE ARE SOME UNKNOWN ABOUT THE EXACT ROLE OF
METAL-WATER REACTIONS. ALSO, THERE IS CONSIDERABLE EVIDENCE THAT ZIRCALOY CLADDING BECOMES VERY
BRITTLE AND TENDS TO FRAGMENT IF SUFFICIENT OXYGEN FROM THE STEAM REACTS WITH THE METAL OR
DISSOLVES IN IT.

BIBLIOGRAPHY + CHEMICAL REACTION + CLADDING + METAL WATER REACTION + ACCIDENT MODEL + ZIRCALOY

039592
VERMONT YANKEE CONTAINMENT AND COMBUSTIBLE GASES
VERMONT YANKEE NUCLEAR POWER CORPORATION
DOCKET-50271-72 +. 13 PAGES, LETTER - VERMONT YANKEE NUCLEAR POWER CORPORATION TO DIVISION OF REACTOR
LICENSING (AEC) - FEBRUARY 15, 1972, DOCKET 50-271, TYPE--PWR, MFG--G.F., AF--FRASCO

DISCUSSES THE CONTROL OF COMBUSTIBLE GASES WHICH COULD BE PRESENT IN THE CONTAINMENT AFTER A
HYPOTHETICAL LOSS-OF-COOLANT ACCIDENT. CONTAINMENT VENTING AND INERTING ARE THE METHODS
DISCUSSED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22151

REACTOR, BWR + METAL WATER REACTION + VENTILATION SYSTEM + RADIOLYTIC GAS + VERMONT YANKEE (BWR) + CONTAINMENT
ATMOSPHERE, INERT

040515
ACRS REPORT ON PACIFIC GAS AND ELECTRIC COMPANY NUCLEAR UNIT 2 - DIABLO CANYON SITE
USAE, ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
2 PAGES, ACRS REPORT, OCTOBER 16, 1969, DOCKET 50-323, TYPE--PWR, MFG--WEST., AF--UTILITY

ITEMS WHICH REQUIRE ADDITIONAL STUDY AND DEVELOPMENT INCLUDE (1) JUSTIFICATION FOR CALCULATED OFF
SITE DOSES DUE TO FUEL HANDLING ACCIDENT, (2) MEANS FOR IN-SERVICE MONITORING OF CORE COMPONENT
VIBRATION, (3) COMMON FAILURE MODES OF PROTECTION SYSTEM OR ENGINEERED SAFETY FEATURES, (4) PURGE
SYSTEM FOR HYDROGEN FROM LOCA, (5) POST ACCIDENT INTEGRITY OF COOLING SYSTEMS, AND (6) PERIODIC
TESTABILITY OF SAFETY FEATURES ACTUATION CIRCUITS.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$7.00
COPY, \$0.65 MICROFICHE

DOSE + INSTRUMENT, PROTECTIVE + REACTOR, PWR + ACCIDENT, REFUELING + TESTING + ACRS + CONSTRUCTION PERMIT
PROCESS + VIBRATION + CORE COMPONENTS + OFF SITE + DIABLO CANYON 2 (PWR) + INSTRUMENTS, MISC.

041021
RESPONSE TO QUESTION 12.0 - HYDROGEN GENERATION
CAROLINA POWER AND LIGHT
DOCKET 50-324-11 +. 2 PAGES, PG 12-1 AND -2 OF BRUNSWICK 1 AND 2 PSAR SUPPLEMENT 6, JUNE 26, 1969, DOCKET 50-
324/325, TYPE--BWR, MFG--G.E., AF--UE+C

STUDIES ARE CONTINUING ON THE POSSIBLE EFFECTS OF RADIOLYSIS OF WATER IN THE UNLIKELY EVENT OF A
LOSS-OF-COOLANT ACCIDENT. THE COMMITTEE BELIEVES THE APPLICANT SHOULD EVALUATE ALL PROBLEMS
WHICH MAY ARISE FROM HYDROGEN GENERATION, INCLUDING VARIOUS LEVELS OF ZIRCALOY-WATER REACTIONS
WHICH COULD OCCUR IF THE EFFECTIVENESS OF THE EMERGENCY CORE COOLING SYSTEM WERE SIGNIFICANTLY

041371 *CONTINUED*

LESS THAN THAT PREDICTED. THE MATTER SHOULD BE RESOLVED BETWEEN THE APPLICANT AND THE AEC REGULATORY STAFF. *** ANSWER ON PG 12-1 AND -2.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00 COPY, \$0.65 MICROFILME

ARC QUESTION + REACTOR, BWR + METAL WATER REACTION + WATER + ACPS + RADIOLYTIC GAS + ZIRCALOY + REPORT, PSAR + BRUNSWICK 1 (BWR) + BRUNSWICK 2 (BWR)

044759

EVANS TW

METAL-WATER REACTIONS DURING A LOSS-OF-COOLANT ACCIDENT IN N-REACTOR
GENERAL ELECTRIC COMPANY, HANFORD ATOMIC PRODUCTS DEPARTMENT
RI-GEN-1541 +. 19 PAGES, 1 FIGURE, 12 REFERENCES, MARCH 22, 1967

ROUGH ESTIMATES WERE MADE OF THE HYDROGEN PRODUCED BY METAL-WATER REACTION DURING A LOSS-OF-COOLANT ACCIDENT WITHOUT THE USE OF THE EMERGENCY AIR-COOLING SYSTEM IN THE HANFORD N-REACTOR. THE PRIME DIFFICULTY IN MAKING THESE ESTIMATES IS DETERMINING THE TIME DEPENDENCE OF THE METAL TEMPERATURES. SEVERAL ANALYTICAL MODELS WERE ASSUMED, AND THE HIGHEST ESTIMATES OF THE HYDROGEN PRODUCTION RATES ARE BELIEVED TO BE THOSE PREDICTED BY THE MODEL ASSUMING ONLY LIMITED STEAM FLOW. MODELS CONSIDERING THE ZIRCALOY CORROSION RATES AND FUEL-ELEMENT MELTING YIELDED LOWER HYDROGEN PRODUCTION RATES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 27161

ACCIDENT ANALYSIS + CHEMICAL REACTION + FUEL MELTDOWN + METAL WATER REACTION + STEAM + URANIUM + HANFORD (PO) + REACTOR, EPDA OWNED + ZIRCALOY + HANFORD SITE + REACTOR, PRODUCTION

044737

VERMONT YANKEE CONTAINMENT INERTING (AMENDMENT 12 TO DOCKET 50-271)

VERMONT YANKEE NUCLEAR POWER CORPORATION

31 PAGES, LETTER - VERMONT YANKEE NUCLEAR POWER CORPORATION TO U.S. ATOMIC ENERGY COMMISSION - MAY 22, 1970,
DOCKET 50-271, TYPE--BWP, FPG--G&F, AE--PEASCO

THE FOREGOING DISCUSSION CLEARLY INDICATES THAT INERTING OF THE VERMONT YANKEE CONTAINMENT IS NOT REQUIRED BECAUSE ONLY NEGLIGIBLE QUANTITIES OF HYDROGEN WOULD BE EVOLVED AS A RESULT OF THE ZIRCONIUM-WATER REACTION ASSOCIATED WITH THE WORSE CONCEIVABLE LOSS-OF-COOLANT ACCIDENT. ALSO, AS INERT ATMOSPHERE IS NO SOLUTION TO THE PROBLEM OF HYDROGEN EVOLVED GRADUALLY DUE TO RADIOLYSIS OF COOLING WATER, BECAUSE OXYGEN AS WELL AS HYDROGEN IS PRODUCED BY RADIOLYSIS. MOREOVER, THERE ARE SERIOUS OPERATIONAL SAFETY PROBLEMS ASSOCIATED WITH AN INERT ATMOSPHERE. THEREFORE, THE VERMONT YANKEE CONTAINMENT WILL NOT BE INERTED UNLESS THIS ACTION IS REQUIRED OFFICIALLY BY THE USAEC.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 10¢ CENTS/PAGE -- MINIMUM CHARGE \$2.00

NRC QUESTION + REACTOR, BWR + EXPLOSION + FIRE + METAL WATER REACTION + WATER + ZIRCONIUM + RADIOLYTIC GAS + VERMONT YANKEE (BWR) + CONTAINMENT ATMOSPHERE, INERT

047278

FLETCHER, WD + HELL, MJ + MARCHESE, RT + GALLAGHER, JL

POST LOCA HYDROGEN GENERATION IN PWR CONTAINMENTS

WESTINGHOUSE ELECTRIC CORPORATION, PITTSBURGH, PENNSYLVANIA

2 PAGES, 1 FIGURE, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, 13(1), PP. 203-204 (JULY 1970)

THE PRODUCTION OF HYDROGEN DUE TO THE RADIOLYSIS OF REACTOR CONTAINMENT SPRAY SOLUTIONS HAS BEEN INVESTIGATED. EXPERIMENTAL RESULTS INDICATE A CONSERVATIVE RATE OF HYDROGEN PRODUCTION DUE TO SUMP SOLUTION RADIOLYSIS OF 0.70 MOLECULES/100 EV OF ENERGY ABSORBED BY THE SOLUTION. EXPERIMENTAL STUDIES OF CORE SOLUTION RADIOLYSIS HAVE SHOWN THE EXTENT OF HYDROGEN PRODUCTION FROM THIS SOURCE IS LIMITED BY THE ATTAINMENT OF A STEADY-STATE HYDROGEN CONCENTRATION IN THE SOLUTION PASSING THROUGH THE CORE. BASED ON EXPERIMENTAL DATA, AN ANALYTIC MODEL WAS DERIVED WHICH CONSERVATIVELY APPROXIMATES THE HYDROGEN PRODUCTION PROCESS AS IT WOULD OCCUR IN THE NUCLEAR PLANT SHOULD A HYPOTHETICAL DESIGN BASIS ACCIDENT OCCUR. THE SIGNIFICANCE OF OTHER SOURCES OF HYDROGEN IN THE POSTACCIDENT ENVIRONMENT ALSO IS DISCUSSED.

AVAILABILITY - W.D. FLETCHER, WESTINGHOUSE ELECTRIC CORPORATION, NPS-PWR SYSTEMS DIVISION, P.O. BOX 355, PITTSBURGH, PENNSYLVANIA 15230

CONTAINMENT SPRAY + EXPLOSION + REACTOR, PWR + ANALYTICAL MODEL + RADIOLYTIC GAS + ACCIDENT, DESIGN BASIS

047302

FSAR SUPPLEMENT 1

METROPOLITAN Edison COMPANY

FO249-24 +. 50 PAGES, FIGURES, TABLES, REFERENCES, AMENDMENT 14 TO THREE MILE ISLAND LICENSE APPLICATION,
JULY 1, 1970, DOCKET 50-289, TYPE--PWP, FPG--B&W, AE--GILBERT ASSOC.

TRANSMITS REVISED PAGES TO THE FINAL SAR AND SUPPLEMENT 1 TO FSAR. SUPPLEMENT 1 IS A 3-PART REPORT DISCUSSING IODINE REMOVAL CAPABILITIES, EVALUATION OF PUGING TO CONTROL POSTACCIDENT

047902 *CONTINUED*
HYDROGEN CONCENTRATION, AND EVALUATION OF ACCIDENT DOSES USING SITE MEASURED METEOROLOGY.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$7.00
COPY, 30.65 MICROFICHE

ACCIDENT ANALYSIS + DOSE + FISSION PRODUCT RELEASE + FISSION PRODUCT, IODINE + REACTOR, PWR + HAZARDS ANALYSIS
+ THREE MILE ISLAND (PWR) + OFF SITE

047589
HYDROGEN PURGING CONTROL AND FLORIDA TORNADOES
FLORIDA POWER AND LIGHT COMPANY
50315-9 +. 40 PAGES, FIGURES, TABLES, REFERENCES, AMENDMENT 4 TO HUTCHINSON ISLAND I LICENSE APPLICATION,
OCTOBER 31, 1964, DOCKET 50-325, TYPE--PWR, MFG--COMB., AF--E945CD

TRANSMITS A REPORT ON PURGING AS THE HYDROGEN CONTROL METHOD FOLLOWING AN LOCA. REPORT INCLUDED
ON THE COMPARISON OF FLORIDA'S MOST SEVERE TORNADOES WITH THOSE IN OTHER PARTS OF THE USA. ALSO
TRANSMITS REVISED PAGES FOR PSAR.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$7.00
COPY, 30.65 MICROFICHE

REACTOR, PWR + DESTRUCTIVE WIND + REPORT, PSAR + WEATHER, SEVERE + ST. LUCIE 1 (PWR)

047825
HESSON JC + IYIMA RO + WILSON RE + NISHIO K + HARNES C
LABORATORY SIMULATIONS OF CLADDING-STEAM REACTIONS FOLLOWING LOSS-OF-COOLANT ACCIDENTS IN WATER-COOLED POWER
REACTORS
ARGONNE NATIONAL LABORATORY, ILLINOIS
ANL-7509 +. 74 PAGES, 19 FIGURES, 5 TABLES, 12 REFERENCES, JANUARY 1970

SUMMARY OF ALL EXPERIMENTAL WORK DETERMINING THE BEHAVIOR OF STAINLESS STEEL-CLAD AND ZIRCALOY-
CLAD UO₂ FUEL RODS IMMEDIATELY FOLLOWING A LOSS-OF-COOLANT ACCIDENT. WHEN OXIDIZING IN A
STEAM AT 1200°C, STAINLESS STEEL CLADDING FOAMS AND EXPANDS AT TEMPERATURES APPROACHING ITS
MELTING POINT. ZIRCALOY CLADDING IS SEVERELY EMBRITTLED WHEN THE TOTAL ABSORBED OXYGEN IS 10
PERCENT OR GREATER. THE ZIRCALOY-CLAD FUEL RODS CAN BE HEATED TO ABOUT 1200 C IN A STEAM
ATMOSPHERE AND THEN WATERQUENCHED WITHOUT ATTACKING THE CLADDING. AT TEMPERATURES SUBSTANTIALLY
ABOVE 1200 C THE CLADDING TENDS TO BREAK ON COOLING. THE EFFECTS OF HYDRIDING ARE ADJUDGED
SECONDARY IN TERMS OF STEAM OXIDATION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CHEMICAL REACTION + FUEL MELTDOWN + METAL WATER REACTION + STEAM + STEEL, STAINLESS + FUEL, PELLET TYPE + ANL
+ URANIUM DIOXIDE + ZIRCALOY + EMERGENCY COOLING + JACOBS

050000
INTERVENTION DENIED IN BAILLY HEARINGS
1 PAGE, INFO. P. 7 (MAY 1977)

BUSINESSMEN FOR THE PUBLIC INTEREST (DAVID CONEY, ATTY.) WAS DENIED PERMISSION TO INTERVIEW IN
CONSTRUCTION PERMIT HEARINGS FOR INDIANA'S FIRST NUCLEAR PLANT. (ASLR RULED CONEY COULD
REAPPLY.) PERMISSION TO INTERVIEW JOINTLY WAS GRANTED TO CONCERNED CITIZENS AGAINST BAILLY
NUCLEAR SITE, LOCAL CHAPTER OF ISAAC WALTON LEAGUE, AND LOCAL RESIDENTS. BETHLEHEM STEEL ALSO
INTERVIEWED: STATING NO OBJECTION TO PLANT, IT WANTS CLARIFICATION OF EMERGENCY PLANS AND
PROCEDURES. INTERVIEW WAS LIMITED TO RADIOLOGICAL CONCERNS, ENGINEERING SAFEGUARDS REGARDING
GENERATION OF HYDROGEN IN EVENT OF LOCA, EMERGENCY PLANS, AND QUALIFICATIONS AND EXPERIENCE OF
NORTHERN INDIANA PUBLIC SERVICE IN NUCLEAR FIELD.

METAL WATER REACTION + INDUSTRY, MANUFACTURING + CONSTRUCTION PERMIT PROCESS + EMERGENCY PROCEDURE + ASLR +
BAILLY 1 (BWR) + PETITION + INDUSTRY, UTILITY + OPPONENT + ORGANIZATION, CITIZEN + PUBLIC HEARING + POWER
PLANT, NUCLEAR

055277
HYDROGEN CONTROL FOLLOWING LOCA AT PEACH BOTTOM 2 AND 3
PHILADELPHIA ELECTRIC COMPANY, PENNSYLVANIA
DOCKET-50277-43 +. 11 PAGES, LETTER - PHILADELPHIA ELECTRIC COMPANY TO DIVISION OF REACTOR LICENSING (AFR) -
MARCH 16, 1977, DOCKET 50-277, TYPE--BWR, MFG--GE., AF--BECHTEL

STATES THAT NITROGEN MAKEUP WILL BE USED TO MAINTAIN OXYGEN CONCENTRATIONS IN THE CONTAINMENT
BELOW 5% AFTER A LOCA. BACKFIT OF ADDITIONAL HYDROGEN CONTROL CAPABILITY SHOULD NOT BE NECESSARY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

RADIOLYTIC GAS + CONTAINMENT ATMOSPHERE, INERT + PEACH BOTTOM 2 (BWR) + PEACH BOTTOM 3 (BWR)

051578
FLETCHER WD + BELL MJ + MARCHESE RT + GALLAGHER JL

041576 *CONTINUED*
POST-LOCA HYDROGEN GENERATION IN PWR CONTAINMENTS
WESTINGHOUSE ELECTRIC CORPORATION, PITTSBURGH, PA
9 PAGES, NUCLEAR TECHNOLOGY, 10(4), PG. 420-427 (APRIL 1971)

EXPERIMENTAL RESULTS INDICATE A CONSERVATIVE RATE OF HYDROGEN PRODUCTION DUE TO SUMP SOLUTION RADIOLYSIS OF 0.30 MOLECULE/100 EV OF ENERGY ABSORBED BY THE SOLUTION. EXPERIMENTAL STUDIES OF COKE SOLUTION RADIOLYSIS HAVE SHOWN THE EXTENT OF HYDROGEN PRODUCTION FROM THIS SOURCE IS LIMITED BY THE ATTAINMENT OF A STEADY-STATE HYDROGEN CONCENTRATION IN THE SOLUTION PASSING THROUGH THE CORE. BASED ON EXPERIMENTAL DATA, AN ANALYTIC MODEL WAS DERIVED WHICH CONSERVATIVELY APPROXIMATES THE HYDROGEN PRODUCTION PROCESS AS IT WOULD OCCUR IN THE NUCLEAR PLANT SHOULD A HYPOTHETICAL DESIGN BASIS ACCIDENT OCCUR. THE SIGNIFICANT OTHER SOURCE OF HYDROGEN IN THE POST-ACCIDENT ENVIRONMENT IS DISCUSSED ALSO.

CONTAINMENT SPRAY + ANALYTICAL MODEL + RADIOLYTIC GAS + PRODUCTION + PRODUCTION, RATE

043362
CARBIENER WA + PITZMAN RL
AN EVALUATION OF THE APPLICABILITY OF EXISTING DATA TO THE ANALYTICAL DESCRIPTION OF A NUCLEAR-REACTOR ACCIDENT
BATTELLE, COLUMBUS LABORATORIES, COLUMBUS, OHIO
441-1904 +, 24 PAGES, 2 FIGURES, 29 REFERENCES, APRIL 1971

THIS STUDY IS RESTRICTED TO PRESSURIZED-WATER AND BOILING-WATER NUCLEAR STEAM SUPPLY SYSTEMS, IN WHICH THE LIMITING POSTULATED ACCIDENT CONSIDERED FOR SAFETY ANALYSIS IS THE LOSS-OF-COOLANT OR BLOWDOWN SITUATION. IN THIS LOW-PROBABILITY EVENT, THE INTEGRITY OF THE PRIMARY COOLANT SYSTEM IS BREACHED BY SOME INITIATING MECHANISM, LEADING TO THE OPENING OF THE SYSTEM TO THE CONTAINMENT ATMOSPHERE. THE SIZE OF THE OPENING CAN BE POSTULATED TO RANGE FROM THE SIZE OF A CONTROL-ROD HOUSING, FOR EXAMPLE, TO THAT RESULTING FROM A CATASTROPHIC FAILURE OF THE PRESSURE VESSEL, BUT THE EVENT MOST COMMONLY CONSIDERED FOR THE DESIGN IS THE DOUBLE-ENDED FAILURE OF ONE OF THE LARGE COOLANT PIPES IN THE PRIMARY SYSTEM. ALTHOUGH THE LARGE PIPE BREAK IS THE DESIGN BASIS, A SPECTRUM OF PIPE BREAK SIZES IS ANALYZED TO HELP ENSURE ADEQUATE EMERGENCY PROTECTION IN THOSE CASES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

*ACCIDENT ANALYSIS + REACTOR, BWR + COMPUTER PROGRAM + CONTAINMENT + HEAT TRANSFER + REACTOR, PWR + REACTOR KINETICS + THERMAL ANALYSIS + ACCIDENT MODEL + RADIOLYTIC GAS + BLOWDOWN + ACCIDENT, DESIGN BASIS + EMERGENCY COOLING SYSTEM

063771
SAFETY GUIDE 7 - CONTROL OF COMBUSTIBLE GAS CONCENTRATIONS IN CONTAINMENT FOLLOWING A LOSS OF COOLANT ACCIDENT
U.S. ATOMIC ENERGY COMMISSION, WASHINGTON, D.C.
LETTER TO SAFETY GUIDE RECIPIENTS +, 3 PAGES, (APRIL 9, 1971)

GENERAL DESIGN CRITERION 41 REQUIRES THAT SYSTEMS TO CONTROL HYDROGEN, OXYGEN, AND OTHER SUBSTANCES WHICH MAY BE RELEASED INTO THE REACTOR CONTAINMENT BE PROVIDED AS NECESSARY TO CONTROL THEIR CONCENTRATIONS FOLLOWING POSTULATED ACCIDENTS TO ENSURE THAT CONTAINMENT INTEGRITY IS MAINTAINED. THIS GUIDE DESCRIBES AN ACCEPTABLE METHOD OF IMPLEMENTING THIS CRITERION.

AVAILABILITY - U.S. ATOMIC ENERGY COMMISSION, DIRECTORATE OF REGULATORY STANDARDS, WASHINGTON, D.C. 20545

REACTOR, BWR + EXPLOSION + FIRE + NRC DESIGN CRITERIA + METAL WATER REACTION + OXYGEN + REACTOR, PWR + CONTAINMENT INTEGRITY + CORROSION + RADIOLYTIC GAS + PRESSURE, INTERNAL + NRC REGULATORY GUIDE

071389
CONTAINMENT ATMOSPHERE DILUTION AT COOPER
NEBRASKA PUBLIC POWER DISTRICT
DOCKET-50298-32 +, 5 PAGES, LETTER - NEBRASKA PUBLIC POWER DISTRICT TO DIVISION OF REACTOR LICENSING (AFCL) - MAY 15, 1972, DOCKET 50-298, TYPE--BWR, MFG--G.E., AF--BURNS + DOE

BRIEF DISCUSSION OF THE DILUTION SYSTEM FOR MAINTAINING THE OXYGEN LEVEL BELOW 5% FOLLOWING A LOSS-OF-COOLANT ACCIDENT. CONTAINMENT PURGING THROUGH THE STANDBY GAS-TREATMENT SYSTEM WILL PROVIDE AN ALTERNATE IF THE DILUTION SYSTEM DOES NOT PERFORM PROPERLY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + CONTAINMENT ATMOSPHERE, INERT + COOPER (BWR)

073022
BACKFITTING OF BRUNSWICK 1-2 TO PROVIDE SYSTEM FOR CONTROLLING HYDROGEN AFTER A LOCA
CAROLINE POWER AND LIGHT COMPANY
DOCKET-50324-79 + 50325-40 +, 3 PAGES, LETTER - CAROLINE POWER AND LIGHT COMPANY TO DIRECTORATE OF LICENSING (AFCL) - JULY 31, 1972, DOCKETS 50-324/325, TYPE--BWR, MFG--G.E., AF--UE+C

COMPANY RESPONSE TO REQUEST FOR INFO TO EVALUATE THE NEED FOR POSSIBLE BACKFITTING OF BRUNSWICK UNITS 1 AND 2 TO PROVIDE HYDROGEN CONTROL SYSTEMS OTHER THAN CONTAINMENT PURGING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

073022 *CONTINUED*
CONTROL + EQUIPMENT + BACKFIT + NORTH ANNA 1 (PWR) + NORTH ANNA 2 (PWR) + CONCENTRATION

073649
ELECTRIC HYDROGEN RECOMBINER PLANNED FOR SUPPLY 1 AND 2 CONTAINMENT
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50280-90 +. 2 PAGES, LETTER - VIRGINIA ELECTRIC AND POWER COMPANY TO DIRECTORATE OF LICENSING (AEC) -
AUGUST 18, 1972, DOCKETS 50-280/281, TYPE--PWR, MFG--WEST., AE--SOTNE + WESTIF?

AFTER REVIEWING THE AVAILABLE SYSTEMS FOR CONTROLLING THE HYDROGEN CONCENTRATION AFTER A LOCA, THE
UTILITY DECIDED THAT AN ELECTRIC HYDROGEN RECOMBINER WOULD BE BETTER THAN A CATALYTIC RECOMBINER.
THE ELECTRIC RECOMBINER WILL CONSIST OF A VERTICAL DUCT CONTAINING SHEATHED RESISTANCE HEATERS.
THE CONTAINMENT ATMOSPHERE IS HEATED BY NATURAL CONVECTION FLOW SUFFICIENTLY TO REACT HYDROGEN
AND OXYGEN. TWO FULL-CAPACITY RECOMBINERS WILL BE INSTALLED INSIDE THE CONTAINMENT. CONTROLS
AND POWER WILL BE FROM OUTSIDE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22141

REACTOR, PWR + ELECTRIC POWER + PLANT PROTECTIVE SYSTEM + CONTAINMENT STRUCTURE + MODIFICATION + SUPPLY 1 (PWR)
+ SUPPLY 2 (PWR) + RECOMBINERS

076561
DESIGN PRECLUDES HYDROGEN POCKETING AT SUPPLY
VIRGINIA ELECTRIC AND POWER COMPANY
2 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), NOV. 29, 1972, DOCKETS 50-287/281, TYPE--PWR, MFG--WEST.,
AE--SYONE AND WEBSTER

THE DESIGN OF THE INTERIOR CONTAINMENT STRUCTURE PRECLUDES ACCUMULATION OF SUBSTANTIALLY DIFFERENT
CONCENTRATIONS OF HYDROGEN IN THE SUBCOMPARTMENTS AS COMPARED TO THE WELL MIXED OPEN PORTIONS OF
THE CONTAINMENT. EACH STEAM-GENERATOR CURICLE IS FITTED WITH SHIELD BLOCKS AT THE 48 FT 4 IN.
LEVEL WHICH ARE REMOVED DURING NORMAL OPERATION. THE OPENING IN THE TOP OF EACH STEAM GENERATOR
CUBICLE IS APPROXIMATELY 300 SQ. FT. IN AREA. SIMILARLY THE OPENING IN THE TOP OF THE
PRESSURIZER CUBICLE IS APPROXIMATELY 100 SQ. FT. IN AREA. DIFFUSION CALCULATIONS INDICATE THAT
MIXING OF THE ATMOSPHERE WILL MAINTAIN CONCENTRATIONS BELOW FLAMMABLE LIMITS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (10¢ CENTS/PAGE -- MINIMUM
CHARGE \$2.00)

CONTAINMENT DESIGN + REACTOR, PWR + RADIOLYTIC GAS + SUPPLY 1 (PWR) + SUPPLY 2 (PWR)

076595
HYDROGEN CONTROL SYSTEM NOT REQUIRED AT DRESDEN 1
U.S. ATOMIC ENERGY COMMISSION, DIRECTORATE OF LICENSING
2 PAGES, LETTER TO COMMONWEALTH EDISON COMPANY, NOVEMBER 29, 1972, DOCKET 50-10, TYPE--BWR, MFG--G.F., AE--
RECHTEL

BASED UPON OUR REVIEW AND ANALYSIS OF THE HYDROGEN PRODUCTION FOLLOWING THE LOCA, WE CONCLUDE THAT
A HYDROGEN CONTROL SYSTEM IS NOT REQUIRED FOR DRESDEN UNIT 1. WE FURTHER CONCLUDE THAT THE
CAPABILITY FOR MEASURING THE HYDROGEN CONCENTRATION AND FOR MIXING THE ATMOSPHERE IN THE
CONTAINMENT FOLLOWING A LOCA SHOULD BE PROVIDED. THIS CAPABILITY IS CONSIDERED NECESSARY TO
ASSURE THAT HYDROGEN CONCENTRATION IS UNIFORM THROUGHOUT THE CONTAINMENT VOLUME AND THAT THE
HYDROGEN CONCENTRATION CAN BE DETERMINED FOLLOWING AN ACCIDENT. YOU ARE REQUESTED TO SUBMIT YOUR
PLANS FOR INCORPORATING THE NECESSARY EQUIPMENT FOR MIXING THE CONTAINMENT ATMOSPHERE AND FOR
MEASURING THE HYDROGEN CONCENTRATION IN THE CONTAINMENT.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (10¢ CENTS/PAGE -- MINIMUM
CHARGE \$2.00)

REACTOR, BWR + CONTAINMENT DESIGN + DRESDEN 1 (BWR) + RADIOLYTIC GAS

077084
ADDITIONAL INFORMATION ON THE PROPOSED CONTAINMENT AIR DILUTION SYSTEM - VERMONT YANKEE
VERMONT YANKEE NUCLEAR POWER CORPORATION
3 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), OCTOBER 2, 1973, DOCKET 50-271, TYPE--BWR, MFG--G.F., AE--
ERASCO

(1) THE PRIMARY-CONTAINMENT SPRAY SYSTEM WILL BE USED TO PROMOTE MIXING IN THE EVENT OF SUSPECTED
POCKETING OF OXYGEN. (2) OXYGEN-HYDROGEN ANALYZER ACCURACY WILL BE AT LEAST 1/2%. (3) TORUS
ATMOSPHERE SAMPLING WILL BE POSSIBLE. (4) OXYGEN CONCENTRATION LIMIT WILL BE REDUCED FROM 5% TO
4% FOR THE PRIMARY CONTAINMENT ATMOSPHERE. (5) GAS ACCUMULATORS FOR SYSTEM AIR-OPERATED VALVES
WILL BE SIZED FOR 7 DAYS OF OPERATION. (6) WITH NO AIR EXCHANGE, HYDROGEN CONCENTRATION WILL NOT
EXCEED 4% UNTIL ABOUT 100 DAYS AFTER THE LOCA.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (10¢ CENTS/PAGE -- MINIMUM
CHARGE \$2.00)

REACTOR, BWR + CONTAINMENT + CONTROL + MODIFICATION + VERMONT YANKEE (BWR) + SYSTEM CAPABILITY

078216
ZITTEL HF
RADIOLYTIC HYDROGEN GENERATION AFTER LOSS-OF-COOLANT ACCIDENTS IN WATER-COOLED POWER REACTORS
OAK RIDGE NATIONAL LABORATORY, TENN.
9 PAGES, 2 TABLES, 4 FIGURES, 8 REFERENCES, NUCLEAR SAFETY, 13(6), PP. 459-467 (NOVEMBER-DECEMBER 1972)

THE RADIOLYTIC GENERATION OF HYDROGEN FROM THE PRESSURE-SUPPRESSION COOLANT LIQUID FOLLOWING A LOSS-OF-COOLANT ACCIDENT IN LIGHT-WATER-COOLED POWER REACTORS IS AN IMPORTANT CONSIDERATION SINCE IT COULD CONCEIVABLY RESULT IN A HAZARDOUS CONDITION. STUDIES CARRIED OUT IN THIS LABORATORY ON THE PROBABLE RADIOLYTIC HYDROGEN GENERATION IN BOTH THE PWR AND BWR ACCIDENT CASES HAVE BEEN INSTRUMENTAL IN ESTABLISHING A PACE FROM WHICH TO CONSIDER THIS POINT. A REVIEW OF THE EXPERIMENTAL WORK AND THE CONCLUSIONS ARISING FROM THE WORK ARE GIVEN.

ACCIDENT ANALYSIS + REACTOR, BWR + CHEMICAL REACTION + REACTOR, PWR + ACCIDENT MODEL + RADIOLYTIC GAS

079017
AMENDMENT 41 TO BROWNS FERRY LICENSE APPLICATION
TENNESSEE VALLEY AUTHORITY
DOCKET-50259-6 +, 69 PAGES, AMENDMENT 41 TO FSAR FOR BROWNS FERRY 1, 2, AND 3, SEPT. 27, 1972, DOCKETS 50-259/260/296, TYPE--BWR, MFG--G.E., AE--TVA

TRANSMITS REVISED PAGES TO THE FSAR AND RESPONSES TO AEC QUESTIONS CONCERNING LOCA HYDROGEN CONTROL.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + REPORT, SAR + BROWNS FERRY 2 (BWR) + BROWNS FERRY 3 (BWR) + BROWNS FERRY 1 (BWR)

080695
CARBIENER WA + RITZMAN RL
AN EVALUATION OF THE APPLICABILITY OF EXISTING DATA TO THE ANALYTICAL DESCRIPTION OF A NUCLEAR-REACTOR ACCIDENT
BATTELLE COLUMBUS LABORATORIES, OHIO
BWL-1904 +, 24 PAGES, 2 FIGURES, APRIL 1971

THE GENERATION OF HYDROGEN FROM RADIOLYTIC DECOMPOSITION OF EMERGENCY-COOLING WATER DURING A REACTOR LOSS-OF-COOLANT ACCIDENT WAS REASSESSED ON THE BASIS OF RECENT EXPERIMENTS. IT WAS CONCLUDED FOR BWR SYSTEMS THAT FLAMMABLE CONCENTRATIONS WERE POSSIBLE, WITH TIMES TO REACH SUCH A LIMIT CONSERVATIVELY ESTIMATED TO BE FROM 15 TO 100 HR. IN ADDITION, THE EFFECTS OF CONTAINMENT INERTING ARE DISCUSSED. FOR PWR SYSTEMS, THE TIME TO REACH FLAMMABILITY LIMITS WAS ESTIMATED TO BE 16 DAYS TO 2 MONTHS. THE RANGE OF PREDICTIONS BY VARIOUS INVESTIGATORS IS UNSATISFYING, BUT THE RESULTS INDICATE THAT HYDROGEN CONTROL MEASURES SHOULD BE CONSIDERED IN BOTH CASES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + EXPLOSION + FIRE + REACTOR, PWR

083263
REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS
DUQUESNE LIGHT COMPANY
DOCKET-50417-6 +, 578 PAGES, AMENDMENT 3 TO BEAVER VALLEY 2 LICENSE APPLICATION, MARCH 14, 1973, DOCKET 50-412, TYPE--PWR, MFG--WEST., AE--STONE+WEBSTER

CONTAINS NEW AND REVISED PAGES TO THE PRELIMINARY SAR CONCERNING CONTAINMENT ISOLATION SYSTEM, LEAK DETECTION, FIRE PROTECTION, VENTILATION SYSTEM, PIPE-BREAK ANALYSIS, AND CONTAINMENT DESIGN. INCLUDES RESPONSES TO AEC QUESTIONS CONCERNING SITING, SEISMIC DESIGN OF STRUCTURES, STRESS ANALYSIS, COMPUTER PROGRAMS FOR CONTAINMENT DESIGN, INSTRUMENTATION, HYDROGEN CONTROL, AND LOCA.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT ANALYSIS + NRC QUESTION + COMPUTER PROGRAM + CONTAINMENT DESIGN + DESIGN CRITERIA + REACTOR, PWR + SITING, REACTOR + VENTILATION SYSTEM + CONTAINMENT INTEGRITY + REPORT, PSAR + SEISMIC DESIGN + FIRE PROTECTION + BEAVER VALLEY 2 (PWR)

084099
REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS
ARKANSAS POWER AND LIGHT CO.
DOCKET-50313-65 +, 68 PAGES, AMENDMENT 34 TO ARKANSAS NUCLEAR 1 LICENSE APPLICATION, FEBRUARY 9, 1973, DOCKET 50-313, TYPE--PWR, MFG--B&W, AE--BECHTEL

CONTAINS NEW AND REVISED PAGES TO THE FINAL SAR CONCERNING HYDROGEN CONTROL, QUALITY-ASSURANCE PERSONNEL, AND INITIAL TEST PROGRAM. INCLUDES RESPONSES TO AEC QUESTIONS CONCERNING ACCIDENT ANALYSIS FOR VARIOUS SIZES OF PIPE BREAKS

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT ANALYSIS + NRC QUESTION + REACTOR, PWR + REPORT, SAR + CONTROL + REACTOR STARTUP TESTING + QUALITY ASSURANCE + ARKANSAS NUCLEAR 1 (PWR) + STAFFING + PIPES AND PIPE FITTINGS

085976
 REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS
 VIRGINIA ELECTRIC AND POWER COMPANY
 DOCKET-50404-28 +. 71 PAGES, AMENDMENT 12 TO NORTH ANNA 3 AND 4 LICENSE APPLICATION, NOVEMBER 16, 1973, DOCKET 50-404/404, TYPE--PWR, MFC--PWR, AE--STONE & WERTER

CONTAINS A COMPANY PROSPECTUS AND REVISED PAGES ON CONTAINMENT DESIGN, INCLUDES NEW AND REVISED RESPONSES TO AEC QUESTIONS CONCERNING THE LOCA, HYDROGEN CONTROL, TESTING OF THE SPRAY SYSTEM, ENVIRONMENTAL MONITORING SYSTEM, AND CORE MELTING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22141

ACCIDENT ANALYSIS + AEC QUESTION + CONTAINMENT DESIGN + CONTAINMENT SPRAY + REACTOR, PWR + CONTROL + REPORT, PSAR + MONITORING PROGRAM, ENVIRONMENTAL + NORTH ANNA 3 (PWR) + NORTH ANNA 4 (PWR)

066021
 RESPONSES TO AEC QUESTIONS
 VIRGINIA ELECTRIC AND POWER COMPANY
 DOCKET-50404-31 +. 10 PAGES, AMENDMENT 14 TO NORTH ANNA 3 AND 4 LICENSE APPLICATION, DECEMBER 13, 1973, DOCKET 50-404/405, TYPE--PWR, MFC--PWR, AE--STONE & WERTER

CONTAINS RESPONSES TO AEC QUESTIONS CONCERNING THE CONTROL OF HYDROGEN FOLLOWING A LOCA AND SUBCOMPARTMENT DIFFERENTIAL PRESSURES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22141

NRC QUESTION + CONTAINMENT + REACTOR, PWR + CONTROL + PRESSURE DROP + REPORT, PSAR + COMPARTMENT + NORTH ANNA 3 (PWR) + NORTH ANNA 4 (PWR)

086338
 REVISIONS TO THE SAR
 GEORGIA POWER COMPANY
 DOCKET-50321-69 +. 152 PAGES, AMENDMENT 30 TO WATTS LICENSE APPLICATION, FEBRUARY 5, 1973, DOCKET 50-321, TYPE--BWR, MFC--G.E., AE--SSI

CONTAINS NEW AND REVISED PAGES TO THE FINAL SAR CONCERNING CONTROL OF COMBUSTIBLE GAS AFTER A LOCA, REACTOR BUILDUP CRANE, STARTUP AND POWER TEST PROGRAM, AND PIPING CODES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22141

REACTOR, BWR + PROCEDURES AND MANUALS + REPORT, SAR + CONTROL + REACTOR STARTUP TESTING + RADIOACTIVE GAS + WATTS 1 (BWR) + CRANE

084911
 COOPER MH + HANKEL PD + TIER RP
 CONTAINMENT PRESSURE OF ELK RIVER REACTOR WITH ZIRCALOY-CLAD CORE FOLLOWING A LOSS-OF-COOLANT ACCIDENT
 UNITED NUCLEAR CORPORATION
 UNC-5163 +. 75 PAGES, FIGURES, DECEMBER 15, 1966

A POSSIBLE REPLACEMENT FUEL DESIGN FOR THE ELK RIVER REACTOR IS A 164 FUEL ELEMENT CORE WITH ZIRCALOY CLAD OPERATING AT A POWER OF 116 MW(T). AN ANALYSIS OF THE CONTAINMENT PRESSURE AND TEMPERATURE FOLLOWING A LOSS-OF-COOLANT ACCIDENT HAS BEEN MADE FOR THE PLANT WITH A ZIRCALOY CLAD CORE. THE MAXIMUM PRESSURE REACHED AT THE END OF THE INITIAL BLOWDOWN IS 20.9 PSIG WHICH IS LESS THAN THE DESIGN PRESSURE OF 21.0 PSIG AND THE TEST PRESSURE OF 26.35 PSIG. THE PRESSURE AFTER THE INITIAL BLOWDOWN DECREASES FOR SEVERAL HOURS BECAUSE THE HEAT REMOVAL BY CONDUCTION IN THE HEAT SINKS IS GREATER THAN THE ENERGY ADDITION OF THE DECAY HEAT, ZIRCALOY-WATER REACTION, AND HYDROGEN COMBUSTION. AFTER 75,000 SECONDS (20.9 HOURS), THE CONTAINMENT PRESSURE RISES TO THE DESIGN PRESSURE BECAUSE THE DECAY HEATING RATE EXCEEDS THE HEAT REMOVAL RATE. INTERNAL COOLING OF THE CONTAINMENT VESSEL IS REQUIRED AT THIS TIME TO MAINTAIN THE CONTAINMENT PRESSURE BELOW THE DESIGN VALUE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22141

ACCIDENT ANALYSIS + REACTOR, BWR + CONTAINMENT VESSEL LOADING + ELK RIVER (BWR) + METAL WATER REACTION + PRESSURE, INTERNAL + BLOWDOWN + SYSTEM OPERABILITY IN ACCIDENT + JACOBS

087459
 POST-LOCA HYDROGEN CONTROL SYSTEM
 DETROIT Edison COMPANY
 20 PAGES, LETTER WITH ATTACHED REPORT TO DIRECTORATE OF LICENSING (AFC), NOVEMBER 28, 1973, DOCKET 50-341, TYPE--BWR, MFC--G.E., AE--SGT. & LUNDY

GIVES DETAILS OF THE DESIGN BASES, SPECIFIC FEATURES, SYSTEMS, AND EQUIPMENT WHICH WILL BE USED FOR POST-LOCA COMBUSTIBLE GAS CONTROL AT FERM1 2.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (10¢ CENTS/PAGE -- MINIMUM CHARGE \$2.00)

007464. REVISIONS TO THE SAR
 REACTOR, RWR + CONTAINMENT GAS + ENGINEERED SAFETY FEATURE + REPORT 2 (RWR) + RESPONSES

0045767
 REVISIONS TO THE SAR AND RESPONSES TO ARC QUESTIONS
 MISSISSIPPI POWER AND LIGHT COMPANY
 Docket 50416-20 +, 417 PAGES, AMENDMENT 12 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, SEPTEMBER 19, 1973,
 Docket 50-416/417, TYPE--RWR, MFG--G.E., AE--BECHTEL

CONTAINS NEW AND REVISED PAGES TO THE PRELIMINARY SAR CONCERNING WEATHER DATA, STRESS IN THE PRESSURE
 STRUCTURE, PRESSURE VESSEL SUPPORT STRUCTURE, LOCA ANALYSIS, REACTOR RATE, HYDROGEN CONTROL
 SYSTEM, STANDBY GAS TREATMENT, DIESEL GENERATORS, VENTILATION SYSTEMS, CONTAMINATION SYSTEM,
 CONTAMINATION PROTECTION, AND QUALITY ASSURANCE. INCLUDES RESPONSES TO ARC QUESTIONS CONCERNING SITE
 DRAINAGE, CONTAINMENT DESIGN, PIPE LINE RUPTURE, HYDROGEN CONTROL, RADIATION PROTECTION, AND
 STANDBY GAS TREATMENT SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT ANALYSIS + ARC QUESTION + REACTOR, RWR + CONTAINMENT DESIGN + SITING, REACTOR + VENTILATION SYSTEM +
 STRESS ANALYSIS + ARC STATISTICS + REPORT, PSAR + DRAINAGE + GRAND GULF 2 (RWR) + GRAND GULF 1 (RWR) +
 STANDBY GAS TREATMENT

000109
 REVISIONS TO THE SAR AND RESPONSES TO ARC QUESTIONS
 MISSISSIPPI POWER AND LIGHT COMPANY
 Docket 50416-20 +, 300 PAGES, AMENDMENT 9 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, JUNE 28, 1973, DOCKET 50-
 416/417, TYPE--RWR, MFG--G.E., AE--BECHTEL

CONTAINS NEW AND REVISED PAGES TO THE PRELIMINARY SAR CONCERNING WEATHER DATA, HYDROGEN CONTROL,
 COOLING SYSTEM FOR ENGINEERED SAFETY FEATURES, RADIATION EXPOSURES, AND SITE SODIUM DATA.
 INCLUDES RESPONSES TO ARC QUESTIONS CONCERNING LOCA, MSIVS, CONTAINMENT DESIGN, ENGINEERED
 SAFETY FEATURES, HYDROGEN CONTROL, AND EMERGENCY COOLING SYSTEMS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ARC QUESTION + REACTOR, RWR + CONTAINMENT ISOLATION + SITING, REACTOR + CONTROL + REPORT, PSAR + FOUNDATION
 ENGINEERING + ENGINEERED SAFETY FEATURE + WEATHER DATA + GRAND GULF 2 (RWR) + GRAND GULF 1 (RWR) + VALVES

001460
 JAHN N
 HYDROGEN PRODUCTION IN CONTAINMENT AFTER A LOSS-OF-COOLANT ACCIDENT IN LIGHT-WATER REACTORS
 TECHNISCHE UNIVERSITÄT MÜNCHEN, WEST GERMANY
 MRP-117 +, 54 PAGES, FIGURES, MARCH 1973 (REP. IN GERMAN)

GIVES A SHORT GENERAL VIEW OF THE RADIOLYSIS PROBLEM. DESCRIBES THE CODE RADI 1, DEVELOPED AT
 TUM, AS WELL AS SOME CURVES OF IMPORTANT PARAMETERS AND RESULTS. (IN GERMAN)

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

COMPUTER PROGRAM + OXYGEN + RADIOLYTIC GAS + COOLING

002128
 REVISIONS TO THE SAR
 BOSTON Edison COMPANY
 Docket 50242-230 +, 41 PAGES, AMENDMENT 3E TO PILGRIM LICENSE APPLICATION, JANUARY 28, 1974, DOCKET 50-293,
 TYPE--RWR, MFG--G.E., AE--BECHTEL

REVISES THE FINAL SAR BY DESCRIBING THE MEANS AND CONTROLS PROVIDED FOR LIMITING COMBUSTIBLE GAS
 CONCENTRATIONS IN THE CONTAINMENT FOLLOWING THE LOCA. THIS IS ACHIEVED BY PROVIDING REDUNDANT
 MEANS OF NITROGEN SUPPLY TO THE CONTAINMENT, NEW EQUIPMENT, AND PIPING IN ACCORDANCE WITH CONES
 AND UPGRADING SYSTEMS IN OTHER AREAS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, RWR + CONTAINMENT + REPORT, SAR + CONTROL + MODIFICATION + RADIOLYTIC GAS + PILGRIM (RWR)

002347
 REVISIONS TO THE SAR AND RESPONSES TO ARC QUESTIONS
 PORTLAND GENERAL ELECTRIC COMPANY
 Docket 50244-24 +, 202 PAGES, AMENDMENT 9 TO TROJAN LICENSE APPLICATION, FEBRUARY 26, 1974, DOCKET 50-344,
 TYPE--RWR, MFG--WEST., AE--BECHTEL

CONTAINS NEW AND REVISED PAGES TO THE FINAL SAR CONCERNING CONTAINMENT STRUCTURE DESIGN CRITERIA,
 REACTOR ANALYSIS, HYDROGEN CONTROL FOLLOWING LOCA, AND REACTOR TRANSIENTS FOLLOWING ACCIDENTS.
 RESPONSES TO ARC QUESTIONS ARE GIVEN AS REVISED SECTIONS TO THE PSAR.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

092347 *CONTINUED*
 ACCIDENT ANALYSIS + NRC QUESTION + CONTAINMENT + CONTAINMENT DESIGN + REACTOR, PWR + REPORT, SAR + CONTROL +
 CORE REFLODDING SYSTEM + PRESSURE TRANSIENT + TROJAN (PWR) + THERMAL TRANSIENT

092407
 CONTROL OF COMBUSTIBLE GAS CONCENTRATION IN CONTAINMENT - WPPSS NO. 2
 WASHINGTON PUBLIC POWER SUPPLY SYSTEM
 26 PAGES, LETTER WITH REPORT TO DIRECTORATE OF LICENSING (AFC), APRIL 29, 1974, DOCKET 50-797, TYPE--BWR, REG--
 G.E., AE--BURNS & ROE

PRESENTS INFORMATION RELATED TO THE DESIGN OF THE HYDROGEN CONTROL SYSTEM FOR WPPSS NO. 2. A
 SERIES OF CALCULATIONS WERE PERFORMED TO ESTABLISH THE CAPACITY OF A RECOMBINER SYSTEM FOR THE
 CONTROL OF GASES IN A BWR CONTAINMENT FOLLOWING A LOCA. CALCULATIONS INDICATE THAT THE TOTAL
 REQUIRED RECOMBINER FLOW RATE IS 80 SCFM.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (10 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00)

REACTOR, BWR + DESIGN STUDY + FLCH + HANFORD 2 (BWR) + RECOMBINERS

096648
 REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS
 OFFSHORE POWER SYSTEMS, JACKSONVILLE, FLORIDA
 DOCKET-STN-50437-25 +. 366 PAGES, AMENDMENT 5 TO OFFSHORE POWER SYSTEMS' LICENSE APPLICATION, MARCH 25, 1974,
 DOCKET-STN-50-437

AMENDS THE APPLICATION FOR LICENSE TO MANUFACTURE BY CHANGES AND ADDITIONS TO THE PLANT DESIGN
 REPORT. ITEMS INCLUDE NONSEISMIC COMPONENT DESIGN, MAIN COOLING SYSTEM INTEGRITY, CONTAINMENT
 SPRAY SYSTEM, ICE CONDENSER, POTENTIAL LEAKAGE PATHS FROM CONTAINMENT, HYDROGEN CONTROL,
 EFFLUENTS, INITIAL TESTING, ACCIDENT ANALYSIS CONCERNING CONTAINMENT PRESSURE, AND RELEASE RATES
 FOR LOCA. RESPONSES TO AEC QUESTIONS ARE GIVEN AS REFERENCES TO SPECIFIC SECTIONS.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

ACCIDENT ANALYSIS + NRC QUESTION + CONTAINMENT SPRAY + DESIGN CRITERIA + EFFLUENT + REACTOR, PWR + REPORT, SAR
 + TESTING + CONTAINMENT INTEGRITY + CONTROL + EQUIPMENT + CONTAINMENT, ICE CONDENSER + OFFSHORE POWER SYSTEMS
 (PWR) + POWER PLANT, FLOATING

A COLLECTION OF KEYWORDS IS USED TO DENOTE THE MAIN SAFETY RELATED POINTS COVERED IN EACH ARTICLE. THE FOLLOWING INDEX IS AN ALPHABETICAL LISTING OF THE KEYWORDS GIVING REFERENCES TO EACH ARTICLE WHICH WAS KEYED TO IT.

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#RESPONSES TO AEC QUESTIONS*	089753 P 11
#RESPONSES TO AEC QUESTIONS*	086021 P 10
#RESPONSES TO AEC QUESTIONS*	096648 P 12
#RESPONSES TO AEC QUESTIONS*	087263 P 9
#REVISIONS TO PRELIMINARY SAR, DAVIS-BESSE*	006044 P 1
#REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS*	089753 P 11
#REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS*	083263 P 9
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#REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS*	090109 P 11

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	# REVISIONS TO THE SAR*	086338 P 10
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	#SUPPLEMENT 5 TO PRELIMINARY SAFETY ANALYSIS REPORT*	037324 P 4
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	#REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS*	085976 P 10
	#REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS*	089753 P 11
	#REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS*	092347 P 11
	#REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS*	083263 P 9
	#REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS*	090109 P 11
	SAR*	092138 P 11
	SAR*	086338 P 10
	#REVISIONS TO PRELIMINARY SAR, DAVIS-BESSE*	006044 P 1
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GAS AND ELECTRIC COMPANY NUCLEAR UNIT 2 - DIABLO CANYON	SITE*	040515 P 4
WATER-COOLED POWER	#LABORATORY SIMULATIONS OF CLADDING-STEAM REACTIONS FOLLOWING LOSS-OF-COOLANT ACCIDENTS IN	047825 P 3
ACCIDENT CONDITIONS IN	#AN EXPERIMENTAL STUDY ON THE BURST STRENGTH OF FUEL CLADDING TUBES UNDER LOSS OF COOLANT	006559 P 1
LOSS OF COOLANT ACCIDENT CONDITIONS IN	#AN EXPERIMENTAL STUDY ON THE BURST STRENGTH OF FUEL CLADDING TUBES UNDER	006559 P 1
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	#SUPPLEMENT 5 TO PRELIMINARY SAFETY ANALYSIS REPORT*	037324 P 4
	SURRY 1 AND 2 CONTAINMENT*	073649 P 8
	SURRY*	076561 P 8
#ELECTRIC HYDROGEN RECOMBINER PLANNED FOR	SYSTEM - VERMONT YANKEE*	077084 P 8
#DESIGN PRECLUDES HYDROGEN POCKETING AT	SYSTEM FOR CONTROLLING HYDROGEN AFTER A LOCA*	073022 P 7
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#BACKFITTING OF BRUNSWICK 1-2 TO PROVIDE	SYSTEM*	024509 P 2
#HYDROGEN CONTROL	SYSTEM*	087459 P 10
#COOPER CONTAINMENT ATMOSPHERIC CONTROL		
#POST-LOCA HYDROGEN CONTROL		
INFLUENCE OF ZIRCONIUM CLADDING ON THE LOFT LOSS-OF-COOLANT	TEST*	008807 P 2
	#ACRS REPORT ON THREE MILE ISLAND-2 CONSTRUCTION PERMIT APPLICATION*	036581 P 3
#HYDROGEN PURGING CONTROL AND FLORIDA	TORNADOES*	047589 P 6
#CHEMICAL AND ASSOCIATED ENERGY-TRANSFER PROBLEMS IN REACTOR SAFETY*		008102 P 2
EXPERIMENTAL STUDY ON THE BURST STRENGTH OF FUEL CLADDING	TUBES UNDER LOSS OF COOLANT ACCIDENT CONDITIONS IN WATER	006559 P 1
STUDY ON THE BURST STRENGTH OF FUEL CLADDING TUBES	UNDER LOSS OF COOLANT ACCIDENT CONDITIONS IN WATER COOLED	006559 P 1
#ACRS REPORT ON PACIFIC GAS AND ELECTRIC COMPANY NUCLEAR	UNIT 2 - DIABLO CANYON SITE*	040515 P 4
DOCKET 50-271)*	# VERMONT YANKEE CONTAINMENT AND COMBUSTIBLE GASES*	039592 P 4
ON THE PROPOSED CONTAINMENT AIR DILUTION SYSTEM -	# VERMONT YANKEE CONTAINMENT INERTING (AMENDMENT 12 TO VERMONT YANKEE*	046738 P 5
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CLADDING TUBES UNDER LOSS OF COOLANT ACCIDENT CONDITIONS IN	WATER COOLED POWER REACTORS* ON THE BURST STRENGTH OF FUEL	006559 P 1
REACTOR*	#METAL- WATER REACTIONS - EFFECTS ON CORE COOLING AND CONTAINMENT*	033052 P 3
	#METAL- WATER REACTIONS DURING A LOSS-OF-COOLANT ACCIDENT IN N-	044759 P 5
	#POTENTIAL METAL- WATER REACTIONS IN LIGHT-WATER-COOLED POWER REACTORS*	038866 P 4
	#POTENTIAL METAL- WATER REACTIONS IN LIGHT-WATER-COOLED POWER REACTORS*	029094 P 2
	WATER REACTOR*	003119 P 1
#HYDROGEN GENERATION IN A BOILING	WATER REACTORS*	091469 P 11
IN CONTAINMENT AFTER A LOSS-OF-COOLANT ACCIDENT IN LIGHT-	WATER-COOLED POWER REACTORS*	029094 P 2
#POTENTIAL METAL-WATER REACTIONS IN LIGHT-	WATER-COOLED POWER REACTORS*	038866 P 4
#POTENTIAL METAL-WATER REACTIONS IN LIGHT-	WATER-COOLED POWER REACTORS*	078216 P 9
HYDROGEN GENERATION AFTER LOSS-OF-COOLANT ACCIDENTS IN	WATER-COOLED POWER REACTORS*	047825 P 6
STEAM REACTIONS FOLLOWING LOSS-OF-COOLANT ACCIDENTS IN	SIMULATIONS OF CLADDING-	092407 P 12
#CONTROL OF COMBUSTIBLE GAS CONCENTRATION IN CCONTAINMENT -	MPPSS NO. 2*	
	#VERMONT YANKEE CONTAINMENT AND COMBUSTIBLE GASES*	039592 P 4
	#VERMONT YANKEE CONTAINMENT INERTING (AMENDMENT 12 TO DOCKET 50-271)	046738 P 5
* ON THE PROPOSED CONTAINMENT AIR DILUTION SYSTEM - VERMONT	YANKEE*	077084 P 8
	#ADDITIONAL INFORMATION	
#CONTAINMENT PRESSURE OF ELK RIVER REACTOR WITH	ZIRCALOY-CLAD CORE FOLLOWING A LOSS-OF-COOLANT ACCIDENT*	086911 P 10
#THE INFLUENCE OF	ZIRCONIUM CLADDING ON THE LOFT LOSS-OF-COOLANT TEST*	008807 P 2

3. SPRAY SYSTEMS

CO8807
 JENSEN SE + FINNEGAN LJ
 THE INFLUENCE OF ZIRCONIUM CLADDING ON THE LOFT LOSS-OF-COOLANT TEST
 PHILLIPS PETROLEUM COMPANY
 2 PAGES, 2 REFERENCES, AHS TRANSACTIONS 8(2), PAGES 540-41, 1965 WINTER MEETING OF THE AMERICAN NUCLEAR SOCIETY, WASHINGTON, D. C., NOVEMBER 15-18, 1965

CONSIDERATIONS EMPLOYED IN THE ANALYSIS ARE DESCRIBED AND THE DIFFERENCES BETWEEN STAINLESS STEEL CLAD AND ZIRCONIUM WITH RESPECT TO SAFETY ARE POINTED OUT. THE LOSS OF COOLANT ACCIDENT WILL PROVIDE THE NECESSARY ENVIRONMENT FOR THE METAL WATER REACTION TO OCCUR. CONTAINMENT PRESSURE VERSUS TIME BEHAVIOR AND PRESSURE REDUCTION BY SPRAY WERE ALSO INVESTIGATED.

CONTAINMENT SPRAY + CONTAINMENT VESSEL LOADING + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + ZIRCONIUM + LOFT (S-RR) + BLOWDOWN + PRESSURE TRANSIENT

011366
 QUAD-CITIES STATION, UNIT 1 - PLANT DESIGN ANALYSIS, VOLUME 1
 COMMONWEALTH EDISON COMPANY, CHICAGO
 24 PAGES, 3 REFERENCES, 1 TABLE, PAGES V-1-16 TO 31, DOCKET NO. 50-254, MAY 31, 1966 PDR

IMMEDIATELY AFTER THE MAJOR PIPE RUPTURE, THE TEMPERATURE OF THE WATER IN THE SUPPRESSION CHAMBER APPROACHES 130 F. AND THE MAXIMUM SYSTEM PRESSURE APPROACHES 39 PSIG DURING THE BLOWDOWN OF THE PRIMARY COOLANT INTO THE DRYWELL. THE CONTAINMENT PRESSURE IS A FUNCTION OF THE METAL-WATER REACTION RATE. ALTHOUGH THE CORE-COOLING SYSTEMS ARE ASSUMED NOT TO FUNCTION IN ORDER TO PROVIDE A BASIS FOR METAL-WATER REACTIONS, ONE OF THE TWO CONTAINMENT COOLING SYSTEMS IS ASSUMED TO FUNCTION NORMALLY. THE DRYWELL SPRAY IS SUFFICIENT TO TRANSPORT THE DECAY HEAT, THE HEAT STORED IN THE CORE, AND ANY HEAT RESULTING FROM THE METAL-WATER REACTION TO THE WET-Well IN THE FORM OF HOT LIQUID. THE ENERGY TRANSPORTED TO THE WATER IN THE SUPPRESSION CHAMBER IS REMOVED FROM THE CONTAINMENT SYSTEM BY HEAT EXCHANGERS. TO OBIATE THE POSSIBILITY OF AN ENERGY RELEASE WITHIN THE PRIMARY CONTAINMENT FROM A HYDROGEN-OXYGEN REACTION UNDER CONDITIONS MORE SEVERE THAN CAN CURRENTLY BE FORESEEN, THE DESIGN INCLUDES AN INERTING SYSTEM TO REDUCE THE OXYGEN CONCENTRATION OF THE ATMOSPHERE WITHIN THE PRIMARY CONTAINMENT.

REACTOR, BWR + CHEMICAL REACTION + CONTAINMENT SPRAY + CONTAINMENT, PRESSURE SUPPRESSION + METAL WATER REACTION + OXYGEN + ZIRCALOY + QUAD CITIES 1 (BWR) + CONTAINMENT ATMOSPHERE, INERT + REPORT, PSAR

018511
 CASTLEMAN AW + TANG IN + MUNKELWITZ HR
 AN INVESTIGATION OF THE CHEMICAL STATES OF IODINE AT LOW CONCENTRATIONS IN AN AQUEOUS ENVIRONMENT
 BROOKHAVEN NATIONAL LABORATORY, UPTON, NEW YORK
 RNL-11329 +. 24 PAGES, 3 FIGURES, 5 TABLES, APRIL 1967, ALSO IN JOURNAL OF INORGANIC AND NUCLEAR CHEMISTRY

THE CHEMICAL STATES OF IODINE IN AN AQUEOUS ENVIRONMENT, AT VERY LOW CONCENTRATIONS AND AT TEMPERATURES OF 1000 TO 1500 C, WERE INVESTIGATED, USING IODINE PRODUCED BY NEUTRON FISSION OF U, UO₂, AND U₃O₈. THE RESULTS SHOW THAT THE FINAL FORMS OF IODINE DEPEND ON THE CHEMICAL NATURE OF THE ENVIRONMENT, BEING LARGELY ELEMENTAL IN A NEUTRAL OR OXIDIZING ATMOSPHERE AND LARGELY IODIDE RADICAL IN A REDUCING ATMOSPHERE. ONLY THE REACTION $I + H_2 \rightarrow HI + H$ CAN ACCOUNT FOR THE EXTENT AND RATE OF FORMATION OF HI OBSERVED WHEN TRACER-LEVEL IODINE IS RELEASED INTO STEAM CONTAINING HYDROGEN. METHYL IODIDE IS PRODUCED BY REACTIONS BETWEEN ATOMIC IODINE AND IMPURITIES IN THE SYSTEM. ALL EXPERIMENTAL RESULTS CAN BE EXPLAINED ON THE BASIS OF KNOWN IODINE STATES.

FISSION PRODUCT, IODINE + IODINE + METAL + OXIDE + STEAM + TRACER, RADIOACTIVE + URANIUM + ORGANIC IODIDE + SPRAY + URANIUM DIOXIDE + WATER VAPOR

019708
 QUESTION 1.5--CONTAINMENT CAPABILITY WITH ZIRCONIUM-WATER REACTION
 WISCONSIN MICHIGAN POWER COMPANY
 4 PAGES, 2 FIGURES, 1 TABLE, PAGES 1.5-1 THROUGH 1.5-2 OF THE SECOND SUPPLEMENT TO PRELIMINARY FACILITY DESCRIPTION AND SAFETY ANALYSIS REPORT FOR WISCONSIN MICHIGAN POWER COMPANY, POINT BEACH NUCLEAR PLANT, DOCKET 50-266, FEBRUARY 1967

TO EVALUATE ADEQUACY OF CONTAINMENT DESIGN FOR LOSS-OF-COOLANT ACCIDENT, ASSUMING THAT NO EMERGENCY CORE-COOLING SYSTEMS FUNCTION, CONSIDER PRESSURES THAT COULD RESULT FROM ENERGY ADDED IN A MANNER SOMEWHAT INDEPENDENT OF SPECIFIC MODEL. PREPARE A CONTAINMENT CAPABILITY CURVE PROVIDING AMOUNT OF ZIRCONIUM-WATER REACTION AS FUNCTION OF TIME THAT CAN OCCUR WITHOUT EXCEEDING 60 PSIG. ASSUME REACTION OCCURS LINEARLY WITH TIME, HYDROGEN PRODUCED IS BURNED AS PRODUCED, AND DELAYED IGNITION OCCURS. CURVES SHOULD BE DRAWN ASSUMING NO ENGINEERED SAFEGUARDS FUNCTION, ONLY FANCOOLERS OR CONTAINMENT SPRAYS OPERATE, AND BOTH FANCOOLERS AND CONTAINMENT SPRAYS OPERATE. ADDITIONAL INFORMATION SUCH AS MAJOR ENERGY SOURCES ASSUMED AND CONTAINMENT-ATMOSPHERE COMPOSITION AND TEMPERATURE SHOULD BE PRESENTED.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

CONTAINMENT DESIGN + CONTAINMENT SPRAY + FIRE + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + REPORT, SAR + ZIRCONIUM + HEAT SINK + PRESSURE, INTERNAL + RESPONSE TO NRC QUESTION + POINT BEACH 1 (PWR) + EMERGENCY COOLING + ENGINEERED SAFETY FEATURE

027037

027037 *CONTINUED*
 PARKER GW + CREEK GE + HORTON NR
 SPRAY AND ABSORPTION TECHNOLOGY (PART II)
 OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENNESSEE
 ORNL-4228 +. 29 PAGES, 17 FIGURES, 10 TABLES, 13 REFERENCES, PAGES 215-243 OF THE NSP ANNUAL PROGRESS REPORT,
 APRIL, 1968

PROGRESS REPORT DEALING WITH - DISSOLUTION AND HYDROLYSIS OF METHYL IODIDE IN MISTING SPRAY
 SOLUTIONS - EXPERIMENTAL EQUIPMENT, EXPERIMENTAL PROCEDURE, SPRAY TESTS IN THE NUCLEAR SAFETY
 PILOT PLANT - EQUIPMENT AND EXPERIMENTAL PROCEDURE, FIRST SERIES OF EXPERIMENTS, SECOND SERIES OF
 EXPERIMENTS, THEORETICAL STUDIES, CONTINUATION OF PROGRAM, RADIATION STABILITY OF SPRAY
 SOLUTIONS - EFFECT OF RADIATION ON PH, IZ EQUIVALENCE, AND SOLIDS FORMATION, RADIOLYTIC H2
 PRODUCTION, SCAVENGING OF FISSION PRODUCTS BY SUPPRESSION POOLS.

CONTAINMENT, PRESSURE SUPPRESSION + IODINE + RADIATION DAMAGE + DECONTAMINATION SPRAY + ORGANIC IODIDE + MIST
 + NSPP + SPRAY + DECONTAMINATION FACTOR + RADIATION EFFECT

030509
 R AND D, AND QUALITY CONTROL
 INDIANA AND MICHIGAN ELECTRIC COMPANY
 41 PAGES, FIGURES, TABLES, AMENDMENT 10 TO COOK 1 AND 2 LICENSE APPLICATION, NOVEMBER 14, 1968, DOCKETS 50-
 315/316

ADDITIONAL INFORMATION ON (1) QUALITY-CONTROL PROGRAM, (2) COLDWELD SPLICING AND TESTING
 PROCEDURES, (3) SEISMIC-DESIGN CRITERIA, (4) RECOMBINER DESIGN AND ASSOCIATED R AND D, (5) PORTS
 FOR CONTAINMENT LINER INSPECTION, (6) CONTAINMENT-SPRAY R AND D, AND (7) FIXED IN-CORE DETECTORS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00

CONTAINMENT SPRAY + DESIGN CRITERIA + INSTRUMENT, IN CORE + METAL WATER REACTION + REACTOR, PWR + PROCEDURES
 AND MANUALS + TESTING + WELDING + MODIFICATION + RADIOLYTIC GAS + EXAMINATION + REPORT, PSAR + QUALITY
 ASSURANCE + EARTHQUAKE ENGINEERING + R AND D PROGRAM + CONTAINMENT LINER + COOK 1 (PWR) + COOK 2 (PWR) +
 RECOMBINERS

036581
 ACRS REPORT ON THREE MILE ISLAND-2 CONSTRUCTION PERMIT APPLICATION
 U.S. ATOMIC ENERGY COMMISSION
 AEC PRESS RELEASE M-173 +. 3 PAGES, JULY 25, 1969, DOCKET 50-320, TYPE--PWR, MFG--B+W, AE--BURNS + ROE

ACRS RECOMMENDED THAT THE FOLLOWING ITEMS WARRANT ADDITIONAL CONSIDERATION - (1) MATTERS
 PREVIOUSLY IDENTIFIED FOR ALL LARGE WATER-COOLED REACTORS, (2) THE ESTIMATE OF MAXIMUM FLOOD
 DISCHARGE FROM THE SUSQUEHANNA RIVER, (3) GROUTING AND TESTING OF CONTAINMENT TENDONS, (4) R-AND-
 D PROGRAM FOR USE OF SODIUM THIOSULFATE ADDITIVE TO CONTAINMENT SPRAY, (5) A PURGE SYSTEM TO COPE
 WITH HYDROGEN BUILDUP IN EVENT OF LOCA, (6) SYSTEMATIC, NONRANDOM, CONCURRENT FAILURES IN
 REDUNDANT DEVICES, (7) STUDY OF HYPOTHESIZED FAILURES DURING TRANSIENTS, AND ACTION NEEDED, (8)
 VIBRATION MONITORING OF CORE COMPONENTS, (9) POSTACCIDENT COOLING INTEGRITY, AND (10) IN-SERVICE
 INSPECTION.

AVAILABILITY - USAEC DIVISION OF PUBLIC INFORMATION, WASHINGTON, D.C. 20545

CONTAINMENT SPRAY + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + ACRS + CONSTRUCTION PERMIT PROCESS + FASTENER +
 FAILURE, INSTRUMENT + CONTAINMENT STRUCTURE + VIBRATION + CORE COMPONENTS + R AND D PROGRAM + SURVEILLANCE
 PROGRAM + FLOOD + THREE MILE ISLAND 2 (PWR)

037714
 RESPONSES TO AEC QUESTIONS AND REVISIONS TO PSAR
 JERSEY CENTRAL POWER AND LIGHT
 AMENDMENT 5 TO OYSTER CREEK 2 LICENSE APPLICATION, DEC. 2, 1968, DOCKET 50-320, TYPE--PWR, MFG--B+W, AE--BURNS
 AND ROE

CONTAINS REVISIONS TO PSAR AND RESPONSES TO AEC QUESTIONS SUBMITTED BY DRL ON OCTOBER 18, 1968.
 RESPONSES TO AEC QUESTIONS CONCERN THE EMERGENCY CORE-COOLING SYSTEM, CONTAINMENT SPRAY SYSTEM,
 RADIOLYTIC HYDROGEN, CONTAINMENT FUEL HANDLING, ISOLATION VALVES, PRESSURE VESSEL, AND THE R AND
 D PROGRAM.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

NRC QUESTION + CONTAINMENT SPRAY + FUEL HANDLING + CONTAINMENT ISOLATION + PRESSURE VESSELS + REACTOR, PWR +
 RADIOLYTIC GAS + REPORT, PSAR + R AND D PROGRAM + THREE MILE ISLAND 2 (PWR) + EMERGENCY COOLING SYSTEM

047278
 FLETCHER, WD + BELL, MJ + MARCHESE, RT + GALLAGHER, JL
 POST LOCA HYDROGEN GENERATION IN PWR CONTAINMENTS
 WESTINGHOUSE ELECTRIC CORPORATION, PITTSBURGH, PENNSYLVANIA
 2 PAGES, 1 FIGURE, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, 13(1), PP. 203-204 (JULY 1970)

THE PRODUCTION OF HYDROGEN DUE TO THE RADIOLYSIS OF REACTOR CONTAINMENT SPRAY SOLUTIONS HAS BEEN

047278 *CONTINUED*

INVESTIGATED. EXPERIMENTAL RESULTS INDICATE A CONSERVATIVE RATE OF HYDROGEN PRODUCTION DUE TO SUMP SOLUTION RADIOLYSIS OF 0.30 MOLECULES/100 EV OF ENERGY ABSORBED BY THE SOLUTION. EXPERIMENTAL STUDIES OF CORE SOLUTION RADIOLYSIS HAVE SHOWN THE EXTENT OF HYDROGEN PRODUCTION FROM THIS SOURCE IS LIMITED BY THE ATTAINMENT OF A STEADY-STATE HYDROGEN CONCENTRATION IN THE SOLUTION PASSING THROUGH THE CORE. BASED ON EXPERIMENTAL DATA, AN ANALYTIC MODEL WAS DERIVED WHICH CONSERVATIVELY APPROXIMATES THE HYDROGEN PRODUCTION PROCESS AS IT WOULD OCCUR IN THE NUCLEAR PLANT SHOULD A HYPOTHETICAL DESIGN BASIS ACCIDENT OCCUR. THE SIGNIFICANCE OF OTHER SOURCES OF HYDROGEN IN THE POST-ACCIDENT ENVIRONMENT ALSO IS DISCUSSED.

AVAILABILITY - W.D. FLETCHER, WESTINGHOUSE ELECTRIC CORPORATION, NES-PWR SYSTEMS DIVISION, P.O. BOX 355, PITTSBURGH, PENNSYLVANIA 15230

CONTAINMENT SPRAY + EXPLOSION + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + ANALYTICAL MODEL + RADIOLYTIC GAS + ACCIDENT, DESIGN BASIS

056705

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ZITTEL HE

DESIGN CONSIDERATIONS OF REACTOR CONTAINMENT SPRAY SYSTEMS - PART VIII. BOILING WATER REACTOR ACCIDENT RADIOLYSIS STUDIES

OAK RIDGE NATIONAL LABORATORY, TENNESSEE

ORNL-TM-2422 (PART VIII) +. 18 PAGES, 12 FIGURES, OCTOBER 1970

BOILING WATER REACTORS (BWR) CURRENTLY UNDER CONSTRUCTION ARE DESIGNED SO THAT IN CASE OF A LOSS-OF-COOLANT ACCIDENT, WATER FROM THE PRESSURE SUPPRESSION POOL CAN BE RECIRCULATED THROUGH THE REACTOR CORE. DURING THIS POST-ACCIDENT FUNCTION THE WATER MAY BE EXPECTED TO BE EXPOSED TO A RADIATION DOSE OF GREATER THAN 10 (POWER OF 8) RADS IN A RELATIVELY SHORT TIME. BECAUSE OF THE RELATIVELY SMALL CONTAINMENT VOLUME OF A TYPICAL BWR THE RATE OF EVOLUTION AS WELL AS THE STEADY-STATE CONCENTRATION OF RADIOLYTIC GAS IS EXTREMELY IMPORTANT. THIS REPORT CONSIDERS THE EFFECTS OF VARIOUS PARAMETERS ON THESE POINTS. THE PARAMETERS COVERED ARE FLOW RATE (100 TO 10,000 GPM), TEMPERATURE (65 TO 125 C), GAS-LIQUID RATIO (1.0 TO 5.0), AND COMPOSITION OF COVER GAS (AIR, 95 PERCENT N₂-5 PERCENT O₂). THE VARIATION OF THESE PARAMETERS WITHIN THE LIMITS SPECIFIED INDICATES THAT THE LOWER LIMIT FOR STEADY-STATE RADIOLYTIC HYDROGEN CONCENTRATION IS BETWEEN 3 TO 4 VOL PERCENT.

REACTOR, BWR + CONTAINMENT SPRAY + CONTAINMENT, PRESSURE SUPPRESSION + ACCIDENT, LOSS OF COOLANT + REACTOR SAFETY SYSTEM + RADIOLYTIC GAS + RADIOLOGY

061578

LIMITED D

FLETCHER WD + BELL MJ + MARCHESE RT + GALLAGHER JL

POST-LOCA HYDROGEN GENERATION IN PWR CONTAINMENTS

WESTINGHOUSE ELECTRIC CORPORATION, PITTSBURGH, PA

8 PAGES, NUCLEAR TECHNOLOGY, 10(4), PG. 420-427 (APRIL 1971)

EXPERIMENTAL RESULTS INDICATE A CONSERVATIVE RATE OF HYDROGEN PRODUCTION DUE TO SUMP SOLUTION RADIOLYSIS OF 0.30 MOLECULE/100 EV OF ENERGY ABSORBED BY THE SOLUTION. EXPERIMENTAL STUDIES OF CORE SOLUTION RADIOLYSIS HAVE SHOWN THE EXTENT OF HYDROGEN PRODUCTION FROM THIS SOURCE IS LIMITED BY THE ATTAINMENT OF A STEADY-STATE HYDROGEN CONCENTRATION IN THE SOLUTION PASSING THROUGH THE CORE. BASED ON EXPERIMENTAL DATA, AN ANALYTIC MODEL WAS DERIVED WHICH CONSERVATIVELY APPROXIMATES THE HYDROGEN PRODUCTION PROCESS AS IT WOULD OCCUR IN THE NUCLEAR PLANT SHOULD A HYPOTHETICAL DESIGN BASIS ACCIDENT (DBA) OCCUR. THE SIGNIFICANT OTHER SOURCE OF HYDROGEN IN THE POST-ACCIDENT ENVIRONMENT IS DISCUSSED ALSO.

CONTAINMENT SPRAY + ACCIDENT, LOSS OF COOLANT + ANALYTICAL MODEL + RADIOLYTIC GAS + PRODUCTION + PRODUCTION, RATE

061580

LIMITED D

ZITTEL HE + POW TH

RADIATION AND THERMAL STABILITY OF SPRAY SOLUTIONS

OAK RIDGE NATIONAL LABORATORY, TN

8 PAGES, NUCLEAR TECHNOLOGY, 10(4), PG. 436-443 (APRIL 1971)

THE TWO SPRAYS FOUND TO DEMONSTRATE ACCEPTABLE STABILITIES UNDER TEST CONDITIONS ARE THE BASIC BORATE (0.15N NaOH-3000 PPM B) AND BASIC BORATE THIOSULFATE (1 WT PERCENT Na₂S₂O₃-0.15N NaOH-3000 PPM B). HOWEVER, EVEN THESE DEMONSTRATE A RADIOLYTIC GAS GENERATION (H₂) SUFFICIENT TO BE A POSSIBLE SAFETY HAZARD. VARIOUS STUDIES HAVE BEEN CARRIED OUT TO ESTABLISH G(G₂) VALUES AND/OR EQUILIBRIUM RADIOLYTIC GAS CONCENTRATIONS. OTHER STUDIES WERE CARRIED OUT ON POSSIBLE SPRAY SOLUTION INTERACTION WITH REACTOR CONTAINMENT METALS AND ALLOYS.

BORON + CHEMICAL REACTION + CONTAINMENT SPRAY + RADIATION DAMAGE + SODIUM + THIOSULFATE + THERMAL CONSIDERATION + CORROSION + RADIOLYTIC GAS + ADDITIVE + HYDROXIDE + RADIATION EFFECT + STABILITY

061582

LIMITED D

BISHOP WA + NITTE DA

STABILITY OF THIOSULFATE SPRAY SOLUTIONS

BABBICK AND WILCOX, LYNCHBURG, VIRGINIA

5 PAGES, NUCLEAR TECHNOLOGY, 10(4), PG. 449-453 (APRIL 1971)

ALTHOUGH CHEMICAL SPRAYS ARE EFFECTIVE FOR REMOVING RADIOACTIVE IODINE, THE SUITABILITY OF A

061582 *CONTINUED*

PARATRICULAR CHEMICAL SOLUTION FOR USE IN THE REACTOR BUILDING SPRAY SYSTEM DEPENDS UPON THE SOLUTIONS STABILITY AND COMPATIBILITY IN THE ENVIRONMENT PRODUCED BY LOCA. THE SUITABILITY OF ALKALINE SODIUM THIOSULFATE FOR USE IN THE REACTOR BUILDING SPRAY SYSTEM AS AN IODINE-REMOVAL AGENT HAS BEEN THE SUBJECT OF AN EXTENSIVE RESEARCH AND DEVELOPMENT PROGRAM BY BARCOCK AND WILCOX. THE RESULTS OF THE PROGRAM DEMONSTRATE THE STABILITY AND COMPATIBILITY OF THE SODIUM-THIOSULFATE SPRAY SOLUTION.

BORON + CHEMICAL REACTION + CONTAINMENT SPRAY + IODINE + OXIDATION + SODIUM + THIOSULFATE + CORROSION + RADIOLYTIC GAS + ADDITIVE + HYDROXIDE + STABILITY + EFFECT, PH

065064

LIMITED DISTRIBUTION

CERRAI E + GADDA F + RONCHETTI C + SCARONI A
DEVELOPMENT PROGRAM ON THE APPLICATION OF STEAM-WATER SPRAY TO REACTOR COOLING. IN-PILE EXPERIMENTS ON STEAM-WATER MIXTURES - EQUIPMENT AND METHODS OF MEASUREMENT
CENTRO INFORMAZIONI STUDI EXPERIENZE, MILAN, ITALY
CISE-R-139 +. 52 PAGES, MARCH 1968

DESCRIBES EQUIPMENT AND METHODS USED DURING WORK ON WATER CHEMISTRY AND CORROSION UNDER IRRADIATION CARRIED OUT UNDER CAN-3 RESEARCH. *** DISCUSSES FOLLOWING ITEMS - (1) METHODS USED FOR RADIOACTIVE CRUD ANALYSIS, (2) DESIGN AND CONSTRUCTION OF A SHIELDED CELL FOR DETERMINING CORROSION RATES ON RADIOACTIVE CORROSION SAMPLES, (3) ANALYSIS OF HYDROGEN IN ZIRCALOY-2 BY VACUUM HOT EXTRACTION TECHNIQUE, AND (4) ANALYSIS OF RADIOLYTIC GASES BY PRESSURE MEASUREMENTS AND BY ON-LINE CHROMATOGRAPHY.

CHROMATOGRAPHY + REACTIVITY EFFECT + STEAM + WATER + REACTOR COOLANT + CORROSION + IN PILE EXPERIMENT + RADIOCHEMICAL ANALYSIS + SPRAY + RADIOLYTIC GAS + ZIRCALOY

068022

LIMITED D

ROW TH
REACTOR CONTAINMENT-BUILDING SPRAY SYSTEMS FOR FISSION-PRODUCT REMOVAL
6 PAGES, 2 TABLES, 3 FIGURES, NUCLEAR SAFETY, 12(5), PAGE 516-22, SEPTEMBER - OCTOBER 1971

CONTAINMENT-BUILDING SPRAY SYSTEMS AS FISSION-PRODUCT-REMOVAL DEVICES ARE BECOMING WIDESPREAD IN PRESSURIZED-WATER-REACTOR DESIGN, AND THE AEC HAS BEEN SPONSORING A RESEARCH PROGRAM TO INVESTIGATE THE APPLICABILITY OF THESE SYSTEMS AS ENGINEERED SAFETY FEATURES. THE OAK RIDGE NATIONAL LABORATORY HAS COORDINATED THE PROGRAM FOR THE AEC AND MAINTAINED LIAISON BETWEEN COMMISSION-SPONSORED LABORATORIES AND NUCLEAR INDUSTRY. THREE-SPRAY SOLUTIONS ARE PRESENTLY IN USE OR BEING SERIOUSLY CONSIDERED BY PLANT DESIGNERS. MOLECULAR IODINE REMOVAL BY THESE SPRAYS IS VERY EFFECTIVE, AND DECONTAMINATION FACTORS RANGING FROM 20 AND 1000 MAY BE OBTAINED, DEPENDING ON THE SOLUTION SELECTED. THE EXPLOSION HAZARD FROM GENERATION OF RADIOLYTIC HYDROGEN, FIRST IDENTIFIED IN THIS PROGRAM IN 1967, CONTINUES TO REQUIRE SERIOUS CONSIDERATION IN PLANT DESIGN.

CONTAINMENT + CONTAINMENT SPRAY + DECONTAMINATION + EXPLOSION + DECONTAMINATION FACTOR

074257

LIMITED D

HYDROGEN MIXING AND MONITORING EQUIPMENT IN DRESDEN-1 CONTAINMENT
COMMONWEALTH EDISON CO.
2 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), APRIL 5, 1973, DOCKET 50-10, TYPE--BWR, MFG--G.E., AE--BECHTEL

THE GENERIC REPORT ON DRESDEN-2 TYPE OF CONTAINMENT NOTES THAT IGNITION AND COMBUSTION ARE DIFFICULT TO INITIATE AND SUSTAIN IN LARGE VOLUMES. DRESDEN-1 CONTAINMENT HAS 18 TIMES THIS VOLUME; ALSO THERMAL CONVECTION RESULTING FROM ATMOSPHERIC COOLING OF THE CONTAINMENT WALLS OCCURS. THE CONTAINMENT SPRAY SYSTEM SPRAYS WATER DOWN THE INSIDE WALLS. THIS WOULD COOL HYDROGEN AND INCREASE MIXING AND THERMAL CONVECTION. THEREFORE, NO ADDITIONAL EQUIPMENT WILL BE INSTALLED AND NO MONITOR IS REQUIRED.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + CONTAINMENT SPRAY + DRESDEN 1 (BWR) + CONTAINMENT STRUCTURE + MODIFICATION + MONITOR + EQUIPMENT + FLOW, CONVECTION + CONCENTRATION

074681

LIMITED D

RESPONSE TO QUESTION 6.19 - PREVENTION OF HYDROGEN STRATIFICATION
DUQUESNE LIGHT CO.
DOCKET-50334-60 +. 1 PAGE, PG. 6.19-1 OF AMENDMENT 1 FOR BEAVER VALLEY 1 FSAR, APRIL 16, 1973, DOCKET 50-334, TYPE--PWR, MFG--WEST., AE--STCNE+WEBSTER

THE INTERNAL DESIGN OF THE CONTAINMENT STRUCTURES ALLOWS AIR TO CIRCULATE FREELY. ALL CUBICLES AND COMPARTMENTS WITHIN THE CONTAINMENT ARE OPEN AT THE TOP AND ALLOW AIR CIRCULATION. CONVECTIVE MIXING IN CONJUNCTION WITH CONTAINMENT SPRAY ASSURES A UNIFORM MIXTURE OF HYDROGEN IN THE CONTAINMENT. CONTAINMENT SYSTEM EXPERIMENT TESTS HAVE VERIFIED THAT ADEQUATE MIXING OF THE CONTAINMENT ATMOSPHERE IS ACHIEVED BY THE CONTAINMENT SPRAY SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

074681 *CONTINUED*
CONTAINMENT SPRAY + REACTOR, PWR + CONTROL + CONTAINMENT STRUCTURE + RESPONSE TO NRC QUESTION + FLOW, MIXING +
FLOW, CONVECTION + REAVER VALLEY 1 (PWR)

074755
REVISIONS TO THE PSAR
MISSISSIPPI POWER AND LIGHT COMPANY
DOCKET-50416-20 +. 34 PAGES, AMENDMENT 5 TO GRAND GULF PSAR, APRIL 9, 1973, DOCKETS 50-416/417, TYPE--BWR, MFG--
-C.E., AE--BECHTEL

CONTAINS REVISED PAGES TO THE PRELIMINARY SAR CONCERNING CONTAINMENT COOLING, CONTROL OF THE
HYDROGEN CONCENTRATION AFTER A LOCA, AND THE RESIDUAL-HEAT-REMOVAL SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + CONTAINMENT SPRAY + CONTROL + REPORT, PSAR + SHUTDOWN COOLING SYSTEM + EMERGENCY COOLING SYSTEM
+ CONCENTRATION + GRAND GULF 2 (BWR) + GRAND GULF 1 (BWR)

078937
ZITTEL HE + LUPICA SB + BATE LC
IMPROVED BASE-BORATE REACTOR SAFETY SPRAY SOLUTION FOR RADIOLYTIC HYDROGEN SUPPRESSION
U.S. PATENT 3,691,084 +. SEPTEMBER 12, 1972

AS A NEW COMPOSITION OF MATTER, WATER OR AN AQUEOUS SOLUTION OF SODIUM HYDROXIDE CONTAINING UP TO
3000 PPM BORON AS THE BORATE, SAID WATER OR SOLUTION HAVING A PH IN THE RANGE 5.8 TO 12.1, SAID
WATER OR SOLUTION CONTAINING A REAGENT SELECTED FROM THE GROUP CONSISTING OF NA2WO4, NA2CO3,
NA2HPO4, AND NAHPO3 AT A CONCENTRATION OF 1 X 10⁻⁶ TO 0.002 M, WHICH IS EFFECTIVE TO
SUPPRESS HYDROGEN FORMATION RESULTING FROM IRRADIATION OF SAID SOLUTION IN A NUCLEAR REACTOR.

AVAILABILITY - THE U.S. PATENT OFFICE, DEPARTMENT OF COMMERCE, WASHINGTON, D.C.

BORON + SPRAY + RADIOLYTIC GAS + UNITED STATES + PATENT + SOLUTION

080415
ZITTEL HE
POST-ACCIDENT HYDROGEN GENERATION FROM PROTECTIVE COATINGS IN POWER REACTORS
OAK RIDGE NATIONAL LABORATORY, TENNESSEE
4 PAGES, 3 TABLES, 2 REFERENCES, NUCLEAR TECHNOLOGY, 17(2), PP. 143-146 (FEBRUARY 1973)

PROTECTIVE COATINGS APPLIED TO THE INTERIOR SURFACES OF REACTOR CONTAINMENT FACILITIES MAY CONSIST
OF A PAINT COVER OVER A ZINC-RICH PRIMER COAT. IN CASE OF A DESIGN BASIS ACCIDENT, THIS COATING
MAY BE EXPOSED TO EXTREMES OF TEMPERATURE AND RADIATION WHILE EXPOSED TO HOT BORATED SUPPRESSION
SOLUTION. THE REACTION BETWEEN THE ZINC-RICH PRIMER COAT AND THE HOT SOLUTION MAY RESULT IN THE
GENERATION OF HYDROGEN. COATED COUPONS OBTAINED FROM MAJOR PAINT VENDORS WERE EXPOSED TO VARIOUS
SPRAY SOLUTIONS UNDER PROXIMATE DESIGN BASIS ACCIDENT (DBA) CONDITIONS. UP TO THE THEORETICAL
AMOUNT OF HYDROGEN WAS EVOLVED.

REACTOR, BWR + CHEMICAL REACTION + CONTAINMENT SPRAY + REACTOR, PWR + ZINC + CONTAINMENT PAINT + SPRAY +
SURFACE, PAINTED + ACCIDENT, DESIGN BASIS

081147
RESPONSE TO QUESTION 5.24 - CONTAINMENT ATMOSPHERIC DILUTION SYSTEM
NIAGARA MOHAWK POWER CORP.
DOCKET-50410-14+. 1 PAGE, PG. 5.24-1 OF AMENDMENT 5 TO NINE MILE POINT PSAR, JAN. 10, 1973, DOCKET 50-410,
TYPE--BWR, MFG--G.E., AE--STONE AND WEBSTER

PROVIDES DETAIL ON EVALUATION OF THE ADEQUACY OF THE CAD SYSTEM TO FUNCTION AS A BACKUP SYSTEM
FOR THE CONTROL OF COMBUSTIBLE GASES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + CONTAINMENT SPRAY + CONTROL + RESPONSE TO NRC QUESTION + CONTAINMENT ATMOSPHERE, INERT + SYSTEM
OPERABILITY IN ACCIDENT + FLOW, MIXING + CONCENTRATION + NINE MILE POINT 2 (BWR)

083577
REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS
PUBLIC SERVICE ELECTRIC AND GAS COMPANY
DOCKET-50272-60 +. 87 PAGES, AMENDMENT 21 TO SALFM 1 AND 2 LICENSE APPLICATION, APRIL 12, 1973, DOCKET 50-
272, TYPE--PWR, MFG--WEST., AE--PUBLIC SERVICE OF NY

CONTAINS NEW AND REVISED PAGES TO THE FINAL SAR CONCERNING DESIGN PARAMETERS AND CONTAINMENT-HEAT-
REMOVAL SYSTEM. RESPONDS TO AEC QUESTIONS CONCERNING WIND STATISTICS, SENSITIZATION OF STAINLESS
STEEL, CONTAINMENT SPRAY, HYDROGEN MONITORING SYSTEM, AND CRANE LIFTING RIGS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

NRC QUESTION + CONTAINMENT SPRAY + DESIGN CRITERIA + REACTOR, PWR + REPORT, SAR + STEEL, STAINLESS +

083577 *CONTINUED*
CONTAINMENT AIR COOLING + MONITOR + WIND STATISTICS + DAMAGE + HEAT TREATMENT + SALEM 1 (PWR) + SALEM 2 (PWR)
+ CRANE

085861
RESPONSE TO QUESTION 5.19.4 - PREVENTION OF GAS STRATIFICATION
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50404-21 +. 1 PAGE, PG. 5.19.4-1 OF AMENDMENT 7 TO NORTH ANNA 3 AND 4 LICENSE APPLICATION, AUGUST 15,
1972. DOCKET 50-404/405, TYPE--PWR, MFG--B&W, AE--STONE & WEBSTER

THE INTERNAL DESIGN OF THE CONTAINMENT STRUCTURES ALLOWS AIR TO CIRCULATE FREELY. ALL CUBICLES
AND COMPARTMENTS WITHIN THE CONTAINMENT ARE OPEN AT THE TOP AND ALLOW AIR CIRCULATION.
CONVECTIVE MIXING IN CONJUNCTION WITH CONTAINMENT SPRAY ASSURES A UNIFORM MIXTURE OF HYDROGEN IN
THE CONTAINMENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT + CONTAINMENT SPRAY + REACTOR, PWR + CONTROL + RESPONSE TO NRC QUESTION + FLOW, MIXING + FLOW,
CONVECTION + NORTH ANNA 3 (PWR) + NORTH ANNA 4 (PWR)

089976
REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS
VIRGINIA ELECTRIC AND POWER COMPANY
DOCKET-50404-28 +. 71 PAGES, AMENDMENT 12 TO NORTH ANNA 3 AND 4 LICENSE APPLICATION, NOVEMBER 15, 1972.
DOCKET 50-404/405, TYPE--PWR, MFG--B&W, AE--STONE & WEBSTER

CONTAINS A COMPANY PROSPECTUS AND REVISED PAGES ON CONTAINMENT DESIGN. INCLUDES NEW AND REVISED
RESPONSES TO AEC QUESTIONS CONCERNING THE LOCA, HYDROGEN CONTROL, TESTING OF THE SPRAY SYSTEM,
ENVIRONMENTAL MONITORING SYSTEM, AND CORE REFLOODING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT ANALYSIS + NRC QUESTION + CONTAINMENT DESIGN + CONTAINMENT SPRAY + ACCIDENT, LOSS OF COOLANT +
REACTOR, PWR + CONTROL + REPORT, PSAR + MONITORING PROGRAM, ENVIRONMENTAL + NORTH ANNA 3 (PWR) + NORTH ANNA 4
(PWR)

089778
REVISIONS TO THE SAR AND RESPONSE TO AEC QUESTIONS
MISSISSIPPI POWER AND LIGHT COMPANY
DOCKET-50416-50 +. 48 PAGES, AMENDMENT 11 TO GRAND GULF 1 AND 2 LICENSE APPLICATION, AUGUST 24, 1973, DOCKET
50-416/417, TYPE--BWR, MFG--G.E., AE--BECHTEL

CONTAINS NEW AND REVISED PAGES TO THE PRELIMINARY SAR CONCERNING CORE BOUNDARY NEUTRON FLUXES AND
AREA GEOLOGY. INCLUDES RESPONSES TO AEC QUESTIONS CONCERNING HYDROGEN CONTROL AND THE
CONTAINMENT SPRAY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

NRC QUESTION + REACTOR, BWR + CONTAINMENT SPRAY + FLUX DISTRIBUTION + GEOLOGY + SITING, REACTOR + CONTROL +
NEUTRON + REPORT, PSAR + GRAND GULF 2 (BWR) + GRAND GULF 1 (BWR)

091714
RESPONSE TO QUESTION 6.2.16 - CONTAINMENT VESSEL PENETRATIONS
TOLEDO EDISON COMPANY
DOCKET-50346-67 +. 1 PAGE, PG. 6.2.16-1 OF AMENDMENT 17 TO DAVIS-BESSE LICENSE APPLICATION, NOVEMBER 19,
1973. DOCKET 50-346, TYPE--PWR, MFG--B&W, AE--BECHTEL

THE CONTAINMENT VESSEL AIR SAMPLE INLET AND OUTLET LINES ARE NOW PROVIDED WITH AUTOMATIC ISOLATION
VALVES INSIDE AND OUTSIDE OF THE CONTAINMENT VESSEL, WHICH COMPLY WITH GENERAL DESIGN CRITERION
56. THE HYDROGEN DILUTION SYSTEM INLET LINES ARE PROVIDED WITH CHECK VALVES INSIDE THE
CONTAINMENT VESSEL WHICH COMPLY WITH THE CRITERION. THE CONTAINMENT VESSEL SPRAY LINES ARE
OPENED BY THE SFAS FOLLOWING A LOCA. ALTHOUGH THEY OPEN TO THE CONTAINMENT VESSEL ATMOSPHERE,
EXTERNAL TO THE CONTAINMENT VESSEL, THIS SYSTEM FORMS A CLOSED LOOP.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U.S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT SPRAY + CONTAINMENT ISOLATION + REACTOR, PWR + CONTROL + SAMPLING + RESPONSE TO NRC QUESTION +
CONTAINMENT PENETRATION, PIPE + PENETRATIONS, PRIMARY CONTAINMENT

096648
REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS
OFFSHORE POWER SYSTEMS, JACKSONVILLE, FLORIDA
DOCKET-STN-50437-25 +. 366 PAGES, AMENDMENT 5 TO OFFSHORE POWER SYSTEMS' LICENSE APPLICATION, MARCH 25, 1974,
DOCKET-STN-50-437

AMENDS THE APPLICATION FOR LICENSE TO MANUFACTURER BY CHANGES AND ADDITIONS TO THE PLANT DESIGN
REPORT. ITEMS INCLUDE NONSEISMIC COMPONENT DESIGN, MAIN COOLING SYSTEM INTEGRITY, CONTAINMENT

096648 *CONTINUO*

SPRAY SYSTEM, ICE CONDENSER, POTENTIAL LEAKAGE PATHS FROM CONTAINMENT, HYDROGEN CONTROL, EFFLUENTS, INITIAL TESTING, ACCIDENT ANALYSIS CONCERNING CONTAINMENT PRESSURE, AND RELEASE RATES FOR LOCA. RESPONSES TO AEC QUESTIONS ARE GIVEN AS REFERENCES TO SPECIFIC SECTIONS.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

ACCIDENT ANALYSIS + NEC QUESTION + CONTAINMENT SPRAY + DESIGN CRITERIA + EFFLUENT + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + REPORT, SAR + TESTING + CONTAINMENT INTEGRITY + CONTROL + EQUIPMENT + CONTAINMENT, ICE CONDENSER + OFFSHORE POWER SYSTEMS (PWR) + POWER PLANT, FLOATING

096783

RESPONSE TO QUESTION 6.84 - HYDROGEN RECIRCULATION SYSTEM
GENERAL ELECTRIC COMPANY

DOCKET-STN-50447-19 +. 1 PAGE, PAGE 06.84 OF AMENDMENT 10 TO GESSAR, JANUARY 18, 1974, DOCKET-STN-50-447, TYPE--BWR, MFG--G.E., AE--NOT GIVEN

PROVIDES THE RESULTS OF AN ANALYSIS OF THE PLANT'S CAPABILITY TO ALLOW INITIATION OF THE HYDROGEN RECIRCULATION SYSTEM AT 10 MINUTES FOLLOWING A LOSS-OF-COOLANT ACCIDENT. DEFINES THE SPECTRUM OF PRIMARY SYSTEM BREAK SIZES FOR WHICH THIS CAPABILITY MAY EXIST AND DISCUSSES THE SPECIFIC LIMITATIONS WHICH DETERMINE THE UNACCEPTABLE BREAK RANGES.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

REACTOR, PWR + CONTAINMENT SPRAY + ACCIDENT, LOSS OF COOLANT + RESPONSE TO NEC QUESTION + SYSTEM CAPABILITY

097712

SILVERMAN L + THOMPSON TJ + MORRISON DL

THE TECHNOLOGY OF NUCLEAR REACTOR SAFETY (VOL. 2). CHAPTER 19 - FISSION PRODUCT BEHAVIOR AND RETENTION IN CONTAINMENT SYSTEMS

HARVARD UNIV., CAMBRIDGE + MASSACHUSETTS INST. OF TECHNOLOGY, CAMBRIDGE
78 PAGES, PP. 619-697, PUBLISHED BY THE MIT PRESS, CAMBRIDGE, 1973

CHAPTER 19 DISCUSSES THE MECHANISMS FOR THE RELEASE OF FISSION PRODUCTS FROM THE FUEL ELEMENTS AND GIVES ESTIMATES OF THE FRACTIONAL RELEASES OF VARIOUS TYPES OF FISSION-PRODUCT NUCLIDES. THE CONCEPTS OF REACTOR CONTAINMENT AND POSSIBLE LEAKAGE FROM IT DURING AN ACCIDENT ARE DISCUSSED IN A LATER CHAPTER. THIS CHAPTER IS CONCERNED WITH THE TRANSPORT AND DEPOSITION OF FISSION PRODUCTS AFTER THEY LEAVE THE FUEL ELEMENT AND THE MEANS AVAILABLE FOR FISSION-PRODUCT RETENTION WITHIN THE CONTAINMENT BY BOTH NATURAL AND ENGINEERED PROCESSES.

CONTAINMENT SPRAY + FISSION GAS RELEASE + FISSION PRODUCT RELEASE + FOAM + IGURINE + FISSION PRODUCT TRANSPORT + CHARCOAL + ORGANIC IODIDE + COATING + SPRAY + FISSION PRODUCT RETENTION + ENGINEERED SAFETY FEATURE

100101

REVISIONS TO THE SAR

COMBUSTION ENGINEERING, INC., CONN.

DOCKET-STN-50470-10 +. 534 PAGES, AMENDMENT 4 TO GESSAR SYSTEM 80 LICENSE APPLICATION, JULY 1, 1974, DOCKET STN 50-470, TYPE--PWR, MFG--COMB., AE--NONE

CONTAINS NEW AND REVISED PAGES TO THE PRELIMINARY SAR CONCERNING REACTOR INTERNALS, FUEL ROD AND CONTROL ELEMENT DESIGN, REACTOR COOLANT BOUNDARY VALVES, STEAM GENERATORS, CONTAINMENT SPRAY, HYDROGEN CONTROL AFTER LOCA, FAILURE MODE ANALYSIS, IODINE REMOVAL EFFECTIVENESS (APPENDIX 6C), FUEL STOPAGE AND HANDLING, INSERVICE TESTING, AND VALVE TABULATIONS BY SYSTEMS.

AVAILABILITY - MICROSURANCE, INC., P.O. BOX 3522 OAK RIDGE, TENN. 37830

CONTAINMENT SPRAY + FISSION PRODUCT, IODINE + FUEL HANDLING + REACTOR, PWR + FUEL STOPAGE + CONTROL + REPORT, PSAR + CORE COMPONENTS + STEAM GENERATOR + FAILURE MODE ANALYSIS + GESSAR (PWR) + STANDARDIZATION + CONTROL RODS + VALVES + FUEL ELEMENTS

KEYWORD INDEX

A COLLECTION OF KEYWORDS IS USED TO DENOTE THE MAIN SAFETY RELATED POINTS COVERED IN EACH ARTICLE. THE FOLLOWING INDEX IS AN ALPHABETICAL LISTING OF THE KEYWORDS GIVING REFERENCES TO EACH ARTICLE WHICH WAS KEYED TO IT.

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REACTOR SAFETY SPRAY SOLUTION FOR RADIOLYTIC HYDROGEN	SUPPRESSION*	#IMPROVED BASE-BORATE	078937 P 5
#RESPONSE TO QUESTION 6.64 - HYDROGEN RECIRCULATION	SYSTEM*		096783 P 7
#RESPONSE TO QUESTION 5.24 - CONTAINMENT ATMOSPHERIC DILUTION	SYSTEM*	#RESPONSE	081147 P 5
#DESIGN CONSIDERATIONS OF REACTOR CONTAINMENT SPRAY	SYSTEMS - PART VIII. BOILING WATER REACTOR ACCIDENT		056705 P 3
#REACTOR CONTAINMENT-BUILDING SPRAY	SYSTEMS FOR FISSION-PRODUCT REMOVAL*		086022 P 4
19 - FISSION PRODUCT BEHAVIOR AND RETENTION IN CONTAINMENT	SYSTEMS*	OF NUCLEAR REACTOR SAFETY (VOL. 2). CHAPTER	097712 P 7
#SPRAY AND ABSORPTION	TECHNOLOGY (PART III)*		027037 P 2
FISSION PRODUCT BEHAVIOR AND RETENTION IN CONTAINMENT #THE	TECHNOLOGY OF NUCLEAR REACTOR SAFETY (VOL. 2). CHAPTER 19 -		097712 P 7
INFLUENCE OF ZIRCONIUM CLADDING ON THE LOFT LOSS-OF-COOLANT	TEST*	#THE	088007 P 1
#RADIATION AND	THERMAL STABILITY OF SPRAY SOLUTIONS*		061580 P 3
#STABILITY OF	THIOSULFATE SPRAY SOLUTIONS*		0

#GUAU-CITIES STATION, UNIT 1 - PLANT DESIGN ANALYSIS, VOLUME 1*	011366 P 1
#RESPONSE TO QUESTION 6.2.16 - CONTAINMENT CONSIDERATIONS OF REACTOR CONTAINMENT SPRAY SYSTEMS - PART VIII. BOILING WATER REACTOR ACCIDENT RADIOLYSIS STUDIES*	091714 P 6
RETENTION 1. #THE TECHNOLOGY OF NUCLEAR REACTOR SAFETY (VOL. 2), CHAPTER 19 - FISSION PRODUCT BEHAVIOR AND VOLUME 1*	056705 P 3
#GUAU-CITIES STATION, UNIT 1 - PLANT DESIGN ANALYSIS, VOLUME 1*	097712 P 7
	011366 P 1
SPRAY TO REACTOR COOLING. IN-PILE EXPERIMENTS ON STEAM- WATER MIXTURES - EQUIPMENT AND METHODS OF MEASUREMENT*	065064 P 4
#QUESTION 1.5--CONTAINMENT CAPABILITY WITH ZIRCONIUM- WATER REACTION*	019708 P 1
OF REACTOR CONTAINMENT SPRAY SYSTEMS - PART VIII. BOILING WATER REACTOR ACCIDENT RADIOLYSIS STUDIES* CONSIDERATIONS	056705 P 3
STEAM- #DEVELOPMENT PROGRAM ON THE APPLICATION OF STEAM- WATER SPRAY TO REACTOR COOLING. IN-PILE EXPERIMENTS ON	065064 P 4
#THE INFLUENCE OF ZIRCONIUM CLADDING ON THE LOFT LOSS-OF-COOLANT TEST*	008807 P 1
#QUESTION 1.5--CONTAINMENT CAPABILITY WITH ZIRCONIUM-WATER REACTION*	019708 P 1

4. FUEL MELTDOWN

000166
SCATENA GJ
CONSEQUENCES OF A POSTULATED FLOW BLOCKAGE INCIDENT IN A BOILING WATER REACTOR
GENERAL ELECTRIC COMPANY
NECJ-10174 +. 95 PAGES, FIGURES, TABLES, 67 REFERENCES, MAY 1970

THE CONSEQUENCES IN TERMS OF FUEL DAMAGE, FISSION PRODUCT RELEASE, LOCAL HIGH-PRESSURE PRODUCTION, AND POSSIBLE PROPAGATION TO ADJACENT ASSEMBLIES HAVE BEEN EVALUATED. THE CONCLUSIONS ARE THAT A FLOW BLOCKAGE INCIDENT WILL NOT RESULT IN LOCAL HIGH-PRESSURE PRODUCTION OF PROPAGATE TO ADJACENT ASSEMBLIES EVEN AT FULL REACTOR POWER CONDITIONS. FUEL CLADDING FAILURE WILL ONLY OCCUR FOR BLOCKAGES GREATER THAN 90 PERCENT EVEN FOR THE MOST SEVERE COMBINATION OF EVENTS, NAMELY A COMPLETE FLOW BLOCKAGE AT FULL POWER. THE REACTOR PROTECTION SYSTEM OFFERS ADEQUATE PROTECTION IN PREVENTING CLADDING OF FUEL MELTING.

AVAILABILITY - ARC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + ACCIDENT, CONSEQUENCES + FISSION PRODUCT RELEASE + FUEL INTEGRITY + ACCIDENT, LOSS OF FLOW + THERMAL MECHANICAL EFFECT + FAILURE, CLADDING + PRESSURE TRANSIENT

002049
WRIGHT RW + ZIVI SM
KINETIC STUDIES OF HETEROGENEOUS WATER REACTORS
THOMPSON RAMP WCOLORIDGE INC.
STL-6306 +. 32 PAGES, 1- FIGURES, TABLE, 14 REFERENCES, JULY 15, 1963

PROGRESS REPORT. AN EXPERIMENT TO SIMULATE GENERATION OF PRESSURE PULSES BY ELECTRICAL MEANS IS DESCRIBED. AN INITIAL PRESSURE PULSE OCCURRED DUE TO VAPORIZATION OF THE FUEL SURFACE. AS THE RETURNING WATER IMPACTS ON THE FUEL, ANOTHER PRESSURE PEAK OCCURS AND THE SEQUENCE IS REPEATED. THE IMPACT OF THE RETURNING WATER MIGHT HAVE DISPERSED THE MELTING FUEL SURFACE IN SL-1, CAUSING THE DESTRUCTIVE PULSE. CALCULATION OF FUEL MELTING IN THE DESTRUCTION OF THE BORAX-1 AND SPERT-1 TESTS ARE GIVEN.

HEAT TRANSFER, BOILING + REACTOR, BWR + BORAX, ALL (S-RR) + REACTOR, SAFETY RESEARCH + REACTOR TRANSIENT + SPERT 1 (S-RR) + TEST, DESTRUCTIVE + SL 1 (BWR) + SIMULATION + PRESSURE PULSE

002436
FINAL REPORT ON SL-1 RECOVERY OPERATION
GENERAL ELECTRIC COMPANY, IDAHO TEST STATION
IDC-19311 +. 306 PAGES, 181 FIGURES, 19 TABLES, JULY 27, 1962

RECOVERY CONSISTED IN REMOVING THE PRESSURE VESSEL TO THE HOT SHOP FOR EXAMINATION. PROBLEMS INCLUDED RADIATION LEVELS UP TO 200 R/HR. EXAMINATION REVEALED THAT IT HAD BEEN SUBJECTED TO EXTREMELY HIGH PRESSURES. ANALYSIS INDICATED THAT THE CENTRAL CONTROL ROD WAS MANUALLY WITHDRAWN 20 IN., INTRODUCING 2.4% EXCESS REACTIVITY, POWER ROSE ON A 4 MILLISEC PERIOD TO LEVEL OF 1.9 TIMES 10(10TH) WATTS. TOTAL NUCLEAR ENERGY GENERATED WAS 130 MW-SEC. CHEMICAL REACTION ADDED 25% MORE ENERGY. RAPID STEAM FORMATION RESULTED IN WATER-IMPACT PRESSURE OF 10,000 PSI. SHIELD PLUGS WERE EJECTED, PRESSURE VESSEL SHEARED PIPING AND WAS LIFTED 9 FT. FIVE % OF GROSS FISSION PRODUCTS WERE EJECTED FROM VESSEL.

INCIDENT, SL 1 + REACTOR, BWR + DECONTAMINATION + FISSION PRODUCT RELEASE + FAILURE, OPERATOR ERROR + PRESSURE VESSELS + INCIDENT, FATALITY + EXCURSION, LARGE + INCIDENT, RECOVERY FROM + SAFETY PRINCIPLES AND PHILOSOPHY + DAMAGE + PRESSURE PULSE

002812
BUCHANAN JR
U. S. REACTOR CONTAINMENT EXPERIENCE- A HANDBOOK OF CURRENT PRACTICE AND ANALYSIS, DESIGN, CONSTRUCTION, TEST, AND OPERATION. CHAPTER 12-RESEARCH
OAK RIDGE NATIONAL LABORATORY
27 PAGES, 4 TABLES, 120 REFERENCES- AUGUST 1965, ORNL-NSIC-5, VOL. 11- CFST1

BRIEF DESCRIPTIONS OF THE MAJOR U. S. CONTAINMENT RESEARCH PROJECTS ARE PRESENTED IN THIS CHAPTER ALONG WITH SUMMARIES OF REFERENCES THAT DESCRIBE THE WORK. THE CHAPTER CONCLUDES WITH A DISCUSSION OF THE FUTURE AIMS OF CONTAINMENT RESEARCH.

- 12-1 INTRODUCTION
- 12-2 STUDIES OF THE RESPONSE OF VESSELS, PIPING, AND OUTER CONTAINMENT STRUCTURES
- 12-3 LOSS-OF-COOLANT ACCIDENT STUDIES
- 12-4 METAL-WATER REACTIONS AND METAL IGNITIONS
- 12-5 STUDIES OF FISSION PRODUCT RELEASE, AEROSOL, AND PARTICULATE GENERATION, AND TRANSPORT OF RADIOACTIVITY
- 12-6 FUTURE AIMS OF CONTAINMENT RESEARCH PROGRAMS

AIR CLEANING + CHEMICAL REACTION + CONTAINMENT DESIGN + CONTAINMENT SPRAY + CONTAINMENT VESSEL LOADING + CONTAINMENT, PRESSURE SUPPRESSION + FISSION PRODUCT RELEASE + ACCIDENT, LOSS OF COOLANT + MISSILE GENERATION AND PROTECTION + PARTICLE + PRESSURE VESSELS + CONTAINMENT, SHOCK GENERATION AND PROTECTION + FISSION PRODUCT TRANSPORT + CONTAINMENT P AND D + ANL + AI + BNL + CONTAINMENT STRUCTURE + BATTELLE NORTHWEST + PIPES AND

BLANK PAGE

002812 *CONTINUED*
PIPE FITTINGS + FILTERS

005196
WEIR JR
ARGONNE TRANSIENT REACTOR TEST FACILITY
OAK RIDGE NATIONAL LABORATORY
3 PAGES, 3 TABLES- NUCLEAR SAFETY, 6(2)- 169-171, REFS. 73-94 ON P. 181 (WINTER 1964-1965)- GPO

THE REACTOR HAS BEEN USED FOR FUEL-ELEMENT MELTDOWN EXPERIMENTS AND FOR STUDIES OF METAL-WATER REACTIONS DURING TRANSIENTS.

CRITICAL ASSEMBLY + OXIDATION + REACTOR DESCRIPTION + TESTING

006316
ADAMS RM + GLASSNER A
NUCLEAR SAFETY
ARGONNE NATIONAL LABORATORY
5 PAGES, 1 FIGURE, 1 TABLE, 4 REFERENCES- PAGES 91-95 FROM REACTOR DEVELOPMENT PROGRAM PROGRESS REPORT, FEBRUARY 15, 1964, ANL-6840- CFSTI

(A) OXIDATION RATES OF V - 10 W/O MO ALLOY FOR SUPER KUKLA. (B) THERMAL CONDUCTIVITY OF METAL POWDERS (REDUCE LIKELIHOOD OF PYROPHORIC REACTIONS). (C) METAL-WATER REACTIONS OF AL, ZR, AND SS CLADINGS, BOTH OUT-OF-PILE AND IN TREAT.

ALUMINUM + CLADDING + OXIDATION + ZIRCONIUM + STEEL, STAINLESS + ANL + IRRADIATION TESTING

006388
PARKER GW + LOWENZ RA + WILHELM JG
RELEASE OF FISSION PRODUCTS FROM REACTOR FUELS DURING TRANSIENT ACCIDENTS SIMULATED IN TREAT
OAK RIDGE NATIONAL LABORATORY
41 PAGES, 6 TABLES, 17 FIGURES, 6 REFERENCES- CONF-650407, INTERNATIONAL SYMPOSIUM ON FISSION PRODUCT RELEASE AND TRANSPORT UNDER ACCIDENT CONDITIONS, APRIL 5-7, 1965, OAK RIDGE, TENN.- CFSTI

THE PURPOSE OF THE ORNL FISSION-PRODUCT-RELEASE EXPERIMENTS CONDUCTED IN THE TREAT REACTOR IS TO STUDY THE RELEASE OF RADIOACTIVE MATERIAL FROM FUEL DURING A REACTOR TRANSIENT IN WHICH THE FUEL CLADDING FAILS OR THE FUEL MELTS OR VAPORIZES RAPIDLY AS A RESULT OF A NUCLEAR ACCIDENT. THE OBJECTIVES OF THIS PROGRAM ARE TO MEASURE AND INTERPRET THE RELEASE OF FISSION PRODUCTS AS A FUNCTION OF FUEL TYPE, CLADDING, ATMOSPHERE, BURNUP, AND TRANSIENT CHARACTERISTICS. THE EXTENT OF REACTION OF WATER (STEAM) WITH METAL CLADDING AND WITH UO₂ FUEL IS DETERMINED IN EXPERIMENTS HAVING A WATER OR STEAM ENVIRONMENT.

CESIUM + FISSION PRODUCT RELEASE + FISSION PRODUCT, IODINE + FISSION PRODUCT, NONVOLATILE + FISSION PRODUCT, VOLATILE + IN PILE EXPERIMENT + IODINE + REACTOR, SAFETY RESEARCH + REACTOR TRANSIENT + TELLURIUM + TREAT (PRR) + FISSION PRODUCT TRANSPORT + IN PILE EXPERIMENT + REACTOR + IRRADIATION TESTING + REACTOR, PULSED + FAILURE, CLADDING

006890
HYER FK + ROSE RP
ANNULAR-RING MODEL FOR LOFT MELTDOWN STUDIES
PHILLIPS PETROLEUM COMPANY
2 PAGES, 3 REFERENCES, ANS TRANSACTIONS 8(2), PAGES 539-40, 1965 WINTER MEETING OF THE AMERICAN NUCLEAR SOCIETY, WASHINGTON, D. C., NOVEMBER 15-18, 1965

SEVERAL TWO-DIMENSIONAL HEAT-TRANSFER MODELS ARE CURRENTLY UNDER CONSIDERATION TO TREAT THE CORE HEATUP WITH THERMAL RADIATION INCLUDED. THE ANNULAR-RING MODEL IS ONE SUCH TECHNIQUE AND IS BASED ON THE ASSUMPTION OF ANNULAR SYMMETRY. HEAT CONDUCTION WITHIN THE CLAD-FUEL MATERIAL IS EXPRESSED BY THE FOURIER EQUATION OF HEAT FLOW WRITTEN IN THE VOLUME INTEGRAL FORM. METAL-WATER REACTION ENERGY CONTRIBUTION IS TAKEN INTO ACCOUNT.

HEAT TRANSFER + ACCIDENT, LOSS OF COOLANT + ZIRCONIUM + LOFT (S-RR) + CORE MELTDOWN + MATHEMATICAL STUDY + MATHEMATICAL TREATMENT

008101
TREAT
ARGONNE NATIONAL LABORATORY
3 PAGES, 1 FIGURE- NOVEMBER 23, 1965- ANL-7115, PP. 79-81, REACTOR DEVELOPMENT PROGRAM PROGRESS REPORT, OCTOBER 1965- CFSTI, \$3.00 CY, \$0.75 MN

IN FOUR EXPERIMENTS OF THE METAL-WATER TRANSPARENT SERIES, URANIUM ALUMINUM ALLOY SPENT TYPE FUEL PLATES WERE SUBJECT TO INCREMENTAL TRANSIENTS STARTING FROM AMBIENT TEMPERATURE AND PRESSURE. EFFECTS RANGED UP TO EXTENSIVE REACTION AND FRAGMENTATION. DEBUGGING AND COMPONENT DESCRIPTION OF LARGE TREAT LOOP.

ALUMINUM + REACTOR, GRAPHITE MODERATED + TREAT (PRR) + URANIUM

008286
LIIMATAINEN RC
NUCLEAR REACTOR SAFETY- THE HIGH TEMPERATURE REACTIONS OF MOLTEN METALS WITH WATER
ARGONNE NATIONAL LABORATORY
ORNL-TR-694 +. 10 PAGES, TABLES, FIGURES, 5 REFERENCES- ARKHIMEDES, J. FINNISH PHYSICAL SOC. 1- 27-36 (1964)

THE SIGNIFICANCE OF CHEMICAL ENERGY IS EVALUATED IN RELATION TO A WATER-COOLED REACTOR WHEREIN THE NUCLEAR ENERGY RELEASE DURING A POWER EXCURSION OR LOSS OF COOLANT INCIDENT IS SUFFICIENT TO MELT THE FUEL ELEMENTS WHICH MAY THEN REACT EXOTHERMICALLY WITH THE WATER. EXPERIMENTAL RESULTS ARE SUMMARIZED FROM BOTH LABORATORY AND TREAT IN-PILE STUDIES ON REACTION OF MOLTEN ALUMINUM, MAGNESIUM, STAINLESS STEEL, URANIUM, AND ZIRCONIUM WITH WATER. THE DATA SHOW THAT THERE ARE THREE INTERRELATED PARAMETERS PERTINENT TO THE METAL-WATER HAZARDS ANALYSIS PROBLEMS FOR A GIVEN CORE MATERIAL- THEY ARE- THE ENERGY INPUT AS DETERMINED BY THE INTEGRATED POWER OF THE REACTOR PULSE, THE REACTOR PERIOD, AND THE PARTICLE SIZE INTO WHICH THE FRAGMENTED CORE MATERIAL IS DISPERSED. FINALLY, RATE LIMITING MECHANISMS AND APPROACHES TO CORRELATING AND PREDICTING METAL-WATER REACTIONS ARE PRESENTED.

ENERGY SOURCE + REACTOR, GRAPHITE MODERATED + ACCIDENT, LOSS OF COOLANT + METAL + REACTOR TRANSIENT + REACTOR, TEST + TREAT (PRR) + ANL

009097
LIFFENGREN DJ
EFFECTS OF CLADDING TEMPERATURE AND MATERIAL ON ECCS PERFORMANCE
GENERAL ELECTRIC COMPANY, SAN JOSE, CALIFORNIA
NEON-10179 +. 62 PAGES, FIGURES, TABLES, REFERENCES, JUNE 1970

THE EFFECTS OF CLADDING TEMPERATURE AND MATERIAL ON EMERGENCY CORE COOLING SYSTEM PERFORMANCE ARE INVESTIGATED. RESULTS OF SIMULATED FULL-LENGTH, FULL-SIZE BUNDLES WITH ELECTRICALLY HEATED RODS SUBJECTED TO COOLING BY SPRAYING OR FLOODING INDICATE THAT THE ECCS IS EFFECTIVE AT TEMPERATURE LEVELS SIGNIFICANTLY HIGHER THAN THOSE PREDICTED, OVER THE ENTIRE POSTULATED LOSS-OF-COOLANT ACCIDENT. THE ECCS CAN MAINTAIN PASIC CORE GEOMETRY AND PREVENT MELTING OF THE FUEL ROD CLADDING. ANY EFFECT OF MATERIAL ON THE PERFORMANCE OF THE ECCS IS LIMITED TO TEMPERATURE LEVELS ABOVE APPROXIMATELY 2300 F WHERE THE METAL-WATER REACTION OF THE ZIRCALOY BECOMES SIGNIFICANT.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, BWR + CORE SPRAY + CLADDING + FUEL INTEGRITY + ACCIDENT, LOSS OF COOLANT + THERMAL MECHANICAL EFFECT + STEEL, STAINLESS + TEST, BENCH + ZIRCALOY + SIMULATION + CORE REFLOODING SYSTEM + ENGINEERED SAFETY FEATURE + EMERGENCY COOLING SYSTEM + FUEL ELEMENTS

009854
SZAWLEWICZ SA
THE AEC REACTOR SAFETY PROGRAM
U. S. ATOMIC ENERGY COMMISSION
7 PAGES, PRESENTED AT THE ANS SYMPOSIUM ON LOCATING NUCLEAR POWER PLANTS IN CITIES, MARCH 22, 1966, NEW YORK CITY

STEERING COMMITTEE ON SAFETY RESEARCH. ACCIDENT-PREVENTING AND CONSEQUENCE-LIMITING SAFEGUARDS. ENGINEERED SAFEGUARDS. LOSS-OF-COOLANT ACCIDENT AND MECHANICAL LOAD IT CREATES, IN-CORE SPRAY AND EMERGENCY COOLING SYSTEM, METAL-WATER REACTION, FUEL MELTDOWN, FISSION-PRODUCT RELEASE, RELIABILITY OF PIPING. LIST OF PLANNED ORNL SUMMARY REPORT BUDGET, IN-PLANT TEST PROGRAM. NUCLEAR SAFETY PILOT PLANT, CONTAINMENT SYSTEMS EXPERIMENT, LOFT, POWER BURST FACILITY.

FISSION PRODUCT RELEASE + REACTOR, PWR + CSE + LOFT (S-RR) + PBF (S-RR) + NSPP + EMERGENCY COOLING + ENGINEERED SAFETY FEATURE

010112
LIIMATAINEN RC
NUCLEAR REACTOR SAFETY - THE MELTDOWN OF METALS AT HIGH TEMPERATURES AND METAL-WATER REACTIONS
ARGONNE NATIONAL LABORATORY
ORNL-TR-694 +. 14 PAGES, TABLES, FIGURES, REFERENCES, TRANSLATED FROM ARKHIMEDES, J. FINNISH PHYSICAL SOC. (1), PP. 27-36 (1964), JCL, \$1.60 FS, \$0.80 MF

THE SIGNIFICANCE OF CHEMICAL ENERGY IS EVALUATED IN RELATION TO A WATER-COOLED REACTOR WHEREIN THE NUCLEAR ENERGY RELEASE DURING A POWER EXCURSION OR LOSS OF COOLANT INCIDENT IS SUFFICIENT TO MELT THE FUEL ELEMENTS WHICH MAY THEN REACT EXOTHERMICALLY WITH THE WATER. EXPERIMENTAL RESULTS ARE SUMMARIZED FROM BOTH LABORATORY AND TREAT IN-PILE STUDIES ON REACTION OF MOLTEN ALUMINUM, MAGNESIUM, STAINLESS STEEL, URANIUM, AND ZIRCONIUM WITH WATER. THE DATA SHOW THAT THERE ARE THREE INTERRELATED PARAMETERS PERTINENT TO THE METAL-WATER HAZARDS ANALYSIS PROBLEMS FOR A GIVEN CORE MATERIAL. THEY ARE - THE ENERGY INPUT AS DETERMINED BY THE INTEGRATED POWER OF THE REACTOR PULSE, THE REACTOR PERIOD, AND THE PARTICLE SIZE INTO WHICH THE FRAGMENTED CORE MATERIAL IS DISPERSED. FINALLY, RATE LIMITING MECHANISMS AND APPROACHES TO CORRELATING AND PREDICTING METAL-WATER REACTIONS ARE PRESENTED.

ACCIDENT ANALYSIS + ALUMINUM + REACTOR, GRAPHITE MODERATED + ACCIDENT, LOSS OF COOLANT + REACTOR, SAFETY RESEARCH + ACCIDENT, REACTIVITY + TREAT (PRR) + URANIUM + ZIRCONIUM + STEEL, STAINLESS + IN PILE EXPERIMENT + REACTOR, LWR + REACTOR, PULSED + MAGNESIUM

010397
 IVINS RD + LIIMATAINEN RC + TESTA FJ
 REACTION OF URANIUM WITH WATER AS INITIATED BY A POWER EXCURSION IN A NUCLEAR REACTOR (TREAT)
 ARGONNE NATIONAL LABORATORY
 9 PAGES, 2 TABLES, 8 FIGURES, NUCLEAR SCIENCE AND ENGINEERING, 25(2), PP. 131-140 (JUNE 1966)

THE EXTENT OF REACTION WITH WATER OF FUEL MATERIALS HAVING URANIUM METAL AS THE MAJOR CONSTITUENT WAS DETERMINED FOR ENERGIES RANGING FROM 37 TO 394 CAL/G AND REACTOR PERIODS FROM 63 TO 515 MSEC. WITH PERIODS OF ABOUT 100 MSEC, MELTING OF FUEL SAMPLES BEGAN AT A FISSION ENERGY INPUT OF 40 CAL/G, WITH COMPLETE MELTING AT 95 CAL/G. THE EXTENT OF REACTION, VARIED FROM A FEW TENTHS OF A PERCENT FOR THOSE SAMPLES THAT HAD NOT MELTED APPRECIABLY, TO 4 PERCENT FOR THOSE THAT COMPLETELY MELTED IN THE EXPERIMENTS CONDUCTED IN 25 C WATER (20 PSIA HELIUM OVERPRESSURE). ABOVE 95 CAL/G, THE SAMPLES FRAGMENTED, AND THE EXTENT OF REACTION INCREASED WITH INCREASING FISSION ENERGY TO 50 PERCENT AT THE HIGHEST ENERGY, 394 CAL/G. THREE EXPERIMENTS WERE PERFORMED IN 285 C WATER (1000-PSI STEAM OVERPRESSURE). THE THREE SAMPLES IN 285 C WATER REACTED 2 TO 3 TIMES AS MUCH AS THOSE IN THE 25 C WATER AT THE SAME ENERGIES.

ACCIDENT ANALYSIS + CHEMICAL REACTION + REACTOR TRANSIENT + TREAT (PWR) + URANIUM

010610
 LIIMATAINEN RC + TESTA FJ
 THERMAL REACTOR SAFETY STUDIES ON UO₂ CORE FUEL PIN CLUSTERS
 ARGONNE NATIONAL LABORATORY, ARGONNE, ILLINOIS
 P-306 +. 23 PAGES, 10 FIGURES, JUNE 10, 1966, PRESENTED AT ANS ANNUAL MEETING, DENVER, COLORADO, JUNE 20-23, 1966, SOURCE

EXPERIMENTS WERE CONDUCTED IN TREAT TO INVESTIGATE THE SAFETY PROBLEMS ASSOCIATED WITH THE BEHAVIOR OF UO₂-CORE, METAL-CLAD FUEL SPECIMENS UNDER CONDITIONS SIMULATING A POWER EXCURSION. SPECIFICALLY, THE PURPOSE OF THESE RECENT SCALE-UP TRANSIENT TESTS WAS TO OBTAIN INFORMATION ON THE CHEMICAL AND PHYSICAL CHANGES THAT TAKE PLACE UPON MELTDOWN OF A SUBASSEMBLY OR A PORTION OF A NUCLEAR REACTOR CORE. PARTICULAR EMPHASIS WAS PLACED ON DETERMINING THE EXTENT OF METAL-WATER REACTION, THE PEAK PRESSURE PRODUCED, AND THE FINAL PARTICLE-SIZE DISTRIBUTION OF FRAGMENTED FUEL CLUSTER. THESE PARAMETERS WERE THEN CORRELATED WITH THE ENERGY OF THE REACTOR PULSE.

FAILURE, FUEL ELEMENT + REACTOR, GRAPHITE MODERATED + REACTOR, SAFETY RESEARCH + REACTOR TRANSIENT + TEST, DESTRUCTIVE + THERMAL MECHANICAL EFFECT + TREAT (PWR) + URANIUM OXIDE + IRRADIATION TESTING + REACTOR, PULSED

010762
 REACTOR DEVELOPMENT PROGRAM PROGRESS REPORT, APRIL, 1966
 ARGONNE NATIONAL LABORATORY
 ANL-7204 +. 89 PAGES, 25 FIGURES, 29 TABLES, REFERENCES, MAY 31, 1966, CFSTI, \$3.00 CY, \$0.75 MN

PG. 20 - FISSION GAS RELEASE FROM EBR 11 U-Pu-FISSION FUELS BECOMES SUBSTANTIAL AFTER FUEL VOLUME INCREASES OF 30 PERCENT. JACKETS CONTAINING 10 ATM OF PRESSURE REMAIN INTACT IF SIZED FOR THIS EXPANSION. PG. 74 - USING A FREE SURFACE (INSTEAD OF A COMPLETELY CLOSED, SOLID-WATER SYSTEM) REDUCES A PRESSURE PULSE TO 4 ATM FROM THE 17 ATM OBSERVED WITH A CONFINED LIQUID. PG. 80 - ZIRCALOY CLAD, VIBRA-PACKED UO₂ FUEL PINS IN A TREAT PULSE SHOWED SIMILAR MELTDOWN RESULTS IN WATER, ALTHOUGH ONE SET WAS INTERNALLY PRESSURIZED TO 1500 PSIA HELIUM AND THE OTHER SET WAS 15 PSIA. HOWEVER, THE UNPRESSURIZED PINS FAILED LATE IN THE PULSE (BY CLAD MELTING), WHILE THE PRESSURIZED ONES FAILED BY CLAD OVERSTRESS AT A LOWER TEMPERATURE EARLY IN THE PULSE. IN ADDITION, THE EXTENT OF METAL-WATER REACTION SEEMS TO BE INDEPENDENT OF THE FORM OF UO₂. VIBRA-PACKED UO₂ DATA AGREES VERY WELL WITH PREVIOUS SINTERED UO₂ PELLET DATA.

EBR 1 AND 2 (RE) + PRESSURE, EXTERNAL + FISSION GAS RELEASE + FUEL BURNUP + REACTOR TRANSIENT + ANL + FAILURE, CLADDING + PRESSURE, INTERNAL

010957
 HARRISON LJ + IVINS RD
 A PHOTOGRAPHIC STUDY OF THE TRANSIENT MELTDOWN BEHAVIOR OF ALUMINUM/URANIUM FUEL PLATES IN WATER
 ARGONNE NATIONAL LABORATORY, IDAHO AND ILLINOIS
 1 PAGE, 5 REFERENCES, ANS TRANSACTIONS, 9(1), PAGE 305 (JUNE, 1966), AMERICAN NUCLEAR SOCIETY ANNUAL MEETING, DENVER, COLORADO, JUNE 20-23, 1966

HIGH-SPEED COLOR MOVIES OF SPERT ID AND HFIR FUEL SAMPLES IN RELATIVELY MODERATE TREAT TRANSIENTS SHOWED THE FUEL TO MELT, INCANDESCENCE, AND REACT WITH WATER. AT HIGH-ENERGY INPUTS, IGNITION AND BURNING FOR 3.6 SEC. THRESHOLD FOR BURNING AND FRAGMENTATION, 1400 TO 1500 C. TEMPERATURE ABOVE 2000 C REACHED IN SAMPLES THAT IGNITED.

ALUMINUM + CLADDING + REACTOR, GRAPHITE MODERATED + REACTOR TRANSIENT + REACTOR, RESEARCH + SPERT I (S-RR) + REACTOR, TEST + TEST, DESTRUCTIVE + TREAT (PWR) + URANIUM + URANIUM OXIDE + HFIR (FTR)

016441
 VOLUME II, APPENDIX J - CORE HEATUP ANALYSIS MODEL.
 JERSEY CENTRAL POWER AND LIGHT COMPANY, MORRISTOWN, NEW JERSEY
 6 PAGES, 4 FIGURES, FACILITY DESCRIPTION AND SAFETY ANALYSIS REPORT, JANUARY 25, 1967, DOCKET NO. 50-219

SHORT DISCUSSION OF BASIC EQUATIONS FOR A SINGLE-FUEL-ROD ASSUMPTION (NO AXIAL OR BETWEEN-CHANNEL HEAT TRANSFER) LEADING TO AN EQUATION SOLVED BY FINITE DIFFERENCE ON A DIGITAL COMPUTER. RADIAL,

016441 *CONTINUED*

AXIAL, AND INTRACHANNEL PEAKING FACTORS USED. FUEL-CLAD INTERFACE CONSIDERED A RESISTANCE. AT CLAD-WATER SURFACES, CONVECTION AND RADIATION HEAT TRANSFER CONSIDERED ALONG WITH (POSITIVE) METAL-WATER REACTION AND (NEGATIVE) CLAD MELT ENERGIES.

AVAILABILITY - USAFC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

REACTOR, PWR + ACCIDENT, LOSS OF COOLANT + CYSTER CREEK (DWP) + REPORT, SAR + THERMAL ANALYSIS + FAILURE, CLADDING + HEAT TRANSFER, RADIANT + FUEL ELEMENTS

017459

GIDHY RL

REACTION OF MOLTEN UO₂ WITH WATER

BATTELLE-NORTHWEST, RICHLAND, WASHINGTON

BNWL-362 +, 10 PAGES, 3 FIGURES, 2 TABLES, JANUARY 1967

REACTION OF MOLTEN UO₂ WITH WATER WAS INVESTIGATED BY ALLOWING MELTED UO₂ TO FALL INTO WATER. OXYGEN-TO-METAL RATIOS INCREASED FROM AN INITIAL VALUE OF 2.002 TO VALUES BETWEEN 2.06 AND 2.16, DEPENDING ON THE INITIAL WATER TEMPERATURE (30 TO 250 C). ATTEMPTS TO MEASURE ANY PRESSURE TRANSIENTS WERE GENERALLY UNSUCCESSFUL. RAPID INJECTION OF MOLTEN UO₂ INTO WATER DID NOT PRODUCE A POWDERED PRODUCT, BUT THE QUENCHED UO₂ WAS VERY FRIABLE AND COULD BE READILY REDUCED TO A COARSE POWDER.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, NATIONAL BUREAU OF STANDARDS, U.S. DEPT. OF COMMERCE, SPRINGFIELD, VA., \$3.00 COPY, \$0.65 MICROFICHE

CHEMICAL REACTION + MOLTEN FUEL + PARTICLE SIZE DISTRIBUTION + URANIUM DIOXIDE + BATTELLE NORTHWEST

017361

EVINS RU + TEVERAUGH AD + BINGLE JD

REACTOR SAFETY - METAL-WATER REACTIONS

ARGONNE NATIONAL LABORATORY, ARGONNE, ILL.

ANL-7225 +, 5 PAGES, 3 FIGURE, PAGES 164-168 FROM ARGONNE NATIONAL LABORATORY. CHEMICAL ENGINEERING DIVISION SEMIANNUAL REPORT, JANUARY-JUNE 1966

SEMIANNUAL PROGRESS REPORT OF WORK ON METAL-WATER REACTIONS. ITEMS REPORTED FOR THIS PERIOD ARE - (1) REACTION OF FLOWING STEAM WITH STAINLESS-STEEL-CLAD AND ZIRCALOY-2-CLAD UO₂-CORE SIMULATED FUEL ELEMENTS IN A FURNACE, (2) PROPOSAL FOR LARGE-SCALE SIMULATION EXPERIMENTS OF THE LOSS-OF-COOLANT ACCIDENT, (3) CALCULATION OF THE EXTENT OF METAL-WATER REACTION DURING SUCH AN ACCIDENT (CHEMLOC PROGRAM), (4) STUDIES OF THE ALUMINUM-WATER REACTIONS BY THE LASER-HEATING METHOD, (5) PHOTOGRAPHIC STUDIES OF ALUMINUM-CLAD FUEL-PLATE SAMPLES IN TREAT. AND (6) STUDIES OF ZIRCALOY-2-CLAD UO₂-CORE SIMULATED FUEL ELEMENTS IN TREAT, INCLUDING THE LOSS-OF-COOLANT (FLAT-TOP TRANSIENT) EXPERIMENTS.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, NATIONAL BUREAU OF STANDARDS, U.S. DEPT. OF COMMERCE, SPRINGFIELD, VA., \$3.00 COPY, \$0.65 MICROFICHE

ACCIDENT ANALYSIS + ALUMINUM + CHEMICAL REACTION + COMPUTER PROGRAM + ACCIDENT, LOSS OF COOLANT + STEAM + THERMAL ANALYSIS + TREAT (PRR) + MOLTEN FUEL + STEEL, STAINLESS + ANL + URANIUM DIOXIDE + ZIRCALOY + LASER HEATING

019883

COOPER MH + HANKEL RD

RE-ANALYSIS OF N.S. SAVANNAH LOSS-OF-COOLANT ACCIDENT

UNITED NUCLEAR CORPORATION, RESEARCH AND ENGINEERING CENTER, ELMSFORD, NEW YORK

UNC-5185 +, 133 PAGES, 40 FIGURES, 6 TABLES, 11 REFERENCES, AUGUST 1, 1967, DOCKET 50-238

VESSEL INLET PIPE WAS ASSUMED TO RUPTURE, WITH NO WATER INJECTION, AND CONTROL PODS STUCK OUT. BLOWDOWN (ANALYZED WITH FLASH) ENDED AT 10 SEC. WITH CONTAINMENT PRESSURE AT 189 PSIG. FUEL SLUMPING (ANALYZED WITH NURLOC) BEGAN AT 1180 SEC. AT 3900 SEC, FAILURE OF THE FLOW BAFFLE DEPOSITED THE WHOLE CORE ON THE BOTTOM HEAD. HYDROGEN WILL NOT BURN. REACTOR VESSEL (ANALYZED WITH TIGER) REACHES PEAK TEMPERATURE OF 1100 F AT ABOUT 10 HR, BUT CONTAINS THE FUEL. 50 PAGES OF COMPUTER INPUT/OUTPUT DATA, AND MODEL.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

COMPUTER PROGRAM + CONTAINMENT DESIGN + ACCIDENT, LOSS OF COOLANT + REACTOR, MARITIME + NS SAVANNAH (PWR) + REACTOR, PWR + ANALYTICAL MODEL + CORE MELTDOWN + BLOWDOWN

022714

GENCO JM

METAL-WATER REACTIONS

BATTELLE-MEMORIAL INSTITUTE

2 PAGES, 2 TABLES, REACTOR MATERIALS, 10(3), PAGES 166-167 (FALL 1967)

REVIEW OF PROGRESS IN THE AREA OF METAL-WATER REACTIONS. CORRELATIONS FOR THE ZIRCONIUM-STEAM REACTION ARE SUMMARIZED AND COMPARED. THE ANL EXPERIMENTS (MELTING ZIRCALOY-2-CLAD UO₂ FUEL RODS IN TREAT) ARE ALSO SUMMARIZED.

022714 *CONTINUED*
CHEMICAL REACTION + TRFAT (PWR) + CHEMICAL KINETICS + ZIRCALOY + REVIEW

079094
MCLAIR, MA
POTENTIAL METAL-WATER REACTIONS IN LIGHT-WATER-COOLED POWER REACTORS
ORNL-RIDGE NATIONAL LAB., TENN.
ORNL-NSIC-23 +. 201 PAGES, FIGURES, TABLES, 206 REFERENCES, AUGUST 1964

A STATE-OF-THE-ART REVIEW OF THE ROLE OF CHEMICAL REACTIONS IN AN UNLIKELY EVENT OF A LIGHT-WATER POWER REACTOR ACCIDENT. THE STUDY CONCLUDED THAT THESE REACTIONS COULD BE ASSESSED REALISTICALLY ONLY BY CONSIDERING AN INTEGRAL MODEL OF THE ACCIDENT. COMPARED WITH THE SITUATION REGARDING THE DEFINITION AND THE MATHEMATICAL SIMULATION OF AN ACCIDENT, THE BASIC KINETICS OF THE CHEMICAL REACTIONS ARE WELL UNDERSTOOD. THERE ARE STILL SOME QUESTIONS ABOUT THE EFFECT OF LIMITED METAL-WATER REACTION ON POSSIBLE FUEL-PLY FRAGMENTATION IN LOSS-OF-COOLANT ACCIDENTS AND ABOUT THE DETONATION LIMITS OF HYDROGEN-AIR-STEAM MIXTURES, HOWEVER.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151, \$3.00 COPY, \$0.05 MICROFICHE

ALUMINUM + BORON + CHEMICAL REACTION + CLADDING + HYDROGEN + ACCIDENT, LOSS OF COOLANT + OXIDATION + OXYGEN + STEAM + WATER + ZIRCONIUM + DRESDEN 3 (DWR) + STEEL, STAINLESS + ACCIDENT MODEL + AIR + LOFT (S-RR) + CHEMICAL KINETICS + CORE MELTDOWN + URANIUM DIOXIDE + ZIRCALOY + INDIAN POINT 2 (IPWR) + PALISADES (PWR) + TURKEY POINT 3 (PWR) + STOICHIOMETRY + ACCIDENT, CONTROL ROD EJECTION + OGDONE 1 (DWR) + THERMAL TRANSIENT

070707
WHITE, JF
INTERIM SUMMARY OF WORK APPLICABLE TO FCC ON PHYSICO-CHEMICAL STUDIES OF CLAD UO₂ UNDER REACTOR ACCIDENT CONDITIONS
GENERAL ELECTRIC, CINCINNATI
GEAP-619 +. 40 PAGES, 8 FIGURES, 10 TABLES, JUNE 1964

AN INTERIM SUMMARY OF WORK BY GE-ASP ON PHYSICAL-CHEMICAL STUDIES OF CLAD UO₂ UNDER REACTOR LOSS-OF-COOLANT ACCIDENT CONDITIONS. WORK INCLUDES (1) KINETICS OF OXIDATION OF UO₂ BY STEAM, OXIDATION OF ZIRCALOY-4 BY STEAM AND AIR, AND OXIDATION OF 304L STAINLESS STEEL BY STEAM AND AIR, (2) TESTS DETERMINING DEFORMATION AND FAILURE MODE OF ZIRCALOY-4 CLADDING UNDER ACCIDENT CONDITIONS, (3) TENSILE STRENGTH MEASUREMENTS ON ZIRCALOY-4 AND 304L STAINLESS STEEL, (4) THERMAL CONDUCTIVITY MEASUREMENTS ON ZIRCALOY-4, 304L STAINLESS STEEL, AND UO₂, AND (5) ELECTRICAL RESISTIVITY AND THERMAL EMITTANCE MEASUREMENTS ON ZIRCALOY-4.

CHEMICAL REACTION + ACCIDENT, LOSS OF COOLANT + OXIDATION + STEAM + TENSILE PROPERTY + STEEL, STAINLESS + AIR + ACTIVATION ENERGY + CHEMICAL KINETICS + URANIUM DIOXIDE + FAILURE, CLADDING + ZIRCALOY + PROPERTY, PHYSICAL + GE NSP

037537
NYEP, H
LOSS-OF-COOLANT INVESTIGATIONS - THE LOFT PROGRAM
6 PAGES, AHS TRANSACTIONS, 812, PC 535-544 (NOVEMBER 18, 1965)

COLLECTION OF PAPERS DEALING WITH LOFT PROGRAM - METHOD FOR CALCULATING CORE TEMPERATURE AFTER LOCA, MELTDOWN STUDIES (RING MODEL), EFFECT OF ZIRCONIUM CLADDING ON LOCA TESTS, BLOWDOWN MODELS, SEMI-SCALE BLOWDOWN TESTS, AND ANALYTICAL MODEL FOR PREDICTING PRESSURE HISTORY WITHIN A CONTAINMENT VESSEL IN RESPONSE TO LOCA.

CLADDING + ACCIDENT, LOSS OF COOLANT + REACTOR, SAFETY RESEARCH + ZIRCONIUM + ANALYTICAL MODEL + LOFT (S-RR) + THERMAL CONSIDERATION + REACTOR, EPRA OWNED + PRESSURE, INTERNAL + BLOWDOWN + R AND D PROGRAM

044759
EVANS, TH
METAL-WATER REACTIONS DURING A LOSS-OF-COOLANT ACCIDENT IN A REACTOR
GENERAL ELECTRIC COMPANY, HANFORD ATOMIC PRODUCTS DEPARTMENT
RL-GEN-1541 +. 18 PAGES, 1 FIGURE, 12 REFERENCES, MARCH 23, 1967

ROUGH ESTIMATES WERE MADE OF THE HYDROGEN PRODUCED BY METAL-WATER REACTION DURING A LOSS-OF-COOLANT ACCIDENT WITHOUT THE USE OF THE EMERGENCY AIR-COOLING SYSTEM IN THE HANFORD N-REACTOR. THE PRIME DIFFICULTY IN MAKING THESE ESTIMATES IS DETERMINING THE TIME DEPENDENCE OF THE METAL TEMPERATURES. SEVERAL ANALYTICAL MODELS WERE ASSUMED, AND THE HIGHEST ESTIMATES OF THE HYDROGEN PRODUCTION RATES ARE BELIEVED TO BE THOSE PREDICTED BY THE MODEL ASSUMING ONLY LIMITED STEAM FLOW. MODELS CONSIDERING THE ZIRCALOY CORROSION RATES AND FUEL-ELEMENT MELTING YIELDED LOWER HYDROGEN PRODUCTION RATES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT ANALYSIS + CHEMICAL REACTION + HYDROGEN + ACCIDENT, LOSS OF COOLANT + STEAM + URANIUM + HANFORD (PR) + REACTOR, EPRA OWNED + ZIRCALOY + HANFORD SITE + REACTOR, PRODUCTION

047925

047825 *CONTINUED*

HESSON JC + IVINS WD + WILSON RE + NISHIO K + EARNES C
LABORATORY SIMULATIONS OF CLADDING-STEAM REACTIONS FOLLOWING LOSS-OF-COOLANT ACCIDENTS IN WATER-COOLED POWER
REACTORS
ARGONNE NATIONAL LABORATORY, ILLINOIS
ANL-7609 +. 39 PAGES, 21 FIGURES, 1 TABLE, 12 REFERENCES, JANUARY 1970

SUMMARY OF ANL EXPERIMENTAL WORK DETERMINING THE BEHAVIOR OF STAINLESS STEEL-CLAD AND ZIRCALOY-
CLAD UO₂ PELLET FUEL RODS IMMEDIATELY FOLLOWING A LOSS-OF-COOLANT ACCIDENT. WHEN OXIDIZING IN A
STEAM ATMOSPHERE, STAINLESS STEEL CLADDING FOAMS AND EXPANES AT TEMPERATURES APPROACHING ITS
MELTING POINT. ZIRCALOY CLADDING IS SEVERELY EMBRITTLED WHEN THE TOTAL ABSORBED OXYGEN IS 18
PERCENT OR GREATER. THE ZIRCALOY-CLAD FUEL RODS CAN BE HEATED TO ABOUT 1200 C IN A STEAM
ATMOSPHERE AND THEN WATERQUENCHED WITHOUT BREAKING THE CLADDING. AT TEMPERATURES SUBSTANTIALLY
ABOVE 1200 C, THE CLADDING TENDS TO BREAK ON COOLING. THE EFFECTS OF HYDRIDING ARE ADJUDGED
SECONDARY TO THOSE OF STEAM OXIDATION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CHEMICAL REACTION + HYDROGEN + ACCIDENT, LOSS OF COOLANT + STEAM + STEEL, STAINLESS + FUEL, PELLET TYPE + ANL
+ URANIUM DIOXIDE + ZIRCALOY + EMERGENCY COOLING + JACOBS

049155

FLORY K + PAOLI R + MESLER R
EXPLOSIONS RESULTING FROM MOLTEN METAL AND WATER IN CONTACT
UNIVERSITY OF KANSAS
5 PAGES, 13 FIGURES, 7 REFERENCES, CHEMICAL ENGINEERING PROGRESS, 65(12), PG 50-54 (DECEMBER 1969)

STATUS OF WORK DETERMINING THE MECHANISM OF EXPLOSIONS THAT RESULT WHEN MOLTEN METAL AND WATER
COME IN CONTACT. A QUALITATIVE REVIEW OF ALL THE EXPERIMENTAL STUDIES MADE UP TO THE PRESENT
TIME INDICATE THAT THE WATER IS ENTRAINED IN THE LIQUID METAL DRIPS, ONCE INSIDE THIS MOLTEN
MASS OF METAL, THE WATER RAPIDLY VAPORIZES CAUSING A PRESSURE PULSE FROM THE STEAM GENERATION.

EXPLOSION + WATER + CORE MELTDOWN + METAL, LIQUID + PRESSURE PULSE

066219

AN EVALUATION OF THE APPLICABILITY OF EXISTING DATA TO THE ANALYTICAL DESCRIPTION OF A NUCLEAR-REACTOR
ACCIDENT--CORE MELTDOWN EVALUATION
BATTELLE COLUMBUS LABORATORIES, 505 KING AVENUE, COLUMBUS, OHIO 43201
BML-1910 +. 50 PAGES, FIGURES, TABLES, REFERENCES, JULY 1971

CONSIDERATION OF A CORE MELTDOWN WAS SEPARATED INTO TWO BROAD AREAS - CONTAINMENT OR CONTROL OF A
LARGE HEAT-GENERATING MASS AND THE ASSURANCE OF FISSION-PRODUCT CONTROL. THE AREAS STUDIED
INCLUDED ANALYSIS OF CORE HEAT TRANSFER, THERMAL CONSIDERATIONS IN CONTAINMENT INTEGRITY,
EVALUATION OF METAL-WATER EXPLOSIONS, GENERATION OF NONCONDENSABLE GASES, EXAMINATION OF HYDROGEN
COMBUSTION OR EXPLOSION, FISSION-PRODUCT BEHAVIOR, AND METALLURGICAL CONSIDERATIONS IN THE
MELTDOWN ACCIDENT. THE STUDY WAS DIRECTED TOWARD PLANT SIZES IN THE RANGE OF 800 TO 1200 MW(E).

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + FISSION PRODUCT RELEASE + HEAT TRANSFER + REACTOR, PWR + CONTROL + ACCIDENT, HYPOTHETICAL +
CORE MELTDOWN + THERMAL TRANSIENT + JACOBS

070056

FORBES IA + FORD DF + KENDALL HW + HACKENZIE JJ
COOLING WATER
8 PAGES, 13 REFERENCES, ENVIRONMENT, 14(1): 40-47 (JANUARY-FEBRUARY 1972)

DESCRIBE REASONS FOR SUCH A SYSTEM IN MODERN N-POWER PLANT. FAILURE OF EXPERIMENTAL MOCK-UP
AT NPTS IN IDAHO IS DISCUSSED. ACCORDINGLY, CURRENT PWR ECC SYSTEM IS INADEQUATE TO HANDLE THE
EMERGENCY SITUATION FOR WHICH IT WAS INTENDED. AUTHORS NOTE THAT AEC HAD FAILED TO ESTABLISH
SAFETY OF N-POWER STATICS BEFORE IT EMBARKED ON FULL-SCALE PROGRAM OF LICENSING POWER
REACTORS. THEY PROCEED TO DESCRIBE UNCERTAINTIES AND THAT AEC HAS DELAYED AND INADEQUATE
PROGRAM TO EVALUATE ACTUAL CONDITIONS OF COMPONENTS, ETC., UNDER LOSS-OF-COOLANT CONDITIONS.
THEY DOCUMENT SOME EXPERIMENTS PERFORMED, ESP. AT CRNL, SHOWING THAT FUEL ELEMENTS SWELL, BOW,
AND BLOCK AS MUCH AS 85% OF COOLANT CHANNELS. FLECHT EXPERIMENTS AT IDAHO ARE ALSO REPORTED.
FINALLY, THEY REJECT COMPUTER CODES NOW USED TO PREDICT LOCA.

COMPUTER PROGRAM + ACCIDENT, CONSEQUENCES + ACCIDENT, LOSS OF COOLANT + REACTOR, POWER + POPULATION EXPOSURE +
CORE MELTDOWN + FLOW BLOCKAGE + R AND D PROGRAM + EMERGENCY COOLING SYSTEM + AGENCY, AEC + OPPONENT +
SPOKESMAN, AEC + POWER PLANT, NUCLEAR

091252

KOTTOCHSKI HM + HOLTBECKER H + RANDEL J
DISCUSSION ON THE PROCESS OF THERMAL INTERACTION BETWEEN MOLTEN FUEL AND COOLANT
7 PAGES, 8 FIGURES, ATOMKERNENERGIE, 22(3), PP. 177-183 (1973)

THEORETICAL STUDIES OF THE INTERACTION BETWEEN MOLTEN MATERIALS AND COOLANT HAVE BEEN PERFORMED.
PRESENTS ANALYSES IN DETAIL OF THE EVENTS FOLLOWING CONTACT: FREEZING OF THE HOT COMPONENT,
NUCLEATION OF VAPOUR, FRAGMENTATION OF THE HOT COMPONENT DUE TO THERMAL STRESSES AND CONDENSATION

Q91252 *CONTINUED*

SHOCKS. IT IS SHOWN THAT IN THE ABSENCE OF GAS ON THE INTERFACE, THE NUCLEATION OF VAPOUR IS DELAYED. IT IS DEMONSTRATED THAT IF THE HOT COMPONENT CONTAINS NO GAS, FRAGMENTATION INTO SMALL PARTICLES CAN OCCUR WHEREAS WITH ENTRAINED GAS, PARTICLE SIZES ARE SIGNIFICANTLY REDUCED. (IN GERMAN)

GERMANY + REVIEW

Q97710

BAKER L + LIMATAINEN RC
THE TECHNOLOGY OF NUCLEAR REACTOR SAFETY (VOL. 2). CHAPTER 17 - CHEMICAL REACTIONS
ARGONNE NATIONAL LABORATORY, ILLINOIS
104 PAGES, PP. 419-523, PUBLISHED BY THE MIT PRESS, CAMBRIDGE, 1973

MANY OF THE ELEMENTS POSSESSING DESIRABLE NUCLEAR PROPERTIES, I.E., ALUMINUM, ZIRCONIUM, AND URANIUM, RANK HIGH IN THE ELECTROMOTIVE SERIES. THE REACTION OF THESE ELEMENTS WITH OXIDIZING AGENTS SUCH AS WATER AND OXYGEN IS, FORTUNATELY, SLOW AT NORMAL TEMPERATURES. IT WAS FEARED, HOWEVER, THAT RAPID OR EXPLOSIVE REACTIONS MIGHT BE INITIATED AS A RESULT OF ACCIDENTAL OVERHEATING. SUMMARIZING THE PRESENT STATE OF KNOWLEDGE REGARDING THE INITIATION OF RAPID OR EXPLOSIVE CHEMICAL REACTIONS IS THE PRINCIPAL PURPOSE OF THIS CHAPTER. THIS DISCUSSION IS ALSO CONCERNED WITH SLOWER CORROSION-LIKE REACTIONS WHICH CAN AFFECT THE SAFETY OF OPERATION OF NUCLEAR REACTORS. INDIVIDUAL CHEMICAL REACTIONS ARE DISCUSSED FROM A FUNDAMENTAL POINT OF VIEW.

ALLOY + ALUMINUM + EXPLOSION + HYDROGEN + ZIRCONIUM + STEEL, STAINLESS + CORROSION + COMBUSTION + RADIOLYTIC
GAS + MAGNESIUM + RECOMBINERS

KEYWORD INDEX

A COLLECTION OF KEYWORDS IS USED TO DENOTE THE MAIN SAFETY RELATED POINTS COVERED IN EACH ARTICLE. THE FOLLOWING INDEX IS AN ALPHABETICAL LISTING OF THE KEYWORDS GIVING REFERENCES TO EACH ARTICLE WHICH WAS KEYED TO IT.

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5. HYDROGEN EXPLOSIONS

00243P
SHAPIRO ZW + MUFFETTE TH
HYDROGEN FLAMMABILITY DATA AND APPLICATION TO PWR LOSS-OF-COOLANT ACCIDENT
WESTINGHOUSE ELECTRIC CORP., BETTIS PLANT, PITTSBURG, PA.
WAPD-SC-545 +. 23 PAGES, 10 FIGURES, SEPTEMBER 1957

INCORPORATED AS PART OF THE HAZARDS SUMMARY REPORT. THE PURPOSE OF THIS REPORT IS TO SUMMARIZE GENERALIZED DATA ON THE INFLAMMABILITY OF HYDROGEN IN STEAM-AIR MIXTURES AND TO APPLY THE DATA TO THE POSTULATED PWR LOSS-OF-COOLANT ACCIDENT TO DETERMINE THE POTENTIAL PRESSURE EFFECTS ON THE PLANT CONTAINER. THE HYDROGEN WOULD PROBABLY BE EVOLVED AT SUCH A HIGH TEMPERATURE THAT SPONTANEOUS IGNITION SHOULD OCCUR, PREVENTING A LARGE AMOUNT OF UNBURNED HYDROGEN FROM ACCUMULATING. THE EVOLUTION OF HYDROGEN IS SUFFICIENTLY SLOW SO THAT IF THE HYDROGEN IS BURNED AS EVOLVED, THE PRESSURE WITHIN THE PLANT CONTAINER WOULD BE RAISED BY ONLY A FEW PSI. AT A TIME WHEN THE TOTAL PRESSURE WOULD BE CONSIDERABLY LESS THAN THE PLANT CONTAINER DESIGN PRESSURE. IF HYDROGEN DOES NOT BURN AS EVOLVED (FOR EXAMPLE IF IT SHOULD ESCAPE FROM THE REACTOR VESSEL THROUGH A WATER TRAP WITH RESULTANT COILING OF THE GAS), IT IS UNLIKELY THAT DETONATION WOULD OCCUR. IF A UNIFORM MIXTURE OF STEAM, AIR, AND HYDROGEN IS OBTAINED IN THE PLANT CONTAINER, THE MAXIMUM HYDROGEN CONCENTRATION WOULD BE BELOW THAT REQUIRED FOR DETONATION. THEREFORE, NO DETONATION SHOULD OCCUR UNLESS LOCALIZED POCKETS OF HYDROGEN OCCUR. EVEN SHOULD SUCH A POCKET DETONATE, IT IS BELIEVED THE PEAK PRESSURE WOULD NOT EXCEED THE PLANT CONTAINER DESIGN PRESSURE.

CONTAINMENT DESIGN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + REPORT, SAR

002717
COTTRELL WB
OZONE EXPLOSION IN IRRADIATED CRYOGENIC APPARATUS AND IMPLICATIONS UPON N.S. SAVANNAH GASEOUS WASTE DISPOSAL SYSTEM
PAK RIDGE NATIONAL LABORATORY
ORNL-CF-59-7-97 +. 4 PAGES, 2 TABLES, 13 REFERENCES, JULY 24, 1958, CPSTI, \$1.80 FS, \$1.80 MF

THE SEVERAL INCIDENTS OF OZONE EXPLOSIONS IN CRYOGENIC APPARATUS IN RADIATION FIELDS ARE REVIEWED. IT IS CONCLUDED THAT THE EXPLOSIONS MAY BE AVOIDED IF OXYGEN AND/OR OZONE ARE EXCLUDED FROM THE LOW-TEMPERATURE REGIONS WHERE, IN STATIC SYSTEMS, THEY TEND TO CONCENTRATE BY LIQUEFACTION. SUCH PROVISIONS WOULD MAKE THE PROPOSED CIRCULATING N₂-COOLED TRAP FOR THE N.S. SAVANNAH OFF-GAS SYSTEM ACCEPTABLE IF THE INITIAL OXYGEN CONTENT OF THE NITROGEN COOLANT IS LESS THAN 200 PPM. HIGHER CONCENTRATIONS ARE UNDOUBTEDLY SAFE BUT THE LACK OF INFORMATION ON SUCH FACETS OF THE PHENOMENA AS QUANTITIES OF OZONE, REQUIRED RADIATION EXPOSURE, AND EXPLOSION-INCITING AGENTS DOES NOT PERMIT A QUANTITATIVE DEFINITION OF THE LIMITING CONDITIONS FOR AN EXPLOSION.

ACCIDENT, COLD COOLANT + CONTAINMENT, HIGH PRESSURE + CONTAINMENT, MULTIPLE + REACTOR, MARITIME + NS SAVANNAH (PART) + GAYGEN + REACTOR, PWR + FILTER, TRAP + HAZARDS ANALYSIS + INCIDENT + OZONE + ACCIDENT, NONREACTOR

003541
MARKELS M + EIDFMAN H + MACEK A + HAGGERTY H + EICHBAUER O
A PROGRAM TO ADVANCE THE TECHNOLOGY OF FIRE EXTINGUISHMENT (HYDROGEN-OXYGEN)
ATLANTIC RESEARCH CORPORATION, ALEXANDRIA, VIRGINIA
75 PAGES, 32 FIGURES, 7 TABLES- MARCH 1963, AD-411396 (ASD-TOR-62-920, PART II)

THE SECOND YEAR'S EFFORT INCLUDED THE STUDY OF (1) SUPPRESSION OF GASEOUS HYDROGEN-OXYGEN DETONATIONS, (2) METHODS FOR CONTROLLING LIQUID HYDROGEN COMBUSTION, AND (3) EXTINGUISHMENT OF LIQUID HYDROGEN-METAL SLURRY FIRES. ISOBUTENE WAS FOUND TO BE BEST. CONFINED LIQUID HYDROGEN COMBUSTION WAS EFFECTIVELY SUPPRESSED BY AIR-HALOGENATED HYDROCARBON MIXTURES WITH 13-65 PER CENT OF INHIBITOR. CONFINED LIQUID HYDROGEN COMBUSTION WAS EXTINGUISHED BY EITHER POWDERED SOLIDS OR LIQUID AGENTS. POTASSIUM BICARBONATE AND HALOGENATED HYDROCARBONS WERE MOST EFFECTIVE OF THE SUBSTANCES STUDIED. MINIMUM AMOUNTS FOR EXTINGUISHING FIRES OF LIQUID HYDROGEN BURNING AT A RATE OF 1 LITER/HOUR RANGED FROM 0.5 TO 0.8 GRAM.

FIRE + OXYGEN

005313
TWO INCIDENTS INVOLVING CRYOGENIC MATERIAL AT A REACTOR SITE
U. S. ATOMIC ENERGY COMMISSION
4 PAGES- HEALTH AND SAFETY INFORMATION, ISSUE NO. 204, MARCH 1, 1965- AEC-DCS

ON MARCH 30, 1963, A FIRE BROKE OUT IN EQUIPMENT ASSOCIATED WITH A CRYO-IRRADIATION EXPERIMENT AT THE GROUND TEST REACTOR (GTR), GENERAL DYNAMICS, FT. WORTH, TEXAS. THE IMMEDIATE CAUSE OF THE FIRE WAS THE RELEASE OF LIQUID HYDROGEN FROM EITHER A FAILED DEWAR OR A LEAKING DYNAMIC SEAL AROUND A PULL ROD ASSEMBLY WHICH PENETRATES THE DEWAR. ULTIMATELY, TWO OF THE THREE DEWARS INVOLVED WERE FOUND TO HAVE FAILED. THE FIRE RESULTED IN ABOUT \$12,000 DAMAGE, NO RADIATION EXPOSURES AND NO INJURIES. ON MAY 14, 1963, A SERIES OF SMALL EXPLOSIONS OCCURRED IN ONE OF TWO DEWARS OF LIQUID NITROGEN BEING USED TO COOL TENSILE TEST SPECIMENS IN A CRYO-IRRADIATION EXPERIMENT. THE REACTOR HAD BEEN OPERATED FOR ABOUT 2 HOURS TO IRRADIATE THE SPECIMENS, BUT WAS NOT OPERATING AT THE TIME OF THE EXPLOSION. NO INJURIES, RADIATION DOSES, OR SPREAD OF RADIOACTIVE MATERIAL RESULTED. THE ONLY DAMAGE WAS TO THE DEWARS AND THEIR CONTENTS.

ACCIDENT + FIRE + REACTOR, TEST + NITROGEN + CRYOGENICS

005804

005804 *CONTINUED*

WARD DL + PEARCE DG + HERRETT DJ

LIQUID-HYDROGEN EXPLOSIONS IN CONTAINMENT VESSELS. INTERIM REPORT

UNITED KINGDOM ATOMIC ENERGY AUTHORITY, HARWELL

AERE-R-4312 +. 18 PAGES, 8 FIGURES, 3 TABLES, JULY 1963, ADVANCES IN CRYOGENIC ENG., 9, PP. 390-400 (1964)

THIS INTERIM REPORT DESCRIBES WORK CARRIED OUT TO MEASURE PRESSURE-TIME RELATIONSHIPS OF A MIXTURE OF LIQUID HYDROGEN AND SOLID AIR EXPLODED WITHIN A LARGE, REINFORCED, VACUUM VESSEL. UP TO 1300 CC OF LIQUID HYDROGEN WERE USED WITH 10 AND 100 PERCENT OF A STOICHIOMETRIC PROPORTION OF SOLID AIR. SINCE THE WORK IS STILL PROCEEDING, NO FINAL CONCLUSIONS HAVE BEEN DRAWN, ALTHOUGH PRELIMINARY RESULTS HAVE BEEN ASSESSED. A FURTHER REPORT WILL BE ISSUED AT THE END OF THE PROGRAM.

TESTING + AIR + CONTAINMENT STRUCTURE + PRESSURE, INTERNAL

005898

HILL K + HORNSTEIN B

DETECTION OF HYDROGEN-AIR FIRES AND EXPLOSIONS IN AEROSPACE VEHICLES VIA OH BAND AND WATER BAND EMISSION

THICKOL CHEMICAL CORPORATION, DENVILLE, NEW JERSEY

96 PAGES, 48 FIGURES, 6 TABLES, 39 REFERENCES- APRIL 1963, ASD-TDR-63-113 (N63-17060)- C-571

TO PROVIDE A BASIS FOR RELIABLE HYDROGEN-AIR FIRE AND EXPLOSION DETECTION IN AEROSPACE VEHICLES, MEASUREMENTS OF THE ABSOLUTE VALUE OF RADIANT INTENSITY WERE MADE OVER THE OH BANDS OF THE ULTRAVIOLET AND THE WATER BANDS IN THE INFRARED. A SURPRISING RESULT WAS THE INCREASE IN OH RADIANT INTENSITY WITH DECREASING PRESSURE. DIFFUSION FLAME VARIABLES WERE HYDROGEN FLOW RATE, PORT DIAMETER, AND PRESSURE FROM 760 TO LESS THAN 20 MM HG. FOR EXPLOSIONS, MIXTURE RATIO AS WELL AS PRESSURE WERE VARIED- THE RATE OF INCREASE OF EMISSION AND PRESSURE AFTER IGNITION WERE MEASURED TO DETERMINE DETECTION LEAD TIME. RESULTS WHERE POSSIBLE ARE PRESENTED AS FUNDAMENTAL QUANTITIES WHICH CAN BE APPLIED WITH REASONABLE RIGOR TO A VARIETY OF DESIGN SITUATIONS. DETECTION BASED UPON MONITORING OH RADIATION IS RECOMMENDED OVER OTHER PROPERTIES SUCH AS IR RADIATION, IONIZATION, TEMPERATURE RISE, OR PRESSURE RISE. APPLICATION OF THE DATA TO SPECIFIC DESIGNS IS DISCUSSED.

ADMINISTRATIVE CONTROL + AEROSPACE SAFETY + FIRE + CRITICALITY EXPERIMENT

006620

SEVEN RESEARCH MEN BURNED IN BLAST, CAMBRIDGE, MASS.

NEWSPAPER ARTICLES- JULY 6, 1965

FAULTY LIQUID-HYDROGEN PURIFIER MAY HAVE CAUSED THE BUBBLE-CHAMBER EXPLOSION AT AEC'S \$12-MILLION MIT-HARVARD ELECTRON ACCELERATOR AT THREE-THIRTY AM JULY 5. IRONICALLY, EVERY OTHER PART AND FACET OF THE NEW 40-IN. BUBBLE-CHAMBER, BEING FILLED FOR THE FIRST TIME, HAD BEEN DOUBLE- AND TRIPLE-CHECKED- THE PURIFIER, BECAUSE IT WAS BOUGHT OFF-THE-SHELF, WAS ASSUMED TO WORK CORRECTLY. THE 95-GAL CAPACITY CHAMBER WAS 99% FILLED WHEN THE FIRST OF SEVERAL BLASTS OCCURRED- DAMAGE WAS AGGRAVATED BY TWO PROPANE TANKS, UNRELATED TO THE BUBBLE-CHAMBER WORK, WHICH HAPPENED TO BE THERE AND ALSO BLEW UP. THREE OF EIGHT INJURED ARE STILL ON THE CRITICAL LIST. DAMAGE MAY TAKE 6-8 MONTHS OR MORE TO REPAIR.

FAILURE, EQUIPMENT + INCIDENT + REACTOR STARTUP EXPERIENCE + INCIDENT, NONREACTOR

006754

WEINTRAUB AA

CONTROL OF LIQUID HYDROGEN HAZARDS AT EXPERIMENTAL FACILITIES- A REVIEW

NEW YORK OPERATIONS OFFICE, AEC

249 PAGES, TABLES, FIGURES- MAY 1965, HASL-160- CFSTI

THE HAZARDS OF LIQUID HYDROGEN AT EXPERIMENTAL FACILITIES ARE DESCRIBED AND CURRENT TECHNIQUES ARE PRESENTED FOR THEIR CONTROL. AS BACKGROUND, THE USES OF HYDROGEN, ITS GENERAL PROPERTIES (APPENDIX A NOTES SPECIFIC PROPERTIES) AND THE DESIGN AND MATERIALS FOR LIQUID HYDROGEN SYSTEMS ARE DISCUSSED. FLAME PROPAGATION, DEFLAGRATION AND DETONATION, IGNITION IN FREE SPACE AND UNDER CONFINED CONDITIONS ARE CONSIDERED UNDER FIRE AND EXPLOSION HAZARDS. THE TECHNIQUES OF HAZARD CONTROL ARE EXAMINED IN RELATION TO HYDROGEN DETECTION SYSTEMS, VENTILATION, LIQUID HYDROGEN DUMP SYSTEMS, FLARING, IGNITION SOURCES, EXPLOSION SUPPRESSION, INERTING, FIRE CONTROL AND PERSONNEL EXPOSURES. STORAGE, TRANSFER AND TRANSPORTATION ARE ALSO DISCUSSED. APPENDIX B CONTAINS CASE HISTORIES OF HYDROGEN ACCIDENTS. TWO OF THE LIQUID HYDROGEN SAFETY GUIDES, CITED AMONG THE 60 REFERENCES, ARE REPRODUCED IN APPENDIX C.

ACCIDENT ANALYSIS + ACCIDENT, CONSEQUENCES + CONTAINMENT + FIRE + INCIDENT COMPILATION + SHIPPING CONTAINER + TRANSPORTATION AND HANDLING + VENTILATION SYSTEM + ACCIDENT, NONNUCLEAR

006921

RIZZO AJ + LIVINGSTON MS

EXPLOSION IN THE CAMBRIDGE ELECTRON ACCELERATION ON JULY 5, 1965

3 PAGES- ATOMIC ENERGY CLEARING HOUSE 11(30)- 4-6 (JULY 26, 1965)- PDP

A BRIEF DESCRIPTION OF THE EQUIPMENT OPERATIONAL STATUS AT THE TIME OF THE EXPLOSION, AND COURSE OF THE INCIDENT, WHICH OCCURRED AS THE CHAMBER WAS BEING FILLED FOR THE FIRST TIME. RESULTS OF THE PRELIMINARY INVESTIGATION ARE NOT CONSIDERED SUFFICIENT TO DRAW CONCLUSIONS ABOUT THE INITIAL FIRE OR EXPLOSION.

006921 *CONTINUED*
ADMINISTRATIVE CONTROL + SAFETY REVIEW + OPERATING EXPERIENCE SUMMARY + BUILDING + REACTOR STARTUP EXPERIENCE
+ INCIDENT, NONREACTOR + ACCELERATOR

006930
REIFF DD
LIQUEFACTION AND STORAGE OF HYDROGEN
8 PAGES- CHEMICAL ENGINEERING 72(19)- 191-8 (SEPTEMBER 13, 1965)

THE PRINCIPLES OF LIQUEFACTION OF GASES AND LOW-TEMPERATURE HEAT TRANSFER ARE THE BASIS FOR A DISCUSSION OF THE DESIGNS REQUIRED FOR THE STORAGE AND HANDLING OF LIQUID HYDROGEN. A BRIEF SAFETY ANALYSIS IS MADE.

CHEMICAL TOXICITY + CODES AND STANDARDS + FIRE + HEAT TRANSFER + FUEL STORAGE + TRANSPORTATION AND HANDLING

008006
ADDITIONAL FACTS ON CAMBRIDGE BUBBLE CHAMBER EXPLOSION SINCE JULY 21, 1965 BULLETIN
NEW YORK OPERATIONS OFFICE
3 PAGES- ATOMIC ENERGY CLEARING HOUSE 11(41)- 31-33 (OCTOBER 11, 1965)- PDR

DESCRIBES POST ACCIDENT STATUS OF SIGNIFICANT COMPONENTS AND FUEL SOURCES. HYDROGEN IS THE MOST LIKELY SOURCE OF THE FIRST EXPLOSION WITH LP GAS SECOND. NO CONCLUSIONS HAVE BEEN REACHED IN THE INVESTIGATION- NO FURTHER BULLETINS WILL BE ISSUED UNTIL THE FINAL REPORT IS COMPLETE IN SEVERAL MONTHS.

FIRE + INCIDENT

008376
MCCOOL WJ
PH-3A NUCLEAR POWER PLANT FIRE
DIVISION OF OPERATIONAL SAFETY, U. S. ATOMIC ENERGY COMMISSION
2 PAGES- OCTOBER 7, 1962, REACTOR OPERATING EXPERIENCE 63-1- AEC-DOS

A HYDROGEN EXPLOSION OCCURRED ON OCTOBER 7, 1962, APPARENTLY AS A RESULT OF VAPOR PHASE LEAKAGE FROM THE PRESSURIZER BEING IGNITED BY A SHORT CIRCUIT. SUPERFICIAL DAMAGE RESULTED.

FIRE + REACTOR, PWR + OPERATING EXPERIENCE SUMMARY + INCIDENT, EQUIPMENT + REACTOR, ERDA OWNED + RADIOLYTIC GAS + PH 3A (PWR) + REACTOR, MILITARY

008832
BEAM WINDOW FAILURE LED TO JULY FIRE AT CAMBRIDGE ELECTRON ACCELERATOR
U.S. ATOMIC ENERGY COMMISSION, WASHINGTON
2 PAGES- FEBRUARY 21, 1966, AEC PRESS RELEASE J-41- DP1

ELECTRON ACCELERATOR EXPLOSION AND FIRE OF JULY 5, 1965 WAS THE RESULT OF SEQUENTIAL FAILURE OF THE INNER AND OUTER BEAM WINDOWS OF THE FACILITY'S HYDROGEN BUBBLE CHAMBER, WHICH RELEASED HYDROGEN INTO THE EXPERIMENTAL AREA. THE ACCIDENT STARTED WHEN FRAGMENTS OF THE INNER BERYLLIUM WINDOW HIT THE OUTER BERYLLIUM WINDOW BREAKING IT AND ALLOWING HYDROGEN TO ESCAPE AND IGNITE. IT WAS THE DESIGN INTENT THAT THE LIQUID HYDROGEN IN THE BUBBLE CHAMBER BE SAFEGUARDED BY A DOUBLE CONTAINMENT SYSTEM. THE VACUUM JACKET FOR THE BUBBLE CHAMBER WAS DESIGNED TO PROVIDE BOTH AN INSULATING VACUUM AROUND THE BUBBLE CHAMBER AND A SAFETY CONTAINER FOR LIQUID HYDROGEN IN THE EVENT OF ITS RELEASE FROM THE CHAMBER ITSELF. A SPECIAL DUMP SYSTEM FOR THE VACUUM JACKET TO VENT THE HYDROGEN OUTSIDE THE BUILDING WAS PROVIDED. THE FACT THAT THE FAILURE OF THE INNER BERYLLIUM WINDOW CAUSED THE FAILURE OF THE OUTER BERYLLIUM WINDOW PREVENTED THE VENTING SYSTEM FROM OPERATING AS INTENDED. A CONTRIBUTING FACTOR TO FIRE DAMAGE WAS THE RELEASE OF LIQUEFIED PROPANE WHICH WAS STORED NEARBY. PROVIDES REFERENCES TO DETAILED REPORTS.

FAILURE, EQUIPMENT + FIRE + INCIDENT, NONREACTOR

009027
MULLER GE
EXPLOSION IN THORIUM PROCESS AREA, KERR MCGEE- CUSHING, OKLAHOMA- FEBRUARY 7, 1966
KERR-MCGEE CORPORATION
2 PAGES- ATOMIC ENERGY CLEARING HOUSE 12(12)- 26-27 (MARCH 21, 1966)

AN ACCUMULATION OF HYDROGEN GAS EXPLODED AT A NITRIC ACID DISSOLUTION STATION, WHERE THORIUM IS RECOVERED FROM PROCESS RESIDUES. FUMES WERE BEING REMOVED BY A PARTIALLY-ON STEAM JET. AN UNUSUAL FOG MAY HAVE CONTRIBUTED TO HYDROGEN BACKING UP IN BUILDING.

THORIUM + VENTILATION SYSTEM + INCIDENT, NONNUCLEAR + DISSOLUTION + ORE CONVERSION + KERR-MCGEE

009609
HAAS PA
MRP BLANKET PROCESSING STUDIES OF O2-H2 HAZARDS IN A LOOP PRESSURIZER
OAK RIDGE NATIONAL LABORATORY

009609 *CONTINUED*
ORNL-2568 +. 20 PAGES, REFERENCES, SEPTEMBER 25, 1958, CFSTI, \$1.01 MF, \$2.60 FS

RESULTS OF EXPERIMENTS MADE UNDER CONDITIONS PROPOSED FOR HOMOGENEOUS REACTOR BLANKET-PROCESSING LOOP STUDIES INDICATED THAT SPONTANEOUS $H_2 + O_2$ REACTIONS WILL NOT OCCUR FREQUENTLY TO SERIOUSLY HAMPER OPERATION FOR REASONABLE STEADY-STATE PERIODS AND WILL NOT RESULT IN HAZARDOUS EQUIPMENT FAILURES. CALCULATED ($2H_2-O_2$) CONCENTRATIONS BELOW LITERATURE VALUES FOR EXPLOSIVE CONCENTRATION LIMITS WERE DETONATED WITH AN IGNITION COIL. THIS RESULT WAS PROBABLY DUE TO SEGREGATION OF GASES, WHICH WOULD BE EXPECTED FROM THE TEST-SYSTEM GEOMETRY. THE PRESSURIZER WAS NOT DAMAGED IN MORE THAN 25 DETONATION REACTIONS, SOME OF WHICH WERE FOR 200 PSI H_2 PLUS 100 PSI O_2 , WITH NO DILUENT, AT 400M TEMPERATURE. RECORDED PRESSURE PEAKS INDICATED THAT PRESSURE RISES WOULD BE LESS THAN 1600 PSI IN OTHER LOOP COMPONENTS. THE PEAK PRESSURES WOULD BE WITHIN THE TEST LIMIT OF THE PUMP-ACTOR CAN (4000 PSI) AND OF ALL OTHER LOOP COMPONENTS.

REACTOR, HOMOGENEOUS + HRT (RE) + OXYGEN + OUT OF PILE EXPERIMENT + HAZARDS ANALYSIS + RECOMBINERS

009859
JOSE C
RFAM TUBE EQUIPMENT FOR THE FKJ-2 (DIDC) COLD NEUTRON SOURCE
KERNFORSCHUNGSANLAGE JULICH
AERE-TRANS-1043 +. 21 PAGES, 6 FIGURES, 19 REFERENCES, AUGUST, 1965, HMSO

SUPHERMAL NEUTRONS ARE PRODUCED IN A BEAM HOLE USING 20-DEGREES-K LIQUID HYDROGEN. RATHER THAN DESIGN AN EXPLOSION-PROOF SYSTEM, THEY PREVENT AIR (OXYGEN) ENTERING BY AN ELABORATE HELIUM BARRIER, WITH ICING-MIRROR SENSORS FOR AIR LEAKAGE.

REACTOR, HWR + REACTOR, RESEARCH + SAFETY REVIEW + GERMANY + IN PILE EXPERIMENT + IRRADIATION TESTING + BEAM HOLE

009907
REPORT ON INVESTIGATION OF EXPLOSION AND FIRE, EXPERIMENTAL HALL, CAMBRIDGE ELECTRON ACCELERATOR, CAMBRIDGE, MASSACHUSETTS, JULY 5, 1966
NEW YORK OPERATIONS OFFICE
TID-22594 +. 99 PAGES, 37 FIGURES, FEBRUARY, 1966, SPD \$0.60

DESCRIPTION OF THE FACILITY AND SEQUENTIAL EVENTS IN THE EXPLOSION AND FIRE. VARIOUS ACCIDENT MODELS WERE EXAMINED. CONCLUSION WAS THAT SEQUENTIAL FAILURE OF INNER AND OUTER BERYLLIUM WINDOWS PREVENTED THE SPECIAL HYDROGEN-VENTING SYSTEM FROM OPERATING. THE INNER WINDOW FAILED BECAUSE OF EXCESSIVE MECHANICAL STRESS (BEYOND DESIGN LIMIT) SUPERIMPOSED ON A HYDROGEN PRESSURE RISE (WITHIN DESIGN RANGE) WHICH TRIGGERED THE RUPTURE. THE FRAGMENTS AND LIQUID-HYDROGEN JET BROKE THE OUTER WINDOW AND RELEASED HYDROGEN INSIDE THE BUILDING. THE HYDROGEN MAY HAVE BEEN IGNITED BY THE ENERGY RELEASED WHEN THE OUTER WINDOW BROKE.

CONTAINMENT, MULTIPLE + INCIDENT, HUMAN ERROR + INCIDENT, NONREACTOR + FAILURE, DESIGN ERROR

010103
WARREN KS
SURVEY OF POTENTIAL VAPOR-PHASE EXPLOSIONS IN DAREX AND SULFEX PROCESSES
OAK RIDGE NATIONAL LABORATORY
ORNL-2927 +. 23 PAGES, 8 FIGURES, 2 TABLES, REFERENCES- DECEMBER 27, 1960- CFSTI, \$0.50

A SURVEY OF THE THERMODYNAMICS AND LIMITS OF FLAMMABILITY OF GASES EXPECTED WHEN SODIUM-BONDED, STAINLESS-STEEL-CLAD REACTOR FUELS ARE DISSOLVED IN DILUTE AQUA REGIA OR SULFURIC ACID SHOWED THAT VAPOR-PHASE EXPLOSIONS ARE A DEFINITE POSSIBILITY WITH THE AQUA REGIA SYSTEM. REACTIONS OF HYDROGEN WITH NITROGEN OXIDES, $NOCl$, AND Cl_2 ARE HIGHLY EXOTHERMIC, AND MIXTURES OF THE GASES ARE EXPLOSIVE OVER WIDE CONCENTRATION RANGES. THE SULFEX PROCESS, IN WHICH ONLY HYDROGEN IS EVOLVED, APPARENTLY COULD BE USED WITHOUT ADDITIONAL HAZARD IF THE SODIUM-WATER REACTION COULD BE CONTAINED.

CHEMICAL REACTION + OXYGEN + CHEMICAL KINETICS + DESIGN STUDY + RADIOCHEMICAL PLANT SAFETY + FUEL REPROCESSING

010413
PEARCE DG + WARD DL + HAYES P
LIQUID-HYDROGEN EXPLOSIONS IN CONTAINMENT VESSELS
UNITED KINGDOM ATOMIC ENERGY AUTHORITY, HARPWELL
AERE-R-4584 +. 70 PAGES, FEBRUARY 1966, HMSO, BIS, \$2.50 CY

A SERIES OF EXPLOSIONS OF LIQUID HYDROGEN AND SOLID AIR WERE PERFORMED IN CLOSED VESSELS. THE PROPORTIONS OF HYDROGEN AND AIR, THE QUANTITIES IN RELATION TO THE CONTAINMENT VOLUME, AND THE CONTAINMENT VOLUMES AND L/D RATIO THEMSELVES, WERE ALL VARIED, AND THE RESULTING PRESSURES, VARIATIONS, AND PEAK PRESSURES WERE MEASURED AGAINST TIME. THE FULL RESULTS ARE ANALYZED HERE AND COMPARED WITH THEORETICAL ANALYSES. THE DYNAMIC RESPONSE OF TYPICAL CONTAINMENT VESSELS SUITABLE FOR USE IN NUCLEAR REACTORS IS CONSIDERED AND COMPARED WITH THE TIME CHARACTERISTICS OF THE EXPLOSION FORCES. IT WAS CLEAR THAT RELEVANT THEORIES WERE DIFFICULT TO LOCATE DESPITE INTENSIVE ENQUIRIES. CONSIDERABLE SCATTER WAS OBSERVED IN THE RESULTS AND APPARENT ANOMALIES OBSERVED WHEN EVALUATING EXPLOSION EFFICIENCIES.

TEST, PRESSURE VESSEL + COMPARISON, THEORY AND EXPERIENCE + CONTAINMENT INTEGRITY + AIR

010986
HYDROGEN EXPLOSION AT REACTOR FACILITY
DIVISION OF OPERATIONAL SAFETY, U. S. ATOMIC ENERGY COMMISSION
SERIOUS ACCIDENTS NO. 270 +. 4 PAGES, 5 FIGURES, JULY 15, 1966, DPI

AN EXPLOSION RESULTED FROM TEMPORARY STORAGE OF A FUEL-TRANSFER COFFIN IN AN AIRLOCK WITH THE EMERGENCY BATTERIES ACCIDENTALLY LEFT ON FULL CHARGE. THE HYDROGEN-AIR EXPLOSION OCCURRED WHEN THE DOOR WAS OPENED, PROBABLY FROM A SWITCH OR ARCLAY SPARK. THE PRESSURE (45 TO 70 PSI) BLEW THE ONE-TON AIRLOCK DOOR OFF ITS HINGES AND GENERATED MISSILES INSIDE THE CONTAINMENT.

REACTOR, BREEDER + EBR 1 AND 2 (RE) + REACTOR, FAST + REACTOR, LMCR + MISSILE GENERATION AND PROTECTION + FUEL HANDLING MACHINE

011600
CRYOGENIC PURIFIER EXPLOSION
DIVISION OF OPERATIONAL SAFETY, U.S. ATOMIC ENERGY COMMISSION, WASHINGTON, D.C.
SERIOUS ACCIDENTS ISSUE NO. 255, 1 PAGE, NOVEMBER 12, 1965, DPI

AN EXPLOSION OCCURRED DURING THE STARTUP OF A CRYOGENIC PURIFIER-DRIER USED TO REMOVE TRACE AMOUNTS OF OIL, WATER, AND NITROGEN FROM HYDROGEN BEFORE ITS USE WITH A BUBBLE-CHAMBER. BEFORE STARTUP, MAINTENANCE HAD BEEN PERFORMED ON THE LATER, ADMITTING AIR TO THE PURIFIER. A VALVE WAS THEN CLOSED, TRAPPING THE AIR WHICH WAS CONDENSED BY A LIQUID NITROGEN BATH. NO PURGE OCCURRED DURING STARTUP UNTIL THE VALVE WAS OPENED AND HYDROGEN ADMITTED TO THE SYSTEM. IT WAS THOUGHT THAT THE HYDROGEN FLOWING OVER THE CONDENSED AIR DETONATED.

INCIDENT, HUMAN ERROR + INCIDENT, NONNUCLEAR

011668
MAGNOX STATIONS LEAD IN ELECTRICITY PRODUCTION
3 PAGES, 1 TABLE, 1 FIGURE, 2 REFERENCES, NUCLEONICS 24(3), PAGES 48-50, MARCH 1966.

BRIEF DISCUSSION OF EXPERIENCES DURING 1965 AS VARIOUS POWER STATIONS. HINKLEY POINT HAD AN EXPLOSION IN THE HYDROGEN-COOLING SYSTEM.

REACTOR, GCR + REACTOR, GRAPHITE MODERATED + UNITED KINGDOM + OPERATING EXPERIENCE SUMMARY

015753
MOORE JG + GILBY EV
A REVIEW OF THE PROBLEMS ARISING FROM THE COMBUSTION OF HYDROGEN IN A WATER REACTOR CONTAINMENT
UNITED KINGDOM ATOMIC ENERGY AUTHORITY, SAFEGUARDS DIVISION
AHSR(SIR-101 +. 48 PAGES, 18 FIGURES, 9 TABLES, 26 REFERENCES, 1966

A CRITICAL REVIEW WAS MADE OF THE FACTORS AFFECTING THE EXPLOSION AND DETONATION OF HYDROGEN-AIR-STEAM MIXTURES. THERE IS LITTLE EXPERIMENTAL INFORMATION DIRECTLY APPLICABLE TO THE CONDITIONS EXPECTED TO OCCUR IN THE CONTAINMENT OF A WATER REACTOR AFTER AN ACCIDENT. THIS PAPER MAKES RECOMMENDATIONS ON THE DATA WHICH SHOULD BE USED IN THESE CONDITIONS. AN APPRECIATION OF THE HAZARD TO CONTAINMENT INTEGRITY HAS SHOWN THAT THE UNCERTAINTIES IN THE DATA ARE SMALL COMPARED WITH THE UNCERTAINTIES IN OTHER AREAS OF THE PROBLEM. PARTICULAR CONSIDERATION WAS GIVEN TO A TYPICAL LARGE PWR, AND IT WAS FOUND THAT THERE IS LITTLE RISK TO THE CONTAINMENT IF THE HYDROGEN IS UNIFORMLY DISTRIBUTED. HOWEVER, IT WAS NOT POSSIBLE TO ASSESS COMPLETELY THE EFFECTS OF AN ASYMMETRIC LOADING DUE TO THE EXPLOSION OR DETONATION OF A PACKET OF HYDROGEN CLOSE TO THE CONTAINMENT BOUNDARY.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, NATIONAL BUREAU OF STANDARDS, U.S. DEPT. OF COMMERCE, SPRINGFIELD, VA., \$3.00 COPY, \$0.65 MICROFICHE

OXYGEN + CONTAINMENT, SHOCK GENERATION AND PROTECTION + STEAM + CONTAINMENT STRUCTURE

016531
PENLAND JR
EXPLOSION SUPPRESSION BY ROOM INERTING
LOS ALAMOS SCIENTIFIC LAB., N. MEXICO
LA-DC-8592 + CONF-670201-2 +. 5 PAGES, FROM SYMPOSIUM ON THE IMPACT OF LOW COST NUCLEAR POWER AND CHEMICAL INDUSTRY, HOUSTON, TEXAS, FEBRUARY 22, 1967

ROOM VOLUMES GREATER THAN 100,000 CU. FT ARE INERTED, BOTH CONCRETE (HIGH PRESSURE) AND SHEET METAL (LOW-PRESSURE ROOMS.) LEAK SEALING AND RELIEF-VALVE CLOSURE WERE PROBLEMS. A SPECIAL RELIEF DEVICE CONSISTS OF ALWAYS-OPEN PNEUMATICALLY OPERATED LOUVERS, CLOSED AFTER A PRESSURE SURGE BLUWS OUT A DOWNSTREAM PANEL - THUS THE SURGE IS RELEASED, BUT HYDROGEN IS CONTAINED TO PREVENT EXPOSURE MIXING OUTSIDE THE BUILDING. THE SYSTEM HAS BEEN IN OPERATION FOR 6 YEARS, AND ABOUT 200 TESTS ON NUCLEAR ROCKETS PERFORMED. MANY LEAKS WITH HYDROGEN AS HIGH AS 12% HAVE NOT PRODUCED FIRE OR EXPLOSION.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, NATIONAL BUREAU OF STANDARDS, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VIRGINIA, \$3.00 COPY, \$0.65 MICROFICHE

CONTAINMENT ISOLATION + OPERATING EXPERIENCE SUMMARY + NUCLEAR ROCKET + CONTAINMENT ATMOSPHERE, INERT + VALVES

017059
GRACIE PS
STRENGTH OF METALS UNDER RAPID LOADING. A SURVEY IN RELATION TO T
ATOMIC ENERGY RESEARCH ESTABLISHMENT, HARWELL, ENGLAND
AERE-M-1471 +. 17 PAGES, 1 FIGURE, REFERENCES, SEPTEMBER 1965

THE PRESENT INTEREST IN RESPONSE OF METALS TO DYNAMIC LOADING ARISE DUE TO THE LIQUID-HYDROGEN LOOP
CONTAINMENT VESSEL ES FROM THE NEED TO DESIGN A TUBULAR ZIRCONIUM ALLOY PRESSURE
VESSEL FOR USE IN-PILE WHICH WILL SAFELY CONTAIN (THOUGH NOT NECESSARILY WITHOUT SUFFERING
DAMAGE) A CONCEIVABLE BUT UNLIKELY HYDROGEN/AIR EXPLOSION. ZIRCONIUM-20 ALLOY APPEARS LIKELY TO
OFFER AT LEAST A 40% EXTRA STRENGTH IN EXPLOSIVE PRESSURIZING SO FAR AS TRANSIENTS IN PRESSURE
SHORTER THAN ABOUT 1 MILLISEC ARE CONCERNED, AND PROBABLY SOME ADVANTAGE FOR CONSIDERABLY LONGER
TRANSIENTS.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, NATIONAL BUREAU OF STANDARDS,
U.S. DEPT. OF COMMERCE, SPRINGFIELD, VA., \$3.00 COPY, \$0.65 MICROFICHE

CONTAINMENT VESSEL LOADING + REACTOR, HMM + PRESSURE VESSELS + AIR + DDD (TR) + ZIRCALOY

018350
SPANGLER CH + LOFT SK + JONCICH MJ
REACTIONS OF GRAPHITE UNDER EXPLODING WIRE CONDITIONS
DEPARTMENT OF CHEMISTRY, MICHAEL FARADAY LABORATORIES, NORTHERN ILLINOIS UNIVERSITY, DEKALB, ILLINOIS
3 PAGES, 3 FIGURES, 2 TABLES, 14 REFERENCES, ELECTROCHEM. TECH. 5(5-5), PAGE 214 THRU 217, (MAY 6, 1967)

GRAPHITE RODS AND YARN WERE EXPLODED IN AIR, HYDROGEN, AND OXYGEN. THE OSCILLOSCOPIC TRACINGS OF
CURRENT VS. TIME WERE DIFFERENT FROM THOSE PREVIOUSLY REPORTED FOR METALS. THE PRODUCTS OBTAINED
FROM THE REACTION WITH HYDROGEN WERE IDENTIFIED BY MASS SPECTROGRAPHY AND SEEM TO CORRESPOND
RATHER WELL WITH PREVIOUSLY REPORTED REACTIONS OF MONOATOMIC CARBON. THE TYPES AND DISTRIBUTION
OF PRODUCTS CAN BE EXPLAINED ON THE BASIS OF INTERMEDIATE METHYLENE FORMATION. REACTION WITH
OXYGEN IS DEPENDENT ON THE RELATIVE OXYGEN AVAILABILITY. IF OXYGEN IS A MINOR COMPONENT, CARBON
MONOXIDE FORMATION IS FAVORED. CARBON DIOXIDE IS FORMED PREFERENTIALLY IN PURE OXYGEN.

CARBON + CHEMICAL REACTION + DEUTERIUM + GRAPHITE + OXIDATION + HIGH TEMPERATURE

029098
HEUZEL N + KLEINE A
EXPERIMENTAL INVESTIGATION OF REACTIONS BETWEEN URANIUM DIOXIDE AND WATER UNDER NONISOTHERMAL, QUASI-ISOBARIC
CONDITIONS
BATTELLE INSTITUTE, FRANKFURT / MAIN, GERMANY
AEC-TR-6960 +. 44 PAGES, APRIL 24, 1968

IN SUPPLEMENTATION OF AN ISOTHERMAL INVESTIGATION OF CHEMICAL REACTIONS BETWEEN NUCLEAR FUELS AND
AIR OR WATER VAPOR, THE CHEMICAL AND PHYSICAL BEHAVIOR OF THE UO₂ TOWARD LIQUID WATER WAS
EXAMINED UNDER NONISOTHERMAL, QUASI-ISOBARIC CONDITIONS. UP TO 1000G UO₂ PELLETS, SPHERICAL
PARTICLES OR POWDER, WERE HEATED INDUCTIVELY TO 1700 C AND DUMPED INTO WATER OF 25 OR 80 C AT 1
ATM OR AT 160 C AT 6.5 ATM RESPECTIVELY. THE SURFACE-TO-VOLUME RATIO OF THE UO₂ POWDER CHANGED
CONSIDERABLY BY SINTERING. EXPERIMENTS PROVED THAT STEAM GENERATION STRONGLY DEPENDS ON WATER
TEMPERATURE AND SPECIFIC SAMPLE SURFACE. IT WAS CONCLUDED THAT THE DANGER OF OXYHYDROGEN
EXPLOSIONS AS A RESULT OF THE DEVELOPMENT OF HYDROGEN FROM RADIOLYSIS AND METAL-WATER REACTIONS
DOES NOT INCREASE MATERIALLY THROUGH THE CONTACT OF HOT URANIUM DIOXIDE WITH WATER.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151, \$3.00
COPY, \$0.65 MICROFICHE

WATER + FUEL, PELLET TYPE + REACTOR + URANIUM DIOXIDE + EXPERIMENT + FUEL REPROCESSING + FUEL, METALLIC TYPE

031408
LETTER, DATED 2/18/69, NFS TO DIV. OF MATERIALS LICENSING AEC, WITH ATTACHMENT DEFINING REQUEST FOR CHANGE NO.
11 TO TECHNICAL SPECIFICATIONS OF PROVISIONAL OPERATING LICENSE CSF-1
NUCLEAR FUEL SERVICES
30 PAGES, LETTER TO J.A. MCBRIDE, FEBRUARY 18, 1969, DOCKET 50-201

REQUEST COVERS CHANGES IN RADIOACTIVITY CONTENT OF GASEOUS AND LIQUID EFFLUENTS, FISSION ISOTOPE
CONCENTRATION IN SOLVENT EXTRACTION, EXTRACTANT CONCENTRATION, PU ION EXCHANGE QUESTION, PU
STORAGE, REWORK EVAPORATOR SOLUTION CONCENTRATION, SOLID WASTE BURIAL, CAUSTIC CONCENTRATION IN
STORAGE TANKS, PERSONNEL PROTECTIVE EQUIPMENT, EFFLUENT MONITORING, PROCESS INSTRUMENTATION,
CONTAMINATION CONTROL, PERSONNEL CONTROL TO RESTRICTED AREAS, CRITICALITY CONTROL, EMERGENCY
EQUIPMENT, CONTROL OF H₂ CONCENTRATION DURING DISSOLUTION.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
CHARGE \$2.00

BORON + CRITICALITY SAFETY + FIRE + INSTRUMENT, PROCESS + LICENSE STATUS + PERSONNEL PROTECTIVE DEVICE +
PLUTONIUM + REGULATION + SAFETY REVIEW + ZIRCONIUM + WASTE TREATMENT, LIQUID + WASTE TREATMENT, GAS + WASTE
DISPOSAL, SOLID + WASTE MANAGEMENT + CONTAMINATION + EQUIPMENT + NFS + SOLVENT EXTRACTION PROCESS + FUEL
REPROCESSING + DISSOLUTION

033334
SAFETY GUIDELINES FOR ACCELERATOR INSTALLATIONS
U.S. ATOMIC ENERGY COMMISSION
HEALTH AND SAFETY INFORMATION ISSUE NO. 275 +. 9 PAGES, 3 FIGURES, 22 REFERENCES, APRIL 24, 1969

(PAPER UCRL-18555.) A REVIEW OF THE ACCELERATOR SAFETY MANUAL (TID-23992) PLUS SOME GENERAL COMMENTS ON (1) HAZARD IDENTIFICATION, FREON TF AND BARIUM EXPLOSION KILLED 2. 74 OIL DIFFUSION PUMPS EXPLODED, (2) HOW SAFE IS SAFE, HOURLY DEATH PROBABILITY CURVE SHOWS ALL ATOMIC INDUSTRIAL 10X SAFER THAN U.S. INDUSTRY AND 5 X SAFER THAN NATIONAL ACCIDENT DEATH RATE, DUTY AT BURRLE CHAMBER IS AS RISKY AS RIDING IN AIRPLANE OR AUTO OR AS RISKY AS BEING 50 YEARS OLD, (3) DISTANCE (BETWEEN BUILDING AND L₂ STORAGE) TABLES ARE BECOMING ACCEPTED, BUILDINGS NEED MINIMUM VENTILATION BUT MORE PROTECTION AGAINST SPARKS, PURGING WITH HELIUM TO REMOVE HYDROGEN BEFORE OXYGEN MELTS.

GUIDE + FIRE + RADIATION IN PERSPECTIVE + OPERATING EXPERIENCE SUMMARY + INCIDENT, NONNUCLEAR + ACCELERATOR + IRRADIATION FACILITY + INDUSTRIAL SAFETY

038958
TUPNER SE
RADIOLYTIC DECOMPOSITION OF WATER IN WATER-MODERATED REACTORS UNDER ACCIDENT CONDITIONS
SOUTHERN NUCLEAR ENGINEERING, INC.
14 PAGES, 5 FIGURES, 6 TABLES, 16 REFERENCES, REACTOR AND FUEL-PROCESSING TECHNOLOGY, 12(1), PG 68-79 (1969)

THE PURPOSE OF THIS REVIEW IS TO PROVIDE A PRACTICAL EVALUATION OF THE POTENTIAL CONCENTRATIONS OF RADIOLYTIC GASES (HYDROGEN AND OXYGEN) WHICH MAY ACCUMULATE IN THE CONTAINMENT ATMOSPHERE FOLLOWING A LOSS-OF-COOLANT ACCIDENT. RESULTS OF THE EVALUATION INDICATE A REASONABLE PROBABILITY THAT HYDROGEN AND OXYGEN WILL ACCUMULATE IN AMOUNTS EXCEEDING THE MINIMUM COMBUSTIBLE CONCENTRATION (COMBUSTIBLE OR FLAMMABLE LIMIT).

BIBLIOGRAPHY + WATER + CHEMICAL KINETICS + RADIOLYTIC GAS + RADIATION EFFECT

042890
PUJIA V + SENNIS C + SIMONETTA P
STORAGE SYSTEMS FOR LIQUID HIGH-LEVEL WASTE - DESIGN CRITERIA RELATED TO THE SAFETY ANALYSIS
COMITATO NAZIONALE PER L'ENERGIA NUCLEARE, ROME (ITALY)
RT/PROT-(69)14 +. 37 PAGES, 1969 (IN ITALIAN)

GENERAL REMARKS - CONTAINMENT - ANALYSIS OF INCIDENTS INHERENT IN STORAGE - MALFUNCTION OF THE FILTER SYSTEM - MALFUNCTION OF THE FANS IN THE VENTILATION SYSTEM - ANALYSIS OF THE RISKS CONNECTED WITH THE CORROSION OF THE STORAGE TANK - BOILING OF THE LIQUID WASTES - ACTIVATION OF THE HYDROGEN-AIR MIXTURE - CRITICAL EXCURSION - SEISMIC CONSIDERATIONS.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00 COPY, \$0.65 MICROFICHE

CRITICALITY SAFETY + DESIGN CRITERIA + SEISMOLOGY + VENTILATION SYSTEM + WASTE STORAGE + FILTER LIFE + CORROSION + STORAGE CONTAINER + BOILING + FILTERS

043713
ALUMINUM TANK EXPLOSION - EXPLOSIVE GAS MIXTURE FROM CORROSION
U.S. ATOMIC ENERGY COMMISSION, DIVISION OF REACTOR LICENSING
R9E-70-3 +. 2 PAGES, APRIL 17, 1970

A LEAK DEVELOPED IN AN UNDERWATER ALUMINUM BALLAST TANK WHICH CONTAINED AIR AT ATMOSPHERIC PRESSURE. TANK WAS DRAINED AND LEFT OVERNITE TO DRY FOR WELDING TO REPAIR LEAK. THE NEXT DAY WHEN THE WELDER STRUCK AN ARC, TANK EXPLODED. INVESTIGATION SHOWED THAT AN EXPLOSIVE HYDROGEN-AIR MIXTURE HAD EVOLVED FROM CORROSION OF THE ALUMINUM. ALL ALUMINUM TANKS HAVE BEEN REPLACED WITH STAINLESS-STEEL TANKS FILLED WITH HELIUM. AT PRESENT ALL TANKS FILLED WITH HELIUM, AND PERIODIC SAMPLING ENSURES PRESENCE OF INERT ATMOSPHERE. SAMPLING REQUIRED BEFORE WELDING.

AEC-DRL

ALUMINUM + FAILURE + REACTOR, TEST + WELDING + CORROSION + HELIUM

046738
VERMONT YANKEE CONTAINMENT INERTING (AMENDMENT 12 TO DOCKET 50-271)
VERMONT YANKEE NUCLEAR POWER CORPORATION
31 PAGES, LETTER - VERMONT YANKEE NUCLEAR POWER CORPORATION TO U.S. ATOMIC ENERGY COMMISSION - MAY 22, 1970, DOCKET 50-271, TYPE--BWR, MFG--G.E., AE-EBASCO

THE FOREGOING DISCUSSION CLEARLY INDICATES THAT INERTING OF THE VERMONT YANKEE CONTAINMENT IS NOT REQUIRED BECAUSE ONLY NEGLIGIBLE QUANTITIES OF HYDROGEN WOULD BE EVOLVED AS A RESULT OF THE ZIRCONIUM-WATER REACTION ASSOCIATED WITH THE WORSE CONCEIVABLE LOSS-OF-COOLANT ACCIDENT. ALSO, AS INERT ATMOSPHERE IS NO SOLUTION TO THE PROBLEM OF HYDROGEN EVOLVED GRADUALLY DUE TO RADIOLYSIS OF COOLING WATER, BECAUSE OXYGEN AS WELL AS HYDROGEN IS PRODUCED BY RADIOLYSIS. MOREOVER, THERE ARE SERIOUS OPERATIONAL SAFETY PROBLEMS ASSOCIATED WITH AN INERT ATMOSPHERE. THEREFORE, THE VERMONT YANKEE CONTAINMENT WILL NOT BE INERTED UNLESS THIS ACTION IS REQUIRED OFFICIALLY BY THE

046735 *CONTINUED*
USAEF.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 109 CENTS/PAGE -- MINIMUM CHARGE \$2.00

NRC QUESTION + REACTOR, BWR + FIRE + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + WATER + ZIRCONIUM + RADIOLYTIC GAS + VERMONT YANKEE (HWR) + CONTAINMENT ATMOSPHERE, INLET

047276
FLETCHER, W. F. + FILL, M. J. + MARCHESE, R. T. + GALLAGHER, J. L.
POST LOCA HYDROGEN GENERATION IN PWR CONTAINMENTS
WESTINGHOUSE ELECTRIC CORPORATION, PITTSBURGH, PENNSYLVANIA
2 PAGES, 1 FIGURE, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, 1311, PP. 203-204 (JULY 1970)

THE PRODUCTION OF HYDROGEN DUE TO THE RADIOLYSIS OF REACTOR CONTAINMENT SPRAY SOLUTIONS HAS BEEN INVESTIGATED. EXPERIMENTAL RESULTS INDICATE A CONSERVATIVE RATE OF HYDROGEN PRODUCTION DUE TO SUMP SOLUTION RADIOLYSIS OF 0.30 MOLECULES/100 EV OF ENERGY ABSORBED BY THE SOLUTION. EXPERIMENTAL STUDIES OF CORE SOLUTION RADIOLYSIS HAVE SHOWN THE EXTENT OF HYDROGEN PRODUCTION FROM THIS SOURCE IS LIMITED BY THE ATTAINMENT OF A STEADY-STATE HYDROGEN CONCENTRATION IN THE SOLUTION PASSING THROUGH THE CORE. BASED ON EXPERIMENTAL DATA, AN ANALYTIC MODEL WAS DERIVED WHICH CONSERVATIVELY APPROXIMATES THE HYDROGEN PRODUCTION PROCESS AS IT WOULD OCCUR IN THE NUCLEAR PLANT SHOULD A HYPOTHETICAL DESIGN BASIS ACCIDENT OCCUR. THE SIGNIFICANCE OF OTHER SOURCES OF HYDROGEN IN THE POSTACCIDENT ENVIRONMENT ALSO IS DISCUSSED.

AVAILABILITY - W.D. FLETCHER, WESTINGHOUSE ELECTRIC CORPORATION, NUC-PWR SYSTEMS DIVISION, P.O. BOX 355, PITTSBURGH, PENNSYLVANIA 15230

CONTAINMENT SPRAY + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + ANALYTICAL MODEL + RADIOLYTIC GAS + ACCIDENT, DESIGN BASIS

054865
LEIPUNSKY OI
HARMFUL EFFECTS OF THE RADIOACTIVITY FROM EXPLOSION OF PURE HYDROGEN BOMBS AND ORDINARY ATOMIC BOMBS.
ATOMNAYA ENERGIYA/U.S.S.R. 3 PAGES 570-579 1957, SVIET AT. ENERGY (ENGLISH TRANSL.) 3 PAGES 1413-1425 1957,
JOINT COMMITTEE ON ATOMIC ENERGY, U. S. CONGRESS 3 PAGES 2423-2447 1959

FISSION PRODUCT RELEASE + NUCLEAR DETONATION + RADIOISOTOPE + EFFECT

057083
AMENDMENT 11 TO FSAR (DCONEE 1, 2, 3)
DUKE POWER COMPANY
DOCKET 50-269-13 +. 700 PAGES, FIGURES, TABLES DOCKET 50-269/270/287, TYPE--PWR, MFG--B+W, AE--DUKE

TRANSMITS REVISED PAGES TO THE SAR, CONCERNED WITH METEOROLOGY, CONTROL OF HYDROGEN AFTER AN ACCIDENT, SWITCH GEAR, REGULATORY SYSTEMS, POSTACCIDENT RECIRCULATION, CONTAINMENT DESIGN, SEISMIC CONSIDERATIONS, REACTOR PHYSICS, ETC.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT DESIGN + FIRE + REACTOR, PWR + REPORT, SAR + METEOROLOGY + REACTOR PHYSICS + SEISMIC DESIGN + DCONEE 1 (PWR)

063771
SAFETY GUIDE 7 - CONTROL OF COMBUSTIBLE GAS CONCENTRATIONS IN CONTAINMENT FOLLOWING A LOSS OF COOLANT ACCIDENT
U.S. ATOMIC ENERGY COMMISSION, WASHINGTON, D.C.
LETTER TO SAFETY GUIDE RECIPIENTS +. 2 PAGES, (APRIL 9, 1971)

GENERAL DESIGN CRITERION 41 REQUIRES THAT SYSTEMS TO CONTROL HYDROGEN, OXYGEN, AND OTHER SUBSTANCES WHICH MAY BE RELEASED INTO THE REACTOR CONTAINMENT BE PROVIDED AS NECESSARY TO CONTROL THEIR CONCENTRATIONS FOLLOWING POSTULATED ACCIDENTS TO ENSURE THAT CONTAINMENT INTEGRITY IS MAINTAINED. THIS GUIDE DESCRIBES AN ACCEPTABLE METHOD OF IMPLEMENTING THIS CRITERION.

AVAILABILITY - U.S. ATOMIC ENERGY COMMISSION, DIRECTORATE OF REGULATORY STANDARDS, WASHINGTON, D.C. 20545

REACTOR, BWR + FIRE + NRC DESIGN CRITERIA + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + OXYGEN + REACTOR, PWR + CONTAINMENT INTEGRITY + CORROSION + RADIOLYTIC GAS + PRESSURE, INTERNAL + NRC REGULATORY GUIDE

065546
RADIOACTIVE OFF-GAS RELEASE AT DRESDEN-1, CAUSED BY HYDROGEN EXPLOSION
COMMONWEALTH EDISON COMPANY, CHICAGO, ILLINOIS
DOCKET-50010-92 +. 5 PAGES, LETTER TO DIVISION OF REACTOR LICENSING FROM COMMONWEALTH EDISON COMPANY, DOCKET 50-10, TYPE--BWR, MFG--G.E., AE--BECHTEL

ON AUG. 12, 1971, TWO RUPTURE DISKS WERE BLOWN IN THE AIR-EJECTOR VENT PIPE, CAUSING HIGH PRESSURE IN THE TURBINE BUILDING. THE RELEASE RESULTED FROM PRESSURE BUILDUP CAUSED BY IGNITION OF RADIOLYTIC HYDROGEN AND OXYGEN, POSSIBLY CAUSED BY A STATIC CHARGE IN THE OFF-GAS FILTERS.

065546 *CONTINUED*

GROUNDING FILTERS ARE BEING SOUGHT. NO OFF-SITE ENVIRONMENTAL EFFECTS HAVE BEEN DETECTED. THERE WAS SOME ON-SITE CONTAMINATION WITHIN 100 FT OF VENT AREA BY SHORT-LIVED NUCLIDES. TWO PERSONS ENTERING THE AREA IN FULL PROTECTIVE CLOTHING RECEIVED 18 MILLIREMS. EVALUATION OF DATA IS CONTINUING. ALL SAFETY SYSTEMS PERFORMED SATISFACTORILY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

AIRBORNE RELEASE + REACTOR, BWR + DRESDEN 1 (BWR) + FISSION PRODUCT RELEASE + OXYGEN + SURVEY, ENVIRONMENT + CONTAMINATION + PERSONNEL EXPOSURE, RADIATION + PRESSURE RELIEF + RADIOACTIVITY RELEASE + RADIOLYTIC GAS + FAILURE, DESIGN ERROR + OFF GAS

068022

ROW TH

REACTOR CONTAINMENT-BUILDING SPRAY SYSTEMS FOR FISSION-PRODUCT REMOVAL

6 PAGES, 2 TABLES, 3 FIGURES, NUCLEAR SAFETY, 12(5), PAGE 516-22, SEPTEMBER - OCTOBER 1971

CONTAINMENT-BUILDING SPRAY SYSTEMS AS FISSION-PRODUCT-REMOVAL DEVICES ARE BECOMING WIDESPREAD IN PRESSURIZED-WATER-REACTOR DESIGN, AND THE AEC HAS BEEN SPONSORING A RESEARCH PROGRAM TO INVESTIGATE THE APPLICABILITY OF THESE SYSTEMS AS ENGINEERED SAFETY FEATURES. THE OAK RIDGE NATIONAL LABORATORY HAS COORDINATED THE PROGRAM FOR THE AEC AND MAINTAINED LIAISON BETWEEN COMMISSION-SPONSORED LABORATORIES AND NUCLEAR INDUSTRY. THREE-SPRAY SOLUTIONS ARE PRESENTLY IN USE OR BEING SERIOUSLY CONSIDERED BY PLANT DESIGNERS. MOLECULAR IODINE REMOVAL BY THESE SPRAYS IS VERY EFFECTIVE, AND DECONTAMINATION FACTORS RANGING FROM 20 AND 1000 MAY BE OBTAINED, DEPENDING ON THE SOLUTION SELECTED. THE EXPLOSION HAZARD FROM GENERATION OF RADIOLYTIC HYDROGEN, FIRST IDENTIFIED IN THIS PROGRAM IN 1967, CONTINUES TO REQUIRE SERIOUS CONSIDERATION IN PLANT DESIGN.

CONTAINMENT + CONTAINMENT SPRAY + DECONTAMINATION + DECONTAMINATION FACTOR

070935

HYDROGEN DETONATION IN OFF GAS SYSTEM AT LA CROSSE

DAIRYLAND POWER COOPERATIVE

4 PAGES, LETTER - DAIRYLAND POWER COOPERATIVE TO DIVISION OF REACTOR LICENSING (AEC) - AUGUST 2, 1972, DOCKET 50-409, TYPE--BWR, MFG--A.C., AE--SGT + LUNDY

THE MAIN CONDENSER OFF-GAS WAS ROUTED TO THE STORAGE TANKS FROM THE NORMAL ROUTE TO STACK SO THAT A BLOWER COULD BE CONNECTED TO A VENT HEADER. AN ERRONEOUS STEAM FLOW INDICATION TO THE RECOMBINER LED TO OPERATOR'S REDUCING FLOW. ONE MINUTE LATER, DETONATION OCCURRED. THE REDUCED STEAM FLOW RESULTED IN AN EXPLOSIVE MIXTURE, AND IGNITION WAS CAUSED BY ELECTRICAL PREHEATER COILS OR BY CATALYTIC ACTION IN RECOMBINER. ONLY DAMAGE WAS A RUPTURED D/P GAGE. ERRONEOUS STEAM FLOW INDICATION CAUSED BY CALIBRATION SHIFT DUE TO UNEQUAL WATER LEGS BECAUSE WATER HAD EVAPORATED FROM LEGS, AND, ON START OF RECOMBINER, THE HIGH LEG FILLED BEFORE DOWNSTREAM LEG.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + FAILURE + STEAM + INSTRUMENT, FLOW + OFF GAS + LACROSSE (BWR) + INSTRUMENT, ABNORMAL INDICATION + OPERATING EXPERIENCE

073408

LA CROSSE MONTHLY OPERATING REPORT FOR JUNE 1972

DAIRYLAND POWER COOPERATIVE

DOCKET-50409-9 + DPC-851-44 +. 20 PAGES, LACROSSE MONTHLY OPERATION REPORT, JUNE 1972, DOCKET 50-409, TYPE--BWR, MFG--A.C., AE--SGT + LUNDY

ITEMS OF INTEREST INCLUDE DISCUSSION OF (1) PROBLEMS ASSOCIATED WITH CLOSING THE SHUTDOWN CONDENSER CONDENSATE RETURN VALVE, (2) CASING INSULATION FIRE ON CIRCULATION PUMP DUE TO OIL LEAK, AND (3) HYDROGEN DETONATION IN THE OFF-GAS SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + FIRE + REPORT, OPERATIONS + OFF GAS + LACROSSE (BWR) + MAIN COOLING SYSTEM + SHUTDOWN COOLING SYSTEM + LUBRICATION + OPERATING EXPERIENCE + PUMPS + VALVES

078092

GARIGLIANO NUCLEAR POWER STATION - OPERATIONS REPORT FOR 1ST QUARTER OF 1972

ENTE NAZIONALE PER L'ENERGIE ELETTRICA, ROME

TID-26210 +. 19 PAGES, FIGURES, TABLES, REFERENCES, MARCH 31, 1972

ONE SHUTDOWN (MAR. 15, 1972) BECAUSE OF BURSTED RUPTURE DIAPHRAGMS IN THE VENT PIPE FOR THE NONCONDENSABLES THAT ISSUED FROM THE STEAM EJECTORS. BURST WAS DUE TO EXPLOSIVE RECOMBINATION OF RADIOLYTICALLY GENERATED HYDROGEN AND OXYGEN. STATION ON LINE BY MAR. 17.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + REPORT, OPERATIONS + OXYGEN + RADIOLYTIC GAS + GARIGLIANO (BWR) + REACTOR SHUTDOWN

079414
EXPLOSION IN OFF-GAS SYSTEM AT QUAD CITIES 1
COMMONWEALTH EDISON CO.
6 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), MARCH 16, 1973, DOCKET 50-265, TYPE--BWR, MFG--G.E., AE--SGT AND LUNDY

A SUDDEN INCREASE IN STACK-GAS RELEASE RATE RESULTED FROM FAILURE OF A RUPTURE DISK IN THE OFF-GAS HOLDUP SYSTEM. THE FAILURE WAS CAUSED BY AN EXPLOSION IN THE OFF-GAS SYSTEM, PROBABLY THE RESULT OF A LIGHTNING STRIKE ON THE PLANT, DETONATING THE HYDROGEN. THE EXPLOSION ALSO DESTROYED THE FILTERS. RELEASE RATES DID NOT EXCEED LIMITS EVEN THOUGH THE PLANT OPERATED WITHOUT FILTERS AT FULL POWER FOR ABOUT A DAY. NO ONE WAS CONTAMINATED. PROPER RADIATION PROTECTION PROCEDURES WERE OBSERVED BY OPERATING PERSONNEL. NO OTHER DAMAGE OCCURRED.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 M STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + FAILURE + FILTER, HIGH EFFICIENCY + INCIDENT, EQUIPMENT + RADIOACTIVITY RELEASE + OFF GAS + SFAL + QUAD CITIES 1 (BWR) + WEATHER, SEVERE + OPERATOR ACTION

090133
EXPLOSION IN A TEMPORARY FILTER AT DRESDEN 2
COMMONWEALTH EDISON COMPANY
4 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), APRIL 5, 1973, DOCKET 50-237, TYPE--BWR, MFG--G.E., AE--SGT AND LUNDY

WITH UNITS 2 AND 3 SHUT DOWN, AN EXPLOSION OCCURRED IN A TEMPORARY FILTER BEING USED TO PUNGE UNIT-2 OFF-GAS PIPING. PURGING HAD BEEN STOPPED TO REPAIR DAMAGED DUCT WORK NEAR THE FILTER. AT THIS TIME, A WELDER STARTED WORKING ON AN UNRELATED JOB 8 FT ABOVE THE SLIGHTLY CONTAMINATED TEMPORARY FILTER. HYDROGEN FROM THE FILTER WAS EXPLODED BY THE WELDING ARC, AND TWO WORKERS WERE SLIGHTLY INJURED. CONTAMINATION WAS LIMITED TO A SMALL AREA NEAR THE FILTER. 1.76 CUBIC FEET OF HF-133 WERE RELEASED. NO DAMAGE WAS DONE TO THE OFF-GAS SYSTEM.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 M STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + FAILURE + MAINTENANCE AND REPAIR + DRESDEN 2 (BWR) + OFF GAS + FAILURE, ADMINISTRATIVE CONTROL + PIPES AND PIPE FITTINGS + FILTERS

090690
TAYLOR RW
THERMAL EFFECTS OF UNDERGROUND NUCLEAR EXPLOSION
LAWRENCE LIVERMORE LABORATORY, CALIFORNIA
9 PAGES, 8 FIGURES, 32 REFERENCES, NUCLEAR TECHNOLOGY, 18(2), PP. 185-193 (MAY 1973)

MOST OF THE ENERGY OF AN UNDERGROUND NUCLEAR EXPLOSION IS DEPOSITED NEAR THE SITE OF THE EXPLOSION AS HEAT. LABORATORY EXPERIMENTS ON SHALES THAT ARE MOSTLY FINE GRAIN MIXTURES OF QUARTZ AND CARBONATE SHOW THAT CO₂ IS RELEASED AT TEMPERATURES AS LOW AS 500 C, EVEN UNDER A CO₂ PRESSURE OF 50 ATM. IN THE FUTURE, THE RELEASE OF LARGE AMOUNTS OF CO₂ MAY BE USED TO ADVANTAGE IN SECONDARY OIL RECOVERY, AND IN THE RECOVERY OF HEAVY CRUDE OILS, BECAUSE OF THE GREAT REDUCTION IN VISCOSITY THAT RESULTS AS CO₂ DISSOLVES IN THESE OILS. THE NUCLEAR CHIMNEY, WITH ITS LARGE VOID VOLUME, LARGE SURFACE AREA FOR CATALYSIS, AND HIGH TEMPERATURES, IS A POTENTIAL HIGH PRESSURE VESSEL FOR CHEMICAL REACTION.

PLUMSHAPE + CARBON DIOXIDE + STEAM + THERMODYNAMICS + TRITIUM + THERMAL PROPERTY

090695
CARBIENER WA + RITZMAN RL
AN EVALUATION OF THE APPLICABILITY OF EXISTING DATA TO THE ANALYTICAL DESCRIPTION OF A NUCLEAR-REACTOR ACCIDENT
BATTELLE COLUMBUS LABORATORIES, OHIO
NMI-1924 +, 24 PAGES, 2 FIGURES, APRIL 1971

THE GENERATION OF HYDROGEN FROM RADIOLYTIC DECOMPOSITION OF EMERGENCY-COOLING WATER DURING A REACTOR LOSS-OF-COOLANT ACCIDENT WAS REASSESSED ON THE BASIS OF RECENT EXPERIMENTS. IT WAS CONCLUDED FOR BWR SYSTEMS THAT FLAMMABLE CONCENTRATIONS WERE POSSIBLE, WITH TIMES TO REACH SUCH A LIMIT CONSERVATIVELY ESTIMATED TO BE FROM 15 TO 100 MIN. IN ADDITION, THE EFFECTS OF CONTAINMENT INERTING ARE DISCUSSED. FOR PWR SYSTEMS, THE TIME TO REACH FLAMMABILITY LIMITS WAS ESTIMATED TO BE 16 DAYS TO 2 MONTHS. THE RANGE OF PREDICTIONS BY VARIOUS INVESTIGATORS IS UNSATISFYING, BUT THE RESULTS INDICATE THAT HYDROGEN CONTROL MEASURES SHOULD BE CONSIDERED IN BOTH CASES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + FIRE + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR

090696
CLOYD DA + MURPHY WJ
HANDLING HAZARDOUS MATERIALS
NASA, TECHNOLOGY UTILIZATION DIVISION
NASA SP-5032 +, 93 PAGES, TABLES, FIGURES, SEPTEMBER 1965

080698

INFORMATION FROM THE AERIAL SPACE PROGRAM IS MADE AVAILABLE TO AMERICAN INDUSTRY, INCLUDING THE LATEST DEVELOPMENTS IN MATERIALS, PROCESSES, PRODUCTS, TECHNIQUES, MANAGEMENT SYSTEMS, AND ANALYTICAL AND DESIGN PROCEDURES. THIS PUBLICATION IS PART OF A SERIES INTENDED TO PROVIDE SUCH TECHNICAL INFORMATION. IT DEALS WITH HIGHLY REACTIVE MATERIALS THAT HAVE BEEN STUDIED IN THE SEARCH FOR FUELS AND CATALYSTS FOR SPACE WORKS. LIQUID HYDROGEN, PENTADECANE, BENZENE, ETHYLENE TRIFLUORIDE, DIBORANE, NITROGEN TETRACHLORIDE, AND HYDRAZINE AND ITS DERIVATIVES. IT DESCRIBES BOTH THE HAZARDS THAT HAVE RESTRICTED THE USE OF THESE MATERIALS AND THE PROCEDURES BY WHICH THEY HAVE BEEN HANDLED AND STORED SAFELY. REFERENCES ARE GIVEN TO WORK DONE BY NASA AND OTHER INVESTIGATIONS.

AVAILABILITY - SUPERINTENDENT OF DOCUMENTS, U.S. GOVERNMENT PRINTING OFFICE, WASHINGTON, D.C. 20540

FIRES - HAZARD, RELATIVE - FLUORINE - HAZARDOUS ANALYSIS - FLUORINE - CHEMISTRY - SPACECRAFT

080699

SCHEMEL GN + MILLER DP + ALTON JE + ET AL
CHEMICAL INHIBITION OF THE HYDROGEN-OXYGEN REACTION
MOUNT-PATTERSON AIR FORCE BASE, CALIF
ASD-TU-62-1047 2, 104 PAGES, 57 FIGURES, DECEMBER 1962

EFFECTS OF INHIBITORS ON THE HYDROGEN-AIR REACTION WERE STUDIED BY MEASURING FLAME SPEEDS OF HYDROGEN-AIR-INHIBITOR MIXTURES, AND VIA SMOKE TUBE AND SPECTROSCOPIC TECHNIQUES. THE BEST INHIBITORS WERE HYDROCARBONS AS A GROUP, MONOMER-SUBSTITUTED HYDROCARBONS, SEVERAL METALLIC COMPOUNDS, AND IRRADIATION. DETAILED KINETIC STUDIES OF THE EFFECTS OF CH₄, C₂H₆, C₂H₄ AND C₂H₂ ON THE HYDROGEN-OXYGEN REACTION INDICATE THAT THEY REMOVE RADICALS - ESPECIALLY H ATOMS - FROM THE REACTING GAS WHEN IT IS IN THE TEMPERATURE RANGE 600 TO 1300 K. METHODS FOR CORRELATING REACTION KINETICS FROM THE EXPERIMENTAL DATA ARE DESCRIBED BRIEFLY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CHEMICAL REACTION - FIRE - OXYGEN - THERMAL EXPERIMENT - CHEMICAL KINETICS

080701

EMPHAMANZ RE
PROJECT POWER, LIQUID HYDROGEN SAFETY - A FIVE YEAR LOG
LOS ALAMOS SCIENTIFIC LABORATORY
LA-DC-7489 + CONF-88020-2 2, 15 PAGES, 1968

LARGE-SCALE USE OF LIQUID HYDROGEN HAS BEEN ASSOCIATED WITH PROJECT POWER AT JOHNS HOPKINS, MARYLAND, SINCE 1954. THERE HAVE BEEN MISADVENTURES THERE, TOGETHER WITH THE ADVICE OF SPECIALISTS, LED TO CONTINUING IMPROVEMENTS IN PROCEDURES AND EQUIPMENT. MANY COMMENTS ON THE LIQUID HYDROGEN SYSTEM ARE DESCRIBED INCLUDING THE LESSONS LEARNED AND RELATED, AND THE GRADUAL DEVELOPMENT OF SAFETY DEVICES AND PROCEDURES ARE TACKLED. IT IS FELT TODAY THAT STANDING OPERATING PROCEDURES, CONTROL OVER INCOMPATIBLE OPERATIONS, ROOM SAFETY, REMOTE CONTROL OF HIGH HYDROGEN FLOW RATES, AND PROVEN EQUIPMENT RELIABILITY WILL THE MAIN CONTRIBUTIONS TO CARRYING OUT LARGE-SCALE LIQUID-HYDROGEN OPERATIONS WITH CONFIDENCE.

AEROSPACE SAFETY - FIRE - SAFETY REVIEW - SAFETY EVALUATION - LIQUID

080702

LOTTI AC + ARDITH WJ + GERRISPLAN CR
HAZARDS TO NUCLEAR PLANTS FROM AIR-BORNE GASEOUS EXPLOSIONS
ENHANCED SERVICES, INC., NEW YORK
CONF-730304 2, 14 PAGES, 7 FIGURES, PAPER PRESENTED AT THE NATIONAL TOPICAL MEETING ON NUCLEAR REACTOR SAFETY
HOLD IN SALT LAKE CITY, UTAH ON MARCH 26, 1973

THE FORMATION OF A DETONATION IN A GAS-AIR MIXTURE IS DISCUSSED. THE SMOKE WAVE AND GROUND ATTENUATION AS A FUNCTION OF THE PLANT ENERGY AND THE DISTANCE TO THE NEAREST STRUCTURE ARE ALSO PRESENTED WITH RECOMMENDATIONS FOR LOCATIONS OF PLANT CRITICAL STRUCTURES WITH RESPECT TO POSSIBLE EXPLOSION SOURCES. THE HAZARDS TO PLANT AREAS RESULTING FROM EXPLOSION GENERATED MISSILES ARE ALSO ADDRESSED.

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SMOKE WAVE - INCIDENT, HYPOTHETICAL - ACCIDENT MODEL - COMBUSTION

080704

HYDROGEN RECOMBINATION IN MEDICAL THERAPY SMUTTER AT MIT REACTOR
MASSACHUSETTS INSTITUTE OF TECHNOLOGY RESEARCH REACTOR
3 PAGES, LETTER TO DIRECTORATE OF LICENSING SAFETY, FEBRUARY 21, 1974, DOCKET 50-20

AN APPARENT HYDROGEN RECOMBINATION OCCURRED IN THE STORAGE TANK FOR WATER USED IN THE MEDICAL THERAPY SMUTTER WHILE MODIFICATIONS WERE BEING MADE TO THE TANK. AS A PIPE WAS BEING WELDED TO THE TANK, A LARGE VOLUME OF GAS RUSHED FROM THE TANK. NO INJURIES, NO DAMAGE, AND NO CONTAMINATION OCCURRED. THE TANK IS NORMALLY FILLING WITH HELIUM. THE EXPLOSION RESULTED WHEN AN ARC WAS STRUCK BY THE WELDER. APPARENTLY HYDROGEN HAD COLLECTED IN THE TANK AS A RESULT OF RADICALLY DECOMPOSITION OF WATER IN THE SMUTTER TANK. BETTER HYDROGEN CONTROL WILL BE INITIATED.

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ALUMINUM = ALUMINUM + FULL MILLION + METAL WITH ALUMINUM + ZINCUM = STEEL, STAINLESS = CRUCIFIXION + COMPOSITION = CATHOLIC CHURCH + MAGNETISM + MICROSCOPE

KEYWORD INDEX

A COLLECTION OF KEYWORDS IS USED TO DENOTE THE MAIN SAFETY RELATED POINTS COVERED IN EACH ARTICLE. THE FOLLOWING INDEX IS AN ALPHABETICAL LISTING OF THE KEYWORDS GIVING REFERENCES TO EACH ARTICLE WHICH WAS KEYED TO IT.

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#EXPLOSION IN OFF-GAS SYSTEM AT QUAD CITIES 1*	079614 P 10
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ISOBARIC #EXPERIMENTAL INVESTIGATION OF REACTIONS BETWEEN URANIUM DIOXIDE AND WATER UNDER NONISOTHERMAL, QUASI-	029098 P 6
DETECTION OF HYDROGEN-AIR FIRES AND EXPLOSIONS IN AEROSPACE DOCKET 50-271)* #SURVEY OF POTENTIAL	010103 P 4
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#RADIOLYTIC DECOMPOSITION OF WATER IN WATER-MODERATED REACTORS UNDER ACCIDENT CONDITIONS*	038958 P 7
#CHAPMAN-JOUQUET SOLUTION FOR NORMAL IONIZING SHOCK WAVES IN HYDROGEN*	097179 P 12
ACCELERATOR* WINDOW FAILURE LED TO JULY FIRE AT CAMBRIDGE ELECTRON	008832 P 3
#REACTIONS OF GRAPHITE UNDER EXPLODING WIRE CONDITIONS*	018350 P 6
#PROJECT ROVER, LIQUID HYDROGEN SAFETY - A FIVE VERMONT YANKEE CONTAINMENT INERTING (AMENDMENT 12 TO DOCKET 50-271)	046738 P 7
YEAR LOOK*	080701 P 11

6. HYDROGEN-OXYGEN REACTIONS

002717
 CUTTHELL WB
 OZONE EXPLOSION IN IRRADIATED CRYOGENIC APPARATUS AND IMPLICATIONS UPON N.S. SAVANNAH GASEOUS WASTE DISPOSAL
 SYSTEM
 OAK RIDGE NATIONAL LABORATORY
 ORNL-CF-58-7-97 +. 9 PAGES, 2 TABLES, 13 REFERENCES, JULY 24, 1958, CFSTI, \$1.80 FS, \$1.80 MF

THE SEVERAL INCIDENTS OF OZONE EXPLOSIONS IN CRYOGENIC APPARATUS IN RADIATION FIELDS ARE REVIEWED. IT IS CONCLUDED THAT THE EXPLOSIONS MAY BE AVOIDED IF OXYGEN AND/OR OZONE ARE EXCLUDED FROM THE LOW-TEMPERATURE REGIONS WHERE, IN STATIC SYSTEMS, THEY TEND TO CONCENTRATE BY LIQUEFACTION. SUCH PROVISIONS WOULD MAKE THE PROPOSED CIRCULATING N₂-COOLED TRAP FOR THE N.S. SAVANNAH OFF-GAS SYSTEM ACCEPTABLE IF THE INITIAL OXYGEN CONTENT OF THE NITROGEN COOLANT IS LESS THAN 200 PPM. HIGHER CONCENTRATIONS ARE UNDOUBTEDLY SAFE BUT THE LACK OF INFORMATION ON SUCH FACETS OF THE PHENOMENA AS QUANTITIES OF OZONE, REQUIRED RADIATION EXPOSURE, AND EXPLOSION-INCITING AGENTS DOES NOT PERMIT A QUANTITATIVE DEFINITION OF THE LIMITING CONDITIONS FOR AN EXPLOSION.

ACCIDENT, COLD COOLANT + CONTAINMENT, HIGH PRESSURE + CONTAINMENT, MULTIPLE + EXPLOSION + REACTOR, MARITIME + N.S. SAVANNAH (PHR) + REACTOR, PHR + FILTER, TRAP + HAZARDS ANALYSIS + INCIDENT + OZONE + ACCIDENT, NONREACTOR

002805
 BAKER L + ERGEN WK + KOLB JO + NYER WE + PETERSON S + WHITMARSH CL
 U. S. REACTOR CONTAINMENT EXPERIENCE- A HANDBOOK OF CURRENT PRACTICE AND ANALYSIS, DESIGN, CONSTRUCTION, TEST, AND OPERATION, CHAPTER 5- ENERGY SOURCES
 OAK RIDGE NATIONAL LABORATORY + ARGONNE NATIONAL LABORATORY + PHILLIPS PETROLEUM COMPANY
 145 PAGES, 64 FIGURES, 24 TABLES, 174 REFERENCES- AUGUST 1965, ORNL-NSIC-5, VOL. 1- CFSTI

THE DESIGN OF CONTAINMENT FOR NUCLEAR REACTORS DEPENDS TO A LARGE EXTENT ON DETERMINING THE ENERGY AVAILABLE FOR RELEASE DURING A REACTOR ACCIDENT. THE THREE MAJOR SOURCES OF ENERGY IN SUCH A SYSTEM ARE NUCLEAR, CHEMICAL, AND STORED THERMAL ENERGY. THESE SOURCES ARE DESCRIBED IN DETAIL, AND THE CONSEQUENCES OF THIS ENERGY RELEASE ON CONTAINMENT DESIGN CALCULATIONS ARE EVALUATED. THE CHEMICAL REACTIONS EXPECTED UNDER ACCIDENT CONDITIONS FOR THE MORE IMPORTANT NUCLEAR CONSTRUCTION MATERIALS AS WELL AS THE SPECIFIC NUCLEAR CONTRIBUTIONS SUCH AS DECAY HEAT, ETC., ARE GIVEN. EACH SECTION ALSO CONTAINS A LARGE NUMBER OF REFERENCES THAT MAY BE USED FOR ADDITIONAL INFORMATION.

5-1 INTRODUCTION
 5-2 CHEMICAL REACTIONS
 5-3 NUCLEAR ENERGY
 REFERENCES

ALUMINUM + CHEMICAL REACTION + DECAY HEAT + DOPPLER COEFFICIENT + ENERGY SOURCE + FIRE + GRAPHITE + METAL
 WATER REACTION + OXIDATION + PHOSPHORIC REACTION + STEAM + URANIUM + WIGNER ENERGY + ZIRCONIUM + POTASSIUM + LITHIUM

003541
 HARKELS A + FRIEDMAN R + MACER A + HAGGERTY W + EICHBAUER R
 A PROGRAM TO ADVANCE THE TECHNOLOGY OF FIRE EXTINGUISHMENT (HYDROGEN-OXYGEN)
 ATLANTIC RESEARCH CORPORATION, ALEXANDRIA, VIRGINIA
 75 PAGES, 32 FIGURES, 7 TABLES- MARCH 1963, AD-411396 (ASD-TDR-62-526, PART II)

THE SECOND YEAR 5 EFFORT INCLUDED THE STUDY OF (1) SUPPRESSION OF GASEOUS HYDROGEN-OXYGEN DETONATIONS, (2) METHODS FOR CONTROLLING LIQUID HYDROGEN COMBUSTION, AND (3) EXTINGUISHMENT OF LIQUID HYDROGEN-METAL SLURRY FIRES. ISOBUTENE WAS FOUND TO BE BEST. CONFINED LIQUID HYDROGEN COMBUSTION WAS EFFECTIVELY SUPPRESSED BY AIR-HALOGENATED HYDROCARBON MIXTURES WITH 13-65 PER CENT OF INHIBITOR. CONFINED LIQUID HYDROGEN COMBUSTION WAS EXTINGUISHED BY EITHER POWDERED SOLIDS OR LIQUID AGENTS. POTASSIUM BICARBONATE AND HALOGENATED HYDROCARBONS WERE MOST EFFECTIVE OF THE SUBSTANCES STUDIED. MINIMUM AMOUNTS FOR EXTINGUISHING FIRES OF LIQUID HYDROGEN BURNING AT A RATE OF 1 LITER/POUR RANGED FROM 0.5 TO 0.8 GRAM.

EXPLOSION + FIRE

006036
 SKINNER WB + MILLER JE + KATON JE + MEDLEY WM + RINGDOSE CH + SNYDEN AD
 CHEMICAL INHIBITION OF THE HYDROGEN-OXYGEN REACTION
 MONSIEUR PESFACH COM. DAYTON, OHIO
 109 PAGES, 52 FIGURES, 24 TABLES, 39 REFERENCES, DECEMBER 1962, ASD-TDR-62-1042 (AD-294625) (N63-12171)- CFSTI

THE EFFECTS OF INHIBITORS ON THE HYDROGEN-AIR REACTION WERE STUDIED BY MEASURING FLAME SPEEDS OF HYDROGEN-AIR-INHIBITOR MIXTURES, AND VIA SHOCK TUBE AND SPECTROSCOPIC TECHNIQUES. THE BEST INHIBITORS WERE HYDROCARBONS AS A GROUP, MONOMER-SUBSTITUTED HYDROCARBONS, SEVERAL METALLIC CHLORIDES, AND IACN CARRIAGE. DETAILED KINETIC STUDIES OF THE EFFECTS OF CH₄, C₂H₄, C₂F₂BR AND C₂F₄ ON THE HYDROGEN-OXYGEN REACTION INDICATE THAT THEY REMOVE RADICALS - CHIEFLY H₂ ATOMS - FROM THE REACTING GAS WHEN IT IS IN THE TEMPERATURE RANGE 500 - 1300 DEGREE K. METHODS FOR CALCULATING REACTION KINETICS FROM THE EXPERIMENTAL DATA ARE DESCRIBED BRIEFLY.

CHEMICAL REACTION

306828
HYDROGEN EVOLUTION WITHIN CONTAINMENT IN PM-TYPE PLANTS. FINAL REPORT
NUCLEAR UTILITY SERVICES, WASHINGTON
88 PAGES, REFERENCES- JUNE 28, 1965, NYC-3420-2- CFSTI

ONE OR MORE OF THE MODIFICATIONS MADE TO THE PM-3A PLANT DURING THE SUMMER 1964 ANTARCTIC SEASON HAD ELIMINATED THE HYDROGEN EVOLUTION TO CONTAINMENT. THE MAJOR EFFORT UNDER THIS CONTRACT WAS TO CONFIRM BY TEST, WHICH OR WHAT COMBINATION OF MODIFICATIONS RESULTED IN THE REDUCTION OF HYDROGEN EVOLUTION SO THAT (I) THE DESIGN OF FUTURE PLANTS WILL BE SUCH THAT NO HYDROGEN WILL BE EVOLVED FROM SHIELD WATER AND (II) NO FUTURE MODIFICATIONS TO THE PM-3A WILL RESULT IN THE RESUMPTION OF THE EVOLUTION OF HYDROGEN. IT WAS SUBSEQUENTLY DECIDED THAT THE TEST PROGRAM BE DEFERRED AND THAT IT NOT BE PERFORMED UNDER THIS CONTRACT. ACCORDINGLY, THIS FINAL REPORT PRESENTS THE WORK ACCOMPLISHED UNDER THE CONTRACT TOGETHER WITH THE RECOMMENDED TEST PROGRAM.

CONTAINMENT, PRESSURE SUPPRESSION, REACTOR, PHF, RADIOLYTIC GAS, CONTAINMENT, WATER FILLED, PM 3A (PHF), REACTOR, MILITARY, RECOMBINERS

009374
BLUME M + STICH EF + MATTHIG P + HISINGER HJ
ULTRAPURIFICATION OF GASES BY MEANS OF NEWLY DEVELOPED CATALYSTS
WALTER ULBRICHT PLANT, VFB LEUNA-MERKE
(FNL-TR-108) +. 9 PAGES, 7 TABLES, 1 FIGURE, 14 REFERENCES, APRIL 1, 1966, TRANSLATED FROM CHEM. TECHN. 17, PAGES 463-464, (1965)

PROTECTIVE GASES, SUCH AS H₂, N₂, AND NOBLE GASES, ARE BEING EMPLOYED IN EVER-INCREASING QUANTITIES IN THE CHEMICAL INDUSTRY, LAMP FACTORIES, SEMI-CONDUCTOR PLANTS, AS WELL AS IN METALLURGY. THESE MUST BE FREE FROM IMPURITIES, PARTICULARLY OXYGEN. ALTHOUGH THE REMOVAL OF SMALL CONCENTRATIONS OF OXYGEN FROM H₂ OR H₂-CONTAINING GASES IS CARRIED OUT MOST ADVANTAGEOUSLY WITH NOBLE METAL CATALYSTS (E.G., LEUNA-CATALYST 7748, 0.5 PERCENT Pd ON GAMMA-AL₂O₃) AT ROOM TEMPERATURE, OXYGEN REMOVAL FROM INERT GASES (N₂ AND NOBLE GASES) IS PERFORMED CHIEFLY BY OXIDATION OF THE METALLIC CONSTITUENTS OF PURIFYING AGENTS. IN THE PAST YEAR, THE CATALYST GROUP OF VFB LEUNA-MERKE DISCOVERED A NICKEL CATALYST, DESIGNATED 6525, HIGHER OXYGEN-ABSORPTION POWER AT ROOM TEMPERATURE IS SEVERAL TIMES GREATER THAN THE USUAL COPPER CATALYSTS. THE PREPARATION, REDUCTION, AND STABILIZATION OF NICKEL CATALYSTS ON AN AL₂O₃ BASE, USED FOR HYDROGENATION OF PHENOL, HAS BEEN REPORTED. ALTHOUGH THE NICKEL-CHROMIUM OXIDE COMBINATION SEEMS TO BE ESPECIALLY SUITABLE, M. GREYSON FAILED TO PLACE EMPHASIS ON IT IN THE JOURNAL, CATALYSIS. AN ACTIVE NICKEL-CHROMIUM OXIDE CATALYST WAS ALSO DEVELOPED IN THE LEUNA PLANT WHICH HAS BEEN DESIGNATED CATALYST 6540. THE PROPERTIES OF CATALYSTS 6525 AND 6540 HAVE BEEN INVESTIGATED IN THEIR ACTION ON THE ULTRAPURIFICATION OF GASES.

CHEMICAL REACTION + DECONTAMINATION + NOBLE GAS + OXIDATION + CHEMICAL KINETICS + CHEMICAL EQUILIBRIUM + RECOMBINERS

009609
HAAS PA
HWP BLANKET PROCESSING STUDIES OF O₂-H₂ HAZARDS IN A LOOP PRESSURIZER
OAK RIDGE NATIONAL LABORATORY
ORNL-2368 +. 20 PAGES, REFERENCES, SEPTEMBER 25, 1956, CFSTI, \$1.01 MF, \$2.60 FS

RESULTS OF EXPERIMENTS MADE UNDER CONDITIONS PROPOSED FOR HOMOGENEOUS REACTOR BLANKET-PROCESSING LOOP STUDIES INDICATED THAT SPONTANEOUS H₂ + O₂ REACTIONS WILL NOT OCCUR FREQUENTLY TO SERIOUSLY HAMPER OPERATION FOR REASONABLE STEADY-STATE PERIODS AND WILL NOT RESULT IN HAZARDOUS EQUIPMENT FAILURES. CALCULATED (2H₂-O₂) CONCENTRATIONS BELOW LITERATURE VALUES FOR EXPLOSIVE CONCENTRATION LIMITS WERE DETONATED WITH AN IGNITION COIL. THIS RESULT WAS PROBABLY DUE TO SEGREGATION OF GASES, WHICH WOULD BE EXPECTED FROM THE TEST-SYSTEM GEOMETRY. THE PRESSURIZER WAS NOT DAMAGED IN MORE THAN 25 DETONATION REACTIONS, SOME OF WHICH WERE FOR 200 PSI H₂ PLUS 100 PSI O₂, WITH NO DILUENT, AT ROOM TEMPERATURE. RECORDED PRESSURE PEAKS INDICATED THAT PRESSURE RISES WOULD BE LESS THAN 1600 PSI IN OTHER LOOP COMPONENTS. THE PEAK PRESSURES WOULD BE WITHIN THE TEST LIMIT OF THE PUMP-ROTOR CAN (4000 PSI) AND OF ALL OTHER LOOP COMPONENTS.

EXPLOSION + REACTOR, HOMOGENEOUS + HRT (RE) + OUT OF PILE EXPERIMENT + HAZARDS ANALYSIS + RECOMBINERS

010103
HARREN KS
SURVEY OF POTENTIAL VAPOR-PHASE EXPLOSIONS IN DAREX AND SULFEX PROCESSES
OAK RIDGE NATIONAL LABORATORY
ORNL-2937 +. 23 PAGES, 3 FIGURES, 2 TABLES, REFERENCES- DECEMBER 27, 1960- CFSTI, \$0.50

A SURVEY OF THE THERMODYNAMICS AND LIMITS OF FLAMMABILITY OF GASES EXPECTED WHEN SODIUM-BONDED, STAINLESS-STEEL-CLAD REACTOR FUELS ARE DISSOLVED IN DILUTE AQUA REGIA OR SULFURIC ACID SHOWED THAT VAPOR-PHASE EXPLOSIONS ARE A DEFINITE POSSIBILITY WITH THE AQUA REGIA SYSTEM. REACTIONS OF HYDROGEN WITH NITROGEN OXIDES, N₂O₄, AND Cl₂ ARE HIGHLY EXOTHERMIC, AND MIXTURES OF THE GASES ARE EXPLOSIVE OVER WIDE CONCENTRATION RANGES. THE SULFEX PROCESS, IN WHICH ONLY HYDROGEN IS EVOLVED, APPARENTLY COULD BE USED WITHOUT ADDITIONAL HAZARD IF THE SODIUM-WATER REACTION COULD BE CONTAINED.

CHEMICAL REACTION + EXPLOSION + CHEMICAL KINETICS + DESIGN STUDY + RADIOCHEMICAL PLANT SAFETY + FUEL REPROCESSING

011766
 QUAD-CITIES STATION, UNIT 1 - PLANT DESIGN ANALYSIS, VOLUME 1
 CHANDLER-HEALTH EDISON COMPANY, CHICAGO
 14 PAGES, 3 REFERENCES, 1 TABLE, PAGES V-1-14 TO 31, LOCKET NO. 50-254, MAY 31, 1966 P75

IMMEDIATELY AFTER THE MAJOR PIPE RUPTURE, THE TEMPERATURE OF THE WATER IN THE SUPPRESSION CHAMBER APPROACHES 120 F, AND THE MAXIMUM SYSTEM PRESSURE APPROACHES 39 PSIG DURING THE FLOWDOWN OF THE PRIMARY COOLANT INTO THE DRYWELL. THE CONTAINMENT PRESSURE IS A FUNCTION OF THE METAL-WATER REACTION RATE. ALTHOUGH THE COFF-COOLING SYSTEMS ARE ASSUMED NOT TO FUNCTION IN ORDER TO PROVIDE A BASIS FOR METAL-WATER REACTIONS, ONE OF THE TWO CONTAINMENT COOLING SYSTEMS IS ASSUMED TO FUNCTION NORMALLY. THE DRYWELL SPRAY IS SUFFICIENT TO TRANSPORT THE DECAY HEAT, THE HEAT STORED IN THE CORE, AND ANY HEAT RESULTING FROM THE METAL-WATER REACTION TO THE WFT-WELL IN THE FORM OF HOT LIQUID. THE ENERGY TRANSPORTED TO THE WATER IN THE SUPPRESSION CHAMBER IS REMOVED FROM THE CONTAINMENT SYSTEM BY HEAT EXCHANGERS. TO ELIMINATE THE POSSIBILITY OF AN ENERGY RELEASE WITHIN THE PRIMARY CONTAINMENT FROM A HYDROGEN-OXYGEN REACTION UNDER CONDITIONS MORE SEVERE THAN CAN CURRENTLY BE FORESEEN, THE DESIGN INCLUDES AN INERTING SYSTEM TO REDUCE THE OXYGEN CONCENTRATION OF THE ATMOSPHERE WITHIN THE PRIMARY CONTAINMENT.

REACTOR, DWR + CHEMICAL REACTION + CONTAINMENT SPRAY + CONTAINMENT, PRESSURE SUPPRESSION + METAL WATER REACTION + ZIRCALOY + QUAD CITIES 1 (BWR) + CONTAINMENT ATMOSPHERE, INERT + REPORT, PSAR

015723
 MOORE JC + GILBY EV
 A REVIEW OF THE PROBLEMS ARISING FROM THE COMBUSTION OF HYDROGEN IN A WATER REACTOR CONTAINMENT
 UNITED KINGDOM ATOMIC ENERGY AUTHORITY, SAFEGUARDS DIVISION
 HASRISIR-101 +, 48 PAGES, 18 FIGURES, 6 TABLES, 26 REFERENCES, 1966

A CRITICAL REVIEW WAS MADE OF THE FACTORS AFFECTING THE EXPLOSION AND DETONATION OF HYDROGEN-AIR-STEAM MIXTURES. THERE IS LITTLE EXPERIMENTAL INFORMATION DIRECTLY APPLICABLE TO THE CONDITIONS EXPECTED TO OCCUR IN THE CONTAINMENT OF A WATER REACTOR AFTER AN ACCIDENT. THIS PAPER MAKES RECOMMENDATIONS ON THE DATA WHICH SHOULD BE USED IN THESE CONDITIONS. AN APPRECIATION OF THE HAZARD TO CONTAINMENT INTEGRITY HAS SHOWN THAT THE UNCERTAINTIES IN THE DATA ARE SMALL COMPARED WITH THE UNCERTAINTIES IN OTHER AREAS OF THE PROBLEM. PARTICULAR CONSIDERATION WAS GIVEN TO A TYPICAL LARGE PWR, AND IT WAS FOUND THAT THERE IS LITTLE RISK TO THE CONTAINMENT IF THE HYDROGEN IS UNIFORMLY DISTRIBUTED. HOWEVER, IT WAS NOT POSSIBLE TO ASSESS COMPLETELY THE EFFECTS OF AN ASYMMETRIC LOADING DUE TO THE EXPLOSION OR DETONATION OF A POCKET OF HYDROGEN CLOSE TO THE CONTAINMENT BOUNDARY.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, NATIONAL BUREAU OF STANDARDS, U.S. DEPT. OF COMMERCE, SPRINGFIELD, VA., \$2.00 COPY, \$0.65 MICROFICHE

EXPLOSION + CONTAINMENT, SHOCK GENERATION AND PROTECTION + STEAM + CONTAINMENT STRUCTURE

016567
 GUNDRY PM + TOMPKINS FC
 CHEMISORPTION OF GASES ON METALS
 IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY, LONDON, S. W.7
 35 PAGES, 125 REFERENCES, CHEMICAL SOCIETY LONDON QUARTERLY REVIEW 14, PAGE 257-291 (1960)

IN THIS REVIEW, WE ARE PREDOMINANTLY CONCERNED WITH THE INTERACTION OF GASES, SUCH AS HYDROGEN, OXYGEN, NITROGEN, AND CARBON MONOXIDE WITH THE METALS, TUNGSTEN, NICKEL, PLATINUM, PALLADIUM, AND COPPER, BECAUSE IT IS ONLY WITH THESE SYSTEMS THAT AN EXTENSIVE BODY OF INFORMATION IS AVAILABLE. FURTHERMORE, APART FROM THE DISSOCIATION OF THE HOMOPOLAR GASEOUS MOLECULES ON CHEMISORPTION, NO COMPLICATIONS ARISE FROM RADICAL FORMATION AS IN THE CHEMISORPTION OF HYDROCARBONS, AMMONIA, ETC.

METAL + COPPER + NICKEL + NITROGEN + CHEMISORPTION + TUNGSTEN + CARBON MONOXIDE

025234
 JENKS GH + CRIESS JC
 AQUEOUS REACTOR AND DESALINATION
 OAK RIDGE NATIONAL LAB., TENN.
 ORNL-4229 +, 4 PAGES, 3 TABLES, 6 REFERENCES, PAGES 71-74 OF REACTOR CHEMISTRY DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING DECEMBER 31, 1967

HERMETICALLY SEALED PRESSURIZED- AND BOILING-WATER REACTORS - BRIEF REVIEW OF WATER CHEMISTRY OF BOTH PRESSURIZED- AND BOILING-WATER REACTORS, PARTICULARLY AS IT RELATES TO THE NECESSITY OF PURIFICATION SYSTEMS, AND CONSIDERATION OF MEANS WHEREBY SMALL REACTORS COULD OPERATE SATISFACTORILY WITHOUT WATER CLEANUP OR SPECIAL GAS HANDLING EQUIPMENT. WATER CHEMISTRY IN A SMALL STATE-OF-THE-ART PRESSURIZED-WATER REACTOR - PLANS AND SPECIFICATIONS FOR A LOW-POWER PRESSURIZED-WATER REACTOR BASED ON STATE-OF-THE-ART INFORMATION ARE BEING PREPARED BY ORNL, AND WE ARE PROVIDING SPECIFICATIONS AND RECOMMENDATIONS IN AREAS RELATED TO WATER TECHNOLOGY IN THE REACTOR. WATER RADIOLYSIS IN THE HFIR - COMPARISON BETWEEN REPORTED AND PREDICTED CONCENTRATIONS OF HYDROGEN IN THE HFIR MODERATOR LED TO THE TENTATIVE CONCLUSION THAT ITS RADIOLYTIC BEHAVIOR IS NEAR THAT PREDICTED. ADDITIONAL ANALYSES OF THE RELATIVE AMOUNTS OF OXYGEN AND HYDROGEN PEROXIDE WOULD BE REQUIRED FOR COMPLETE VERIFICATION.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA., 22151, \$3.00 COPY, \$0.65 MICROFICHE

025234 *CONTINUED*
 REACTOR, HWF + DESIGN CRITERIA + REACTOR, FAST + REACTOR, PAR + STEAM + WATER + CHEMICAL KINETICS + COOLANT
 CHEMISTRY + HFIR (FTR) + REACTOR, FUEL OWNED + REACTOR, LWR + INHAUSION TESTING + RADIOLYTIC GAS + WATER
 TREATMENT + REACTOR, PULSED + PROPERTY, PHYSICAL + PROPERTY, CHEMICAL + RADIATION EFFECT

029094
 MCCLAIN RA
 POTENTIAL METAL-WATER REACTIONS IN LIGHT-WATER-COOLED POWER REACTORS
 OAK RIDGE NATIONAL LAB., TENN.
 ORNL-NSIC-22 +. 201 PAGES, FIGURES, TABLES, 206 REFERENCES, AUGUST 1968

A STATE-OF-THE-ART REVIEW OF THE ROLE OF CHEMICAL REACTIONS IN AN UNLIKELY EVENT OF A LIGHT-WATER
 POWER REACTOR ACCIDENT. THE STUDY CONCLUDED THAT THESE REACTIONS COULD BE ASSESSED REALISTICALLY
 ONLY BY CONSIDERING AN INTEGRAL MODEL OF THE ACCIDENT. COMPARED WITH THE SITUATION REGARDING THE
 DEFINITION AND THE MATHEMATICAL SIMULATION OF AN ACCIDENT, THE BASIC KINETICS OF THE CHEMICAL
 REACTIONS ARE WELL UNDERSTOOD. THERE ARE STILL SOME QUESTIONS ABOUT THE EFFECT OF LIMITED METAL-
 WATER REACTION ON POSSIBLE FUEL-PIN FRAGMENTATION IN LOSS-OF-COOLANT ACCIDENTS AND ABOUT THE
 DETONATION LIMITS OF HYDROGEN-AIR-STEAM MIXTURES, HOWEVER.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

ALUMINUM + BORON + CHEMICAL REACTION + CLADDING + FUEL MELTDOWN + ACCIDENT, LOSS OF COOLANT + METAL WATER
 REACTION + OXIDATION + STEAM + WATER + ZIRCONIUM + PRESSEN 3 (HWR) + STEEL, STAINLESS + ACCIDENT MODEL + AIR
 + LOFT (SRR) + CHEMICAL KINETICS + COFE MELTDOWN + URANIUM DIOXIDE + ZIRCALOY + INDIAN POINT 2 (PWR) +
 PALISADES (PAR) + TURKEY POINT 3 (PAR) + STECHIDMETRY + ACCIDENT, CONTROL ROD EJECTION + OCONEE 1 (PWR) +
 THERMAL TRANSIENT

024075
 JACHIMOWSKI CJ + HOUGHTON WM
 EFFECT OF CARBON DIOXIDE AND WATER VAPOR ON THE INDUCTION PERIOD OF THE HYDROGEN-OXYGEN REACTION
 NASA, LANGLEY RESEARCH CENTER, LANGLEY STATION, HAMPTON, VA.
 NASA-TN-D-6695 +. 13 PAGES, 4 FIGURES, 7 TABLES, 12 REFERENCES, AUGUST 1969

THE EFFECT OF CO₂ AND WATER VAPOR ON THE INDUCTION-PERIOD KINETICS OF THE H₂-O₂ REACTION WAS
 STUDIED IN A SHOCK TUBE AT TEMPERATURES BETWEEN 1000 AND 1500 K. THE RESULTS SHOW THAT CO₂ DOES
 NOT PRODUCE ANY NOTICEABLE EFFECT, WHEREAS WATER VAPOR APPEARS TO ACCELERATE THE H₂-O₂ REACTION.
 THE ANALYSIS OF EXPERIMENTAL DATA INDICATES THAT THE ACCELERATING INFLUENCE OF WATER VAPOR IS DUE
 TO TWO PROCESSES. ONE PROCESS IS DOMINANT AT THE HIGHER TEMPERATURES, THE CHAIN-BRANCHING
 REACTION (O + H₂O YIELDS 2OH), AND THE OTHER, AN UNIDENTIFIED PROCESS, IS DOMINANT AT THE LOWER
 TEMPERATURES.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

CHEMICAL REACTION + CARBON DIOXIDE + AFRON + CHEMICAL KINETICS + WATER VAPOR

029811
 STEINBERG M + POWELL JR + BELLE A + MAROWITZ B
 POLLUTION-FREE HYBRID FOSSIL-NUCLEAR FUELED WMD POWER CYCLE
 HOLLANDHAVEN NATIONAL LAB., LPTCA, N.Y.
 ORNL-12319 + CONF-660837-1 +. 51 PAGES, MARCH 1968

DESCRIBES HYBRID PLANT WHEREBY HYDROGEN IS GENERATED BY PC-FUELLING FOSSIL FUEL WITH NUCLEAR-
 GENERATED STEAM AND OXYGEN IS OBTAINED FROM AIR-SEPARATION PLANT. STEAM INJECTED INTO COMBUSTION
 GASES TO CONTROL TEMP. AND PRESSURE THROUGH DUCT. OVERALL THERMAL EFFICIENCY OF 55 PER CENT IS
 PRACTICAL. CAPITAL INVESTMENT, PRODUCTION COST, AND FUEL COSTS GIVEN. PLANT ALLOWS USE OF
 FOSSIL FUEL IN A POLLUTION-FREE PLANT. WATER- AND GAS-COOLED REACTORS CAN BE USED IN CYCLE.
 THERMAL POLLUTION IS DECREASED, AND A CLEAN DUCT IS PROVIDED.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 COPY, \$0.65 MICROFICHE

CHEMICAL REACTION + ENERGY SOURCE + ATMOSPHERIC POLLUTION + ELECTRIC POWER + AIR + DESIGN STUDY + SYSTEM
 DESCRIPTION + ECONOMIC STUDY + THERMAL POLLUTION + POWER GENERATION METHOD

034742
 VARTAN DG + JOSHI CJ + PRASAD LM
 APPARATUS FOR THE DETERMINATION OF DISSOLVED GASES IN NUCLEAR REACTIVE COOLANTS (WATER)
 BHADRA ATOMIC RESEARCH CENTRE, DELHAI, INDIA
 BARC - 386 +. 17 PAGES, 4 FIGURES, 1964

SET UP A SYSTEM AT THE CHEMICAL CONTROL LABORATORY OF THE REACTOR OPERATIONS DIVISION TO ANALYSE
 THE DISSOLVED GASES IN REACTOR COOLANTS. IT CONSISTS OF TWO PARTS, NAMELY, ONE FOR STRIPPING OUT
 THE DISSOLVED GASES AND MEASURING THE VOLUME AND THE OTHER CALLED THE ANALYSER FOR THE
 DETERMINATION OF THEIR PERCENTAGE (W/V) COMPOSITION. THE ANALYSER CAN BE USED INDEPENDENTLY TO
 ANALYSE A MIXTURE OF CARBON DIOXIDE, OXYGEN, NITROGEN AND HYDROGEN.

AVAILABILITY - USAC DEPOSITORY LIBRARIES IN THE U. S. AND OVERSEAS

034742 *CONTINUED*
CARBON DIOXIDE + NITROGEN + ANALYTICAL TECHNIQUE + REACTOR, LWR, + SYSTEM DESCRIPTION + INSTRUMENT, COOLANT
QUALITY + GAS

035481
CHANGE REQUEST - EXPERIMENTS AT LESS THAN ROOM TEMPERATURE
GULF GENERAL ATOMIC
PAGES, LETTER TO D.J. SKOVHOLT, ORL, APRIL 2, 1969, DOCKET 50-253

SECTION 10.7. EXPERIMENTS BELOW AMBIENT ROOM TEMPERATURE MAY BE DONE UNDER FOLLOWING CONDITIONS: -
(1) NO COOLANTS INSIDE CORE, (2) INSULATED CONTACT SURFACE WITHIN CORE TO BE WITHIN 5 C OF
AMBIENT CORE TEMP. (3) PROVIDE SHIELD SO THAT SINGLE FAILURE CANNOT ALLOW COOLANT TO CONTACT
CORE OR CONTROLS. (4) REACTIVITY EFFECT OF FLOWING COOLANT LIMITED TO \$1.00 FOR STEADY STATE AND
TO DIFFERENCE BETWEEN \$1.00 AND PLANNED EXCESS REACTIVITY FOR SINGLE PULSE. (5) EQUIP SUPPLY
DEWARS WITH RELIEF VALVES AND WITH VENT TUBES EXIT END LOCATED AT LEAST 1 METER FROM CORE. (6)
EXPOSURE TIME OF COOLANT LIMITED TO PREVENT HAZARD. (7) LIQUID H₂, O₂ AND AIR PROHIBITED AS
COOLANTS. (8) WRITTEN APPROVAL FROM CRITICALITY SAFEGUARDS COMMITTEE IS REQUIRED.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM
CHARGE \$2.00)

REACTIVITY, EXCESS + NITROGEN + AIR + TEMPERATURE GRADIENT + MODIFICATION + TECHNICAL SPECIFICATIONS + TRIGA
(RM) + REACTOR, PULSED + CRYOGENICS + ACCELERATOR + IRRADIATION FACILITY + LIQUID + COOLING + INSULATION

040822
DEMENT AL + DAU OJ + EVANS EA + NIGHTINGALE RE
QUARTERLY PROGRESS REPORT, JAN., FEB., MAR. 1969, REACTOR FUELS AND MATERIALS DEVELOPMENT PROGRAMS FOR FUELS
AND MATERIALS BRANCH OF USAEC DIVISION OF REACTOR DEVELOPMENT AND TECHNOLOGY
BATTELLE-NORTHWEST, RICHLAND, WASHINGTON
ORNL-1056 +. 260 PAGES, MAY 1969

(PROGRESS REPORT.) ELECTRON MICROSCOPY STUDIES OF GAS-GRAPHITE REACTIONS - INVESTIGATION OF
MICROSTRUCTURAL CHANGES PRODUCED IN NUCLEAR GRAPHITES BY OXIDATION REACTIONS HAS CONTINUED WITH A
STUDY OF THERMAL REACTIONS WITH WATER VAPOR CONTAINING SMALL AMOUNTS OF OXYGEN. INERT-GAS-
SENSITIZED RADIOLYSIS STUDIES - STUDIES HAVE BEEN CONDUCTED TO DETERMINE THE RADIOLYTIC RATE OF
THE REACTION OF CO₂ AND H₂ AT LOW CONCENTRATIONS. G(CO) AND G(CH₄) VALUES HAVE BEEN DETERMINED.
COMPUTER CALCULATIONS OF GRAPHITE OXIDATION IN HTGR - FOUR DIFFERENT WATER-INJECTION TESTS
CONDUCTED AT THE DRAGON REACTOR HAVE BEEN ANALYZED ON THE COMPUTER, ASSUMING ONLY THERMALLY-
INDUCED REACTIONS OCCUR.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY. \$0.65 MICROFICHE

CHEMICAL REACTION + COMPUTER PROGRAM + GRAPHITE + OXIDATION + CARBON DIOXIDE + THERMAL CONSIDERATION +
RADIOLYTIC GAS + REACTOR, HTGR

044773
JHASTON RS
COMBUSTION SAFETY IN THE SPACECRAFT ENVIRONMENT
NASA MANNED SPACECRAFT CENTER, HOUSTON, TEXAS
6 PAGES, 8 FIGURES, 2 REFERENCES, AEROSPACE MEDICINE, 40(11), PP. 1197-1202 (NOVEMBER 1969)

IN THIS REPORT, CONSIDERATIONS OF THE APOLLO COMMAND MODULE ATMOSPHERE ARE REVIEWED, AND CRITERIA
USED IN SELECTION OF MATERIALS ARE OUTLINED. THE SPACECRAFT FIRE-EXTINGUISHER SYSTEM IS
DISCUSSED, AND SPECIFIC CHANGES IN EQUIPMENT DESIGN AND FABRICATION ARE REVIEWED. RESULTS ARE
INDICATIVE THAT FIRE HAZARD WITHIN THE APOLLO SPACECRAFT HAS BEEN ELIMINATED.

AEROSPACE SAFETY + FIRE + PERSONNEL PROTECTIVE DEVICE + INSTRUMENT, CONTROL + COMBUSTION + ENVIRONMENT +
LITHIUM + SPACECRAFT + IGNITION

0-7086
VAN WAVEREN NJ
HOLD-UP TIME OF THE RADIOACTIVE GASEOUS MIXTURE IN THE OFF-GAS SYSTEM DELAY SECTION
TECHNISCHE HOOGESCHOOL, DELFT (NETHERLANDS)
AEC-TS-7092 +. 25 PAGES, TRANSLATION OF A GERMAN REPORT, DECEMBER 2, 1966

TO PREVENT CONTAMINATION OF THE ENVIRONMENT, ANY RADIOACTIVE GASES FORMED ARE PASSED THROUGH A
DELAY SECTION IN WHICH THE RADIOACTIVE ISOTOPE'S DECAY. A CERTAIN MINIMUM DELAY TIME IS
NECESSARY IN ORDER TO INSURE A VALID CALCULATION OF THE RADIOACTIVITY DISPERSION IN THE
ENVIRONMENT. THE DELAY SECTION USED FOR THE MEASUREMENTS WAS SHORTER THAN THAT PLANNED AND
EQUIPPED FOR THE EXPERIMENT. A CALCULATION PERFORMED USING A LAMINAR FLOW AS THE STARTING
POINT GIVES A DELAY TIME WHICH IS IN AGREEMENT WITH THE RESULTS OBTAINED. INASMUCH AS THE FLOW
CONDITIONS ARE KNOWN, THE RESULTS CAN BE EXPLAINED FAIRLY READILY.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY. \$0.65 MICROFICHE

KRYPTON + IODINE + XENON + ARGON + NITROGEN + STACK + FLOW, LEAKAGE + OFF GAS

048461
TECHNICAL SPECIFICATION CHANGE 1 - PERMITS LESS DISTANCE BETWEEN CORE AND CRYOGENIC MATERIALS
U.S. ATOMIC ENERGY COMMISSION, DIVISION OF REACTOR LICENSING
5 PAGES, LETTER - U.S. ATOMIC ENERGY COMMISSION, DIVISION OF REACTOR LICENSING TO GULF GENERAL ATOMIC, INC. -
APRIL 18, 1969, DCCFT 90-293

CONCERNING THE PERFORMANCE OF IRRADIATION EXPERIMENTS INVOLVING LOW-TEMPERATURE MATERIALS, THE
PROPOSED CHANGE WOULD DELETE THE REQUIREMENT IN SECTION 10.7 THAT CRYOGENIC MATERIALS BE LOCATED
AS CLOSE TO THE REACTOR THAN ONE METER. CHANGE AUTHORIZED.

AVAILABILITY - NRC PUBLIC DOCUMENT #COM. 1717 H STREET, WASHINGTON, D. C. 20543, 108 CENTS/PAGE -- MINIMUM
CHARGE \$2.301

REACTOR, RESEARCH + AIR + TECHNICAL SPECIFICATIONS + CRYOGENICS + SAFETY EVALUATION

057920
KULLEN BJ + MURPHY WA + CARLS EL + LEVITZ NM + VOGEL GJ + KINZLER KV
ENGINEERING DEVELOPMENT OF FLUID-BED FLUORIDE VOLATILITY PROCESSES - PART 16. A SAFETY MANUAL FOR THE
ENGINEERING-SCALE ALPHA FACILITY
ARGONNE NATIONAL LABORATORY, ARGONNE, ILLINOIS
ANL-7572 +. 92 PAGES, 30 FIGURES, 12 TABLES, 16 REFERENCES, APRIL 1970

THIS MANUAL DESCRIBES SAFETY PROCEDURES AND WARNINGS AND PROTECTIVE DEVICES USED IN THE OPERATION
OF A PLUTONIUM-PROCESSING FACILITY. HAZARDS PROTECTED AGAINST ARE RELEASE OF RADIOACTIVE OR
OTHER NOXIOUS MATERIALS, FIRES, CRITICALITY, FAILURE OF ELECTRIC POWER, PROCESS ABNORMALITIES,
AND EXPLOSION HAZARDS. ALSO CONSIDERED ARE SAFE PROCEDURES FOR ROUTINE OPERATIONS, SUCH AS
PROCESSING OPERATIONS, MATERIAL TRANSFER INTO AND OUT OF GLOVEBOXES, AND WASTE DISPOSAL.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

FIAT + GLOVE BOX + ALPHA EMITTER + PLUTONIUM + VENTILATION SYSTEM + FLUORINE + SAFETY PRINCIPLES AND
PHILOSOPHY + SAFETY PROGRAM + MONITORING SYSTEM, RADIATION + FLUORIDE + OPERATING EXPERIENCE + RADIATION
MONITORS

063771
SAFETY GUIDE 7 - CONTROL OF COMBUSTIBLE GAS CONCENTRATIONS IN CONTAINMENT FOLLOWING A LOSS OF COOLANT ACCIDENT
U.S. ATOMIC ENERGY COMMISSION, WASHINGTON, D.C.
LETTER TO SAFETY GUIDE RECIPIENTS +. 3 PAGES, (APRIL 9, 1971)

GENERAL DESIGN CRITERION 41 REQUIRES THAT SYSTEMS TO CONTROL HYDROGEN, OXYGEN, AND OTHER
SUBSTANCES WHICH MAY BE RELEASED INTO THE REACTOR CONTAINMENT BE PROVIDED AS NECESSARY TO CONTROL
THEIR CONCENTRATIONS FOLLOWING POSTULATED ACCIDENTS TO ENSURE THAT CONTAINMENT INTEGRITY IS
MAINTAINED. THIS GUIDE DESCRIBES AN ACCEPTABLE METHOD OF IMPLEMENTING THIS CRITERION.

AVAILABILITY - U.S. ATOMIC ENERGY COMMISSION, DIRECTORATE OF REGULATORY STANDARDS, WASHINGTON, D.C. 20545

REACTOR, BWR + EXPLOSION + FIAT + NRC DESIGN CRITERIA + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION +
REACTOR, PWR + CONTAINMENT INTEGRITY + CORROSION + RADIOLYTIC GAS + PRESSURE, INTERNAL + NRC REGULATORY GUIDE

065546
RADIOACTIVE OFF-GAS RELEASE AT DRESDEN-1, CAUSED BY HYDROGEN EXPLOSION
COMMONWEALTH EDISON COMPANY, CHICAGO, ILLINOIS
DOCKET-50010-92 +. 5 PAGES, LETTER TO DIVISION OF REACTOR LICENSING FROM COMMONWEALTH EDISON COMPANY, DOCKET
50-10, TYPE--BWR, MFG--G.E., AE--RECHTEL

ON AUG. 12, 1971, TWO RUPTURE DISKS WERE BLOWN IN THE AIR-EJECTOR VENT PIPE, CAUSING HIGH
RADIATION IN THE TURBINE BUILDING. THE RELEASE RESULTED FROM PRESSURE BUILDUP CAUSED BY IGNITION
OF RADIOLYTIC HYDROGEN AND OXYGEN, POSSIBLY CAUSED BY A STATIC CHARGE IN THE OFF-GAS FILTERS.
GROUNDING FILTERS ARE BEING SOUGHT. NO OFF-SITE ENVIRONMENTAL EFFECTS HAVE BEEN DETECTED. THERE
WAS SOME ON-SITE CONTAMINATION WITHIN 100 FT OF VENT AREA BY SHORT-LIVED NUCLIDES. TWO PERSONS
ENTERING THE AREA IN FULL PROTECTIVE CLOTHING RECEIVED 14 MILLIREMS. EVALUATION OF DATA IS
CONTINUING. ALL SAFETY SYSTEMS PERFORMED SATISFACTORILY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

AIRBORNE RELEASE + REACTOR, BWR + DRESDEN 1 (BWR) + EXPLOSION + FISSION PRODUCT RELEASE + SURVEY, ENVIRONMENT
+ CONTAMINATION + PERSONNEL EXPOSURE, RADIATION + PRESSURE RELIEF + RADIOACTIVITY RELEASE + RADIOLYTIC GAS +
FAILURE, DESIGN ERROR + OFF GAS

059933
CUTFORTH DC + PERRY WM
PURITY OF EBR-II PRIMARY COVER GAS
ARGONNE NATIONAL LABORATORY, ILLINOIS
ANL-ENG-52 +. 31 PAGES, NOVEMBER 1971

THE PRIMARY COVER GAS OF EXPERIMENTAL BREEDER REACTOR II IS CONTINUOUSLY MONITORED FOR OXYGEN,
NITROGEN, AND HYDROGEN CONTENT. A PROGRAM WAS STARTED IN MARCH 1963 TO IDENTIFY THE SOURCES OF
THESE IMPURITIES AND TO REDUCE THEIR LEVEL IN THE COVER GAS. AT THAT TIME, THE NITROGEN

049931 *CONTINUED*

CONCENTRATION AVERAGED ABOUT 6000 PPM, WITH SHORT-TERM LEVELS AS HIGH AS 20,000 PPM; THE HYDROGEN CONCENTRATION WAS OCCASIONALLY AS HIGH AS 400 PPM. NITROGEN (FROM AIR) WAS INTRODUCED PRIMARILY THROUGH THE ARGON COOLING SYSTEM OF THE FUEL-UNLOADING MACHINE AND THROUGH THE FUEL-HOLODOWN PACKING GLAND DURING FUEL-TRANSFER OPERATIONS IN THE PRIMARY TANK. THE PRINCIPAL SOURCE OF HYDROGEN (MOISTURE) WAS TRACED TO INADEQUATE DRYING OF THE INTERBUILDING FUEL-TRANSFER CASK. MODIFICATIONS OF EQUIPMENT HAVE SIGNIFICANTLY REDUCED THE FREQUENCY AND MAGNITUDE OF INLEAKAGE OF IMPURITIES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

APP 1 AND 2 (PE) + REACTOR, FAST + REACTOR, LMR + REACTOR, TEST + ARGON + NITROGEN + COVER GAS

072667

KILHA VM + SLAWICKI MA + FLEWICKS FC + HOLMES JT

DESIGN AND PERFORMANCE OF AN OXYGEN-HYDROGEN METER MODULE FOR ON-LINE SODIUM ANALYSIS AT FFTF

ARGONNE NATIONAL LABORATORY

7 PAGES, 1 FIGURE, 6 REFERENCES, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, 14(2), PP. 608-609 (OCTOBER 1971)

ON-LINE METERS TO MONITOR SODIUM FOR IMPURITIES SUCH AS OXYGEN, HYDROGEN, AND CARBON ARE NEEDED FOR THE SAFE AND EFFICIENT OPERATION OF LIQUID METAL FAST BREEDER REACTORS (LMFBRs). METERS ARE ALSO NEEDED FOR DEVELOPMENT STUDIES ON MATERIAL COMPATIBILITY, RADIOACTIVITY TRANSPORT, AND SODIUM PURIFICATION TO PERMIT MEANINGFUL COMPARISON OF DATA. METER SYSTEMS OCCUPYING ONE OR TWO STANDARD MODULES OF SPACE IN AN INSTRUMENT PACKAGE ARE BEING DEVELOPED FOR USE AT FFTF. A MODULE FOR MONITORING BOTH OXYGEN AND HYDROGEN HAS BEEN DESIGNED AT ARGONNE NATIONAL LABORATORY. THE CONCEPT AND DESIGN OF THE OXYGEN-HYDROGEN METER MODULE HAS BEEN PROVED BY SUCCESSFUL OPERATION, REPRODUCIBILITY OF DATA, AND CAPABILITY FOR MAINTENANCE.

AVAILABILITY - V. M. KOLBA, ARGONNE NATIONAL LABORATORY, 9700 S. CASS AVENUE, ARGONNE, ILLINOIS 60439

DESIGN STUDY + MONITOR + TEST, INSTRUMENT RESPONSE + INSTRUMENT, COOLANT QUALITY + PERFORMANCE + INSTRUMENTS, MISC.

075985

LESURE JE + TAYLOR GF

MATERIAL SELECTION AND CORROSION CONTROL METHODS FOR CANDU NUCLEAR POWER REACTORS

ATOMIC ENERGY OF CANADA, LTD., CHALK RIVER

ACL-4057 + 13 PAGES, 7 FIGURES, 20 REFERENCES, APRIL 1972

WATER IS THE HEAT TRANSPORT FLUID IN MANY POWER REACTORS, INCLUDING ALL CURRENT CANADIAN ONES. IN THE REACTOR, OXYGEN IS PRODUCED BY RADIOLYSIS, INCREASING THE AGGRESSIVENESS OF THE WATER TOWARDS MOST METALS. SUPPRESSION OF THIS OXYGEN PRODUCTION IS A PRIMARY OBJECTIVE OF CORROSION CONTROL IN CANADIAN REACTORS. ZIRCONIUM-ALLOY CORROSION IS NOT MARKEDLY AFFECTED BY THE PH OF THE WATER, BUT MAINTAINING ALKALINITY PERMITS USE OF CHT-REACTOR OF CARBON STEEL, WHICH IS BOTH INEXPENSIVE AND LOW IN THOSE ELEMENTS WHICH CAN BE ACTIVATED TO LONG-LIVED ISOTOPES. LITHIUM HYDROXIDE IS USED TO MAINTAIN A PH OF 10 TO 10.5 IN THE PLW'S, WHILE AMMONIA PERFORMS THIS FUNCTION IN THE BLW'S. MATERIALS FOR ALL COMPONENTS INVOLVING PENETRATIONS OF THE CIRCUIT (SUCH AS VALVE STEMS, VALVE PACKINGS AND FUEL CHANNEL END FITTINGS) ARE SELECTED TO ENSURE VERY HIGH RELIABILITY SO AS TO CONSERVE HEAVY WATER.

AVAILABILITY - SCIENTIFIC DOCUMENT DISTRIBUTION OFFICE, ATOMIC ENERGY OF CANADA, LTD., CHALK RIVER, ONTARIO, CANADA (\$5.50 PER COPY)

CLADDING + CORROSION + COOLANT CHEMISTRY + MATERIAL + ZIRCALOY + CORE COMPONENTS + STEAM GENERATOR + COOLANT QUALITY + PUMPS + VALVES + PIPES AND PIPE FITTINGS

076945

SUPPLEMENT 1 TO ORL SAFETY EVALUATION OF PEACH BOTTOM 2-3

U.S. ATOMIC ENERGY COMMISSION, DIRECTORATE OF LICENSING

OMC-1-50277-70 + 10 PAGES, SAFETY EVALUATION, SUPPLEMENT 1 FOR PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3, DEC. 11, 1971, DUCKETS 50-277/278, TYPE--RAR, MFG--G.E., AF--BECHTEL

PERTAINS TO USE OF SYSTEM FOR DILUTING CONTAMINANT ATMOSPHERE, ANTICIPATED TRANSIENTS WITHOUT SCRAM, ANALYSIS OF CONTROL-ROD-DRIP ACCIDENT.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT + ACCIDENT, CONTROL ROD CORBIN + SAFETY EVALUATION + PEACH BOTTOM 2 (BNK) + CONCENTRATION + PEACH BOTTOM 3 (BNK) + TRANSIENT

078092

ENRIGLIANO NUCLEAR POWER STATION - OPERATIONS REPORT FOR 1ST QUARTER OF 1972

ENTE NAZIONALE PER L'INFORMAZIONE ELETTRICA, FOPE

TIC-26710 + 19 PAGES, FIGURES, TABLES, REFERENCES, MARCH 31, 1972

ONE SHUTDOWN (MAR. 15, 1972) BECAUSE OF BURSTED RUPTURE DIAPHRAGMS IN THE VENT PIPE FOR THE NONCONDENSABLES THAT ISSUE FROM THE STEAM EJECTIONS. BURST WAS DUE TO EXPLOSIVE RECOMBINATION OF RAPIDLY CYCLICALLY GENERATED HYDROGEN AND OXYGEN. STATION ON LINE BY MAR. 17.

Q78092 *CONTINUED*
 AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, BWR + EXPLOSION + REPORT, OPERATIONS + RADIOLYTIC CASE + GAFGLIAND (BWR) + REACTOR SHUTDOWN

Q80699
 SKINNER GB + MILLER DR + KATCH JF + ET. AL
 CHEMICAL INHIBITION OF THE HYDROGEN-OXYGEN REACTION
 WRIGHT-PATTERSON AIR FORCE BASE, OHIO
 ASD-TDR-62-1042 +. 104 PAGES, 52 FIGURES, DECEMBER 1962

EFFECTS OF INHIBITORS ON THE HYDROGEN-AIR REACTION WERE STUDIED BY MEASURING FLAME SPEEDS OF HYDROGEN-AIR-INHIBITOR MIXTURES, AND VIA SHOCK TUBE AND SPECTROSCOPIC TECHNIQUES. THE BEST INHIBITORS WERE HYDROCARBONS AS A GROUP, BROMINE-SUBSTITUTED HYDROCARBONS, SEVERAL METALLIC CHLORIDES, AND IRON CARBONYL. DETAILED KINETIC STUDIES OF THE EFFECTS OF CH₄, C₂H₄, C₂F₃RR AND C₂F₄BR₂ ON THE HYDROGEN-OXYGEN REACTION INDICATE THAT THEY REMOVE RADICALS - CHIEFLY H ATOMS - FROM THE REACTING GAS WHEN IT IS IN THE TEMPERATURE RANGE 900 TO 1300 K. METHODS FOR CALCULATING REACTION KINETICS, FROM THE EXPERIMENTAL DATA ARE DESCRIBED BRIEFLY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 CHEMICAL REACTION + EXPLOSION + FIRE + THERMAL EXPERIMENT + CHEMICAL KINETICS

Q84046
 CUTFORTH DC + PERRY WM
 PURITY OF EBR-11 PRIMARY COVER GAS
 ARGONNE NATIONAL LABORATORY, ILLINOIS
 ANL/EOR-52 +. 31 PAGES, NOVEMBER, 1973

THE PRIMARY COVER GAS OF EXPERIMENTAL BREEDER REACTOR 11 (EBR-11) IS CONTINUOUSLY MONITORED FOR OXYGEN, NITROGEN, AND HYDROGEN CONTENT. A PROGRAM WAS STARTED IN MARCH 1968 TO IDENTIFY THE SOURCES OF THESE IMPURITIES AND TO REDUCE THEIR LEVEL IN THE COVER GAS. AT THAT TIME, THE NITROGEN CONCENTRATION AVERAGED ABOUT 6000 PPM WITH SHORT-TERM LEVELS AS HIGH AS 20,000 PPM & THE HYDROGEN CONCENTRATION WAS OCCASIONALLY AS HIGH AS 500 PPM. NITROGEN (FROM AIR) WAS FOUND TO BE INTRODUCED PRIMARILY THROUGH THE ARGON COOLING OF THE FUEL-RELOADING MACHINE AND THROUGH THE FUEL-HOLD PACKING GLAND DURING FUEL-TRANSFER OPERATIONS IN THE PRIMARY TANK. THE PRINCIPAL SOURCE OF HYDROGEN (MOISTURE) WAS TRACED TO INADEQUATE DRYING OF THE INTERBUILDING FUEL-TRANSFER CASE (OR COFFIN). MODIFICATIONS OF EQUIPMENT HAVE SIGNIFICANTLY REDUCED THE FREQUENCY AND MAGNITUDE OF INLEAKAGES OF IMPURITIES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 FUEL HANDLING + ARGON + MONITOR, GAS + NITROGEN + COVER GAS + FUEL HANDLING MACHINE + OPERATING EXPERIENCE + IMPURITY

Q89801
 MOORE GF + TOMLINSON LH
 SUPPNER-FLAME ARRESTER FOR BURNING OFF-GAS FROM A BOILING WATER REACTOR POWER PLANT
 U.S. PATENT 3,740,313 +. 4 PAGES, JULY 1, 1971

A COOLED POROUS PLUG DEVICE IN COMBINATION WITH A CONTINUOUS IGNITION SOURCE IS USED FOR BURNING OFF EXPLOSIVE MIXTURES OF CONTAMINATED RADIOLYTIC HYDROGEN-OXYGEN GAS FLOW DISCHARGED FROM THE STEAM TURBINE CYCLE OF A BOILING WATER NUCLEAR POWER REACTOR. OPTIONAL USE OF A SECOND COOLED POROUS PLUG IS SHOWN, THE SECOND POROUS PLUG BEING LOCATED DOWNSTREAM OF THE BURNER TO FUNCTION AS A HEAT EXCHANGER TO COOL THE COMBUSTION PRODUCTS FOR CONTROLLED CONDENSATION OF THE WATER VAPOR.

AVAILABILITY - THE U.S. PATENT OFFICE, DEPT. OF COMMERCE, WASHINGTON, D.C.

REACTOR, BWR + EXPLOSION + POPCORN MEDIA + IGNITION + PATENT + ENGINEERED SAFETY FEATURE + SAFETY DEVICE + RECOMBINERS

Q90412
 AMENDS FULL TERM LICENSE APPLICATION
 JERSEY CENTRAL POWER AND LIGHT COMPANY
 25 PAGES, LETTER WITH ATTACHED SUPPLEMENT 4 TO DIRECTORATE OF LICENSING (AEC), NOVEMBER 21, 1973, DOCKET 50-219, TYPE--BWR, MFG--G.F., AE--BURNS & ROE

RESPONDS TO QUESTIONS CONCERNING POTENTIAL POST-LOCA OXYGEN SOURCES, OXYGEN CONCENTRATIONS, WEIGHT OF ZIRCONIUM IN THE CORE, AND CONTAINMENT ATMOSPHERE MIXING.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

NRC QUESTION + REACTOR, BWR + OYSTER CREEK (BWR) + ZIRCONIUM + CONTROL + LICENSE APPLICATION + CONTAINMENT ATMOSPHERE. INERT + OPERATING LICENSE PROCESS + FLOW, MIXING + CONCENTRATION

091464
JAN 4 11
HYDROGEN PRODUCTION IN CONTAINMENT AFTER A LOSS-OF-COOLANT ACCIDENT IN LIGHT-WATER REACTORS
TECHNISCHE UNIVERSITÄT MÜNCHEN, WEST GERMANY
IN-117 +. 50 PAGES, FIGURES, MARCH 1973 (REPT. IN GERMAN)

GIVES A SHORT GENERAL VIEW OF THE RADIOLYSIS PROBLEM. DESCRIBES THE CODE RADI 1, DEVELOPED AT LFA, AS WELL AS SOME CURVES OF IMPORTANT PARAMETERS AND RESULTS. (IN GERMAN)

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

COMPUTER PROGRAM + ACCIDENT, LOSS OF COOLANT + RADIOLYTIC GAS + COOLING

042272
MAY 11 1973
THE MONITORING OF HYDROGEN AND OXYGEN IN LIQUID SODIUM
CONF-730449-- +. 6 PAGES, PP. 101-106, PRESENTED AT THE RNES LIQUID ALKALI METALS CONFERENCE, HELD AT NOTTINGHAM UNIVERSITY, APRIL 4-6, 1973

HYDRIDE ACTIVATED HYDROGEN CONCENTRATION CELLS, OF THE TYPE (HISUB 21)(ISUB 11)/FE/MH/FE/HISUB 21) WHERE THE IFON IS IN THE FORM OF THIN HYDROGEN PERMEABLE MEMBRANES, ARE DESCRIBED. ELECTROLYTES CONSISTING OF CALCIUM HYDRIDE-CALCIUM CHLORIDE MIXTURES HAVE BEEN FOUND TO GIVE CLOSE TO THEORETICAL EMFs AND HAVE BEEN USED TO MEASURE THE EQUILIBRIUM HYDROGEN DISSOCIATION PRESSURE OF LITHIUM-LITHIUM HYDRIDE ELECTRODES BETWEEN 550 AND 380 C. THE EMF RESPONSE FOLLOWING A STEPWISE CHANGE IN HYDROGEN PRESSURE IS COMPARED WITH TWO SIMPLE DIFFUSION MODELS. PRELIMINARY EXPERIMENTS ARE DESCRIBED TO EVALUATE COMMERCIALY AVAILABLE THOISUB 21-YISUB 21OISUB 31 ELECTROLYTES FOR THE MEASUREMENT OF OXYGEN IN SODIUM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ENERGY SOURCE + COMPARISON, THEORY AND EXPERIENCE + HYDRIDE + MONITOR

097171
SAMUEL WA + GREER JS
INVESTIGATION OF METHODS FOR ARRESTING DETONATIONS IN GAS MIXTURES
MSA RESEARCH CORP., EVANS CITY, PA.
MSA-67-187 +. 61 PAGES, NOVEMBER 2, 1967

AN INVESTIGATION OF METHODS FOR INHIBITING AND ARRESTING DETONATIONS IN H₂-O₂ SYSTEMS IS REPORTED. AN INHIBITION-ARRESTING SYSTEM HAS BEEN EVOLVED THAT SHOULD COST LESS THAN ONE-SEVENTH AS MUCH AS AIR DILUTION. THE PROJECTED COMPARATIVE COSTS ARE \$800,000 VERSUS \$4,850,000. WHEN A SIMULATED CAVERN EFFLUENT WAS DILUTED WITH STEAM TO APPROXIMATELY ONE AND THREE-QUARTER TIMES ITS ORIGINAL VOLUME, IT WOULD NOT DETONATE. THE RESULTING HISUB 21 CONCENTRATION WAS 17.5%, AND ALTHOUGH A FLAMMABLE MIXTURE, A RUBBLE WITH ONLY NINE INCHES OF WATER HEAD WAS EFFECTIVE AS A FLAME BARRIER.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

EXPLOSION + PLOWSHARE + RADIOLYTIC GAS + SAFETY EVALUATION

097172
GREER JS + RANKIN PL
LIMITS OF HYDROGEN-OXYGEN-NITROGEN-STEAM MIXTURES
MSA RESEARCH CORP., EVANS CITY, PA.
MSA-68-109 +. 43 PAGES, JUNE 11, 1968

THE COMBUSTION LIMITS OF STEAM-DILUTED HYDROGEN-OXYGEN MIXTURES WERE DETERMINED AT 1150 PSIG IN A 0.5 CU FT STAINLESS STEEL TEST CELL. GAS SAMPLES WERE EXTRACTED AT TEMPERATURE TO ESTABLISH THE COMPOSITION OF COMBUSTIBLE MIXTURES. TEMPERATURE AND PRESSURE EXCURSIONS WERE RECORDED THROUGHOUT MOST OF THE TESTS. A STOICHIOMETRIC HYDROGEN-OXYGEN MIXTURE CONFINED AT 950 F AND 1150 PSIG BECOMES COMBUSTIBLE WHEN THE MIXTURE CONTAINS BETWEEN 90 AND 95% STEAM. AN EXCESS OF HYDROGEN IN MIXTURES CONTAINED AT 950 F INCREASED THE COMBUSTION LIMIT TO >95% STEAM. ESTABLISHING THE COMBUSTION LIMITS OF HYDROGEN-OXYGEN MIXTURES AT 950 F RESOLVES INTO A PROBLEM OF PREVENTING THERMAL INITIATION IN THE MIXTURE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

STEAM + COMBUSTION + RADIOLYTIC GAS + SAFETY EVALUATION

097173
HYDROGEN PRODUCTION IN LIGHT WATER REACTORS
TECHNISCHE UNIV. MÜNCHEN, GARCHING, F.R.G. GERMANY
NP-19937 +. 255 PAGES, JUNE 1973 (IN GERMAN)

THE RECENT STATE OF KNOWLEDGE CONCERNING HYDROGEN PRODUCTION IN LWR'S AS WELL AS OTHER DIRECTLY CONNECTED PROBLEMS IS REVIEWED. THUS THE PRODUCTION OF OXYGEN IS DEALT WITH ALSO. AN ATTEMPT IS MADE TO DEFINE THE EFFECT OF VARIOUS PARAMETERS OF CHEMICAL AND PHYSICAL NATURE ON THE RADIOLYSIS. PROBLEMS OF METAL REACTIONS, GAMMA-RAY ABSORPTION, AND THE COMBUSTIBILITY OF HYDROGEN-AIR (STEAM) MIXTURES ARE ALSO TREATED.

097173 *CONTINUED*
 AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 HYDROGRAPHY + REACTOR, RAP + METAL WATER REACTION + REACTOR, PAR + STEAM + COMBUSTION + RADIOLYTIC GAS

097174
 WILLIAMS LO
 LIFESAVING OF AMERICA
 MARTIN MARITTE CORP., DENVER
 10 PAGES, ASTRONAUT, AERONAUT., 10(2), PP. 42-41 (FEBRUARY 1972)

THE BASES FOR A PROPOSED SYSTEM OF LARGE NUCLEAR POWER PLANTS IN THE OCEANS PRODUCING ELECTRIC POWER AND HYDROGEN ARE PRESENTED. THE HYDROGEN WOULD FUEL INLAND POWER PLANTS AND MOBILE POWER SOURCES AND SATISFY MOST OTHER ENERGY DEMANDS.

ENERGY SOURCE + N-POWER FORECAST + POWER GENERATION METHOD + POWER PLANT, NUCLEAR + OFFSHORE POWER SYSTEMS (PWR)

097177
 STEWART M + MOORE OF
 FLAME RECOMBINATION OF OXYGEN AND HYDROGEN
 GENERAL ELECTRIC COMPANY
 11 PAGES, CHEM. ENG. PROG., SYMP. SERIES, 6(104), PP. 1-11 (1970)

THE DESIGN OBJECTIVES ARE COMBUSTION PRINCIPLES ARE DISCUSSED FOR DISPOSAL BY FLAME RECOMBINATION OF THE RADIOLYTIC OFF-GAS FROM A WATER-COOLED NUCLEAR REACTOR. THE OFF-GAS IS MAINLY A STOICHIOMETRIC HYDROGEN-OXYGEN MIXTURE. IT IS SHOWN THAT THE CHARACTERISTICS OF THE WATER-COOLED POROUS PLUG BURNER ARE NOT ONLY CONSISTENT WITH BUT APPEAR NECESSARY TO MEET BOTH THE BASIC AND PRACTICAL REQUIREMENTS OF THE PROBLEM. THE DEVELOPMENT OF THE COMPONENTS FOR A SAFE, RELIABLE AND RELATIVELY INEXPENSIVE RECOMBINER IS DESCRIBED. A VERSATILE FACILITY WAS BUILT FOR TESTING OF COMPLETE BURNER SYSTEMS AS WELL AS RELATED SAFETY SYSTEMS.

DESIGN CRITERIA + RADIOLYTIC GAS + COMPONENTS + SAFETY EVALUATION + RECOMBINERS

097178
 WIZUMO K + TANI J
 CATALYTIC RECOMBINATION FOR OXYGEN AND HYDROGEN IN OFF-GAS OF NUCLEAR POWER PLANTS
 USANA OXYGEN INDUSTRIES LTD., JAPAN
 7 PAGES, KONAISO GASU, 9(2), PP. 460-442 (APRIL 1972) (IN JAPANESE)

A SERIES OF EXPERIMENTS WERE PERFORMED TO OBTAIN DESIGN DATA FOR THE CATALYTIC RECOMBINATOR OF OXYGEN AND HYDROGEN IN THE OFF-GAS FROM NUCLEAR POWER PLANTS. OBJECTIVE, METHOD, AND RESULT OF THE EXPERIMENTS ARE DESCRIBED. 0.5 WT % PALLADIUM-ALUMINA SPHERICAL CATALYZER OF DIAMETER 3.2 APPROXIMATELY 6.4 MM WAS USED AS SAMPLE. THE RECOMBINATION EXPERIMENT WAS PERFORMED WITH THE VOL % OF OXYGEN RANGING FROM 0.65 TO 2.2 AND THAT OF HYDROGEN FROM 1.1 TO 4.0. AS A RESULT OF THE RECOMBINATION, REMAINDER OF THE HYDROGEN WAS BELOW 1 PPM IN ALL CASES. TEMPERATURE OF THE CATALYZER, ON THE OTHER HAND, ROSE TO 190 TO 490 C. DEPENDING ON THE INITIAL CONTENT OF THE OXYGEN AND HYDROGEN. MECHANICAL STRENGTH AND ACTIVITY OF THE CATALYZER WERE ALSO TESTED UNDER VARIOUS CONDITIONS. THE RESULTS SHOW THAT PERFORMANCE OF THE CATALYZER DOES NOT WORSEN IF THE TEMPERATURE IS KEPT BELOW 500 C.

CATALYST + RECOMBINERS

097182
 MINIF JO
 CONDENSER-TYPE GAS COMBINER
 U.S. PATENT 3,755,075 +. 10 PAGES, AUGUST 29, 1973

A CONDENSER-TYPE GAS COMBINER, INTENDED PRIMARILY FOR USE WITH NUCLEAR REACTORS, IS DESIGNED WHEREIN HYDROGEN AND OXYGEN ARE RECOMBINED AT LOW PRESSURES USING A CONDENSER AS A DRIVING FORCE TO TRANSPORT THE HYDROGEN AND OXYGEN GASES THROUGH A CATALYTIC BED. TWO EMBODIMENTS ARE DISCLOSED FOR USE WITH WATER-BOILER (HYDROGENOUS AND LARGE BOILING-WATER REACTORS.)

AVAILABILITY - THE U.S. PATENT OFFICE, DEPT. OF COMMERCE, WASHINGTON, D.C.

REACTOR, RAP + DESIGN CRITERIA + PATENT + CONDENSER + CATALYST + RECOMBINERS

KEYWORD INDEX

A COLLECTION OF KEYWORDS IS USED TO DENOTE THE MAIN SAFETY RELATED POINTS COVERED IN EACH ARTICLE. THE FOLLOWING INDEX IS AN ALPHABETICAL LISTING OF THE KEYWORDS GIVING REFERENCES TO EACH ARTICLE WHICH WAS KEYED TO IT.

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[illegible]

1. 本局為便利僑胞起見，特在各地設立辦事處，凡有僑胞欲辦理各項業務，請逕向該處洽辦，無庸親至本局。

此致
 敬礼
 王明

[illegible]

091449	#	9
093771	#	8
093141	#	1
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091729	#	6
090412	#	8
091116	#	10
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092717	#	1
094162	#	4
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[illegible]

RED PLUMBERING WEALTHY POSSESSIONS - PART 19. A SAFETY
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ANALYSIS SECTION AND COMBINATION CENTRAL OFFICES OF
THE NATIONAL LABOR RELATIONS BOARD
ANALYSIS OF CASES AS WELL AS OF MANY RELEVANT
OF WELSH STATE PLANS
ANALYSIS OF CASES AS WELL AS OF MANY RELEVANT

CARDNAME MATERIALS **MATERIAL SPECIFICATION**
AND ANALYSIS, DESIGN, CONSTRUCTION, TEST, AND OPERATION.

#6048

RECORDS SECTION - 1944 64
LOSS OF COLLIER ACCIDENT SAFETY GUIDE 7 - CONTROL OF
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ACCIDENTS SAFETY GUIDE 7 - CONTROL OF COMBUSTIBLE GAS

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7. METAL-WATER REACTIONS

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INFORMATION IS PART OF THE FOLLOWING SUMMARY REPORT. THE PURPOSE OF THIS REPORT IS TO SUMMARIZE AVAILABLE DATA ON THE POSSIBILITY OF HYDROGEN IN STEAM-RISE PICTURES AND TO APPLY THE DATA TO THE ESTIMATED TWO-LESSON-REACTOR ACCIDENT IN DETERMINING THE POTENTIAL PRESSURE EFFECTS ON THE PLANT CONTAINER. THE HYDROGEN WOULD PROBABLY BE EVOLVED AT SUCH A HIGH TEMPERATURE THAT SOME LOCAL INITIAL SMOKE OCCUR, PRESENTING A LARGE AMOUNT OF UNBURNED HYDROGEN FROM ACCUMULATION. THE EVOLUTION OF HYDROGEN IS SUFFICIENTLY SLOW SO THAT IF THE HYDROGEN IS BURNED, AS EVOLVED, THE PRESSURE WITHIN THE PLANT CONTAINER WOULD BE RAISED BY ONLY A FEW PSI, AT A TIME WHEN THE TOTAL PRESSURE WITHIN IS CONSIDERABLY LESS THAN THE PLANT CONTAINER DESIGN PRESSURE. IF HYDROGEN DOES NOT BURN AS EVOLVED, THE CHANCE IF IT SHOULD ESCAPE FROM THE REACTOR VESSEL TOGETHER WITH A LEAK WITH RESULTANT COOLING OF THE GAS, IT IS UNLIKELY THAT DETONATION WOULD OCCUR. IF A JET-OF PICTURE OF STEAM, AIR, AND HYDROGEN IS OBTAINED IN THE PLANT CONTAINER, THE MAXIMUM HYDROGEN CONCENTRATION WOULD BE HELD THAT REQUIRED FOR DETONATION. THEREFORE, NO DETONATION SHOULD OCCUR UNLESS LOCALIZED POCKETS OF HYDROGEN OCCUR. EVEN SHOULD SUCH A POCKET EXIST, IT IS BELIEVED THE PLANT PRESSURE WOULD NOT EXCEED THE PLANT CONTAINER DESIGN PRESSURE.

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 2. FROM NATIONAL LABORATORY, PROGRAM NATIONAL LABORATORY, PHILLIPS PETROLEUM COMPANY
 344 BAKER, ON SUBJECTS, 34 TABLES, 174 PAGES - AUGUST 1965, HNL-NSIC-5, VOL. I - CFSTI

THE DESIGN OF CONTAINMENT FOR NUCLEAR REACTORS DEPENDS TO A LARGE EXTENT ON DETERMINING THE ENERGY AVAILABLE FOR RELEASE DURING A FAST-ACCIDENT. THE THREE MAJOR SOURCES OF ENERGY IN SUCH A SYSTEM ARE NUCLEAR, CHEMICAL, AND STORED THERMAL ENERGY. THESE SOURCES ARE DESCRIBED IN DETAIL, AND THE CONSEQUENCE OF THIS ENERGY RELEASE ON CONTAINMENT DESIGN CALCULATIONS ARE EVALUATED. THE CHEMICAL REACTIONS EXPECTED UNDER ACCIDENT CONDITIONS FOR THE MORE IMPORTANT NUCLEAR CONSTRUCTION MATERIALS AS WELL AS THE SPECIFIC NUCLEAR CONTRIBUTIONS SUCH AS DECAY HEAT, ETC., ARE GIVEN. WHEN SELECTED, ALSO CONTAINS A LARGE NUMBER OF REFERENCES THAT MAY BE USED FOR ADDITIONAL INFORMATION.

- 4-1 INTRODUCTION
- 4-2 CHEMICAL REACTIONS
- 4-3 NUCLEAR ENERGY
- REFERENCES

ALLIUM • CHEMICAL REACTION • DECAY HEAT • DOPPLER COEFFICIENT • ENERGY SOURCE • FIRE • GRAPHITE • OXIDATION
• PAUOFF • PYROLYTIC REACTION • STEAM • URANIUM • WIGNER ENERGY • ZIRCONIUM • POTASSIUM • LITHIUM

HYDROGEN OPERATIONS IN A BOILING WATER REACTOR
COMPLETABILITY: 75% IN COMPLIANCE
5/1/90 TO 5/2 PAGES, 23 FIGURES, 12 TABLES, 10 REFERENCES, APPENDIX 2 TO DRESDEN 3 LICENSE APPLICATION.
SUBJECT: 24, 1970, DRESDEN 30-249

EVALUATES THE POTENTIAL HYDROGEN GENERATION AND ITS SUBSEQUENT ACCUMULATION IN THE PRIMARY CIRCUIT OF A LOOP MAP FOLLOWING A POSTULATED LOSS-OF-FLUID-ACCIDENT. THE REPORT INCLUDES THE APPLICATION OF EXPERIMENTAL TEST DATA TO A TYPICAL 3400-MWT NUCLEAR POWER PLANT AND A GENERIC EVALUATION OF THE EFFECTS OF THE PERTINENT PARAMETERS SUCH AS METAL-WATER REACTION, BREAK AREA, AND ADSORPTIVE DECOMPOSITION RATE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT ANALYSIS • AIRBORNE RELEASE • ACCIDENT, LOSS OF COOLANT • VENTILATION SYSTEM • ZIRCONIUM • DRESDEN 3
(PART) • FALLOUT • FALLOUT, INVESTIGATION • CONTAINMENT ATMOSPHERE, INERT • GAS

CHEMICAL AND ASSOCIATED FREQUENCY-TRANSFERENCE PROBLEMS IN REACTOR SAFETY
ATOMIC ENERGY NATIONAL LABORATORY

² - LANS, 1 FIGURE, 1 TABLE - NOVEMBER - 23, 1965, AML-7015, PP. 41-83, REACTOR DEVELOPMENT PROGRAM PROGRESS REPORT, OCTOBER 1965 - FEBRUARY 1966 CY, 10-75 AN.

EXPERIMENTS ON URANIUM DIOXIDE STEAM REACTORS WERE PERFORMED WITH OXIDE PELLETS, HALF INCH DIAMETER AND HEIGHT, 95 PERCENT THEORETICAL DENSITY AT 1500 DEGREE F C AND AMBIENT PRESSURE IN THE PRESENCE OF AIR. BY FLUX-INDEPENDENT METHODS IT WAS FOUND THAT THE DIOXIDE WAS OXIDIZED TO A FINAL OXIDATION TO URANIUM RATIO OF 2.17 MOSTLY DURING THE FIRST 70 MINUTES. THE REACTION WOULD PROBABLY NOT CONTRIBUTE TO A FOLLOWING A LOSS OF URANIUM ACCIDENT, BUT NOTHING IS SAID ABOUT ITS INFLUENCE ON FISSION FRAGMENT RELEASE.

008102 *CONTINUED*
 REACTOR, GRAPHITE MODERATED * ACCIDENT, LOSS OF COOLANT * TREAT (1944)

008907
 JENSEN SE * FINNEGAN LJ
 THE INFLUENCE OF ZIRCONIUM CLADDING ON THE LOSS-OF-COOLANT TEST
 PHILLIPS PETROLEUM COMPANY
 2 PAGES, 2 REFERENCES, AAS TRANSACTIONS #171, PAGES 543-541, 1965 WINTER MEETING OF THE AMERICAN NUCLEAR SOCIETY, WASHINGTON, D. C., NOVEMBER 15-19, 1965

CONSIDERATIONS EMPLOYED IN THE ANALYSIS ARE DESCRIBED AND THE DIFFERENCES BETWEEN STAINLESS STEEL CLAD AND ZIRCONIUM WITH RESPECT TO SAFETY ARE POINTED OUT. THE LOSS OF COOLANT ACCIDENT WILL PROVIDE THE NECESSARY ENVIRONMENT FOR THE METAL-WATER REACTION TO OCCUR. CONTAINMENT PRESSURE VERSUS TIME BEHAVIOR AND PRESSURE REDUCTION BY SPRAY WERE ALSO INVESTIGATED.

CONTAINMENT SPRAY * CONTAINMENT VESSEL LOADING * ACCIDENT, LOSS OF COOLANT * ZIRCONIUM * LOFT (S-HRI) * CLADDING * PRESSURE TRANSIENT

009211
 KILPATRICK M * LOTT SK
 REACTION OF FLOWING STEAM WITH REFRACTORY METALS
 ARGONNE NATIONAL LABORATORY, ILLINOIS
 2 PAGES, 4 FIGURES, 5 REFERENCES- JOURNAL OF ELECTROCHEM SOC. 113(1)- 15-16 (JANUARY 1966)

WHEN PHENIUM REACTS WITH STEAM AT 1 ATM PRESSURE, THE RATE OF EVOLUTION OF HYDROGEN IS CONSTANT WITH TIME, AND THE METAL REMAINS BRIGHT WITH NO EVIDENCE OF A COATING. THE APPARENT ENERGY OF ACTIVATION FOR THE REACTION IS 20 KCAL/MOLE, AND THE ENTHALPY OF SUBLIMATION OF PHENIUM OXIDE IS 33.5 KCAL/MOLE, WHICH SUGGESTS THAT THE RATE-DETERMINING STEP IS THE SUBLIMATION OF THE OXIDE.

CHEMICAL REACTION * STEAM * SURFACE * PHENIUM

011346
 QUAD-CITIES STATION, UNIT 1 - PLANT DESIGN ANALYSIS, VOLUME 1
 COMMONWEALTH EDISON COMPANY, CHICAGO
 14 PAGES, 3 REFERENCES, 1 TABLE, PAGES V-1-16 TO 31, DOCKET NO. 50-254, MAY 31, 1966 PDR

IMMEDIATELY AFTER THE MAJOR PIPE RUPTURE, THE TEMPERATURE OF THE WATER IN THE SUPPRESSION CHAMBER APPROACHES 133 F, AND THE MAXIMUM SYSTEM PRESSURE APPROACHES 39 PSIG DURING THE BLOWDOWN OF THE PRIMARY COOLANT INTO THE DRYWELL. THE CONTAINMENT PRESSURE IS A FUNCTION OF THE METAL-WATER REACTION RATE. ALTHOUGH THE CORE-COOLING SYSTEMS ARE ASSUMED NOT TO FUNCTION IN ORDER TO PROVIDE A BASIS FOR METAL-WATER REACTIONS, ONE OF THE TWO CONTAINMENT COOLING SYSTEMS IS ASSUMED TO FUNCTION NORMALLY. THE DRYWELL SPRAY IS SUFFICIENT TO TRANSPORT THE DECAY HEAT, THE HEAT STORED IN THE CORE, AND A HEAT RESULTING FROM THE METAL-WATER REACTION TO THE DRYWELL IN THE FORM OF HOT LIQUID. THE ENERGY TRANSPORTED TO THE WATER IN THE SUPPRESSION CHAMBER IS REMOVED FROM THE CONTAINMENT SYSTEM BY HEAT EXCHANGERS. TO OBVIATE THE POSSIBILITY OF AN ENERGY RELEASE WITHIN THE PRIMARY CONTAINMENT FROM A HYDROGEN-OXYGEN REACTION UNDER CONDITIONS MORE SEVERE THAN CAN CURRENTLY BE FORESEEN, THE DESIGN INCLUDES AN INERTING SYSTEM TO REDUCE THE OXYGEN CONCENTRATION OF THE ATMOSPHERE WITHIN THE PRIMARY CONTAINMENT.

REACTOR, BWR * CHEMICAL REACTION * CONTAINMENT SPRAY * CONTAINMENT, PRESSURE SUPPRESSION * OXYGEN * ZIRCALOY * QUAD CITIES 1 (BWR) * CONTAINMENT ATMOSPHERE, INERT * REPORT, PSAR

022709
 ZIRCONIUM HAZARDS RESEARCH, PROGRESS REPORT NO. 2, SEPTEMBER 1, 1957 TO FEBRUARY 28, 1958
 UNITED STATES DEPARTMENT OF INTERIOR
 AECU-36R2 * 25 PAGES, 5 TABLES, 3 FIGURES, 1958

SUMMARIZES WORK PERFORMED BY THE BUREAU OF MINES DURING THE PERIOD SEPTEMBER 1, 1957 THROUGH FEBRUARY 28, 1958, ON THE SENSITIVITY CHARACTERISTICS OF ZIRCONIUM SAMPLES SUCH AS SPONGE, SCRAP, FOIL, AND POWDER. OF PARTICULAR INTEREST WAS THE DETERMINATION OF THE RELATIVE SENSITIVITY OF THESE MATERIALS TO STIMULI SUCH AS ELECTROSTATIC DISCHARGES AND INDUCED SHOCK WAVES. ZIRCONIUM-WATER AND ZIRCONIUM-GAS REACTIONS AT RELATIVELY LOW TEMPERATURES WERE INVESTIGATED ALSO.

CHEMICAL REACTION * PYROPHORIC REACTION * CARBON DIOXIDE * ZIRCONIUM * NITROGEN * ZIRCALOY * WATER VAPOR

029094
 MCCLAIN HA
 POTENTIAL METAL-WATER REACTIONS IN LIGHT-WATER-COOLED POWER REACTORS
 OAK RIDGE NATIONAL LAB., TENN.
 ORNL-NSIC-23 * 201 PAGES, FIGURES, TABLES, 206 REFERENCES, AUGUST 1968

A STATE-OF-THE-ART REVIEW OF THE ROLE OF CHEMICAL REACTIONS IN AN UNLIKELY EVENT OF A LIGHT-WATER POWER REACTOR ACCIDENT. THE STUDY CONCLUDED THAT THESE REACTIONS COULD BE ASSESSED REALISTICALLY ONLY BY CONSIDERING AN INTEGRAL MODEL OF THE ACCIDENT. COMPARED WITH THE SITUATION REGARDING THE DEFINITION AND THE MATHEMATICAL SIMULATION OF AN ACCIDENT, THE BASIC KINETICS OF THE CHEMICAL REACTIONS ARE WELL UNDERSTOOD. THERE ARE STILL SOME QUESTIONS ABOUT THE EFFECT OF LIMITED METAL-WATER REACTION ON POSSIBLE FUEL-PIN FRAGMENTATION IN LOSS-OF-COOLANT ACCIDENTS AND ABOUT THE

037024 *CONTINUED*
CONTINUATION LIMITS OF HYDROGEN-AIR-STEAM MIXTURES, HOWEVER.

AVAILABILITY - FLEA-IMMUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151, \$3.00 COPY, 30.05 MICROFILME

ALUMINUM + BORO. + CHEMICAL REACTION + CLADDING + FUEL MELTDOWN + ACCIDENT, LOSS OF COOLANT + OXIDATION + HYDROGEN + STEAM + WATER + ZIRCONIUM + DRESDEN 2 (BWR) + STEEL, STAINLESS + ACCIDENT MODEL + AIR + LOFT (S-RR) + CHEMICAL KINETICS + CORE MELTDOWN + URANIUM DIOXIDE + ZIRCALOY + INDIAN POINT 2 (PWR) + PALISADES (PWR) + INDIAN POINT 2 (PWR) + STOICHIOMETRY + ACCIDENT, CONTROL FOR EJECTION + DCONEE 1 (PWR) + THERMAL TRANSIENT

040509
AND ON AND QUALITY CONTROL
INDIANA AND MICHIGAN ELECTRIC COMPANY
47 PAGES, FIGURES, TABLES, AGREEMENT TO COCK 1 AND 2 LICENSE APPLICATION, NOVEMBER 14, 1968, DOCKETS 50-375716.

ADDITIONAL INFORMATION IN (1) QUALITY-CONTROL PROGRAM, (2) CABLED SPLICING AND TESTING PROCEDURES, (3) SEISMIC-DESIGN CRITERIA, (4) RECOMBINER DESIGN AND ASSOCIATED R AND D, (5) PORTS FOR CONTAINMENT LINE INSPECTION, (6) CONTAINMENT-SPRAY R AND D, AND (7) FIXED INCORE DETECTORS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

CONTAINMENT SPRAY + DESIGN CRITERIA + INSTRUMENT, IN CORE + REACTOR, PWR + PROCEDURES AND MANUALS + TESTING + WELDING + MODIFICATION + RADIOLYTIC GAS + EXAMINATION + REPORT, TSN + QUALITY ASSURANCE + EARTHQUAKE ENGINEERING + R AND D PROGRAM + CONTAINMENT LINE + COCK 1 (PWR) + COCK 2 (PWR) + RECOMBINERS

072663
VOL. 3 - SAFETY ANALYSIS AND SYSTEM DESCRIPTIONS.

SYSTEMS DESCRIBED INCLUDE ELECTRICAL, STEAM AND POWER CONVERSION, AND RADWASTE. INITIAL TESTS AND CONDUCT OF OPERATIONS ARE DISCUSSED. ACCIDENT ANALYSIS CONSIDERS FUEL HANDLING ACCIDENT, ROD EJECTION, LOSS OF COOLANT, MAXIMUM HYPOTHETICAL, AND GASEOUS RADWASTE DECAY TANK RUPTURE. FOR THE LOCA, THE 2-HOUR DISE AT EXCLUSION DISTANCE IS 1.11 REMS THYROID. FOR A FUEL HANDLING ACCIDENT, THE INTEGRATED DOSE IS 2.25 REMS THYROID AND 0.134 REMS WHOLE-BODY. FOR THE LOCA, IF METAL-WATER REACTION AND SUBSEQUENT HYDROGEN ENERGIES ARE TRANSFERRED TO ATMOSPHERE AS SUPERHEAT, THEN THE VESSEL CAN STAND 77.1 PERCENT OF THE REACTION BY 1000 SEC.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

CONTAINMENT VESSEL LOADING + REACTOR, PWR + REACTOR DESCRIPTION + HAZARDS ANALYSIS + SYSTEM DESCRIPTION + REPORT, PSA + SAFETY ANALYSIS

033052
JANUARY 1968
METAL-WATER REACTIONS - EFFECTS ON CORE COOLING AND CONTAINMENT
GENERAL ELECTRIC, SAN JOSE, CALIF.
APL-5454 +, 42 PAGES, 25 FIGURES, 1 TABLE, 9 REFERENCES, MARCH 1968

THE ROLE OF METAL-WATER REACTIONS IN A BWR LOSS-OF-COOLANT ACCIDENT IS DISCUSSED. IF THE DESIGN MINIMUM OF THE EMERGENCY-CORE-COOLING SYSTEMS ARE OPERATING, CALCULATIONS AND EXPERIMENTAL TESTS SO FAR INDICATE THAT THE AMOUNT OF ZIRCALOY-STEAM REACTION IS SIGNIFICANT. ALSO IT WAS CONCLUDED THAT THE PRESSURE-SUPPRESSION CONTAINMENT CAN READILY ACCOMMODATE ANY HYDROGEN PRODUCED BY THE METAL-WATER REACTION, WHETHER OR NOT IT BURNS. THEREFORE, THESE REACTIONS ARE NOT THE OVERRIDING CONSIDERATION IN SIZING THE EMERGENCY-CORE-COOLING SYSTEMS.

AVAILABILITY - P. W. JANNI, GENERAL ELECTRIC CO., ATOMIC POWER EQUIPMENT DEPARTMENT, SAN JOSE, CALIF.

REACTOR, PWR + CHEMICAL REACTION + CONTAINMENT DESIGN + ACCIDENT, LOSS OF COOLANT + STEAM + AIR + ZIRCALOY + EMERGENCY COOLING

034891
HYDROGEN CONTROL EQUIPMENT AT DRESDEN 2 AND 3
COMMONWEALTH EDISON COMPANY
Docket-50249-115 +, 15 PAGES, LETTER - COMMONWEALTH EDISON COMPANY TO DIVISION OF REACTOR LICENSING (AREC) - FEBRUARY 22, 1972, Docket 50-249, TYPE--BWR, MFG--WEST., AF--SOT + LUNDY

PROPOSES A SOLUTION TO CONTROLLING THE COMBUSTIBLE GASES WITHIN THE CONTAINMENT FOLLOWING A LOSS-OF-COOLANT ACCIDENT. METHOD CONSISTS OF SIMPLY ADDING NITROGEN TO DILUTE THE OXYGEN CONCENTRATION BELOW THE FLAMMABILITY LIMIT. THE CONTAINMENT PRESSURE WILL INCREASE DUE TO THE NITROGEN ADDITION BUT WILL BE LIMITED OR CONTROLLED BY LEAKAGE.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + DRESDEN 2 (BWR) + DRESDEN 2 (BWR) + RADIOLYTIC GAS + CONTAINMENT ATMOSPHERE, INFRT

036402
CONSIDERATIONS PERTAINING TO CONTAINMENT INERTING
GENERAL ELECTRIC COMPANY, SAN JOSE, CALIFORNIA
APLD-5454 +. 104 PAGES, FIGURES, TABLES, REFERENCES, AUGUST 15, 1968

REPORT CONTAINS EVALUATION OF CONTAINMENT INERTING FOR BWR. BASED ON THIS EVALUATION, GENERAL ELECTRIC SAYS INERTING IS UNWARRANTED. ADVERSE EFFECTS OF INERTING ON PERSONNEL JEOPARDY AND RESTRICTED INSERVICE INSPECTIONS FOR BWR CONTAINMENT JUDGED DETRIMENTAL TO OVERALL PLANT SAFETY. INERTING REQUIREMENT ORIGINATED FROM EARLY DEMANDS THAT CONTAINMENT BE DESIGNED TO WITHSTAND METAL-WATER REACTION RESULTING FROM ASSUMED REACTOR CORE MELTDOWN. BECAUSE OF MAJOR IMPROVEMENTS IN CORE STANDBY COOLING, CONTAINMENT WITHOUT INERTING CAN HAVE SUBSTANTIAL MARGIN REMAINING WITHIN ITS PRESSURE RATING FOR THE WORST EXPECTED METAL-WATER REACTION, WHETHER HYDROGEN BURNS OR NOT. PRE-ASSESSMENT HAS DEMONSTRATED THAT CONTAINMENT INERTING IS UNWARRANTED.

AVAILABILITY - A.P. RAY, GENERAL ELECTRIC COMPANY, ATOMIC POWER EQUIPMENT DEPARTMENT, SAN JOSE, CALIFORNIA

REACTOR, BWR + CONTAINMENT, PRESSURE SUPPRESSION + ATMOSPHERIC DIFFUSION + FIRE + ACCIDENT, LOSS OF COOLANT + ENGINEERED SAFETY FEATURE

038944
MULLEN HA
POTENTIAL METAL-WATER REACTIONS IN LIGHT-WATER-COOLED POWER REACTORS
OAK RIDGE NATIONAL LABORATORY
13 PAGES, 4 FIGURES, 55 REFERENCES, NUCLEAR SAFETY, 10(5), PG 392-404 (SEPTEMBER-OCTOBER 1969)

THE AVAILABLE DATA ON THE ROLE OF CHEMICAL REACTIONS IN THE UNLIKELY EVENT OF A LIGHT-WATER-COOLED POWER-REACTOR ACCIDENT WERE COLLECTED AND STUDIED. USE OF THE ENGINEERED SAFETY FEATURES IN NUCLEAR POWER PLANTS WOULD LIMIT THE EXTENT OF ANY METAL-WATER REACTION IN A DESIGN-BASIS ACCIDENT TO A NEGLIGIBLE VALUE. HOWEVER, FOR THE DEGENERATE CASES WHERE THE ENGINEERED SAFETY FEATURES DO NOT OPERATE PROPERLY WHEN REQUIRED, THERE ARE SOME UNKNOWN ABOUT THE EXACT ROLE OF METAL-WATER REACTIONS. ALSO, THERE IS CONSIDERABLE EVIDENCE THAT ZIRCALOY CLADDING BECOMES VERY BRITTLE AND TENDS TO FRAGMENT IF SUFFICIENT OXYGEN FROM THE STEAM REACTS WITH THE METAL OR DISSOLVES IN IT.

SYNOPSIS + CHEMICAL REACTION + CLADDING + ACCIDENT, LOSS OF COOLANT + ACCIDENT MODEL + ZIRCALOY

039597
VERMONT YANKEE CONTAINMENT AND COMBUSTIBLE GASES
VERMONT YANKEE NUCLEAR POWER CORPORATION
DOCKET 50-271-72 +. 13 PAGES, LETTER - VERMONT YANKEE NUCLEAR POWER CORPORATION TO DIVISION OF REACTOR LICENSING (AEC) - FEBRUARY 15, 1972, DOCKET 50-271, TYPE--BWR, PFG--G.E., AE--EBASCO

DISCUSSES THE CONTROL OF COMBUSTIBLE GASES WHICH COULD BE PRESENT IN THE CONTAINMENT AFTER A HYPOTHETICAL LOSS-OF-COOLANT ACCIDENT. CONTAINMENT VENTING AND INERTING ARE THE METHODS DISCUSSED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + VENTILATION SYSTEM + RADIOLYTIC GAS + VERMONT YANKEE (BWR) + CONTAINMENT ATMOSPHERE, INERT

041021
RESPONSE TO QUESTION 12.0 - HYDROGEN GENERATION
CALIFORNIA POWER AND LIGHT
DOCKET 50-324-11 +. 2 PAGES, PG 12-1 AND -2 OF BRUNSWICK 1 AND 2 PSAR SUPPLEMENT 6, JUNE 26, 1969, DOCKETS 50-247325, TYPE--BWR, PFG--G.E., AE--LE+C

STUDIES ARE CONTINUING ON THE POSSIBLE EFFECTS OF RADIOLYSIS OF WATER IN THE UNLIKELY EVENT OF A LOSS-OF-COOLANT ACCIDENT. THE COMMITTEE BELIEVES THE APPLICANT SHOULD EVALUATE ALL PROBLEMS WHICH MAY ARISE FROM HYDROGEN GENERATION, INCLUDING VARIOUS LEVELS OF ZIRCALOY-WATER REACTIONS WHICH COULD OCCUR IF THE EFFECTIVENESS OF THE EMERGENCY CORE COOLING SYSTEM WERE SIGNIFICANTLY LESS THAN THAT PREDICTED. THE MATTER SHOULD BE RESOLVED BETWEEN THE APPLICANT AND THE AEC REGULATORY STAFF. *** ANSWER ON PG 12-1 AND -2.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00 COPY, \$0.65 MICROFICHE

Q/C QUESTION + REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + WATER + ACRS + RADIOLYTIC GAS + ZIRCALOY + REPORT, PSAR + BRUNSWICK 1 (BWR) + BRUNSWICK 2 (BWR)

044759
EVANS TA
METAL-WATER REACTIONS DURING A LOSS-OF-COOLANT ACCIDENT IN N-REACTOR
GENERAL ELECTRIC COMPANY, HANFORD ATOMIC PRODUCTS DEPARTMENT
RL-GEN-1541 +. 18 PAGES, 1 FIGURE, 12 REFERENCES, MARCH 23, 1967

ROUGH ESTIMATES WERE MADE OF THE HYDROGEN PRODUCED BY METAL-WATER REACTION DURING A LOSS-OF-COOLANT ACCIDENT WITHOUT THE USE OF THE EMERGENCY AIR-COOLING SYSTEM IN THE HANFORD N-REACTOR.

044759 *CONTINUED*

THE PRIME DIFFICULTY IN MAKING THESE ESTIMATES IS DETERMINING THE TIME DEPENDENCE OF THE METAL TEMPERATURES. SEVERAL ANALYTICAL MODELS WERE ASSUMED, AND THE HIGHEST ESTIMATES OF THE HYDROGEN PRODUCTION RATES ARE BELIEVED TO BE THOSE PREDICTED BY THE MODEL ASSUMING ONLY LIMITED STEAM FLOW. MODELS CONSIDERING THE ZIRCALOY CORROSION RATES AND FUEL-ELEMENT MELTING YIELDED LOWER HYDROGEN PRODUCTION RATES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT ANALYSIS + CHEMICAL REACTION + FUEL MELTDOWN + ACCIDENT, LOSS OF COOLANT + STEAM + URANIUM + HANFORD (PWR) + REACTOR, ERDA OWNED + ZIRCALOY + HANFORD SITE + REACTOR, PRODUCTION

046738

VERMONT YANKEE CONTAINMENT INERTING (AMENDMENT 12 TO DOCKET 50-271)

VERMONT YANKEE NUCLEAR POWER CORPORATION

31 PAGES, LETTER - VERMONT YANKEE NUCLEAR POWER CORPORATION TO U.S. ATOMIC ENERGY COMMISSION - MAY 22, 1970, DOCKET 50-271, TYPE--BWR, MFG--G.E., AE-EBASCO

THE FOREGOING DISCUSSION CLEARLY INDICATES THAT INERTING OF THE VERMONT YANKEE CONTAINMENT IS NOT REQUIRED BECAUSE ONLY NEGLIGIBLE QUANTITIES OF HYDROGEN WOULD BE EVOLVED AS A RESULT OF THE ZIRCONIUM-WATER REACTION ASSOCIATED WITH THE WORSE CONCEIVABLE LOSS-OF-COOLANT ACCIDENT. ALSO, AS INERT ATMOSPHERE IS NO SOLUTION TO THE PROBLEM OF HYDROGEN EVOLVED GRADUALLY DUE TO RADIOLYSIS OF COOLING WATER, BECAUSE OXYGEN AS WELL AS HYDROGEN IS PRODUCED BY RADIOLYSIS. MOREOVER, THERE ARE SERIOUS OPERATIONAL SAFETY PROBLEMS ASSOCIATED WITH AN INERT ATMOSPHERE. THEREFORE, THE VERMONT YANKEE CONTAINMENT WILL NOT BE INERTED UNLESS THIS ACTION IS REQUIRED OFFICIALLY BY THE USAEC.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (108 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

NRC QUESTION + REACTOR, BWR + EXPLOSION + FIRE + ACCIDENT, LOSS OF COOLANT + WATER + ZIRCONIUM + RADIOLYTIC GAS + VERMONT YANKEE (BWR) + CONTAINMENT ATMOSPHERE, INERT

047825

HESSON JC + IVINS RO + WILSON RE + NISHIO K + BARNES C

LABORATORY SIMULATIONS OF CLADDING-STEAM REACTIONS FOLLOWING LOSS-OF-COOLANT ACCIDENTS IN WATER-COOLED POWER REACTORS

ARGONNE NATIONAL LABORATORY, ILLINOIS

ANL-7609 +. 39 PAGES, 21 FIGURES, 5 TABLES, 12 REFERENCES, JANUARY 1970

SUMMARY OF ANL EXPERIMENTAL WORK DETERMINING THE BEHAVIOR OF STAINLESS STEEL-CLAD AND ZIRCALOY-CLAD UO₂ PELLET FUEL RODS IMMEDIATELY FOLLOWING A LOSS-OF-COOLANT ACCIDENT. WHEN OXIDIZING IN A STEAM ATMOSPHERE, STAINLESS STEEL CLADDING FOAMS AND EXPANDS AT TEMPERATURES APPROACHING ITS MELTING POINT. ZIRCALOY CLADDING IS SEVERELY EMBRITTLED WHEN THE TOTAL ABSORBED OXYGEN IS 18 PERCENT OR GREATER. THE ZIRCALOY-CLAD FUEL RODS CAN BE HEATED TO ABOUT 1200 C IN A STEAM ATMOSPHERE AND THEN WATER-QUENCHED WITHOUT BREAKING THE CLADDING. AT TEMPERATURES SUBSTANTIALLY ABOVE 1200 C, THE CLADDING TENDS TO BREAK ON COOLING. THE EFFECTS OF HYDRIDING ARE ADJUDGED SECONDARY TO THOSE OF STEAM OXIDATION.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CHEMICAL REACTION + FUEL MELTDOWN + ACCIDENT, LOSS OF COOLANT + STEAM + STEEL, STAINLESS + FUEL, PELLET TYPE + ANL + URANIUM DIOXIDE + ZIRCALOY + EMERGENCY COOLING + JACOBS

050030

INTERVENTION DENIED IN BAILLY HEARINGS

1 PAGE, INFO, P. 2 (MAY 1972)

BUSINESSMEN FOR THE PUBLIC INTEREST (DAVID COMEY, ATTY.) WAS DENIED PERMISSION TO INTERVENE IN CONSTRUCTION PERMIT HEARINGS FOR INDIANA'S FIRST N-POWER PLANT. (ASLB RULED COMEY COULD REAPPLY.) PERMISSION TO INTERVENE JOINTLY WAS GRANTED TO CONCERNED CITIZENS AGAINST BAILLY NUCLEAR SITE, LOCAL CHAPTER OF ISAAC WALTON LEAGUE, AND LOCAL RESIDENTS. BETHLEHEM STEEL ALSO INTERVENED; STATING NO OBJECTION TO PLANT, IT WANTS CLARIFICATION OF EMERGENCY PLANS AND PROCEDURES. INTERVENTION WAS LIMITED TO RADIOLOGICAL CONCERNS, ENGINEERING SAFEGUARDS REGARDING GENERATION OF HYDROGEN IN EVENT OF LOCA, EMERGENCY PLANS, AND QUALIFICATIONS AND EXPERIENCE OF NORTHERN INDIANA PUBLIC SERVICE IN NUCLEAR FIELD.

ACCIDENT, LOSS OF COOLANT + INDUSTRY, MANUFACTURING + CONSTRUCTION PERMIT PROCESS + EMERGENCY PROCEDURE + ASLB + BAILLY 1 (BWR) + PETITION + INDUSTRY, UTILITY + OPPONENT + ORGANIZATION, CITIZEN + PUBLIC HEARING + POWER PLANT, NUCLEAR

053771

SAFETY GUIDE 7 - CONTROL OF COMBUSTIBLE GAS CONCENTRATIONS IN CONTAINMENT FOLLOWING A LOSS OF COOLANT ACCIDENT

U.S. ATOMIC ENERGY COMMISSION, WASHINGTON, D.C.

LETTER TO SAFETY GUIDE RECIPIENTS +. 3 PAGES, (APRIL 9, 1971)

GENERAL DESIGN CRITERION 41 REQUIRES THAT SYSTEMS TO CONTROL HYDROGEN, OXYGEN, AND OTHER SUBSTANCES WHICH MAY BE RELEASED INTO THE REACTOR CONTAINMENT BE PROVIDED AS NECESSARY TO CONTROL THEIR CONCENTRATIONS FOLLOWING POSTULATED ACCIDENTS TO ENSURE THAT CONTAINMENT INTEGRITY IS

063771 *CONTINUED*

MAINTAINED. THIS GUIDE DESCRIBES AN ACCEPTABLE METHOD OF IMPLEMENTING THIS CRITERION.

AVAILABILITY - U.S. ATOMIC ENERGY COMMISSION, DIRECTORATE OF REGULATORY STANDARDS, WASHINGTON, D.C. 20545

REACTOR, BWR + EXPLOSION + FIRE + NRC DESIGN CRITERIA + ACCIDENT, LOSS OF COOLANT + OXYGEN + REACTOR, PWR + CONTAINMENT INTEGRITY + CORROSION + RADIOLYTIC GAS + PRESSURE, INTERNAL + ARC REGULATORY GUIDE

086911

COOPER MF + HANKEL RD + TEER BR

CONTAINMENT PRESSURE OF ELK RIVER REACTOR WITH ZIRCALOY-CLAD CORE FOLLOWING A LOSS-OF-COOLANT ACCIDENT

UNITED NUCLEAR CORPORATION

UNC-9163 + 75 PAGES, FIGURES, DECEMBER 15, 1966

A POSSIBLE REPLACEMENT FUEL DESIGN FOR THE ELK RIVER REACTOR IS A 164 FUEL ELEMENT CORE WITH ZIRCALOY-CLAD OPERATING AT A POWER OF 116 MW(T). AN ANALYSIS OF THE CONTAINMENT PRESSURE AND TEMPERATURE FOLLOWING A LOSS-OF-COOLANT ACCIDENT HAS BEEN MADE FOR THE PLANT WITH A ZIRCALOY CLAD CORE. THE MAXIMUM PRESSURE REACHED AT THE END OF THE INITIAL BLOWDOWN IS 20.9 PSIG WHICH IS LESS THAN THE DESIGN PRESSURE OF 21.0 PSIG AND THE TEST PRESSURE OF 26.25 PSIG. THE PRESSURE AFTER THE INITIAL BLOWDOWN DECREASES FOR SEVERAL HOURS BECAUSE THE HEAT REMOVAL BY CONDUCTION IN THE HEAT SINKS IS GREATER THAN THE ENERGY ADDITION OF THE DECAY HEAT, ZIRCALOY-WATER REACTION, AND HYDROGEN COMBUSTION. AFTER 75,000 SECONDS (20.8 HOURS), THE CONTAINMENT PRESSURE RISES TO THE DESIGN PRESSURE BECAUSE THE DECAY HEATING RATE EXCEEDS THE HEAT REMOVAL RATE. INTERNAL COOLING OF THE CONTAINMENT VESSEL IS REQUIRED AT THIS TIME TO MAINTAIN THE CONTAINMENT PRESSURE BELOW THE DESIGN VALUE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT ANALYSIS + REACTOR, BWR + CONTAINMENT VESSEL LOADING + ELK RIVER (PWR) + ACCIDENT, LOSS OF COOLANT + PRESSURE, INTERNAL + BLOWDOWN + SYSTEM OPERABILITY IN ACCIDENT + JACOBS

097173

HYDROGEN PRODUCTION IN LIGHT WATER REACTORS

TECHNISCHE UNIV. MUENCHEN, GARCHING, F.R.G. GERMANY

NP-19937 + 253 PAGES, JUNE 1973 (IN GERMAN)

THE RECENT STATE OF KNOWLEDGE CONCERNING HYDROGEN PRODUCTION IN LWR'S AS WELL AS OTHER DIRECTLY CONNECTED PROBLEMS IS REVIEWED. THUS THE PRODUCTION OF OXYGEN IS DEALT WITH ALSO. AN ATTEMPT IS MADE TO DEFINE THE EFFECT OF VARIOUS PARAMETERS OF CHEMICAL AND PHYSICAL NATURE ON THE RADIOLYSIS. PROBLEMS OF METAL REACTIONS, GAMMA-RAY ABSORPTION, AND THE COMBUSTIBILITY OF HYDROGEN-AIR (STEAM) MIXTURES ARE ALSO TREATED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

BIBLIOGRAPHY + REACTOR, BWR + OXYGEN + REACTOR, PWR + STEAM + COMBUSTION + RADIOLYTIC GAS

097710

BAKER L + LIMATAINEN PC

THE TECHNOLOGY OF NUCLEAR REACTOR SAFETY (VOL. 2). CHAPTER 17 - CHEMICAL REACTIONS

ARGONNE NATIONAL LABORATORY, ILLINOIS

104 PAGES, PP. 419-522, PUBLISHED BY THE MIT PRESS, CAMBRIDGE; 1973

MANY OF THE ELEMENTS POSSESSING DESIRABLE NUCLEAR PROPERTIES, I.E., ALUMINUM, ZIRCONIUM, AND URANIUM, RANK HIGH IN THE ELECTROMOTIVE SERIES. THE REACTION OF THESE ELEMENTS WITH OXIDIZING AGENTS SUCH AS WATER AND OXYGEN IS, FORTUNATELY, SLOW AT NORMAL TEMPERATURES. IT WAS FEARED, HOWEVER, THAT RAPID OR EXPLOSIVE REACTIONS MIGHT BE INITIATED AS A RESULT OF ACCIDENTAL OVERHEATING. SUMMARIZING THE PRESENT STATE OF KNOWLEDGE REGARDING THE INITIATION OF RAPID OR EXPLOSIVE CHEMICAL REACTIONS IS THE PRINCIPAL PURPOSE OF THIS CHAPTER. THIS DISCUSSION IS ALSO CONCERNED WITH SLOWER CORROSION-LIKE REACTIONS WHICH CAN AFFECT THE SAFETY OF OPERATION OF NUCLEAR REACTORS. INDIVIDUAL CHEMICAL REACTIONS ARE DISCUSSED FROM A FUNDAMENTAL POINT OF VIEW.

ALLOY + ALUMINUM + EXPLOSION + FUEL MELTDOWN + ZIRCONIUM + STEEL, STAINLESS + CORROSIVE + COMBUSTION + RADIOLYTIC GAS + MAGNESIUM + RECOMBINERS

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A COLLECTION OF KEYWORDS IS USED TO DENOTE THE MAIN SAFETY RELATED POINTS COVERED IN EACH ARTICLE. THE FOLLOWING INDEX IS AN ALPHABETICAL LISTING OF THE KEYWORDS GIVING REFERENCES TO EACH ARTICLE WHICH WAS KEYED TO IT.

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#METAL-WATER REACTIONS DURING A LOSS-OF-COOLANT FLAMMABILITY DATA AND APPLICATION TO PWR LOSS-OF-COOLANT REACTOR WITH ZIRCALOY-CLAD CORE FOLLOWING A LOSS-OF-COOLANT CONCENTRATIONS IN CONTAINMENT FOLLOWING A LOSS OF COOLANT OF CLADDING-STEAM REACTIONS FOLLOWING LOSS-OF-COOLANT #VERMONT YANKEE CONTAINMENT INERTING I	ACCIDENT IN N-REACTOR* ACCIDENT* ACCIDENT* ACCIDENT* ACCIDENTS IN WATER-COOLED POWER REACTORS* AMENDMENT 12 TO DOCKET 50-271)* ANALYSIS AND SYSTEM DESCRIPTIONS.* ANALYSIS, DESIGN, CONSTRUCTION, TEST, AND OPERATION. ANALYSIS, VOLUME 1* APPLICATION TO PWR LOSS-OF-COOLANT ACCIDENT* ASSOCIATED ENERGY-TRANSFER PROBLEMS IN REACTOR SAFETY*	#HYDROGEN #CONTAINMENT PRESSURE OF ELK RIVER #SAFETY GUIDE 7 - CONTROL OF COMBUSTIBLE GAS SIMULATIONS 044759 P 4 002438 P 1 086911 P 6 063771 P 5 047825 P 5 046738 P 5 032683 P 3 002805 P 1 011366 P 2 002438 P 1 008102 P 1
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COOLED PIPES LABORATORY SIMULATIONS OF CLADDING-STEAM POTENTIAL METAL-WATER POTENTIAL METAL-WATER OF NUCLEAR REACTOR SAFETY (VOL. 2). CHAPTER 17 - CHEMICAL PRACTICE AND ANALYSIS, DESIGN, CONSTRUCTION, TEST, AND THE TECHNOLOGY OF NUCLEAR CHEMICAL AND ASSOCIATED ENERGY-TRANSFER PROBLEMS IN CONTAINMENT PRESSURE OF ELK RIVER HYDROGEN GENERATION IN A BOILING WATER WATER REACTIONS DURING A LOSS-OF-COOLANT ACCIDENT IN N- HYDROGEN PRODUCTION IN LIGHT WATER POTENTIAL METAL-WATER REACTIONS IN LIGHT-WATER-COOLED POWER POTENTIAL METAL-WATER REACTIONS IN LIGHT-WATER-COOLED POWER FOLLOWING LOSS-OF-COOLANT ACCIDENTS IN WATER-COOLED POWER FEBRUARY 24, 1958 REACTION OF FLOWING STEAM WITH REFRACTORY METALS ZIRCONIUM HAZARDS CONTAINMENT PRESSURE OF ELK	009211 P 2 033052 P 3 044759 P 4 047825 P 5 038866 P 4 029094 P 2 097710 P 6 086911 P 1 031119 P 1 044759 P 4 097173 P 6 038866 P 4 029094 P 2 047825 P 5 009211 P 2 022709 P 2 041021 P 4 086911 P 6
PRACTICE AND ANALYSIS, DESIGN, CONSTRUCTION, TEST, AND THE TECHNOLOGY OF NUCLEAR REACTOR VOL. 3 - IN CONTAINMENT FOLLOWING A LOSS OF COOLANT ACCIDENT CHEMICAL AND ASSOCIATED ENERGY-TRANSFER PROBLEMS IN REACTOR COOLANT ACCIDENTS IN WATER-COOLED POWER REACTORS CONSTRUCTION, TEST, AND OPERATION, CHAPTER 5 - ENERGY QUAD-CITIES WATER-COOLED POWER LABORATORY SIMULATIONS OF CLADDING-STEAM REACTION OF FLOWING VOL. 3 - SAFETY ANALYSIS AND	002805 P 1 097710 P 6 032683 P 3 063771 P 5 081012 P 1 047825 P 5 028005 P 1 011366 P 2 047825 P 5 092111 P 2 032683 P 3
CHEMICAL REACTIONS INFLUENCE OF ZIRCONIUM CLADDING ON THE LOSS-OF-COOLANT OF CURRENT PRACTICE AND ANALYSIS, DESIGN, CONSTRUCTION, CHEMICAL AND ASSOCIATED ENERGY-TRANSFER PROBLEMS IN REACTOR SAFETY	097710 P 6 008807 P 2 002805 P 1 081012 P 1
CURRENT PRACTICE AND ANALYSIS, DESIGN, CONSTRUCTION, TEST, QUAD-CITIES STATION,	002805 P 1 011366 P 2
COCKET 50-2711 THE TECHNOLOGY OF NUCLEAR REACTOR SAFETY QUAD-CITIES STATION, UNIT 1 - PLANT DESIGN ANALYSIS,	039592 P 4 046738 P 5 097710 P 6 032683 P 3 011366 P 2
REACTOR METAL-WATER METAL-WATER POTENTIAL METAL-WATER POTENTIAL METAL-WATER HYDROGEN GENERATION IN A BOILING HYDROGEN PRODUCTION IN LIGHT	033052 P 3 044759 P 4 038866 P 4 029094 P 2 031119 P 1 097173 P 6

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#POTENTIAL METAL-WATER REACTIONS IN LIGHT-WATER-COOLED POWER REACTORS*	029094 P 2
#POTENTIAL METAL-WATER REACTIONS IN LIGHT-WATER-COOLED POWER REACTORS*	038866 P 4
STEAM REACTIONS FOLLOWING LOSS-OF-COOLANT ACCIDENTS IN WATER-COOLED POWER REACTORS*	SIMULATIONS OF CLADDING- 047825 P 5

#VERMONT YANKEE CONTAINMENT AND COMBUSTIBLE GASES*	039592 P 4
#VERMONT YANKEE CONTAINMENT INERTING (AMENDMENT 12 TO DOCKET 50-271)	046738 P 5

#CONTAINMENT PRESSURE OF ELK RIVER REACTOR WITH ZIRCALOY-CLAD CORE FOLLOWING A LOSS-OF-COOLANT ACCIDENT*	046911 P 6
#THE INFLUENCE OF ZIRCONIUM CLADDING ON THE LOFT LOSS-OF-COOLANT TEST*	008807 P 2
SEPTEMBER 1, 1957 TO FEBRUARY 28, 1958* # ZIRCONIUM HAZARDS RESEARCH, PROGRESS REPORT NO. 2,	022709 P 2

8. RADIOLYTIC GAS

000278
BROOKSBANK RE + CARR WH
MATERIAL FORM FOR MAXIMUM SAFETY IN THE SHIPPING OF ALPHA-EMITTING MATERIALS
OAK RIDGE NATIONAL LABORATORY, TENNESSEE
ORNL-4554 +. 12 PAGES, APRIL 1970

PLUTONIUM AND OTHER ALPHA-EMITTING MATERIALS ARE COMMONLY SHIPPED FROM A CHEMICAL PROCESSING PLANT IN THE FORM OF NITRATE SOLUTIONS. WHEREAS THIS IS CURRENTLY AN ACCEPTABLE PRACTICE, THE ANTICIPATED SHIPPING REQUIREMENTS OF THE LMFBR PROGRAM MAKE REEXAMINATION OF THE SAFETY ASPECTS OF THE SHIPPING FORM OF SUCH MATERIALS ADVISABLE. ALTHOUGH THE SHIPMENT OF LIQUIDS HAS CERTAIN INHERENT ADVANTAGES, THE SHIPMENT OF SOLIDS IS SIGNIFICANTLY LESS EXPENSIVE AND IS ALSO MUCH SAFER FOR ANY GIVEN CONTAINER. DATA ARE PRESENTED TO SHOW THAT (1) SAFETY CONSIDERATIONS TEND TO FAVOR THE SHIPMENT OF ALPHA-EMITTING MATERIALS IN THE FORM OF A SOLID, (2) THIS SOLID FORM WILL PROBABLY BE AN OXIDE, AND (3) THE SAFEST PHYSICAL FORM IS A MICROSPHERE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
FUEL HANDLING + ALPHA EMITTER + SHIPPING CONTAINER + SAFETY EVALUATION

000554
REVISIONS TO FINAL SAR, DRESDEN 3
COMMONWEALTH EDISON COMPANY
DOCKET-50249-40 +. 15 PAGES, FIGURES, TABLES, AMENDMENT 24 TO DRESDEN 3 LICENSE APPLICATION, SEPTEMBER 4, 1970, DOCKET 50-249

TRANSMITS REVISED PAGES TO PSA. CONCERNS TOPICS INDICATED BY KEYWORDS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + HYDROGEN + REACTOR TRANSIENT + REPORT, SAR + DRESDEN 3 (BWR) + MONITOR, AIR + CONTAINMENT STRUCTURE + SHIELDING + NOZZLE + FAILURE, TUBING + SURVEILLANCE PROGRAM + INSTRUMENT, PRESSURE + LEAK + INSTRUMENTS, MISC.

000895
REVISIONS (SUPPLEMENT 13) TO FINAL SAR (INDIAN POINT 2)
CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
50247-40 +. 100 PAGES, FIGURES, TABLES, REFERENCES, AMENDMENT 23 TO INDIAN POINT 2 LICENSE APPLICATION, AUGUST 13, 1970, DOCKET 50-247, TYPE--PWR, MFG--WEST., AE--UNITED ENGR

TRANSMITS SUPPLEMENT 13 TO FINAL SAR. DEALS WITH SEISMIC DESIGN OF PIPE SUPPORTS, BREAKS IN PRIMARY SYSTEM, BORDON INJECTION, SAFEGUARDS-INITIATING CIRCUITRY, MISSILE GENERATED, PERSONNEL SUMMARIES, HEAT TRANSFER, RADIATION DOSES TO WORKERS (AFTER LOCA), RADIOLYTIC HYDROGEN, CRITERION FOR CONTAINMENT ISOLATION VALVES, CONTAINMENT PENETRATIONS, ETC.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00 COPY, \$0.65 MICROFICHE

DESIGN CRITERIA + HEAT TRANSFER + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + REPORT, SAR + POISON, SOLUBLE + TRAINING + PERSONNEL EXPOSURE, RADIATION + INDIAN POINT 2 (PWR) + ENGINEERED SAFETY FEATURE + STAFFING + SEISMIC DESIGN + VALVES + PENETRATIONS, PRIMARY CONTAINMENT

003119
HYDROGEN GENERATION IN A BOILING WATER REACTOR
COMMONWEALTH EDISON COMPANY
50249-39 +. 52 PAGES, 23 FIGURES, 12 TABLES, 11 REFERENCES, AMENDMENT 23 TO DRESDEN 3 LICENSE APPLICATION, AUGUST 24, 1970, DOCKET 50-249

EVALUATES THE POTENTIAL HYDROGEN GENERATION AND ITS SUBSEQUENT ACCUMULATION IN THE PRIMARY CONTAINMENT OF A LARGE BWR FOLLOWING A POSTULATED LOSS-OF-COOLANT ACCIDENT. THE REPORT INCLUDES THE APPLICATION OF EXPERIMENTAL TEST DATA TO A TYPICAL 3440-MWT NUCLEAR POWER PLANT AND A GENERIC EVALUATION OF THE EFFECTS OF THE PERTINENT PARAMETERS SUCH AS METAL-WATER REACTION, BREAK AREA, AND RADIOLYTIC DECOMPOSITION RATE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

AIRBORNE RELEASE + HYDROGEN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + VENTILATION SYSTEM + ZIRCONIUM + DRESDEN 3 (BWR) + THEORETICAL INVESTIGATION + CONTAINMENT ATMOSPHERE, INERT + GAS

006491
PARABLE JH
REVIEW OF KEWB EXPERIMENTAL PROGRAM
OAK RIDGE NATIONAL LABORATORY
4 PAGES, 14 REFERENCES- NUCLEAR SAFETY 3(1)- 28-31- REF. 28-41 ON P. 37- (SEPTEMBER 1961)- GPO

REVIEWS OLD-STATIC, PERIODIC AND TRANSIENT EXPERIMENTS. DISCUSSES SHUTDOWN BY TEMPERATURE RISE AND RADIOLYTIC GAS FORMATION AND REFLECTOR DELAYED-NEUTRON.

KEWB (S-RR) + TEMPERATURE COEFFICIENT

007028
HYDROGEN EVOLUTION WITHIN CONTAINMENT IN PM-TYPE PLANTS. FINAL REPORT
NUCLEAR UTILITY SERVICES, WASHINGTON
80 PAGES, REFERENCES- JUNE 18, 1965, NYC-3420-2- CFSTI

LINE OR MAKE OF THE MODIFICATIONS MADE TO THE PM-3A PLANT DURING THE SUMMER 1964 ANTARCTIC SEASON HAD ELIMINATED THE HYDROGEN EVOLUTION TO CONTAINMENT. THE MAJOR EFFORT UNDER THIS CONTRACT WAS TO CONFIRM BY TEST, WHICH OF WHAT COMBINATION OF MODIFICATIONS RESULTED IN THE REDUCTION OF HYDROGEN EVOLUTION SO THAT (I) THE DESIGN OF FUTURE PLANTS WILL BE SUCH THAT NO HYDROGEN WILL BE EVOLVED FROM SHIELD WATER AND (II) NO FUTURE MODIFICATIONS TO THE PM-3A WILL RESULT IN THE RESUMPTION OF THE EVOLUTION OF HYDROGEN. IT WAS SUBSEQUENTLY DECIDED THAT THE TEST PROGRAM BE DEFERRED AND THAT IT NOT BE PERFORMED UNDER THIS CONTRACT. ACCORDINGLY, THIS FINAL REPORT PRESENTS THE WORK ACCOMPLISHED UNDER THE CONTRACT TOGETHER WITH THE RECOMMENDED TEST PROGRAM.

CONTAINMENT, PRESSURE SUPPRESSION + HYDROGEN + OXYGEN + REACTOR, PWR + CONTAINMENT, WATER FILLED + PM 3A (PWR)
+ REACTOR, MILITARY + RECOMBINERS

007134
BUEGLY NJ + BRADSHAW RL + CAMPSON FM + MCCLAIN WC + PARKER FL + SCHAFER WF + KUBOTA H
DISPOSAL IN NATURAL SALT FORMATIONS
OAK RIDGE NATIONAL LABORATORY
17 PAGES, FIGURE, TABLE- OCTOBER 1964, CPNL-2697, PAGES 19-31 OF HEALTH PHYSICS DIVISION ANNUAL PROGRESS
REPORT FOR PERIOD ENDING JULY 31, 1964- CFSTI

PROGRESS IS REPORTED ON PROJECT SALT VAULT - A DEMONSTRATION OF HIGH-LEVEL WASTE STORAGE IN SALT MINES. THE EQUIPMENT AND INSTRUMENTATION NECESSARY FOR THE DEMONSTRATION IS DESCRIBED. CLOSURE OF THE CAVITY DUE TO ELEVATED TEMPERATURES IS DISCUSSED. RADIOLYTIC PRODUCTION OF CHLORINE FROM SALT IS REVIEWED.

GEOLOGY + THERMAL CONSIDERATION + WASTE TRANSPORTATION + HAZARDS ANALYSIS + WASTE DISPOSAL, SALT

007491
BLOMEKE JO + FREDERICK EJ + SALMON R + ARNOLD ED
THE COSTS OF PERMANENT DISPOSAL OF POWER-REACTOR FUEL-PROCESSING WASTE IN TANKS
OAK RIDGE NATIONAL LABORATORY
106 PAGES, 15 FIGURES, 27 TABLES, 29 REFERENCES- SEPTEMBER, 1965, CPNL-2873- CFSTI, \$4.00 CY, \$0.75 MN

THE COSTS OF PERMANENT STORAGE OF REACTOR FUEL PROCESSING WASTES ARE ESTIMATED FOR A 22,400-MWE NUCLEAR-POWER ECONOMY. THE WASTES ARISE FROM CHEMICAL DISSOLUTION OF THE FUEL CLADDING AND SOLVENT EXTRACTION PURIFICATION OF A COMBINATION OF URANIUM AND THORIUM CONVERTER FUELS. IT IS ASSUMED THAT A PERMANENT TAX-FREE FUND IS ESTABLISHED DURING A 20-YR PERIOD OF WASTE ACCUMULATION OF SUCH SIZE THAT THE ANNUAL TAX-FREE INTEREST WILL BE SUFFICIENT TO PROVIDE FOR PERIODIC REPLACEMENT OF TANKS AND FOR THE ANNUAL OPERATING EXPENSES OF THE FACILITY. TOTAL COSTS FOR STORING REAFFINATE WASTE, WERE LEAST FOR STORAGE OF ACID WASTES IN TANKS OF 75-YR LIFE WITH GOVERNMENT OWNERSHIP, AND GREATEST FOR STORAGE OF ALKALINE WASTES IN TANKS OF 25-YR LIFE WITH PRIVATE OWNERSHIP.

WASTE STORAGE + WASTE DISPOSAL, ECONOMICS + WASTE SOURCE AND TYPE + WASTE MANAGEMENT

007754
DULIN RV
CONTROL OF OXYGEN IN PWR HELIUM SYSTEMS
BATTHELL-NORTHWEST
2 PAGES, 1 TABLE, 1 FIGURE, AMERICAN NUCLEAR SOCIETY CONFERENCE ON REACTOR OPERATING EXPERIENCE, JACKSON LAKE LODGE, WYOMING, JULY 28-29, 1965, ANS TRANSACTIONS, SUPPLEMENT TO VOLUME 8, PAGES 46-47

PREVIOUSLY, HYDROGEN HAD BEEN ADDED TO THE HELIUM CORE-COVER GAS PERIODICALLY. THIS PARTIALLY REDUCED OXYGEN, BUT HYDROGEN WAS QUICKLY REDUCED. DEUTERIUM AND OXYGEN ALLOWED TO BUILD UP TO SATURATION, THEN HYDROGEN ADDED. ANALYSIS SHOWED HYDROGEN PREFERRED BY OXYGEN, SO THAT EXCESS HYDROGEN ACTED AS A CATALYST. A UNIFORM 1 PERCENT HYDROGEN IS NOW MAINTAINED, AND THERE HAS BEEN LITTLE PROBLEM WITH EXCESS OXYGEN.

REACTOR, PWR + REACTOR, PRESSURE TUBE + PWR (TR) + REACTOR, TEST + OPERATING EXPERIENCE SUMMARY + COOLANT CHEMISTRY

007755
CHIFFER CD + SHOPLAUGH JR + WHITEMORE WL
STABILITY OF U-235-SUB-1.7 STAINLESS-CLAD TRIGA FUEL ELEMENTS SUBJECTED TO LARGE REACTIVITY INSERTIONS AND LONG-TERM STEADY-STATE OPERATION
GENERAL ATOMIC, SAN DIEGO, CALIFORNIA
1 PAGE, 1 REFERENCE, AMERICAN NUCLEAR SOCIETY CONFERENCE ON REACTOR OPERATING EXPERIENCE, JACKSON LAKE LODGE, WYOMING, JULY 28-29, 1965, ANS TRANSACTIONS, SUPPLEMENT TO VOLUME 8, PAGE 48

REACTOR HAS OPERATED 2100 MHR, UP TO 1.5 MW STEADY STATE, AND WITH 651 PULSES (4 TO 4.6 DOLLARS) WITH STAINLESS-STEEL-CLAD ELEMENTS. BENDING OBSERVED AFTER 4.6-DOLLAR PULSES, ALSO 10-PSI INCREASE IN ELEMENTS (700 CI) DUE TO HYDROGEN DISSOCIATION. ON COOLING, THE HYDROGEN RE-FORMS.

007755 *CONTINUED*
CLADDING + FUEL ELEMENT BOWING + INTEGRITY + REACTOR, RESEARCH + STEEL, STAINLESS + OPERATING EXPERIENCE
SUMMARY + TEST, PHYSICS + TRIGA (FRI) + REACTOR, PULSED + PRESSURE, INTERNAL + FUEL ELEMENTS

007761
EDWARDS DR
EXPERIENCE WITH ROD DROP TIMES AT THE UMRK
UNIVERSITY OF MISSOURI, ROLLA, MISSOURI
1 PAGE, 1 TABLE, 3 REFERENCES, AMERICAN NUCLEAR SOCIETY CONFERENCE ON REACTOR OPERATING EXPERIENCE, JACKSON
LAKE LODGE, WYOMING, JULY 28-29, 1965, ANS TRANSACTIONS, SUPPLEMENT TO VOLUME 8, PAGE 53

ROD-DROP-TIME MEASUREMENTS TAKEN AT SIX-MONTH INTERVALS FAILED TO SHOW INCIPENT FAILURE. WATER
LEAKED INTO THE 304 STAINLESS-STEEL ROD FILLED WITH B4C AND CADMIUM THROUGH THE SEAL PLUG, AND
DECOMPOSED. A ROD, SWOLLEN BY 8.6 PERCENT, JAMMED ON STARTUP AND FAILED TO DROP. THE OTHER TWO
RODS ALSO HAD SWOLLEN. BOPON-STAINLESS-STEEL RODS, HAVING 80 PERCENT EFFECTIVENESS OF OLD RODS,
ARE REPLACEMENTS.

CONTROL ROD BURNUP + INCIDENT + REACTOR, POOL TYPE + FAILURE, SCRAM MECHANISM

007776
PROCTOR JF + MARINE IN
GEOLOGIC, HYDROLOGIC, AND SAFETY CONSIDERATIONS IN THE STORAGE OF RADIOACTIVE WASTES IN A VAULT EXCAVATED IN
CRYSTALLINE ROCK
SAVANNAH RIVER LABORATORY, AIKEN, SOUTH CAROLINA + U. S. GEOLOGICAL SURVEY, AIKEN, SOUTH CAROLINA
15 PAGES, 7 FIGURES, 3 TABLES, 16 REFERENCES- NUCLEAR SCIENCE AND ENGINEERING- 22(3)- 350-365 (1965)

A RECENT INVESTIGATION ESTABLISHED THE TECHNICAL FEASIBILITY AND INDICATED THE HIGH DEGREE OF
SAFETY THAT COULD BE AFFORDED BY THE STORAGE OF HIGH-LEVEL RADIOACTIVE WASTES IN UNLINED VAULTS
EXCAVATED IN CRYSTALLINE ROCK 1500 FT. BENEATH THE SURFACE OF THE SAVANNAH RIVER PLANT NEAR
AIKEN, S. C. THREE BARRIERS PREVENT MIGRATION OF THE RADIONUCLIDES- THE VERY LOW PERMEABILITY
OF THE ROCK IN WHICH THE STORAGE VAULT IS LOCATED, THE VIRTUALLY IMPERMEABLE CLAY LAYER
SEPARATING THE ROCK AND SEDIMENTS, AND THE ION EXCHANGE PROPERTIES OF THE SEDIMENTS. ANY ONE OF
THESE BARRIERS IS CAPABLE OF CONFINING THE RADIONUCLIDES WELL WITHIN THE PLANT BOUNDARIES FOR A
TIME MUCH GREATER THAN THE 600-YEAR PERIOD REQUIRED TO RENDER THE WASTES INNOCUOUS.

CESIUM + PLUTONIUM + SOIL, RADIONUCLIDE MOVEMENT THROUGH + STRONTIUM + WASTE STORAGE + NEPTUNIUM + GROUND
WATER, NUCLIDE OCCURRENCE + SAVANNAH RIVER PLANT + AMERICIUM + HYDROLOGY + ION EXCHANGE + WASTE DISPOSAL,
BEDROCK + GEOLOGY, STRATIGRAPHY + GEOLOGY, GEOCHEMICAL + GEOLOGY, GEOPHYSICAL

007973
MCCOOL WJ
EXPLOSION IN NITROGEN DEWAR AT THE GROUND TEST REACTOR (GTR)
DIVISION OF OPERATIONAL SAFETY, USAEC
2 PAGES- MAY 14, 1963, REACTOR OPERATING EXPERIENCE 64-10- AEC-DOS

LIQUID NITROGEN IN DEWARS WAS IRRADIATED FOR FIVE HOURS- FIVE HOURS LATER EXPLOSION WRECKED THE
DEWAR BUT DID NOT HARM THE REACTOR. AS SUGGESTED IN AERJET GENERAL CORP. REPORT NO. 0716-
19101SP, EXPLOSIONS IN PILE IRRADIATED LIQUID NITROGEN, OZONE IS FORMED FROM OXYGEN AND EXPLODES
ON CONTACT WITH AMBIENT AFTER THE NITROGEN EVAPORATES.

CHEMICAL REACTION + FAILURE, EQUIPMENT + EXPLOSION + IN PILE EXPERIMENT + REACTOR, RESEARCH + NITROGEN +
OPERATING EXPERIENCE SUMMARY + OZONE + REACTOR, ERDA OWNED + CRYOGENICS

008175
NATHANS MM
PROJECT GNOME, ISOTOPE PROGRAM - FINAL REPORT
LAWRENCE RADIATION LABORATORY, LIVERMORE, CALIFORNIA
123 PAGES, TABLES, FIGURES- AUGUST 2, 1963, PNE-102F- CFSTI- 34.00

THIS REPORT DISCUSSES THE DISTRIBUTION AND THE DISPOSITION OF A NUMBER OF NUCLIDES FOLLOWING A
NUCLEAR DETONATION IN A SALT MEDIUM AS WELL AS THE MEANS BY WHICH THESE NUCLIDES MIGHT BE
RECOVERED.

ECONOMICS + GEOLOGY + PLOWSHARE + PLUTONIUM + THORIUM + TRITIUM + URANIUM + ACTIVATION PRODUCT + POLONIUM +
SAMPLING + GROSS BETA + GROSS GAMMA + GROUND WATER, NUCLIDE OCCURRENCE + NUCLEAR DETONATION + AMERICIUM +
CURIUM + ISOTOPIC FRACTIONATION + THALLIUM

008186
JENKS GH
EFFECTS OF REACTOR OPERATION ON HFIR COOLANT
OAK RIDGE NATIONAL LABORATORY
81 PAGES, 12 FIGURES, 14 TABLES, 49 REFERENCES- OCTOBER 1965, ORNL-3848- CFSTI, \$3.00 CY, \$0.75 MN

INTERACTION OF RADICAL AND MOLECULAR SPECIES FORMED IN THE DECOMPOSITION OF WATER LEADS TO
FORMATION OF STEADY STATES IN PRESSURIZED SYSTEMS IN WHICH RATES OF FORMATION AND DISAPPEARANCE
OF A SPECIES ARE EQUAL. STEADY-STATE CONCENTRATIONS IN THE HFIR WERE CALCULATED USING- (1)
PUBLISHED INFORMATION ON REACTIONS, (2) PUBLISHED VALUES FOR RATE CONSTANT AT ABOUT 25 DEGREE C

009100 *CONTINUED*
AND ESTIMATED ACTIVATION ENERGIES FOR REACTIONS, AND (3) G-VALUES FOR RADIOLYTIC SPECIES OBTAINED FROM PUBLISHED VALUES AND FROM ANALYSES OF REPORTED EXPERIMENTAL DATA FOR STEADY-STATE CONCENTRATIONS OF HYDROGEN GAS.

COMPUTER PROGRAM + REACTOR, RESEARCH + REACTOR, TEST + COOLANT CHEMISTRY + HFIR (FTR) + RADIOCHEMICAL ANALYSIS
+ REACTOR, LWR + REACTOR, FLUX TRAP

009420
RDCCLA CC
SYSTEM CHEMISTRY OF A LARGE BWR
SOCIETA' ELETTRONUCLEARE NATIONALE, SCAURI, ITALY
+ PAGES, 5 FIGURES, 4 TABLES, 4 REFERENCES, NUCLEONICS 24(2)- 39-46 (FEBRUARY 1966)

DISCUSSES EXPERIENCE AT CAVIGLIANO, ITALY (506 MWTH). CARRYOVER MEASUREMENTS SHOW DRUM SEPARATION FACTORS GREATER THAN 2000. RADIOLYTIC GAS AVERAGES 12.5 LITERS/SEC AT FULL POWER. CRUD BURSTS WERE ASSOCIATED WITH PLACING AN IMPROPERLY VENTED DEMINON STREAM, WHICH WOULD INTRODUCE AIR INTO SYSTEM AND PRODUCE NITRIC ACID. LOWER CLEANUP FLOW RATE (HIGH PH) REDUCED CRUD LEVELS, BUT WHEN CLEANUP FLOW REINSTITATED AND AIR PURPOSEFULLY ADDED THERE WAS NOT EVEN A TEMPORARY INCREASE IN CRUD. CRUD APPEARS TO BE CAUSED BY FEEDWATER IMPURITIES, (RATHER THAN CORROSION) INCLUDING CORROSION OF NON-STAINLESS STEEL FEEDWATER HEATERS.

REACTOR, PWR + OPERATING EXPERIENCE SUMMARY + CRUD + COOLANT CHEMISTRY + ITALY

009376
MCCOOL NJ
PM-3A NUCLEAR POWER PLANT FIRE
DIVISION OF OPERATIONAL SAFETY, U. S. ATOMIC ENERGY COMMISSION
2 PAGES- OCTOBER 7, 1962. REACTOR OPERATING EXPERIENCE 63-1- AEC-DOS

A HYDROGEN EXPLOSION OCCURRED ON OCTOBER 7, 1962, APPARENTLY AS A RESULT OF VAPOR PHASE LEAKAGE FROM THE PRESSURIZER BEING IGNITED BY A SHORT CIRCUIT. SUPERFICIAL DAMAGE RESULTED.

EXPLOSION + FIRE + HYDROGEN + REACTOR, PWR + OPERATING EXPERIENCE SUMMARY + INCIDENT, EQUIPMENT + REACTOR, F-3A JAWED + PM 3A (PWR) + REACTOR, MILITARY

009330
MANNING JC
KRYPTON RELEASE AT WESTERN ELECTRIC, FEBRUARY 8, 1966
WESTERN ELECTRIC COMPANY
2 PAGES- ATOMIC ENERGY CLEARING HOUSE 12(13)- 33-34 (MARCH 28, 1966)

A VALVE IN A RADFLO UNIT WAS ADRN, AND RELEASED 21 CURIES OF KRYPTON 95 TO THE STACK.

KRYPTON RELEASE + FAILURE, COMPONENT + KRYPTON + INCIDENT, NONREACTOR

009322
1-1 CONTAINMENT VACUUM BREAKER FAILURE DISCHARGES RADIOGAS TO CONTAINMENT, FEBRUARY 14, 1966
COLUMBIA UNIVERSITY
2 PAGES- ATOMIC ENERGY CLEARING HOUSE 12(13)- 22-23 (MARCH 28, 1966)

AN OPEN-CIRCUIT SOLENOID FAILURE OPENED AN 18 INCH VALVE, CONNECTING REACTOR BUILDING THROUGH FILTERS TO STACK. UPON REACTOR STARTUP TO 2MW, STACK GASES BACK-FLOWED INTO REACTOR BUILDING WHEREUPON THE NORMAL VENTILATION SYSTEM DISCHARGED THE GASES TO ATMOSPHERE. RELEASES DID NOT EXCEED 10 CFR 20 FOR CESIUM 136 AND ARGON 41. POSITION INDICATORS FOR THIS (AND SIMILAR) VALVES ARE BEING PLACED AT THE REACTOR CONSOLE IN A MANNER SIMILAR TO THE CONTAINMENT ISOLATION VALVES.

FAILURE, COMPONENT + CONTAINMENT VACUUM BREAKER

010366
WITHERS WT
H2O DRIVE VENTED AT BONUS TO RELIEVE RADIOLYTIC GASES, JUNE 15, 1966
PROPERTY FROM WATER RESOURCES AUTHORITY
1 PAGES, JUNE 15, 1966, DUCKET 115-4, ATOMIC ENERGY CLEARING HOUSE, 12(27), PAGES 21-23, (JULY 4, 1966)

SEVENTY-SEVEN PERCENT HYDROGEN AND 17 PERCENT OXYGEN WERE FOUND IN RACK-HOUSING 9. THREE DAYS AT FULL POWER IS ENOUGH FOR THE MIXTURE TO PRODUCE A HYDROGEN-OXYGEN REACTION. VENTS WERE INSTALLED TO THE MAIN STEAM LINE WITH ORIFICES. TESTS SHOWED THAT A BROKEN VENT LINE WOULD NOT SIGNIFICANTLY AFFECT THE FCD-DROP TIME. SAFETY ANALYSIS DESCRIBED.

H2O DRIVE (H2O) + EXPLOSION + REACTOR, INTERNAL SUPERHEAT + OPERATING EXPERIENCE SUMMARY + MODIFICATION + CONTROL
H2O DRIVE MECHANISMS

010366

010966 *CONTINUED*

DOLLE L

PROBLEMS ARISING FROM THE USE OF HEAVY WATER IN NUCLEAR REACTORS

AECL-2406 +, 34 PAGES, 12 FIGURES, 29 REFERENCES, MARCH 1966, TRANSLATED FROM INDUSTRIES ATOMIQUES 917-81 57-69 (1965), AECL, DEPT. MN

DISCUSSES EFFECTS OF IGNIZING PAYS AND OF INTERACTION WITH CONTAINING WALLS. EL-3 EXPERIENCE IS FREQUENTLY QUOTED IN SECTIONS ON RADIOACTIVATION, CONSERVATION, RADIO-DECOMPOSITION, AND CHEMICAL CONTAMINATION AND PURIFICATION. LITHIUM-6 SULPHATE WAS TESTED AS A SOLUBLE POISON IN EL-3, WITH LITHIUM RECOVERED FROM THE DEMINERALIZER. LITHIUM IS CONSIDERED THE BEST CHOICE AMONG THE 5 POISONS (INCLUDING H₂O) CONSIDERED, DESPITE THE TEMPORARY TRITIUM INCREASE (FACTOR OF 5) AND DESPITE THE TRITON REACTION WITH OXYGEN TO PRODUCE F-18. A STILL IS USED TO RECLAIM DEGRADED WATER AT EL-3. EL-3 INFRARED ANALYSIS WITH INTERFERENCE FILTER WILL DETECT 10-100 PPM D₂O IN H₂O SECONDARY COOLANT. DISSOLVED HYDROGEN, IN ABSENCE OF OXYGEN, SUPPRESSES EVALUATION OF RADIOLYTIC GASES.

FRANCE + REACTOR, HWR + POISON, SOLUBLE + ACTIVATION PRODUCT + OPERATING EXPERIENCE SUMMARY + COOLANT CHEMISTRY

C11005

HWR QUARTERLY PROGRESS REPORT, JULY TO SEPTEMBER 1964

INSTITUTE FOR ATOMENERGI DECD. HALDEN REACTOR PROJECT

HPF-57 +, 137 PAGES, 26 FIGURES, 9 TABLES, DECEMBER 1964, CEP MN

MEASUREMENT OF THE LEVEL OF THE LIQUID MODERATOR IS NO LONGER MADE WITH AN ELECTRIC DEPTSTICK, BUT A MODIFIED HELIUM BUBBLER SYSTEM. EXPLOSION TESTS WERE RUN ON CONTROL THIMBLES OUT OF REACTOR TO DETERMINE SAFE LIMITS OF RADIOLYTIC GAS. GAS ACCUMULATIONS IN THE REACTOR ARE MEASURED BY THERMOCOUPLES ON THE THIMBLE. WHEN LIMITS ARE APPROACHED, THE REACTOR PRESSURE IS REDUCED TO EXPEL THE GAS. INPILE BURNOUT DETECTORS (SPECIAL PELLETS HAVING A CLUD-MEET VOID TO INCREASE HEAT FLUX NEAR THERMOCOUPLES) WERE TESTED BY RAISING REACTOR POWER PAST THE NORMAL LIMIT. TEMPERATURE TRACES AT STEADY POWER SHOWED A RISE TO FILM BOILING TEMPERATURE, THEN A DROP TO NORMAL TEMPERATURE.

REACTOR, HWR + BURNOUT HEAT FLUX + EXPLOSION + REACTOR, HWR + INSTRUMENT, IN CORE + INSTRUMENT, LIQUID LEVEL + NORWAY + CONTROL ROD DRIVE MECHANISMS

011785

THOMAS CC + HALL WF + LUMB RF

RADIOACTIVE MATERIAL RELEASE FROM GAMMA SOURCE

WESTERN NEW YORK NUCLEAR RESEARCH CENTER, INC., BUFFALO

CONF-243-43 + GELIN-AED-CONF-63-168-42 +, 1 PAGE, THE RESEARCH REACTOR AS A GAMMA SOURCE, OCTOBER 1963, PAGE 15, PRESENTED AT REGIONAL MEETING AMERICAN NUCLEAR SOCIETY CONFERENCE ON PROBLEMS OF OPERATING RESEARCH AND POWER REACTORS, OTTAWA, CANADA, OCTOBER 21-23, 1963, DOCKET NO. 50-57, CPSTI

PAGE 15- ONE GAMMA SOURCE IS A CIRCULATING LOOP OF INDIUM SULPHATE. THE FIRST RUN WAS TERMINATED AFTER 54 HOURS BECAUSE BURSTS OF RADIOLYTIC GAS WERE INTERFERING WITH PUMPING AND WERE DRIVING RADIOACTIVE MATERIAL OUT THE VENT OF THE LOOP.

IN PILE EXPERIMENT + REACTOR, RESEARCH + INDIUM + INCIUENT

012171

HIGH-PRESSURE RELEASE IN AN EIGHT-INCH TUBE OF THE PUERTO RICO RESEARCH REACTOR

DIVISION OF OPERATIONAL SAFETY, USAEC

3 PAGES, REACTOR SAFETY OPERATING EXPERIENCES, 66-3 (OCTOBER 25, 1966), DPI

A BEAM-TUBE SHIELD-PLUG NEAR THE REACTOR CORE RUPTURED AS A RESULT OF INTERNAL PRESSURE AND BLEW OFF THE END OF THE BEAM TUBE. THE PLUG WAS SOLID BARYTES CONCRETE ENCASED IN QUARTER-INCH-THICK ALUMINUM. THE WELDED END-DISK OF THE BEAM TUBE WAS FORCED AGAINST THE FUEL ELEMENTS. NO DAMAGE TO THE ELEMENTS OCCURRED. AN IDENTICAL PLUG LOCATED IN A SECOND BEAM TUBE WAS REMOVED. NO SWELLING OR EVIDENCE OF INTERNAL PRESSURE WAS FOUND. THE CAUSE OF THE PRESSURE BUILDUP IS NOT KNOWN, BUT POSSIBILITIES ARE (1) HYDROGEN AND OXYGEN GAS FORMATION DUE TO RADIOLYSIS OF WATER FROM HYDRATION OF THE CONCRETE OR LEAKAGE FROM A PIN HOLE, (2) GAS FORMATION BY CORROSION AT THE ALUMINUM-CONCRETE INTERFACE. PLUGS ARE NOW LOCATED AT THE OUTER END OF THE BEAM TUBES AND WILL BE SECURED.

FAILURE, EQUIPMENT + EXPLOSION + REACTOR, RESEARCH + CORROSION + INCIDENT, EQUIPMENT + PUERTO RICO + REACTOR, ERCA OWNED + REACTOR, POOL TYPE + SHIELDING + BEAM HOLE + PRESSURE, INTERNAL

012244

BLNUS NUCLEAR POWER PLANT DEL MONTHLY REPORT FOR APRIL, 1966

COMBUSTION ENGINEERING INCORPORATED, WINDSOR, CONNECTICUT + PUERTO RICO WATER RESOURCES AUTHORITY, SAN JUAN, PUERTO RICO

18 PAGES, 5 FIGURES, 8 TABLES, APRIL 1966, DOCKET NO. 115-4, POR

OF INTEREST ARE - BONUS WAS SHUT DOWN MOST OF THE MONTH WHEN AN EXPLOSIVE MIXTURE OF HYDROGEN AND OXYGEN WAS DETECTED IN CONTROL-ROD-RACK HOUSINGS. A VENT LINE WAS DESIGNED, AND A TEST INDICATED A 0.05 SEC DELAY ON INSERTION DURING A SIMULATED VENT LINE BREAK. DURING CONTROL ROD BREAKAWAY TORQUE TESTS, 3 RODS FAILED TO SCRAM A TOTAL OF 11 TIMES. SEAL WATER PUMP PACKING WAS CHANGED TO BUNA-N, WHEN TEFLON-ASBESTOS SHOWN TO SCORE COLMONOY PLUNGERS. BECAUSE OF CONTINUED TROUBLE WITH STATIC INVERTER, AN M-G SET IS BEING CONSIDERED. POWER DISTRIBUTION CALCULATIONS REPORTED.

012244 *CONTINUED*
 REACTOR, BWR + BENUS (ISR) + EMERGENCY POWER, ELECTRIC + REACTOR, INTERNAL SUPERHEAT + POWER DISTRIBUTION +
 OPERATING EXPERIENCE SUMMARY + FAILURE, SCRAM MECHANISM + REPORT, OPERATIONS SUMMARY + CONTROL ROD DRIVE
 MECHANISMS

012247
 BENUS NUCLEAR POWER PLANT OF MONTHLY REPORT FOR JUNE 1966
 PUERTO RICO WATER RESOURCES AUTHORITY, SAN JUAN, PUERTO RICO + COMBUSTION ENGINEERING INCORPORATED, WINDSOR,
 CONNECTICUT
 18 PAGES, 5 FIGURES, 2 TABLES, JUNE 1966, DOCKET NO. 115-4, PDR

BENUS REMAINED SHUT DOWN TO WORK ON CONTROL-ROD PROBLEMS. THE CRACKED AND WARPED CENTRAL ROD WAS
 REPLACED AND WILL BE SECTIONED FOR ANALYSIS. SEVERAL RODS WERE GIVEN GAMMA SCANS FOR CO-58 TO
 DETERMINE RELATIVE FAST NEUTRON COSES. CONTROL ROD DRIVE THREAD CRACKING MAY BE DUE TO
 DIFFERENTIAL EXPANSION OF PACK NUTS. FALSE SCRAM ANNUNCIATION OF A LOW-REACTOR-WATER-LEVEL SCRAM
 WAS DUE TO MISSING WASHERS BETWEEN THE FLOAT-ROD AND THE MERCOID BRACKET, WHICH ALLOWED MERCROID
 ASSEMBLY VIBRATION. APPENDIX A IS A DESCRIPTION OF THE CONTROL-ROD-HOUSING VENT SYSTEM AND AN
 ANALYSIS OF POTENTIALLY HAZARDOUS CONDITIONS RESULTING FROM VENT-SYSTEM FAILURES.

REACTOR, BWR + BENUS (ISR) + CONTROL ROD BURNUP + REACTOR, INTERNAL SUPERHEAT + VENTILATION SYSTEM + SCRAM,
 SPURIOUS + REPORT, OPERATIONS SUMMARY + CONTROL ROD DRIVE MECHANISMS

012790
 STRATTON K
 EXPERIENCE IN THE SHIPMENT AND CHEMICAL REPROCESSING OF GETR AND VBWR FUEL
 GENERAL ELECTRIC COMPANY, PLEASANTON, CALIFORNIA
 1 PAGE, TRANSACTIONS AMERICAN NUCLEAR SOCIETY, 5, PP. 361 (NOVEMBER 1962)

TWO SHIPPING CASKS OF CONVENTIONAL DESIGN WERE USED. EACH CASK TRANSPORTED TEN CUT ELEMENTS OF
 EITHER DESIGN IN A VERTICAL CAVITY 15 INCHES IN DIAMETER BY 40 INCHES DEEP, AND PROVIDED 10
 INCHES OF LEAD SHIELDING. LOADED SHIPPING WEIGHT WAS ABOUT 23,000 POUNDS. A SPECIALLY DESIGNED
 BASKET WAS USED TO SUPPORT THE ELEMENTS IN TRANSIT AND WAS FABRICATED FROM ALUMINUM-CLAD CADMIUM
 STRIPS FOR CRITICALITY CONTROL. THE PLATE-SURFACE TEMPERATURE OF A CENTRALLY LOCATED FUEL
 ELEMENT IN A LOADED CASK GAVE A MAXIMUM EQUILIBRIUM VALUE OF 131 F WITHOUT LIQUID COOLANT AND THE
 CASK CLOSED. ALL ELEMENTS HAD COOLED FOR 120 DAYS (MINIMUM REQUIRED FOR PROCESSING FACILITY
 ACCEPTANCE) AND HAD OPERATED IN THE REACTOR (GETR) FOR ABOUT EIGHT WEEKS AT AN AVERAGE POWER OF
 ONE MW. NO INCREASE IN CASK-SURFACE TEMPERATURE ABOVE AMBIENT WAS EVER MEASURABLE. TESTS WERE
 ALSO CONDUCTED TO DETERMINE THE EXTENT OF RADIOLYTIC-GAS BUILD-UP IN THE SEALED CASK CAVITY. TWO
 ANALYSES TAKEN AFTER A FOUR-DAY PERIOD, WITH NO SIGNIFICANT VARIATION IN H₂ OR O₂ CONCENTRATION
 OBSERVED. ON TWO OCCASIONS IT WAS NECESSARY TO SHIP CASKS CONTAINING ELEMENTS WITH EXPOSED FUEL.
 THREE OF THESE ELEMENTS (120-DAY COOLING TIME) WERE ISOLATED IN WATER-FILLED SEALED CANS FOR
 PERIODS EXCEEDING TWO WEEKS TO OBSERVE THE BUILD-UP OF BETA-GAMMA ACTIVITY. THE MAXIMUM
 CONCENTRATION OF 5 BY 10 MINUS 9 MICROCURIES ML WAS LOW ENOUGH TO PERMIT SHIPMENT OF THESE
 ELEMENTS IN THE NORMAL MANNER.

CRITICALITY, SAFETY + HEAT TRANSFER + REACTOR, TEST + GETR (TR) + OPERATING EXPERIENCE SUMMARY + CONTAMINATION

014204
 QUESTION 10.2, WHAT CONSIDERATION MINIMIZE EXPLOSION IN OFF-GAS
 ALLIS-CHALMERS MANUFACTURING COMPANY
 ACNP-02614 +. 1 PAGE, AMENDMENT 1 TO THE APPLICATION OF THE ALLIS-CHALMERS MFG. CO. FOR CONSTRUCTION
 AUTHORIZATION OF THE LA-CROSSE BOILING-WATER REACTOR, PAGE 39, DECEMBER 20, 1962, DOCKET NO. 115-5

PORTIONS OF GASFOUS-WASTE SYSTEM WHICH CONTAIN HYDROGEN AND OXYGEN WILL BE DESIGNED TO WITHSTAND
 EFFECTS OF VIOLENT RECOMBINATION (EXCEPT STORAGE TANKS). FLAME ARRESTORS WILL BE USED.

AVAILABILITY - USAEC-PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

EXPLOSION + OFF GAS

014466
 SNIGBERGER D + HECKMAN R
 VENT-GAS TREATMENT PLANT. PROJECT DRIBBLE. SALMON EVENT. FINAL REPORT
 LAWRENCE RADIATION LABORATORY
 WUF-3016 +. 18 PAGES, 2 FIGURES, OCTOBER 21, 1966

THE VENT-GAS TREATMENT PLANT DESCRIBED IN THIS REPORT IS A RESEARCH FACILITY BUILT TO STUDY
 RADIOACTIVE GASES GENERATED IN UNDERGROUND NUCLEAR TESTS AT THE TATUM SALT DOME NEAR HATTIESBURG,
 MISS. THE MAIN PROCESS FEATURES ARE - (1) A FLOW-CONTROL AND DILUTION SYSTEM TO OBTAIN SAFE
 HYDROGEN DILUTION, (2) SODIUM HYDROXIDE GAS SCRUBBERS, (3) AN ACTIVATED-CHARCOAL ABSOLUTE-TYPE
 FILTRATION SYSTEM, AND (4) A HIGH STACK TO ENSURE SAFE DILUTION OF THE UNREMOVED RADIOACTIVE
 EFFLUENT GASES FROM THE PROCESS.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, NATIONAL BUREAU OF STANDARDS,
 U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VIRGINIA 22151, \$3.75 COPY, \$0.65 MICRONEGATIVE

ATMOSPHERIC DIFFUSION EXPERIMENT + FISSION GAS RELEASE + HYDROGEN + SCRUBBER + WASTE DISPOSAL, ATMOSPHERIC +
 WASTE TREATMENT, GAS + CHARCOAL + FILTER, HIGH EFFICIENCY + TEST, SYSTEM OPERABILITY + RADIOCHEMICAL PLANT
 SAFETY + RADIOISOTOPE + SALMON EVENT + FILTERS

014527
PROPOSED TECHNICAL SPECIFICATION CHANGE AT WESTERN NEW YORK REACTOR, LOW FLOW OPERATION
WESTERN NEW YORK RESEARCH CENTER
1 PAGE, JAN. 16, 1967, DOCKET NO. 50-57

REQUESTS 1-MW OPERATION AT 500 GPM TO OBTAIN N-16 HOLDUP INFORMATION. CALCULATION SHOWS INCIPIENT BOILING AT HOT SPOT AT 1.14 MW, WITH A BULK INLET TEMP. OF 80 F. ONE-MW HEAT FLUX AT 500 GPM IS COMPUTED AS ONE-SIXTH THE BURNOUT HEAT FLUX.

AVAILABILITY - USAEC-PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

BURNOUT HEAT FLUX + HOT SPOT + NITROGEN + TECHNICAL SPECIFICATIONS + REACTOR, POOL TYPE + REACTOR, PULSED + FLOW BLOCKAGE

014765
WESTERN NEW YORK PROPOSED CHANGE - 1 MW OPERATION AT 500 GPM TO OBSERVE N-16 CONDITIONS
WESTERN NEW YORK NUCLEAR RESEARCH CENTER, INC.
1 PAGE, JANUARY 16, 1967, DOCKET NO. 50-57

AT 500 GPM, WITH A BULK-COOLANT INLET TEMPERATURE OF 80 F. HEAT FLUXES EQUIVALENT TO 1.14-MW OPERATION CORRESPOND TO THE ONSET OF NUCLEATE BOILING AND ARE A FACTOR OF 16 BELOW THE BURNOUT HEAT FLUX. WNYRC WISHES A SPECIFIC TECH-SPEC. CHANGE TO AUTHORIZE THIS EXPERIMENT.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

HOT SPOT + NITROGEN + TECHNICAL SPECIFICATIONS + ONB + REACTOR, POOL TYPE + REACTOR, PULSED + FLOW BLOCKAGE

015743
THOMAS CC + HALL WF + LUMB RF
RADIOACTIVE MATERIAL RELEASE FROM GAMMA SOURCE
WESTERN NEW YORK NUCLEAR RESEARCH CENTER, INC., BUFFALO
CONF-243-43 + GMELIN-AED-CONF-63-168-42 +. 1 PAGE, THE RESEARCH REACTOR AS A GAMMA SOURCE, OCTOBER 1963, PAGE 15. PRESENTED AT REGIONAL MEETING AMERICAN NUCLEAR SOCIETY CONFERENCE ON PROBLEMS OF OPERATING RESEARCH AND POWER REACTORS, OTTAWA, CANADA, OCTOBER 21-23, 1963, DOCKET NO. 50-57, CFSTI

PAGE 15- ONE GAMMA SOURCE IS A CIRCULATING LOOP OF INDIUM SULPHATE. THE FIRST RUN WAS TERMINATED AFTER 54 HOURS BECAUSE BURSTS OF RADIOLYTIC GAS WERE INTERFERING WITH PUMPING AND WERE DRIVING RADIOACTIVE MATERIAL OUT THE VENT OF THE LOOP.

IN PILE EXPERIMENT + REACTOR, RESEARCH + INDIUM + INCIDENT

016140
REACTOR OPERATIONS AT THE BONUS PLANT. MONTHLY REPORT NO. 8
PUERTO RICO WATER RESOURCES AUTHORITY, SAN JUAN
PRWRA-103 +. 63 PAGES, AUGUST 1966

THE EIGHT SUPERHEATER CONTROL RODS SHOWED OCCASIONAL STICKING DUE TO EXCESSIVE FRICTION IN THE WATER-SEAL ASSEMBLIES. FAULTY WIRING ALLOWED A BOILER AND A SUPERHEATER CONTROL ROD TO BE WITHDRAWN SIMULTANEOUSLY. TESTS WERE CONDUCTED ON THE RACK-HOUSING PURGE SYSTEM, WHICH PREVENTS ACCUMULATION OF EXPLOSIVE MIXTURES OF HYDROGEN AND OXYGEN.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, NATIONAL BUREAU OF STANDARDS, U.S. DEPT. OF COMMERCE, SPRINGFIELD, VIRGINIA, \$3.00 COPY, \$0.65 MICROFICHE

REACTOR, BWR + BONUS (ISR) + REPORT, OPERATIONS + REACTOR, INTERNAL SUPERHEAT + OPERATING EXPERIENCE SUMMARY + FAILURE, DESIGN ERROR + FAILURE, SCRAM MECHANISM + OFF GAS + SEAL + FAILURE, INSTALLATION ERROR + CONTROL ROD DRIVE MECHANISMS

016292
ELK RIVER REACTOR OPERATIONS ANALYSIS PROGRAM. PROGRESS REPORT, FEBRUARY 1965
ALLIS-CHALMERS MFG. CO., BETHESDA, MD.
ACNP-65525 +. 13 PAGES, 4 FIGURES, 4 TABLES, MARCH 15, 1965

THIS PROGRESS REPORT IS ONE OF A SERIES AND COVERS THE FOLLOWING TASKS - (102) EVAPORATOR WATER LEVELS, (102) REACTIVITY HISTORY, (103) POWER DISTRIBUTION, (106) NVT AT SAMPLE LOCATIONS, (201) FUEL-CYCLE STUDIES, (204) CONTROL ROD WORTH, (208) TECHNICAL SPECIFICATION CHANGES, (401) PURIFICATION SYSTEM, (404) THIMBLE-COOLING SYSTEM, (406) OFF-GAS SYSTEM, (407) BORDON POISON SYSTEM, (611) DECONTAMINATION AND WASTE DISPOSAL, (612) CASK HANDLING AND STORAGE, (615) CORROSION SAMPLE AND TESTS, (616) RADIOLYTIC-GAS SAMPLING.

REACTOR, BWR + CONTROL ROD BURNUP + CONTROL ROD WORTH + DECONTAMINATION + ELK RIVER (BWR) + FUEL BURNUP + WASTE DISPOSAL + POWER DISTRIBUTION + CORROSION + COOLANT CHEMISTRY + TECHNICAL SPECIFICATIONS + REPORT, OPERATIONS ANALYSIS + SHUTDOWN SYSTEM, SECONDARY

016520
BANE RW + CARNALL WT + STEWART CC

016520 *CONTINUED*
 LANTHANUM CONTAMINATION AT CP5
 ILLINOIS NATIONAL LABORATORY, ILL
 1 PAGE, 1 FIGURE, NUCLEAR APPLICATIONS 215, PAGE 270 (MAY, 1967)

A HALF-GRAM SAMPLE OF LANTHANUM OXIDE, OVEN DRIED AT 110 C AND SEALED IN A QUARTZ CAPSULE, WAS IRRADIATED FOR 1.5 X 10 TO THE 19TH N/CM SQ. PREVIOUS SAMPLES HAD BEEN SUCCESSFULLY IRRADIATED. WHEN THE SAMPLE WAS REMOVED, THE CONTAINER WAS DISCOVERED RUPTURED, AND CONSIDERABLE CONTAMINATION OCCURRED. STUDIES SHOWED A DRASTIC WEIGHT LOSS IN LA2O3 AT 300 C (AS TWO WATERS PER MOLECULE WERE LOST) AND AT 450 C (ONE WATER PER MOLECULE LOST), AND A NET 14% WEIGHT LOSS. THE ACCIDENT PROBABLY WAS CAUSED BY RADIOLYTIC GAS DECOMPOSITION DURING IRRADIATION, RUPTURING AN IMPERFECT TUBE.

FAILURE + REACTION, HWR + IN PILE EXPERIMENT + OXIDE + REACTOR, RESEARCH + SAFETY REVIEW + CONTAMINATION + INCIDENT + LANTHANUM + REACTOR, PDA CNED + CP 5 (PP) + PRESSURE, INTERNAL

017264
 HURPUS C + SPIEGLER P + NORMAN A
 MEASUREMENT AND INTERPRETATION OF DYNAMIC VOID GROWTH IN HOMOGENEOUS FISSION SOLUTIONS
 ATOMICS INTERNATIONAL, SAN DIEGO, CALIFORNIA
 4 PAGES, 9 FIGURES, 2 TABLES, PAPER PRESENTED AT THE SEVENTH ANNUAL MEETING OF THE AMERICAN NUCLEAR SOCIETY, PITTSBURGH, PENNSYLVANIA, JUNE 5, 1961

A PART OF THE KWR PROGRAM TO OBTAIN EXPERIMENTAL DATA ON DYNAMIC BEHAVIOR OF WATER-BOILER REACTIONS AND TO DEVELOP ANALYTICAL METHODS TO PREDICT BWR KINETICS FOR USE IN SAFETY EVALUATIONS. FOR SHORT-PERIOD (LESS THAN 10 MS) POWER TRANSIENTS, THE POWER-BURST SHAPE IS STRONGLY INFLUENCED BY FORMATION OF RADIOLYTIC GAS BUBBLES. PRESSURE-VOLUME-TEMPERATURE CHARACTERISTICS ARE MEASURED FOR CAPSULES CONTAINING FUEL SOLUTION SUBJECTED TO RADIATION BURST FROM KWRB REACTOR. DATA INDICATE THAT FISSION-TRACK NUCLEATION OCCURS WHENEVER CRITICAL GAS CONCENTRATION IN FISSION SOLUTION IS EXCEEDED. BUBBLE FORMATION AND GROWTH LEAD TO PRESSURE FIELD, FROM WHICH THE OBSERVED VOLUME CHANGE CAN BE CALCULATED.

HEAT TRANSFER, BOILING + HEAT TRANSFER + REACTOR, HOMOGENEOUS + KWRB (S-RR) + REACTOR, RESEARCH + NUCLEATE BOILING

017357
 LINDHE S + CARLSON F + EDWALL B + BERLIN B
 CHEMICAL PROBLEMS IN NUCLEAR REACTORS
 AB ATOMENERGI, SWEDEN
 4 PAGES, 1 FIGURE, SVENSK KEMISK TIDSKRIFT 79(2) PAGES 111-121 (1967), IN SWEDISH

REVIEW OF THE PRODUCTION OF RADIOLYTIC GASES AND RADIOACTIVE CORROSION PRODUCTS IN PRESSURIZED AND BOILING-WATER REACTORS. BUILDUP OF RADIOACTIVITY ON THE FUEL ELEMENT AND THE PRIMARY COOLANT SYSTEM SURFACES DUE TO THESE CORROSION PRODUCTS IS DISCUSSED.

ACTIVITY BUILDUP + CHEMICAL REACTION + HYDROGEN + WATER + ACTIVATION PRODUCT + NITROGEN + REACTOR COOLANT + CORROSION + SWEDEN

017598
 AERJET-GENERAL PROPOSED AMENDMENT FOR IRRADIATION OF AMMONIUM PERCHLORATE IN AGNIR
 AERJET-GENERAL CORPORATION, SAN RAMON, CALIFORNIA
 NEMO-1021 +. 37 PAGES, FIGURES, TABLES, REFERENCES, FEBRUARY 2, 1967, DOCKET NO. 50-228

REQUESTS TECH-SPECS. CHANGE TO ALLOW IRRADIATION OF 20 GM OF AMMONIUM PERCHLORATE. TWO DOUBLY ENCAPSULATED 10-GM SAMPLES ARE TO BE IRRADIATED AT 250 KW FOR 40 TO 600 HR. AGN SAFETY REVIEW INCLUDED. SHOWS 3400-PSIA INTERNAL PRESSURE AT 180 C FROM RADIOISOTOPES, VS 4030 PSIA CAPSULE DESIGN PRESSURE.

AVAILABILITY - USAEC PUBLIC DOCUMENT RCNM, WASHINGTON, D. C.

REACTOR, RESEARCH + SAFETY REVIEW + TECHNICAL SPECIFICATIONS + THIGA (RR) + IRRADIATION TESTING + PRESSURE, INTERNAL

018440
 IDAHO STATE U. SUPPLIES ADDITIONAL INFORMATION ON AGN-201 UNDER CONSTRUCTION
 IDAHO STATE UNIVERSITY, POCAHELLO, IDAHO
 5 PAGES, SEPTEMBER 22, 1967, DOCKET NO. 50-244

ISL CONSIDERS THAT COKE-TANK RUPTURE DUE TO RADIOLYTIC GAS FROM THE MODERATOR IS NOT A CREDIBLE ACCIDENT. THEY DISCUSS 3 MODIFICATIONS TO THE BUILDING VENTILATION SYSTEM TO PREVENT SPREAD OF ANY SUCH GAS THROUGH THE ENTIRE BUILDING. ALSO INCLUDES PERSONNEL INFORMATION.

AVAILABILITY - USAEC PUBLIC DOCUMENT RCNM, WASHINGTON, D. C.

SILVERBURNE RELEASE + RADIATION DAMAGE + REACTOR, TRAINING + VENTILATION SYSTEM + MODERATOR + MODIFICATION + AGN (TRNG) + STAFFING

018469
MIDDLEBROOK H + BRAMFITT AC
DEVELOPMENT WORK IN SUPPORT OF THE D.M.T.R. BOILING WATER LOOP
TRG-REPORT-1404 + CONF-660521 +. 7 PAGES, DECEMBER 5, 1966, PAGES 61-68 FROM IN-PILE IRRADIATION EQUIPMENT
AND TECHNIQUES, SYMPOSIUM HELD AT HARWELL, MAY 1966

DISCUSSES CERTAIN ASPECTS (PRIMARILY REMOVAL OF RADIOYTIC GAS) OF SMALL-SCALE PILOT LOOP OPERATED
AT DOUNREAY TO STUDY PROBLEMS ASSOCIATED WITH USE OF FERRITIC STEELS IN PLACE OF MORE EXPENSIVE
STAINLESS STEEL (WATER CHEMISTRY AND CORROSION). LCCP CIRCULATES WATER AT 1,000 PSI, 280 C,
THROUGH CORE. EMPHASIZES SAMPLING TECHNIQUES.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, NATIONAL BUREAU OF STANDARDS,
U.S. DEPT. OF COMMERCE, SPRINGFIELD, VA., \$3.00 COPY, \$0.65 MICROFICHE

IN PILE EXPERIMENT + STEEL + REACTOR, TEST + UNITED KINGDOM + SAMPLING + CORROSION + COOLANT CHEMISTRY +
DOUNREAY (LMFBR) + R AND D PROGRAM

018680
SKAARDAL RC
OPERATIONAL PROBLEMS AND SOLUTIONS
9 PAGES, FIGURES, POWER REACTOR TECHNOLOGY 8(4) PAGES 271-279 (FALL 1965)

SUMMARIZES PROBLEMS AND REPAIR METHODS AS REPORTED AT ANS MEETING. DIFFICULTIES WERE TRACED TO
DESIGN, FABRICATION, OR INSPECTION. CONTROL-SYSTEM PROBLEMS INCLUDED STUCK RODS DUE TO DEBRIS
AND BUCKLING CAUSED BY RADIATION DAMAGE, AND FAILURE OF NICKEL PLATE TO PROTECT CADMIUM FROM
CORROSION. BRIEFLY DISCUSSES (1) FLOW OSCILLATIONS AT ELK RIVER, (2) FLOW-INDUCED VIBRATION
FAILURES AT BIG ROCK POINT, YANKEE, GTR, AND SPERT III, (3) CORROSION OF INCONEL AT AGESEA, (4)
LEAKS IN MECHANICAL COMPONENTS AT YANKEE AND SPERT III, (5) CONTROL OF OXYGEN FROM RADIOLYSIS OF
D2O AT PRTP, AND (6) MODIFICATIONS TO IRRADIATION FACILITIES AT TWO POOL-TYPE RESEARCH REACTORS.

FAILURE, EQUIPMENT + FAILURE + HEAVY WATER + REACTOR, HWR + RADIATION DAMAGE + REACTOR, RESEARCH + REACTOR,
PCWR + OPERATING EXPERIENCE SUMMARY + CORROSION + FLUCTUATION + MODIFICATION + FAILURE, FABRICATION ERROR +
IRRADIATION TESTING + REACTOR, POOL TYPE + FAILURE, DESIGN ERROR + FAILURE, SCRAM MECHANISM + FAILURE,
ADMINISTRATIVE CONTROL + VIBRATION + INCONEL + MAIN COOLING SYSTEM + FLOW, RECIRCULATION + CONTROL RODS

018960
PRAIRIE ISLAND NUCLEAR GENERATING PLANT FACILITY DESCRIPTION AND SAFETY ANALYSIS REPORT, VOLUME III
NORTHERN STATES POWER COMPANY, MINNEAPOLIS, MINNESOTA
330 PAGES, TABLES, FIGURES, SEPTEMBER 20, 1967, DOCKET NO. 50-292/306

CONTAINS APPENDIXES A TO I, INCLUDING, (B) METEOROLOGICAL MODEL, (D) TURBINE RUNAWAY CONSEQUENCES
AND LIKELIHOOD, (E) RADIOLYTIC DECOMPOSITION OF SAFETY-INJECTION WATER, (F) SHARED-EQUIPMENT
EVALUATION, (G) RADIOACTIVE SOURCES FOR CONTAINMENT LEAKAGE, (H) REPORT OF ENVIRONMENTAL STUDIES,
GEOLOGY, HYDROLOGY, SEISMOLOGY, AND STRUCTURAL-DESIGN PROCEDURES.

AVAILABILITY - USAEC PUBLIC OCCUPANT FORM, WASHINGTON, D. C. 20432

FISSION PRODUCT RELEASE + REACTOR, PWR + SITING + SOURCE, CONTINUOUS + SITE CLIMATOLOGY + METEOROLOGY +
REPORT, PSAR + PRAIRIE ISLAND 1 (PWR)

020673
SASSE RA
GAMMA AND NEUTRON RADIOLYSIS OF THE SYSTEM TRICHLOROETHYLENE-OXYGEN-WATER
US ARMY NUCLEAR DEFENSE LABORATORY, EDGEMOND ARSENAL, MARYLAND
10 PAGES, 8 FIGURES, 3 TABLES, 18 REFERENCES, HEALTH PHYSICS 13(9), PAGE 1015-1024, (SEPT. 1967)

THE GAMMA AND NEUTRON RADIOLYSIS OF AQUEOUS TRICHLOROETHYLENE (TCE) WAS INVESTIGATED. THE OXYGEN-
RICH TCE SYSTEM YIELDS WERE VERY DOSE-RATE DEPENDENT, WHEREAS THE AIR-FREE SYSTEM WAS NOT. A
MECHANISM IS PROPOSED FOR THE AIR-FREE TCE SYSTEM BASED ON LIMITING G VALUES OBTAINED BY ADDING
SCAVENGERS.

CHEMICAL REACTION + DOSIMETRY + GAMMA + NEUTRON + UNITED STATES

020738
KASE KR
RADIOACTIVE GAS PRODUCTION AT A 100-MEV ELECTRON LINAC FACILITY
LAWRENCE RADIATION LAB., UNIVERSITY OF CALIF., LIVERMORE, CALIF.
8 PAGES, 11 FIGURES, 3 TABLES, 7 REFERENCES, HEALTH PHYSICS 13(8), PAGE 869-876, (AUGUST 1967)

A METHOD IS PRESENTED FOR DETERMINING THE PRODUCTION OF RADIOACTIVE N-13 AND C-15 AT A 100-MEV
ELECTRON LINEAR-ACCELERATOR FACILITY. THE DEPENDENCE OF THE AIR CONCENTRATIONS ON VENTILATION
RATES AND BEAM TRAVEL DISTANCE IS DISCUSSED. IT IS DETERMINED THAT N-13 IS THE LIMITING
RADIONUCLIDE. MPC AND DOSE CALCULATIONS ARE PRESENTED FOR N-13. THE IMPLICATIONS OF N-13
PRODUCTION ARE DISCUSSED IN TERMS OF VENTILATION RATES FOR TARGET AREAS AND OPERATIONAL CONTROLS.
A SAMPLE CALCULATION IS PRESENTED.

DOSE + OXYGEN + VENTILATION SYSTEM + NITROGEN + DOSE CALCULATION, INTERNAL + LRL + ACCELERATOR

021302

REL RESEARCH REACTOR START-UP TEST PROGRAM - APPROACH TO POWER AND FULL POWER OPERATION
 AMF ATOMICS, A DIVISION OF AMERICAN MACHINE AND FOUNDRY CO., GREENWICH, CONNECTICUT
 112 PAGES, 39 FIGURES, 11 TABLES, NOV. 1959, DOCKET NO. 50-17

CONTAINS RESULTS OF TESTS TO DEMONSTRATE REACTOR OPERABILITY AT ITS FULL POWER OF 5 MW. CONTAINS
 FUEL-PLATE AND LEAD-SHIELD-COMPONENT TEMPERATURES, SHIELD AND FACILITY RADIATION DOSE LEVELS, PH
 AND CONDUCTIVITY VARIATIONS IN THE POOL WATER, AND IDENTIFICATION OF ACTIVITIES IN THE POOL WATER
 AND ABOVE THE POOL SURFACE.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

USE + MEASUREMENT + REACTOR, RESEARCH + MEASUREMENT, TEMPERATURE + REACTOR STARTUP EXPERIENCE + REACTOR, POOL
 TYPE + SHIELDING + COOLANT QUALITY + FUEL ELEMENTS

021401

AQUEOUS HOMOGENEOUS SUSPENSION REACTOR PROJECT. ANNUAL REPORT. PART A, RESEARCH AND DEVELOPMENT
 KUNING VAN ELECTROTECHNISCHE MATERIALEN, NV., ARNHEM, NETHERLANDS
 NP-16168 (PT. A) +. 28 PAGES, FIGURES, 1965

TECHNIQUES WERE DEVELOPED TO PRODUCE THIN-METAL OR THIN COATINGS ON FUEL PARTICLES TO MINIMIZE
 OBSERVED IRRADIATION DAMAGE. THE MOST SERIOUS PROBLEM EXPECTED, THAT OF HARD CAKE FORMATIONS IN
 THE SYSTEM, HAS NOT OCCURRED. ALSO REPORTS IRRADIATION TESTING, INSTRUMENT DEVELOPMENT,
 OPERATION OF PUMPS AND VALVES, MEASUREMENTS OF RADIOLYTIC GAS PRODUCTION, AND HEALTH PHYSICS
 ASPECTS OF THE FUEL IRRADIATIONS.

AVAILABILITY - MICROCARD EDITIONS, INC. (FOR SALE) ACCOUNTING AND SHIPPING DEPARTMENT, WEST SALEM, WISCONSIN
 54669

REACTOR, CIRCULATING FUEL + COATED PARTICLE + MEASUREMENT + NETHERLANDS + RADIATION SAFETY AND CONTROL +
 IRRADIATION TESTING + F AND G PROGRAM + INSTRUMENTS, MISC.

021911

DETAILED REPORT ON STUCK ROD AT STEPIAC FORREST REACTOR
 UNION CARBIDE CORPORATION, TUXEDO, NEW YORK
 2 PAGE, LETTER - UNION CARBIDE CORPORATION TO DIVISION OF REACTOR LICENSING (AEC) - DECEMBER 22, 1967, DOCKET
 50-54

AFTER A ROUTINE SHUTDOWN A SHIM SAFETY ROD WAS FOUND TO BE 4 IN. FROM FULL INSERTION. THE
 DISTANCE BETWEEN THE FLAT FACES OF THE ROD HAD INCREASED FROM 0.925 IN TO 1.025 IN. HAIRLINE
 CRACKS WERE FOUND IN THE WELDED END PLUG, CAUSED BY MISHANDLING. THE DIMENSION CHANGE WAS CAUSED
 BY RADIOLYTIC DECOMPOSITION OF WATER THAT LEAKED INTO THE ROD THROUGH THE CRACKS.

AVAILABILITY - ARC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00)

FAILURE, OPERATOR ERROR + REACTOR, RESEARCH + WELDS + FLAW + CONTROL ROD, SHIM SAFETY + REACTOR, POOL TYPE +
 FAILURE, SCRAM MECHANISM + LEAK + CONSTRUCTION

022584

JENKS GH + GRIESS JC
 WATER CHEMISTRY IN PRESSURIZED AND BOILING WATER POWER REACTORS
 OAK RIDGE NATIONAL LABORATORY, OAK RIDGE, TENN.
 ORNL-4173 +. 55 PAGES, TABLES, FIGURES, REFERENCES, NOVEMBER 1967

THE CHEMICAL BEHAVIOR OF WATER IN SMALL, HERMETICALLY SEALED, TERRESTRIAL LOW-POWER REACTORS
 (TLPR) HAS BEEN PREDICTED FROM INFORMATION AVAILABLE IN THE LITERATURE. TITANIUM INSTEAD OF
 STAINLESS STEEL OR INCONEL HAS BEEN SUGGESTED A STRUCTURAL MATERIAL FOR THESE REACTORS.
 RADIOLYTIC GASES POSE NO PROBLEM IN PRESSURIZED-WATER REACTORS IF THE WATER IS SUFFICIENTLY PURE
 AND HYDROGEN IS ADDED TO IT. THEY ARE NO PROBLEM IN BOILING-WATER REACTORS IF THESE GASES
 RECIRCULATE IN THESE REACTORS AS PREDICTED.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VIRGINIA, \$3.00
 COPY, \$0.65 MICROFICHE

REACTOR, BWR + REACTOR, PWR + ORNL + CORROSION + CHEMICAL KINETICS + COOLANT CHEMISTRY + DESIGN STUDY

022690

ISHIWATARI N
 WATER CHEMISTRY OF JPCR
 JAPAN ATOMIC ENERGY RESEARCH INST., TOKYO, JAPAN
 JAERI-1125 +. 21 PAGES, TABLES, FIGURES, REFERENCES, OCTOBER 1966

REPORTS RESULTS OF ADDITIONAL WORK ON THE WATER CHEMISTRY OF THE JAPAN POWER DEMONSTRATION REACTOR
 (JPCR). MEASUREMENTS OF THE RADIOLYSIS, INDUCED ACTIVITIES, AND WATER QUALITIES ARE GIVEN.
 RADIOLYTIC GAS AND INDUCED RADIONUCLIDE CONCENTRATIONS IN THE REACTOR WATER ARE SIMILAR TO THOSE
 IN THE OTHER BOILING-WATER REACTORS. THE CHEMICAL ASPECTS OF THIS REACTOR, INCLUDING THE
 SUPPRESSION OF THE RELEASE OF RADIOIODINE FROM THE COOLANT SYSTEM, ARE CONSIDERED EXCELLENT.

022690 *CONTINUED*
 AVAILABILITY - MICROCARD EDITIONS, INC. (FOR SALE), ACCOUNTING AND SHIPPING DEPARTMENT, WEST SALEM, WISCONSIN

ACTIVITY BUILDUP * REACTOR, BWR * CORROSION * COOLANT CHEMISTRY * JAPAN * RADIOISOTOPE, INDUCED * COOLANT
 PURIFICATION SYSTEM

022691
 HAMMAR L * ALLISON G * ANDERSEN A * CARLSON F * FJELLESTAD K * INNVAER R * ROSE R
 WATER CHEMISTRY RESEARCH AT THE HALDEN BOILING HEAVY WATER REACTOR (HBWR)
 INSTITUTT FOR ATOMENERGI, HALDEN, NORWAY
 NKA-55 * 149 PAGES, FIGURES, TABLES, REFERENCES, JUNE 1967

A WATER CHEMISTRY PROGRAM WAS PERFORMED AT THE HALDEN BOILING WATER REACTOR TO INVESTIGATE THE
 RADIOLYSIS OF WATER AND THE N-16 ACTIVITY IN STEAM. RADIOLYTIC GAS FORMATION WAS CONFINED
 LARGELY TO THE BOILING WATER WITHIN THE FUEL CHANNEL AND WAS LOWER THAN THAT FOR THE BOILING
 LIGHT-WATER REACTORS. ADDITION OF DEUTERIUM OR AMMONIA TO THE HEAVY WATER SUPPRESSED THE
 FORMATION OF RADIOLYTIC GAS BUT INCREASED THE STEAM-WATER DISTRIBUTION RATIO OF THE N-16.

REACTOR, BWR * DEUTERIUM * HEAVY WATER * NITROGEN * CHEMICAL ANALYSIS * COOLANT CHEMISTRY * NORWAY *
 RADIOISOTOPE, INDUCED * HBWR (HBWR)

022713
 LINDBERG S * CARLSON F * EDWALL B * BERLIN B
 CHEMICAL PROBLEMS IN NUCLEAR REACTORS
 KÄRNEROLAGET ATOMENERGI, STOCKHOLM, SWEDEN
 9 PAGES, 10 REFERENCES, SVENSK KEM. TIDSKR., 79, PAGES 113-121 (1967) IN SWEDISH

REVIEWS CHEMICAL PROBLEMS ASSOCIATED WITH THE OPERATION OF PRESSURIZED AND BOILING WATER REACTORS.
 DISCUSSES RADIOLYTIC GAS FORMATION AS WELL AS BUILDUP AND BEHAVIOR OF RADIOACTIVE CORROSION
 PRODUCTS IN STRUCTURE EXTERNAL TO THE CORE AND DEPOSITION ON FUEL ELEMENT SURFACES. PROBLEMS ON
 PURIFICATION OF WATER AND STEAM ARE BRIEFLY DISCUSSED.

CHEMICAL REACTION * CORROSION * COOLANT CHEMISTRY * REACTOR, LWR * SWEDEN * RADIOISOTOPE, INDUCED * SURFACE
 FILM DEPOSITION

023931
 ROWE MD * CRAWFORD TS
 AN INVESTIGATION INTO THE EFFECT OF NUCLEAR RADIATION ON THE CORROSION OF MILD STEEL IN CONTACT WITH WET
 CONCRETE
 CENTRAL ELECTRICITY GENERATING BOARD, BERKELEY (ENGLAND), BERKELEY NUCLEAR LABS.
 RD-H-N-326 * 6 PAGES, FIGURES, OCTOBER 1964

IT HAS BEEN POSTULATED THAT ALTHOUGH MILD STEEL EMBEDDED IN THICK CONCRETE STRUCTURES SUFFERS ONLY
 SLIGHT CORROSION, THE CORROSION RATE MIGHT BE ACCELERATED BY FREE OXYGEN RESULTING FROM THE
 RADIOLYSIS OF WATER UNDER A GAMMA FLUX. CONSEQUENTLY A SERIES OF TESTS WAS UNDERTAKEN FROM WHICH
 IT HAS BEEN FOUND THAT CORROSION OF ONE SET OF SPECIMENS, IRRADIATED IN GAMMA FLUX, WAS GREATER
 THAN THAT OF CONTROL SPECIMENS, BUT A 1-IN. THICKNESS OF CONCRETE GAVE COMPLETE PROTECTION.

AVAILABILITY - AEC DEPOSITORY LIBRARIES IN THE U.S. AND OVERSEAS

CONCRETE * OXYGEN * STEEL * WATER * CORROSION * RADIATION EFFECT

024190
 REITER R
 APPARATUS AND METHODS FOR PROTECTION AGAINST RADON AND ITS DECAY PRODUCTS IN MINE ATMOSPHERES
 9 PAGES, NUKLEONIK 9, PAGES 356-67 (MAY 1967) IN GERMAN

THE REQUIREMENTS PLACED ON MEASUREMENT TECHNOLOGY IN THE DETERMINATION OF RN LEVELS IN MINES ARE
 OUTLINED. THE DEVICE DEVELOPED FOR THE DETERMINATION OF THE RN LEVEL IS BASED ON THE AEROSOL
 FILTER METHOD. THE PRINCIPLE OF THIS DEVICE IS OUTLINED AND ITS CONSTRUCTION DESCRIBED. AN
 EXAMPLE IS GIVEN OF ITS OPERATION. METHODS FOR DECREASING THE RN CONCENTRATION IN MINES ARE
 GIVEN.

AEROSOL * MONITOR, SAMPLING * SAMPLING * AIR * RADON * AEROSOL, RADIOACTIVE * RADIATION SAFETY AND CONTROL *
 EQUIPMENT * FILTERS

025234
 JENKS GH * GRIFFISS JC
 AQUEOUS REACTOR AND DESALINATION
 OAK RIDGE NATIONAL LAB., TENN.
 ORNL-4229 * 4 PAGES, 3 TABLES, 6 REFERENCES, PAGES 71-74 OF REACTOR CHEMISTRY DIVISION ANNUAL PROGRESS
 REPORT FOR PERIOD ENDING DECEMBER 31, 1967

HERMETICALLY SEALED PRESSURIZED- AND BOILING-WATER REACTORS - BRIEF REVIEW OF WATER CHEMISTRY OF
 BOTH PRESSURIZED- AND BOILING-WATER REACTORS, PARTICULARLY AS IT RELATES TO THE NECESSITY OF
 PURIFICATION SYSTEMS, AND CONSIDERATION OF MEANS WHEREBY SMALL REACTORS COULD OPERATE

025234 *CONTINUED*

SATISFACTORILY WITHOUT WATER CLEANUP OR SPECIAL GAS HANDLING EQUIPMENT. WATER CHEMISTRY IN A SMALL STATE-OF-THE-ART PRESSURIZED-WATER REACTOR - PLANS AND SPECIFICATIONS FOR A LOW-POWER PRESSURIZED-WATER REACTOR BASED ON STATE-OF-THE-ART INFORMATION ARE BEING PREPARED BY ORNL, AND WE ARE PROVIDING SPECIFICATIONS AND RECOMMENDATIONS IN AREAS RELATED TO WATER TECHNOLOGY IN THE REACTOR. WATER RADIOLYSIS IN THE HFIR - COMPARISON BETWEEN REPORTED AND PREDICTED CONCENTRATIONS OF HYDROGEN IN THE HFIR MODERATOR LED TO THE TENTATIVE CONCLUSION THAT ITS RADIOLYTIC BEHAVIOR IS NEAR THAT PREDICTED. ADDITIONAL ANALYSES OF THE RELATIVE AMOUNTS OF OXYGEN AND HYDROGEN PEROXIDE WOULD BE REQUIRED FOR COMPLETE VERIFICATION.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA., 22151, \$3.00 COPY, \$0.65 MICROFICHE

REACTOR, BWR + DESIGN CRITERIA + REACTOR, FAST + HYDROGEN + OXYGEN + REACTOR, PWR + STEAM + WATER + CHEMICAL KINETICS + COOLANT CHEMISTRY + HFIR (FTR) + REACTOR, ERDA OWNED + REACTOR, LWR + IRRADIATION TESTING + WATER TREATMENT + REACTOR, PULSED + PROPERTY, PHYSICAL + PROPERTY, CHEMICAL + RADIATION EFFECT

025726

TURBINE CONDENSER TUBE FAILURES, WASTE DISCHARGE
YANKEE ATOMIC ELECTRIC COMPANY

8 PAGES, 2 FIGURES FROM YANKEE NUCLEAR POWER STATION OPERATION REPORT NO. 95, JANUARY 1968, DOCKET 50-29, TYPE - PWR, MFG--WEST, AE--STONE + WEBSTER

ON JAN. 22, STEAM-GENERATOR-BLOWDOWN CHLORIDE CONTENT RAPIDLY INCREASED FROM 0.05 TO 0.60 PPM. LOAD WAS REDUCED, MAIN CONDENSER WEST WATER BOX ENTERED, AND THREE TUBES WERE PLUGGED. ON JAN. 25, BOX WAS AGAIN ENTERED BUT NO PLUGGING NEEDED. ***CONTROL RODS AND THROTTLE VALVES WERE EXERCISED. PRESSURIZER RADIOLYTIC GAS FRACTIONS ARE REPORTED WITH AMMONIATED UNBORATED WATER. ***SUMMARY OF 1967 WASTE DISCHARGE SHOWS - (LIQUID) 54.1 MILLICURIES BETA-GAMMA AND 1589.54 CURIES TRITIUM, (GAS) 2.31 B-G AND 15.07 OF TRITIUM. SHIPPED WASTE CONSISTED OF 4 CASKS (37,000 CURIES) AND 52 FUEL ELEMENTS (64,650,000 CURIES).

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

REPORT, OPERATIONS + REACTOR, PWR + YANKEE RWE (PWR) + WASTE DISPOSAL, GAS + WASTE DISPOSAL, LIQUID + PRESSURIZER + CHLORINE + FAILURE, TUBING + TURBINE

025914

ADDITIONAL AR-41 RELEASE FROM TRIGA PCLL WATER
GULF GENERAL ATOMIC, SAN DIEGO, CALIFORNIA

2 PAGES, LETTER TO D.J. SKOVHOLT FROM P.H. MILLER, APRIL 5, 1968, DOCKET NO. 50-227

AS A RESULT OF TURBULENCE IN THE POOL WATER, AR-41 ACTIVITY LEAVING THE BEAM TUBES AND POOL IS 6.4 MICROCURIES/SEC RATHER THAN 2.48, AS PREVIOUSLY INDICATED IN HAZARDS ANALYSIS REPORT. RESULTS ARE BASED ON MEASUREMENTS IN REACTOR ROOM AND STACK DISCHARGE OF CONCENTRATION OF 4×10 (MINUS 6) MICROCURIES/CC. DOWNWIND CONCENTRATION FOR MOST UNFAVORABLE CONDITIONS IS A FACTOR OF 6 LESS THAN PERMISSIBLE.

AVAILABILITY - USAEC, PUBLIC DOCUMENT ROOM

AIRBORNE RELEASE + REACTOR, RESEARCH + COMPARISON, THEORY AND EXPERIENCE + ARGON + TECHNICAL SPECIFICATIONS + TRIGA (RR) + OPERATING EXPERIENCE

026067

SAFETY PROCEDURES AND HAZARDS OF DECOMMISSIONED (RR (L-54) REACTOR
IIT RESEARCH INSTITUTE, CHICAGO, ILLINOIS

4 PAGES, LETTER TO D.J. SKOVHOLT FROM P.B. MOLER AND P.E. ZELAC, MARCH 6, 1968, DOCKET NO. 50-1

THE RISK OF PRESSURE BUILDUP DUE TO RADIOLYTIC PRODUCTION OF H₂ AND O₂, AND SUBSEQUENT PRECIPITATION OF UO₂ BY H₂C₂, ARE NOT CREDIBLE SINCE (1) RECOMBINATION RATE OF H₂ AND O₂ WAS OBSERVED TO BE SAME AS PRODUCTION RATE DURING OPERATION, AND (2) EVEN IF ALL UO₂ PRECIPITATED, REACTOR WOULD REMAIN SUBCRITICAL. EMERGENCY PROCEDURES AVAILABLE BEFORE OPERATION CEASED ARE STILL SUITABLE NOW FOR PLAUSIBLE INCIDENTS SUCH AS FIRE OR EXPLOSION AND INVOLVE ARRANGEMENTS WITH CHICAGO FIRE DEPT., AEC RADIOLOGICAL ASSISTANCE TEAM, CAMPUS SECURITY FORCE, AND HEALTH PHYSICS.

AVAILABILITY - USAEC, PUBLIC DOCUMENT ROOM

CHEMICAL REACTION + EXPLOSION + FIRE + REACTOR, HOMOGENEOUS + HAZARD, RELATIVE + REACTOR, RESEARCH + EMERGENCY PROCEDURE + PRECIPITATION + URANIUM DIOXIDE + RADIOLOGICAL ASSISTANCE + DECOMMISSIONING + PRESSURE, INTERNAL

026555

111 L-54 LICENSE CHANGED TO POSSESSION ONLY
DIVISION OF REACTOR LICENSING, AEC

13 PAGES, AMENDMENT 8 TO FACILITY LICENSE R-3, LETTER TO R. V. MOLER FROM D. J. SKOVHOLT, JUNE 26, 1968, DOCKET 50-1.

UNTIL FUEL RADIOACTIVITY DECAYS AND IT CAN BE RETURNED TO AEC, FUEL WILL BE STORED IN STAINLESS-STEEL REACTOR VESSEL. CALCULATIONS SHOW THAT WITHOUT RECOMBINATION, RADIOLYSIS WOULD HAVE PRODUCED A PRESSURE INCREASE OF 68 IN. (HG) IN A SYSTEM DESIGNED FOR 600 IN. OBSERVATION OF ONLY

026565 *CONTINUED*

0.1 IN. INDICATES RECOMBINATION RATE EQUALS PRODUCTION RATE. NO UO₂ PRECIPITATION HAS BEEN OBSERVED EVEN WHEN H₂C₂ PRODUCTION WAS GREATER. CONTROL-ROD DRIVES ARE DISCONNECTED, AND MECHANICAL BLOCKS PREVENT MANUAL LIFTING OF RODS.

AVAILABILITY -- PUBLIC DOCUMENT ROOM, WASHINGTON, D.C.

REACTOR, RESEARCH + TECHNICAL SPECIFICATIONS + DECOMMISSIONING + SAFETY EVALUATION

027625

SCRAM CAUSED BY AIR DRYER PLUGGING
YANKEE ATOMIC ELECTRIC COMPANY, BOSTON, MASSACHUSETTS
7 PAGES, 2 FIGURES, 1 TABLE, YANKEE OPERATIONS REPORT 93 FOR NOVEMBER 1967, DECEMBER 22, 1967, DOCKET 50-29,
TYPE--PWR, MFG--WEST., AE--STCNE + WFBSTER

ON NOV. 6 THE COOLANT BURN WAS REDUCED TO 4 PPM, AND ON NOV. 15 THE END OF CORE LIFE WITHOUT PH ADJUSTMENT WAS REACHED AND STRETCHOUT OPERATION BEGAN. ***ON NOV. 13, A MECHANICAL MALFUNCTION OF THE AIR DRYER PLUGGED THE AIR OUTLET PORTS TO THE INSTRUMENT AIR HEADER. THE RESULTANT TOTAL LOSS OF INSTRUMENT AIR CAUSED A TRIP OF THE HEATER DRAIN AND BOILER FEED PUMPS, CAUSING A TURBINE TRIP BECAUSE OF LOW STEAM GENERATOR LEVEL. ***DATA GIVEN ON OXYGEN, NITROGEN, AND HYDROGEN FRACTIONS IN PRESSURIZER FOR HONORED AND UNBORATED CONDITIONS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.001

AIR CLEANING + FUEL BURNUP + REPORT, OPERATIONS + REACTOR, PWR + SCRAM, REAL + YANKEE ROWE (PWR) + PRESSURIZER + CHEMICAL SHIM

027837

HUMBOLDT BAY OPERATIONS REPORT, JAN. 1 THRU JUNE 30, 1968
PACIFIC GAS AND ELECTRIC COMPANY
12 PAGES, TABLES, LETTER TO DRL, AUGUST 19, 1968, DOCKET 50-133, TYPE--BWR, MFG--G.E., AE--BECHTEL

AIR-EJECTOR ACTIVITY HAS DECREASED FROM 0.044 TO 0.0384 C/SEC AT 210 MWTH, AS TRAMP URANIUM HAS DECREASED. CONTAINMENT CONTINUOUS LEAK RATE IS 0.067 W/D PER DAY AT 20 IN. WATER GAGE. RADIOLYTIC GAS PRODUCED IS 0.03 SCFM/MWTH. OUTAGES DUE TO SCRAMS WERE FROM (1) TREE FELL ACROSS 110 KV LINE, (2) MIST FALLING ON SALT DEPOSITED ON OCB BUSHINGS CAUSED A FLASHOVER AND COMPLETE LOAD REJECTION, (3) FREQUENCY UPSET CAUSED MG SET MALFUNCTION AFTER A LIGHTNING STRIKE, (4) DURING A QUICK LOAD PICKUP TEST WITH SOME STEAM BYPASS, THE PRESSURE SAGGED ENOUGH FOR WATER IN THE LEVEL COLUMN TO FLASH. THE HIGH LEVEL INDICATION CAUSED LOW FEEDWATER FLOW AND THEN A LOW WATER LEVEL SCRAM.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.001

REACTOR, BWR + HUMBOLDT BAY (BWR) + PRESSURE VESSEL + SCRAM, REAL + INCIDENT, EQUIPMENT + INSTRUMENT, LIQUID LEVEL + CFF GAS + INSTRUMENT, ABNORMAL INDICATION + REPORT, OPERATIONS SUMMARY + ACCIDENT, LOAD REJECTION + BATTERIES & CHARGERS

028400

HOLMES RE + HALLIDAY P + MATHIAS CJ
MEASUREMENT OF ARGON-41 ACTIVITY DISCHARGED FROM THE SHIELD-COOLING AIR OF MAGNOX REACTORS
ATOMIC POWER CONSTRUCTIONS LTD., SUTTON, SURREY, UNITED KINGDOM
SM-110 +. 1 PAGE, PAGE 2 OF ABSTRACTS OF PAPERS FROM SYMPOSIUM ON OPERATING AND DEVELOPMENTAL EXPERIENCE IN THE TREATMENT OF AIRBORNE RADIOACTIVE WASTES, NEW YORK, AUGUST 26-30, 1968

THE EARLY MAGNOX REACTORS BUILT IN THE UNITED KINGDOM UTILIZED STEEL PRESSURE VESSELS SURROUNDED BY CONCRETE BIOLOGICAL SHIELDS. COOLING OF THESE SHIELDS IS ACHIEVED BY MEANS OF LARGE VOLUMES OF ATMOSPHERIC AIR. ARGON IN THE AIR IS ACTIVATED BY THE AR-40 (N, GAMMA)AR-41 THERMAL NEUTRON REACTION. LOW-COST PORTABLE EQUIPMENT WAS DESIGNED TO MEASURE THE SPECIFIC ACTIVITY OF THIS SHIELD-COOLING AIR. CALIBRATION OF THE EQUIPMENT WAS ACHIEVED BY MEANS OF A 5-CC AMPOULE OF ARGON ACTIVATED IN BEPO. THE CALIBRATED EQUIPMENT WAS UTILIZED TO MEASURE THE SPECIFIC ACTIVITY OF SHIELD-COOLING AIR DISCHARGED FROM BRADWELL, CALDER HALL, HUNTERSTON, TRAFSFYNYDD, AND TOKAI MURA POWER STATIONS.

AVAILABILITY - R. E. HOLMES, P. HALLIDAY OR D. J. MATHIAS, ATOMIC POWER CONSTRUCTIONS LTD., SUTTON, SURREY, UNITED KINGDOM

AIR CLEANING + ARGON + ANALYTICAL TECHNIQUE + IN PILE EXPERIMENT + SHIELDING + RADIOISOTOPE, INDUCED + CALIBRATION

028418

ROW TH
REACTOR CONTAINMENT SPRAY TECHNOLOGY PROGRAM
OAK RIDGE NATIONAL LABORATORY
SM-110 +. 1 PAGE, PAGE 26 OF ABSTRACTS OF PAPERS FROM SYMPOSIUM ON OPERATING AND DEVELOPMENTAL EXPERIENCE IN THE TREATMENT OF AIRBORNE RADIOACTIVE WASTES, NEW YORK, AUGUST 26-30, 1968

THE DESIGN BASIS ACCIDENT IN WATER-MODERATED POWER REACTORS IS A LOSS-OF-COOLANT ACCIDENT IN WHICH

028418 *CONTINUED*

WATER SPRAYS ARE GENERALLY USED TO CONTROL THE CONTAINMENT PRESSURE TRANSIENT BY CONDENSING THE RELEASED STEAM-AIR MIXTURE. ADDITIVES TO THE SPRAY HAVE BEEN PROPOSED AS A WAY TO INCREASE THEIR USEFULNESS BY ENHANCING THE REMOVAL OF VARIOUS FORMS OF RADIOIODINE FROM THE CONTAINMENT ATMOSPHERE. A PROGRAM TO INVESTIGATE THE GAS-LIQUID SYSTEMS INVOLVED IS CO-ORDINATED BY ORNL FOR THE US ATOMIC ENERGY COMMISSION. CONSIDERATION IS ALSO BEING GIVEN TO CORROSION, THERMAL AND RADIATION STABILITY OF THE SOLUTIONS.

AVAILABILITY - T. H. POW. OAK RIDGE NATIONAL LABORATORY, P. O. BOX X, OAK RIDGE, TENN.

AIR CLEANING + HYDROGEN + IODINE + ORGANIC IODIDE + CORROSION + NSPP + MASS TRANSFER + RADIATION EFFECT

028723

VALENTINE AM

AN INVESTIGATION OF A BUBBLER TRITIUM SAMPLER

LCS 41AMCS: SCIENTIFIC LABORATORY, NEW MEXICO

LA-3916 +. 11 PAGES, 5 FIGURES, 6 TABLES, 3 REFERENCES, APRIL 1968

INVESTIGATION OF A BUBBLER TRITIUM SAMPLER INDICATED COLLECTION CHARACTERISTICS SIMILAR TO REPORTED HUMAN BODY UPTAKE RATES FOR TRITIUM GAS AND TRITIATED WATER VAPOR. THE BUBBLER COLLECTOR CONSISTED OF A DRY GAS WASH BOTTLE WITH A FRITTED GLASS TIP ON THE INLET AND DISTILLED WATER AS THE COLLECTING MEDIUM. TESTS WERE MADE UNDER BOTH LABORATORY AND FIELD CONDITIONS, AND THE EFFECTS OF VARYING THE FLOW RATE, WATER VOLUME, AND WATER TEMPERATURE WERE DETERMINED. A FLOW-THROUGH IONIZATION CHAMBER INSTRUMENT WAS USED TO MEASURE THE TRITIUM CONCENTRATIONS SAMPLED, AND THE COLLECTED TRITIUM WAS DETERMINED BY LIQUID SCINTILLATION COUNTING. THIS COLLECTOR CAN SELECTIVELY SAMPLE TRITIATED WATER VAPOR IN THE PRESENCE OF TRITIUM GAS, AND ALLOWS THE HEALTH PHYSICIST TO MAKE A BETTER ASSESSMENT OF TRITIATED WATER VAPOR CONCENTRATIONS IN AIR.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VIRGINIA 22151, \$3.00 COPY, \$0.65 MICROFICHE

COUNTER + CHAMBER, ION + TRITIUM + SAMPLING + AIR + ANALYTICAL TECHNIQUE + BUBBLE + GAS + FILTERS

028830

CHEMICAL SURVEILLANCE OF THE CARCLINAS-VIRGINIA TUBE REACTOR

WESTINGHOUSE ELECTRIC CORPORATION

CWNA-295 +. 149 PAGES, FIGURES, TABLES, REFERENCES, AUGUST 1967

GENERAL STUDY DEALING WITH DEGRADATION OF O₂ (USE O₂ INSTEAD OF H₂ GAS TO SUPPRESS RADIOLYSIS), FLUORIDE PICKUP IN MODERATOR FROM INSULATION, ADDITION OF ALKALI TO REDUCE CRUD AND SURFACE FILM BUILDUP, AND FAILURE OF PIPE IN THE SWEEP GAS SYSTEM (CAUSED BY CHLORIDES FROM RECOMBINER PALLADIUM PELLETS).

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151, \$3.00 COPY, \$0.65 MICROFICHE

REACTOR, HWR + FAILURE, PIPE + REACTOR, PRESSURE TUBE + REACTOR, PWR + FLUORINE + OPERATING EXPERIENCE SUMMARY + CRUD + COOLANT CHEMISTRY + REPORT, OPERATIONS ANALYSIS + STRESS CORROSION + CHLORIDE + RECOMBINERS

029733

WATER ACCUMULATION IN DRY REFLECTOR AFFECTS POWER RANGE INSTRUMENT CALIBRATION

TEXAS A AND M UNIVERSITY

4 PAGES, LETTER TO D.J. SKOVHOLT, DRL, OCTOBER 31, 1968, DOCKET 50-129

A CARBON REFLECTOR CANNED WITH ALUMINUM AND VENTED ABOVE POOL WATER LEVEL LEAKED WHERE THE VENT TUBE CRACKED WHERE THE SHAGLOK FITTING REDUCED THE ALUMINUM WALL THICKNESS. THE CRACK HAD DEVELOPED DURING REPEATED ATTEMPTS TO SEAT THE REFLECTOR THE DAY BEFORE. ON STARTUP TO 0.5 MW, FUEL TEMPERATURE DROPPED FROM 588 TO 560 F IN 2.5 HR, THEN AFTER 10 MIN AT 1 MW, THE REFLECTOR RELEASED A SPUIT OF WATER AND RADIOGAS FROM THE VENT LINE AT THE BRIDGE, AND INDICATED POWER LEVEL DROPPED TO 0.9 MW. THE 6 F FUEL TEMP. INCREASE INDICATED A REACTIVITY GAIN OF 40.12. ***NO EXPOSURES RESULTED. THE VENT WAS REMOVED AND HOLES DRILLED TO OPERATE THE REFLECTORS NET.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

GRAPHITE + REACTOR, RESEARCH + STRESS + FASTENER + INCIDENT, EQUIPMENT + TRIGA (RR) + REFLECTOR + DAMAGE + INSTRUMENT, ABNORMAL INDICATION + INSTRUMENT, POWER RANGE + FAILURE, TUBING

030392

DILLE L + DIRIAN G

CHEMICAL ASPECTS OF THE REACTIVITY COMPENSATION BY HOMOGENEOUS POISONING OF A NUCLEAR REACTOR

32 PAGES, PP. 187-218 OF LA CHIMICA DEL ACQUA NEI REATTORI NUCLEARI, ROME, COMITATO NAZIONALE ENERGIA NUCLEARE, 1966 (IN FRENCH)

THE PRINCIPLE OF COMPENSATION OF THE XENON EFFECT BY HOMOGENEOUS POISONING OF THE REACTOR IS DESCRIBED. THE FACTORS GOVERNING THE SELECTION OF THE SOLUBLE POISON ARE OUTLINED. CONCENTRATION OF SOLUBLE POISON IN THE REACTOR IS COMPARED WITH THE XENON POISONING BUILDUP. THE

030392 *CONTINUED*

FIXATION OF THE SOLUBLE POISONS OF B, CD, LI, AND GD IS SHOWN GRAPHICALLY. THE DATA LEAD TO THE CONCLUSION THAT THE COMPENSATION OF THE XENON EFFECT IN A LARGE POWER REACTOR IS POSSIBLE BY HOMOGENEOUS POISONING OF THE MODERATOR. THE MOST FAVORABLE SOLUBLE POISONS ARE B, CD, NATURAL GD, AND LI-6.

BORON + CADMIUM + CONTROL SYSTEM + FRANCE + REACTOR KINETICS + XENON + REACTOR CONTROL + XENON OSCILLATION + LITHIUM + GADOLINIUM

030407

AEC QUESTIONS ON OYSTER CREEK 2 REACTOR

U.S. ATOMIC ENERGY COMMISSION

7 PAGES, LETTER FROM AEC ORL TO JERSEY CENTRAL POWER AND LIGHT CO., OCT. 18, 1968, DOCKET 50-320

CONTAINS QUESTIONS TO BE ANSWERED TO ASSIST IN REVIEW OF LICENSE APPLICATION. EIGHT QUESTIONS ON EMERGENCY CORE-COOLING SYSTEM, 2 ON RADIOLYTIC HYDROGEN GENERATION, 1 ON EMERGENCY DIESEL, 2 ON CONTAINMENT, 2 ON FUEL HANDLING, 1 ON ISOLATION VALVES, 1 ON XENON OSCILLATIONS, 1 ON PRESS. VESSEL, 1 ON TECH. SPECS., 2 ON PRESSURE-VESSEL DESIGN, 4 ON R AND D, 6 ON WASTE DISPOSAL, AND 2 ON IODINE-REDUCTION CAPABILITY. (QUESTIONS ONLY - NO ANSWERS.)

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

NRC QUESTION + FISSION PRODUCT, IODINE + FUEL HANDLING + HYDROGEN + CONTAINMENT ISOLATION + PRESSURE VESSELS + REACTOR, PWR + WASTE DISPOSAL + CONTAINMENT INTEGRITY + CONSTRUCTION PERMIT PROCESS + XENON OSCILLATION + EMERGENCY COOLING + THREE MILE ISLAND 2 (PWR) + VALVES + GENERATOR, DIESEL

030505

REVISIONS TO PSAR

INDIANA AND MICHIGAN ELECTRIC COMPANY

30 PAGES, FIGURES, TABLES, APPENDMENT 11 TO COOK 1 AND 2 LICENSE APPLICATION, NOVEMBER 27, 1968, DOCKET 50-315/316

CONTAINS REVISION PAGES FOR PSAR, REFLECTING ADDITIONAL INFORMATION PRESENTED IN AMENDS. 8, 9, AND 10. REVISIONS TO 3 AEC QUESTIONS ARE INCLUDED (CONCERN CORROSION AND SURVEILLANCE PROGRAM FOR CONTAINMENT LINER, PERFORMANCE AND DESCRIPTION OF RECOMBINER, AND QUALITY-CONTROL PROGRAM).

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

NRC QUESTION + HYDROGEN + REACTOR, PWR + CORROSION + REPORT, PSAR + QUALITY ASSURANCE + CONTAINMENT LINER + SURVEILLANCE PROGRAM + COOK 1 (PWR) + COOK 2 (PWR) + RECOMBINERS

030509

R AND D, AND QUALITY CONTROL

INDIANA AND MICHIGAN ELECTRIC COMPANY

41 PAGES, FIGURES, TABLES, APPENDMENT 10 TO COOK 1 AND 2 LICENSE APPLICATION, NOVEMBER 14, 1968, DOCKETS 50-315/316

ADDITIONAL INFORMATION ON (1) QUALITY-CONTROL PROGRAM, (2) CADWELD SPLICING AND TESTING PROCEDURES, (3) SEISMIC-DESIGN CRITERIA, (4) RECOMBINER DESIGN AND ASSOCIATED R AND D, (5) PORTS FOR CONTAINMENT LINER INSPECTION, (6) CONTAINMENT-SPRAY R AND D, AND (7) FIXED INCORE DETECTORS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

CONTAINMENT SPRAY + DESIGN CRITERIA + HYDROGEN + INSTRUMENT, IN CORE + METAL WATER REACTION + REACTOR, PWR + PROCEDURES AND MANUALS + TESTING + WELDING + MODIFICATION + EXAMINATION + REPORT, PSAR + QUALITY ASSURANCE + EARTHQUAKE ENGINEERING + R AND D PROGRAM + CONTAINMENT LINER + COOK 1 (PWR) + COOK 2 (PWR) + RECOMBINERS

031019

BEAM PORT MODERATOR FAILURE

U.S. ATOMIC ENERGY COMMISSION

ROE 69-2 +, JANUARY 22, 1969

2.5 YEARS AFTER INSTALLATION, WELDS ON A GRAPHITE-FILLED BOX (LOCATED BETWEEN CORE AND BEAM PORT) FAILED FROM THERMAL CYCLING, RELEASING GRAPHITE POWDER. REACTOR SCRAMMED AT 1.2 TO 1.6 X FULL (1 MWTH) POWER. OPERATOR ATTRIBUTED THIS TO SERVO-CONTROL FAILURE (AS OCCURRED OFTEN) BUT COULD NOT RESTART DUE TO XENON. ***RELEASED GAS VOIDS INCREASED NEUTRON TRANSMISSION TO CHAMBERS, AS N-16 AND POOL SURFACE RADIATION DID NOT INCREASE. GRAPHITE IN CORE HAD NO COMPUTED REACTIVITY EFFECT. ***NEW BOX HAS INTERNAL STIFFNESS, USES SOLID GRAPHITE TO AVOID POOL CONTAMINATION, AND IS VENTED TO THE BEAM PORT.

FAILURE, EQUIPMENT + GRAPHITE + FAILURE, OPERATOR ERROR + CONTROLLER + REACTOR TRANSIENT + REACTOR, RESEARCH + SCRAM, REAL + THERMAL MECHANICAL EFFECT + WELDING + MODERATOR + REACTOR POWER + BEAM HOLE + REFLECTOR + PRESSURE, INTERNAL + FAILURE, ADMINISTRATIVE CONTROL + REACTIVITY EFFECT, ANOMALOUS

031933
 ARE QUESTIONS AND ADDITIONAL INFORMATION ON PROTECTIVE INSTRUMENTATION
 NEW YORK STATE ELECTRIC AND GAS COMPANY
 33 PAGES, AMENDMENT 4 TO BELL LICENSE APPLICATION, MARCH 3, 1969, DOCKET 50-319, TYPE--BWR, MFG--G.E., AE--UE+C

CONTAINS RESPONSES TO 4 QUESTIONS CONCERNING RADIOLYTIC DECOMPOSITION OF WATER. SUPPLEMENTARY
 INFORMATION ON SAFEGUARDS AND SAFETY SYSTEM INSTRUMENTATION IS IDENTICAL TO THAT FOR COOPER
 STATION, WITH EXCEPTION THAT RECIRC. LOOP SELECTION LOGIC IS DIFFERENT BECAUSE OF THE INCLUSION
 OF AN EQUALIZER LINE IN BELL. TOPICS - OPERATIONAL DESIGN BASIS FOR THE LOCAL POWER-RANGE-
 MONITORING SUBSYSTEM, LOSS OF STATION POWER, SPENT FUEL-Pool COOLING, ADDITION OF SEISMOGRAPH,
 DESIGN OF RADIOACTIVE BUILDING, TRANSMISSION OF SEISMIC SHEAR, STRUCTURAL PENETRATIONS, AND LINER
 WELDING.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (108 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00)

NRC QUESTION + REACTOR, BWR + INSTRUMENT, PROTECTIVE + BELL (BWR) + INSTRUMENTS, MISC.

032557
 SPITSYN VI + BALUKOVA VO + BAGRETSOV VF
 PHYSICOCHEMICAL CONDITIONS OF UNDERGROUND DISPOSAL OF RADIOACTIVE WASTES
 4 PAGES, 5 REFERENCES, SOVIET ATOMIC ENERGY 2(2), PAGES 160-63 (FEB. 1968)

THIS ARTICLE IS DEVOTED TO INVESTIGATIONS ASSOCIATED WITH THE SELECTION OF A WASTES BURIAL GROUND
 IN A ZONE OF CONCRETE WASTES FEATURING A HIGH SALT CONTENT, WHEN THE WASTES ARE INTRODUCED IN THE
 GEOLOGICAL MEDIUM BY MEANS OF INJECTION WELLS.

CHEMICAL REACTION + SITING, WASTE DISPOSAL + SOIL, RADIONUCLIDE MOVEMENT THROUGH + WASTE DISPOSAL, ECONOMICS +
 WASTE TREATMENT, LIQUID + WASTE DISPOSAL, LIQUID + WASTE MANAGEMENT + FILTRATION + PRECIPITATION + SORPTION +
 WASTE DISPOSAL, HYDRAULIC FRACTURING + GEOLOGY, GEOCHEMICAL + SEDIMENT

032794
 VOICING OF REFLECTOR ELEMENTS
 U.S. ATOMIC ENERGY COMMISSION
 DOE-69-7 +. 3 PAGES, MARCH 27, 1969

THE DAY BEFORE THE INCIDENT, A CANNED REFLECTOR CONTAINING GRAPHITE WAS RELOCATED, CRACKING THE
 VENT LINE AT A SWAGELON FITTING. WATER REPLACED THE AIR VOID. ON STARTUP TO 1 MW, FUEL
 TEMPERATURES AT 500 KW SLOWLY DECREASED DURING A POWER CALIBRATION WHILE OTHER INSTRUMENTS HELD
 STEADY. AFTER 14 MIN AT 1 MW, POWER LEVEL BEGAN FLUCTUATING BETWEEN 840 AND 900 KW. WATER
 SPURTED OUT OF THE VENT ONTO THE BRIDGE. ***WATER IN THE REFLECTOR HAD REDUCED INSTRUMENT
 SENSITIVITY, AND GRADUAL GAS ACCUMULATION SLOWLY DISPLACED WATER UNTIL LARGE BUBBLES CAUSED WATER
 SPURTING, AND OSCILLATIONS RESULTED FROM WATER-GAS ACTION IN REFLECTOR. REFLECTOR NOW OPERATED
 NET.

GRAPHITE + REACTOR, RESEARCH + INSTRUMENT, TEMPERATURE + REACTOR POWER + TRIGA (RR) + REFLECTOR + INSTRUMENT,
 ABNORMAL INDICATION + FUEL ELEMENTS

033905
 SMYTHE LF
 CHEMICAL MONITORING OF HEAVY WATER MODERATED RESEARCH REACTORS
 AUSTRALIAN ATOMIC ENERGY COMMISSION RESEARCH ESTABLISHMENT
 30 PAGES, 7 TABLES, 122 REFERENCES, PP. 163-191 OF PROGRESS IN NUCLEAR ENERGY, SERIES IX, 3(5,6,7), 1963

BOOK DISCUSSES TYPES OF REACTOR, COMMISSIONING TESTS (CLEANNESS, DRYING, LOADING HEAVY WATER,
 OTHER WATER CIRCUITS, MODERATOR ION EXCHANGE UNIT, GAS BLANKET PURIFICATION UNIT, RECOMBINER
 UNIT), ROUTINE CHEMICAL MONITORING OF REACTORS, AND SOME CHEMICAL PROBLEMS (CORROSION IN HEAVY
 WATER, DEGRADATION OF HEAVY WATER, RADIATION DAMAGE TO ION EXCHANGE RESINS, FUEL ELEMENT AND
 EXPERIMENTAL ASSEMBLY FAILURES, MICROBIOLOGY OF HEAVY WATER), AND STAFF REQUIREMENTS AND
 FACILITIES.

DEUTERIUM + REACTOR, BWR + PWR (TP) + RADIATION DAMAGE + REACTOR, RESEARCH + REACTOR, TEST + AUSTRALIA +
 PLUTO (TW) + DIDO (TF) + CORROSION + ION EXCHANGE + ARU (TR) + MIRA (RR) + RADIATION EFFECT

033490
 AGT AA
 FUEL CONDITIONS AT THE NOVODVORLENZ NUCLEAR POWER STATION.
 4 PAGES, ELEKT. STA. NO. 39, PAGES 41-4 (AUGUST 1968) (IN RUSSIAN)

THE FIRST UNIT IS A 210-MW PAR AND THREE CONDENSING AX-70 TURBINES. MOISTURE SEPARATORS ARE
 MOUNTED BEHIND THE HP BLADES AND THE L.P. BLADES ARE BUILT UP WITH STELLITE TO PREVENT EDGE
 EROSION. REMOVAL OF O₂ FROM THE MAKE-UP WATER IN THE FIRST AND SECOND CIRCUITS AND SUPPRESSION
 OF WATER RADIOLYSIS BY H₂ FORMED BY THE PARTIAL DECOMPOSITION OF NH₃ OR HYDRAZINE HYDRATE MAKES
 FOR RELIABLE OPERATION.

HYDROGEN + REACTOR, PWR + MIST + COOLANT CHEMISTRY + USSR + TURBINE

033521
ACKS REVIEW OF OPERATING LICENSE APPLICATION FOR NINE MILE POINT
U.S. AEC. DIVISION OF REACTOR LICENSING
3 PAGES, LETTER - DRL TO NIAGARA MOHAWK POWER CORP. - APRIL 23, 1969, DOCKET 50-220, TYPE--BWR, MFG--G.E., AE--
NIAGARA MOHAWK

FAVORABLE OPINION FOR OPERATION UP TO 1538 MW PROVIDED THAT DUE REGARD IS GIVEN TO: (1) POSSIBLE INTERGRANULAR CORROSION OF VESSEL DUE TO USE OF FURNACE-SENSITIZED 304 STAINLESS STEEL, (2) CORROSION SURVEILLANCE PROGRAM, (3) PERIODIC INSPECTION OF PRIMARY SYSTEM, (4) METHODS TO DETECT LEAKS OF PRIMARY SYSTEM, (5) EFFECTS OF RADIOLYSIS AND HYDROGEN FROM METAL-WATER REACTIONS, (6) INSTRUMENTING AND MONITORING FOR VIBRATION AND LOOSE COMPONENTS IN VESSEL, (7) EARLY DETECTION OF GROSS FUEL FAILURE.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + METAL WATER REACTION + NINE MILE POINT (BWR) + PRESSURE VESSELS + SAFETY REVIEW + ACRS + CORROSION + INSTRUMENT, DETECTION FAILED FUEL ELEMENT + MONITOR + VIBRATION + OPERATING LICENSE PROCESS + MAIN COOLING SYSTEM + SURVEILLANCE PROGRAM + LEAK RATE + INDICATORS

033763
SUPPLEMENT 2 TO PSAR - SITE STUDIES AND RESPONSES TO AEC QUESTIONS
NIAGARA MOHAWK CORPORATION
50300-2 +. 45 PAGES, FIGURES, TABLES, AMENDMENT 2 TO EASTON LICENSE APPLICATION, MARCH 19, 1968, DOCKET 50-300, TYPE--BWR, MFG--G.E., AE--STCNE + WEBSTER

GIVES RESULTS OF GEOLOGICAL FIELD EXPLORATIONS AND LABORATORY TESTS TO PROVIDE BASIS FOR GEOLOGIC, HYDROLOGIC, SEISMOLOGIC, AND FOUNDATION-ENGINEERING STUDIES. RESPONSES TO AEC QUESTIONS GIVEN ON SITE, RADIOLYTIC DECOMPOSITION, SEISMIC DESIGN CRITERIA, INTERCHANNEL FLOW INSTABILITY, AND STRUCTURAL DESIGN.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

NRC QUESTION + REACTOR, BWR + DESIGN CRITERIA + SOIL PROPERTY + GEOLOGY, STRATIGRAPHY + FLOW DISTRIBUTION + GEOLOGY, GEOPHYSICAL + REPORT, PSAR + EARTHQUAKE ENGINEERING + FOUNDATION ENGINEERING + TECTONICS + EASTON (BWR) + FUEL ELEMENTS

034371
REACTION OF GASEOUS IMPURITIES IN A HIGH TEMPERATURE GAS-COOLED REACTOR
BNWL-SA-1820 +. 13 PAGES, APRIL 1968

THE GCP COMPUTER CODE HAS BEEN UPDATED TO STUDY THE GAS-GRAPHITE REACTIONS IN AN HTGR. THE EFFECT OF RADIOLYTIC AS WELL AS THERMAL REACTIONS ON THE STEADY STATE GAS COMPOSITIONS OF AN OPERATING HTGR IS DETERMINED. THE CODE IS ALSO USEFUL IN CALCULATING THE POSSIBLE CONSEQUENCES OF VARIOUS REACTOR ACCIDENTS.

CHEMICAL REACTION + COMPUTER PROGRAM + GRAPHITE + STEAM + THERMAL PROPERTY + WATER VAPOR + REACTOR, HTGR

034372
WOODLEY, R.E.
THE RADIOLYTIC REACTION OF GRAPHITE WITH WATER VAPOR
BATTELLE-NORTHWEST, RICHLAND, WASHINGTON
BNWL-SA-1804 +. 13 PAGES, 6 FIGURES, 3 REFERENCES, APRIL 22, 1968

ENERGY ABSORBED BY HELIUM IN A REACTOR ENVIRONMENT CAN BE READILY TRANSFERRED TO A REACTIVE CONTAMINANT SUCH AS WATER VAPOR WHICH IN ITS ACTIVATED STATE MAY SUBSEQUENTLY REACT WITH GRAPHITE COMPONENTS EVEN AT LOW TEMPERATURE LEADING TO AN INTOLERABLE RATE OF GRAPHITE LOSS.

AVAILABILITY - R.E. WOODLEY, BATTELLE MEMORIAL INSTITUTE, PACIFIC NORTHWEST LABORATORY, RICHLAND, WASHINGTON 99352

CHEMICAL REACTION + GRAPHITE + STEAM + CORROSION + CHEMICAL KINETICS + WATER VAPOR

034468
CHENOUDARD J
BEHAVIOR OF HEAVY WATER IN PILES OF THE C.E.A.
COMMISSARIAT A L'ENERGIE ATOMIQUE
6 PAGES, 2 FIGURES, 3 TABLES, 6 REFERENCES, PROCEEDINGS OF THE FIRST CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY (1955)

THE CHATILLON PILE CONTAINS 1680 KG OF NATURAL URANIUM AND 4.5 TONS OF HEAVY WATER. THE SACLAY PILE CONTAINS 3 TONS OF NATURAL URANIUM AND 7.2 TONS OF HEAVY WATER. THE MAXIMUM POWERS AND FLUXES OBTAINED ARE, RESPECTIVELY, 150 KW AND 2000 KW, 10^{12} TH AND 10^{12} NEUTRON FLUX. IN THESE TWO PILES WE HAVE CARRIED OUT (A) INVESTIGATIONS ON THE ISOTOPIC COMPOSITION OF HEAVY WATER, (B) INVESTIGATIONS OF THE GASES EVOLVED BY THE DECOMPOSITION OF THE IRRADIATED HEAVY WATER, AND OF THEIR RECOMBINATION, (C) PERIODICAL ANALYSES FOR IMPURITIES.

034446 *CONTINUED*
 DEUFFELION + FRANCE + AGNITER, LIQUID + COOLANT CHEMISTRY + REACTOR, LWR

034457
 JAMES LG + JOHNSON, P + SARTLETT, C + MATCH, LP
 DISPOSAL OF SOLID WASTES GENERATED IN FLUIDIZED-BED FLUORIDE VOLATILITY FUEL REPROCESSING
 BETHLEHEM NATIONAL LABORATORY, LEHIGH, NEW YORK
 NT-50139 (1-511) + 9 PAGES, 1 FIGURE, 5 TABLES, 3 REFERENCES, OCTOBER 1968

SEVERAL METHODS WERE STUDIED FOR TREATMENT OF AL2O3 BED WASTE. OF THESE, DISPERSION OF THE
 RESIDUAL BED MATERIAL IN GLASS MATRICES WERE CONSIDERED THE MOST PROMISING. THIS PROCESS OF
 FIXATION IN A STABLE SOLID MASS PROVIDED THE ESSENTIAL PROPERTY OF IMMOBILITY FOR THE INDIVIDUAL
 PARTICLES AND THEIR ASSOCIATED FISSION PRODUCTS. ALSO, THE END PRODUCT HAD A RELATIVELY HIGH
 THERMAL CONDUCTIVITY, WHICH WOULD REDUCE THE PROBLEM OF RADIOLYTIC HEAT DISSIPATION IN FINAL
 STORAGE. OF THE SEVERAL VARIETIES OF GLASS INVESTIGATED, THOSE OF THE SODA-LIME SILICATE
 COMPOSITIONS APPEAR MOST SUITABLE.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA., 22151, \$3.00
 COPY, \$0.05 MICROFILME

ALUMINUM + WASTE DISPOSAL + WASTE DISPOSAL, SOLID + GLASS + FISSION PRODUCT RETENTION + FLUIDIZED BED +
 VOLATILITY PROCESS + FUEL REPROCESSING + FLUORIDE

034461
 HYDROGEN CONTROL EQUIPMENT AT DRESDEN 2 AND 3
 GENERAL ELECTRIC EDISON COMPANY
 Docket-50244-114 + 15 PAGES, LETTER - GENERAL ELECTRIC EDISON COMPANY TO DIVISION OF REACTOR LICENSING (AEC) -
 FEBRUARY 22, 1972, Docket 50-245, TYPE--BWR, MFG--AEST, AE--SGT + LUNNY

PROPOSES A SOLUTION TO CONTROLLING THE COMBUSTIBLE GASES WITHIN THE CONTAINMENT FOLLOWING A LOSS-
 OF-COOLANT ACCIDENT. METHOD CONSISTS OF SIMPLY ADDING NITROGEN TO DILUTE THE OXYGEN
 CONCENTRATION BELOW THE FLAMMABILITY LIMIT. THE CONTAINMENT PRESSURE WILL INCREASE DUE TO THE
 NITROGEN ADDITION BUT WILL BE LIMITED OR CONTROLLED BY LEAKAGE.

AVAILABILITY - AEC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00

REACTOR, BWR + HYDROGEN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + DRESDEN 3 (BWR) + DRESDEN 2 (BWR)
 + CONTAINMENT ATMOSPHERE, INERT

034466
 INDIAN POINT 3 SAFETY EVALUATION
 AEC DIVISION OF REACTOR LICENSING
 20 PAGES, AEC SAFETY EVALUATION - INDIAN POINT 3 CONSTRUCTION PERMIT - FEBRUARY 20, 1969, Docket 50-286, TYPE--
 PAR, MFG--WEST, AE--UNITED ENVR.

CONCISE DESCRIPTION AND EVALUATION OF THE SITE, PRINCIPAL PLANT FEATURES, IMPORTANT SAFETY
 CONSIDERATIONS, ACCIDENT ANALYSIS, R-AND-D PROGRAM, AND QUALITY-ASSURANCE PROGRAM. EFFECT OF
 TECHNOLOGIES ON SPENT-FUEL STORAGE PIT IS BEING EVALUATED. A AND D ON CLAD DEFORMATION AND EFFECT
 ON ECCS UNDER SIMULATED LOSS-OF-COOLANT CONDITIONS IS BEING CONDUCTED. ADDITIONAL RESEARCH WILL
 BE CONDUCTED ON REMOVAL OF ORGANIC IODIDES BY IMPREGATED CHARCOAL AT HIGH RELATIVE HUMIDITY. A
 FLAME RECOMBINER WILL BE USED TO DISPOSE OF RADIOLYTIC HYDROGEN.

AVAILABILITY - AEC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00

FILTER EFFICIENCY + REACTOR, PWR + FUEL STORAGE + CONSTRUCTION PERMIT PROCESS + CHARCOAL + ORGANIC IODIDE +
 REGULATION, AEC + FAILURE, CLADDING + SAFETY PRINCIPLES AND PHILOSOPHY + SYSTEM DESCRIPTION + DESTRUCTIVE
 TEST + SAFETY EVALUATION + A AND D PROGRAM + INDIAN POINT 3 (PWR) + RECOMBINERS

035543
 COMPLIANCE WITH ACRS CONCERNS
 BECHTEL CORP.
 20 PAGES, AMENDMENT 7 TO HATCH LICENSE APPLICATION, JUNE 24, 1969, Docket 50-231, TYPE--BWR, MFG--G.E., AE--SSI

DESCRIBES PLANS FOR COMPLIANCE WITH THE RECOMMENDATIONS OF THE ACRS CONTAINED IN REPORT DATED MAY
 15, 1969. THE SPECIFIC ACRS CONCERNS ARE PROBLEMS UNIQUE TO BWRs. IN-SERVICE INSPECTION OF THE
 PRIMARY SYSTEM, INCREASING OF A ROD BLOCK MONITOR SYSTEM, AN AUTO RELIEF INTERLOCK, A FLOW
 REFERENCE SCRAM, SCRAM RELIABILITY, SCRAM-FAILURE TRANSIENT STUDY, DESIGN OF ENGINEERED SAFETY
 FEATURES, ECCS POSTACCIDENT INTEGRITY, DESIGN OF ECCS SUCTION PIPING SEISMIC DESIGN, AND EFFECTS
 OF RADIOLYSIS OF WATER.

AVAILABILITY - AEC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 109 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00

REACTOR, PWR + DESIGN CRITERIA + ACRS + INSTRUMENT, CONTROL + SAFETY PRINCIPLES AND PHILOSOPHY + REPORT, PSAR
 + EMERGENCY SHUTTING + MAIN CIRCUITING SYSTEM + EARTHQUAKE ENGINEERING + ENGINEERED SAFETY FEATURE + HATCH 1
 (HART) + PIPES AND PIPE FITTINGS

036126
PROPOSED AMENDMENT 7 - INCREASE CONTINUOUS POWER TO 5 WATTS
UNIVERSITY OF UTAH
3 PAGES, LETTER TO D.J. SKOVHOLT, AEC-DRL, FEBRUARY 28, 1969, DOCKET 50-72

(LETTER OF 2/28/69). OTHER AGNS (AERONAUT GENERAL AND NAVY POSTGRADUATE SCHOOL) HAVE OPERATED AT 20 W CONTINUOUSLY. *** CENTRAL AND SHIELDING MODIFICATIONS REQUIRED ARE - (1) DEACTIVATE CHANNEL 1 ABOVE 0.1 WATT, (2) INCREASE CHANNEL 2 SCRAM POINT, (3) CHANGE RANGE SETTINGS (NOT SCRAM CIRCUITS) ON CHANNEL 3, (4) ADDITIONAL SHIELDING OF 24-IN. SOLID-BLOCK WALLS AND 16-IN. SOLID-CONCRETE TOP. NO PCLL WATER DECOMPOSITION IS EXPECTED AS CORE FLUX IS NOW MUCH HIGHER, WITH NO DECOMPOSITION.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 M STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, RESEARCH + REACTOR SAFETY SYSTEM + REACTOR, TRAINING + INSTRUMENT, CONTROL + TECHNICAL SPECIFICATIONS + SHIELDING + AGN (TAG) + POWER UPGRATING

036839
CRAWLEY DT
PRESSURE BUILD-UP OF PLUTONIUM NITRATE SOLUTIONS IN SEALED SHIPPING CONTAINERS
ATLANTIC RICHFIELD HANFORD COMPANY, RICHLAND, WASHINGTON
AKH-1093 +. 23 PAGES, 7 FIGURES, JULY 16, 1969

MEASURED PRESSURE BUILD-UP OF HIGH-CONCENTRATION PLUTONIUM NITRATE SOLUTIONS IN VENTED POLYETHYLENE BOTTLES SEALED IN PRESSURE VESSELS SIMILAR TO SHIPPING CONTAINERS. TESTS INDICATED THAT SIZABLE PRESSURES CAN BE EXPECTED IF PLUTONIUM-VI IS PRESENT WHEN SHIPPING CONTAINERS ARE SEALED.

AVAILABILITY - D.T. CRAWLEY, ATLANTIC RICHFIELD HANFORD COMPANY, RICHLAND, WASHINGTON

CONTAINMENT, PRESSURE VENTING + PLUTONIUM + PRESSURE VESSELS + SHIPPING CONTAINER + TESTING + LIQUID + NITRATE

037383
LETTER FROM NIAGARA MOHAWK POWER CORPORATION TO DRL
NIAGARA MOHAWK POWER CORPORATION
2 PAGES, LETTER - NIAGARA MOHAWK POWER CORPORATION TO DRL - SEPTEMBER 24, 1969, DOCKET 50-220, TYPE--BWR, MFG--G.E., AE--NIAGARA MOHAWK

AFFIRMS THAT THE RECOMMENDATIONS OF ACPS FOR NINE MILE POINT ACTION BEFORE POWER OPERATION ARE BEING CARRIED OUT. CORROSION TEST SPECIMENS HAVE BEEN INSTALLED IN REACTOR. PLAN FOR PERIODIC INSPECTION OF MAIN STEAM LINES IS DESCRIBED IN TECH. SPECS. HYDROGEN HAZARD IS BEING STUDIED AND RECOMMENDATIONS AWAIT DATA FROM CRNL TEST LOOP AND AT KRB REACTOR. VIBRATION MONITORING INSTRUMENTATION IS BEING STUDIED. STEAM LINE RADIOACTIVITY MONITORS ARE BEING IMPROVED.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

REACTOR, BWR + HYDROGEN + NINE MILE POINT (BWR) + STEAM + ACPS + EXAMINATION + MONITORING SYSTEM, RADIATION + VIBRATION + R AND D PROGRAM + SURVEILLANCE PROGRAM + PIPES AND PIPE FITTINGS + INSTRUMENTS, MISC.

037714
RESPONSES TO AEC QUESTIONS AND REVISIONS TO PSAR
JERSEY CENTRAL POWER AND LIGHT
AMENDMENT 5 TO OYSTER CREEK 2 LICENSE APPLICATION, DEC. 7, 1968, DOCKET 50-320, TYPE--PWR, MFG--B&W, AE--BURNS AND ROE

CONTAINS REVISIONS TO PSAR AND RESPONSES TO AEC QUESTIONS SUBMITTED BY DRL ON OCTOBER 18, 1968. RESPONSES TO AEC QUESTIONS CONCERN THE EMERGENCY CORE-COOLING SYSTEM, CONTAINMENT SPRAY SYSTEM, RADIOLYTIC HYDROGEN, CONTAINMENT FUEL HANDLING, ISOLATION VALVES, PRESSURE VESSEL, AND THE R AND D PROGRAM.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

NRC QUESTION + CONTAINMENT SPRAY + FUEL HANDLING + HYDROGEN + CONTAINMENT ISOLATION + PRESSURE VESSELS + REACTOR, PWR + REPORT, PSAR + R AND D PROGRAM + THREE MILE ISLAND 2 (PWR) + EMERGENCY COOLING SYSTEM

037986
HOOVER DA + INGALLS WP
STUDY OF POLYETHYLENE BOTTLES AS CONTAINERS FOR PLUTONIUM NITRATE
ATLANTIC RICHFIELD HANFORD CO.
CONF-681001 +. 21 PAGES, 10 FIGURES, 5 REFERENCES, OCTOBER 14, 1968

HIGH DENSITY POLYETHYLENE BOTTLES HAVE BEEN USED FOR THE PAST TWO YEARS AS PRIMARY CONTAINERS FOR PLUTONIUM NITRATE SOLUTIONS UNDER BOTH TRANSPORT AND STORAGE CONDITIONS. DURING THE FIRST SIX MONTHS OF USE, SOME CONCERN WAS EVIDENCED BECAUSE OF LEAKS AT THE BOTTLE SEAL, MALFUNCTION OF THE BOTTLE VENTS, AND STRESS CRACKS IN THE BOTTLES. THE RESULTS OF AN R AND D PROGRAM CONDUCTED TO

037986 *CONTINUED*
CORRECT THESE PROBLEM AREAS ARE REPORTED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

PLUTONIUM + SHIPPING CONTAINER + HANFORD SITE + SAFETY ANALYSIS

039958
TURNER SE
RADIOLYTIC DECOMPOSITION OF WATER IN WATER-MODERATED REACTORS UNDER ACCIDENT CONDITIONS
SOUTHERN NUCLEAR ENGINEERING, INC.
14 PAGES, 5 FIGURES, 6 TABLES, 16 REFERENCES, REACTOR AND FUEL-PROCESSING TECHNOLOGY, 12(1), PG 68-79 (1969)

THE PURPOSE OF THIS REVIEW IS TO PROVIDE A PRACTICAL EVALUATION OF THE POTENTIAL CONCENTRATIONS OF RADIOLYTIC GASES (HYDROGEN AND OXYGEN) WHICH MAY ACCUMULATE IN THE CONTAINMENT ATMOSPHERE FOLLOWING A LOSS-OF-COOLANT ACCIDENT. RESULTS OF THE EVALUATION INDICATE A REASONABLE PROBABILITY THAT HYDROGEN AND OXYGEN WILL ACCUMULATE IN AMOUNTS EXCEEDING THE MINIMUM COMBUSTIBLE CONCENTRATION (COMBUSTIBLE OR FLAMMABLE LIMIT).

BIBLIOGRAPHY + EXPLOSION + HYDROGEN + WATER + CHEMICAL KINETICS + RADIATION EFFECT

039592
VERMONT YANKEE CONTAINMENT AND COMBUSTIBLE GASES
VERMONT YANKEE NUCLEAR POWER CORPORATION
DOCKET-50271-72 +. 13 PAGES, LETTER - VERMONT YANKEE NUCLEAR POWER CORPORATION TO DIVISION OF REACTOR LICENSING (AEC) - FEBRUARY 15, 1972, DOCKET 50-271, TYPE--BWR, MFG--G.E., AE--EBASCO

DISCUSSES THE CONTROL OF COMBUSTIBLE GASES WHICH COULD BE PRESENT IN THE CONTAINMENT AFTER A HYPOTHETICAL LOSS-OF-COOLANT ACCIDENT. CONTAINMENT VENTING AND INERTING ARE THE METHODS DISCUSSED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + HYDROGEN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + VENTILATION SYSTEM + VERMONT YANKEE (BWR) + CONTAINMENT ATMOSPHERE, INERT

040170
FLETCHER WD
EFFECTS OF COOLANT CHEMISTRY ON CORROSION AND CORROSION PRODUCTS
WESTINGHOUSE ELECTRIC CORPORATION, PITTSBURGH, PA.
1 PAGE, AEC TRANSACTIONS, 12(1), PAGE 70 (JUNE 1969)

AN IMPORTANT STUDY IN WATER-COOLED REACTOR TECHNOLOGY IS THE LONG-TERM EFFECTS OF COOLANT CHEMISTRY ON THE PROCESS AND PRODUCTS OF CORROSION. CORROSION OF REACTOR SYSTEM MATERIALS BY THE HIGH-TEMPERATURE, AQUEOUS ENVIRONMENT IS UNAVOIDABLE AND THEREFORE MUST BE RECONCILED THROUGH PROPER SYSTEM DESIGN AND CONTROL OF THE WATER CHEMISTRY. THE SEVERITY OF THE CORROSION IS STRONGLY DEPENDENT ON THE CONSTRUCTION MATERIALS AND ONE'S ABILITY TO CONTROL CHEMICAL CONDITIONING, IMPURITIES, AND CHEMICAL TREATMENT.

AVAILABILITY - W. D. FLETCHER, WESTINGHOUSE ELECTRIC CORPORATION, ATOMIC POWER DIVISION, P.O. BOX 355, PITTSBURGH, PENNSYLVANIA 15230

BORON + WATER + ACTIVATION PRODUCT + STEEL, STAINLESS + THERMAL CONSIDERATION + CORROSION + COOLANT CHEMISTRY + ZIRCALOY + SURFACE FILM DEPOSIT + INCONEL

040832
BEMENT AL + DIAU GJ + EVANS EA + NIGHTINGALE RE
QUARTERLY PROGRESS REPORT, JAN., FEB., MAR. 1969, REACTOR FUELS AND MATERIALS DEVELOPMENT PROGRAMS FOR FUELS AND MATERIALS BRANCH OF USAEC, DIVISION OF REACTOR DEVELOPMENT AND TECHNOLOGY
BATTELLE-NORTHWEST, RICHLAND, WASHINGTON
BNWL-1058 +. 260 PAGES, MAY 1969

(PROGRESS REPORT.) ELECTRON MICROSCOPY STUDIES OF GAS-GRAPHITE REACTIONS - INVESTIGATION OF MICROSTRUCTURAL CHANGES PRODUCED IN NUCLEAR GRAPHITES BY OXIDATION REACTIONS HAS CONTINUED WITH A STUDY OF THERMAL REACTIONS WITH WATER VAPOR CONTAINING SMALL AMOUNTS OF OXYGEN. INERT-GAS-SENSITIZED RADIOLYSIS STUDIES - STUDIES HAVE BEEN CONDUCTED TO DETERMINE THE RADIOLYTIC RATE OF THE REACTION OF CO₂ AND H₂ AT LOW CONCENTRATIONS. G(CO) AND G(CH₄) VALUES HAVE BEEN DETERMINED. COMPUTER CALCULATIONS OF GRAPHITE OXIDATION IN HTGR - FOUR DIFFERENT WATER-INJECTION TESTS CONDUCTED AT THE DRAGON REACTOR HAVE BEEN ANALYZED ON THE COMPUTER, ASSUMING ONLY THERMALLY-INDUCED REACTIONS OCCUR.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFILM

CHEMICAL REACTION + COMPUTER PROGRAM + GRAPHITE + HYDROGEN + OXIDATION + OXYGEN + CARBON DIOXIDE + THERMAL CONSIDERATION + REACTOR, HTGR

041021
 RESPONSE TO QUESTION 12.D - HYDREGEN GENERATION
 CAROLINA POWER AND LIGHT
 DOCKET 50-324-11 +. 2 PAGES, PG 12-1 AND -2 OF BRUNSWICK 1 AND 2 PSAR SUPPLEMENT 6, JUNE 26, 1969, DOCKETS 50-324/325, TYPE--BWR, MFG--G.E., AE--LE+C

STUDIES ARE CONTINUING ON THE POSSIBLE EFFECTS OF RADIOLYSIS OF WATER IN THE UNLIKELY EVENT OF A LOSS-OF-COOLANT ACCIDENT. THE COMMITTEE BELIEVES THE APPLICANT SHOULD EVALUATE ALL PROBLEMS WHICH MAY ARISE FROM HYDROGEN GENERATION, INCLUDING VARIOUS LEVELS OF ZIRCALOY-WATER REACTIONS WHICH COULD OCCUR IF THE EFFECTIVENESS OF THE EMERGENCY CORE COOLING SYSTEM WERE SIGNIFICANTLY LESS THAN THAT PREDICTED. THE MATTER SHOULD BE RESOLVED BETWEEN THE APPLICANT AND THE AEC REGULATORY STAFF. *** ANSWER ON PG 12-1 AND -2.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
 CDPV, \$0.65 MICROFILME

NRC QUESTION + REACTOR, BWR + HYDROGEN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + WATER + ACRS + ZIRCALOY + REPORT, PSAR + BRUNSWICK 1 (BWR) + BRUNSWICK 2 (BWR)

045175
 INCREASE IN ARGON-41 CONCENTRATION IN AIR REQUESTED FOR TRIGA FACILITY
 U.S. ATOMIC ENERGY COMMISSION
 2 PAGES, LETTER - U.S. ATOMIC ENERGY COMMISSION TO U.S. DEPT. OF THE INTERIOR, GEOLOGICAL SURVEY - MAY 28, 1970, DOCKET 50-274

REQUEST GRANTED TO PERMIT RELEASE OF AR-41 IN CONCENTRATIONS UP TO 4.0×10^{-6} TH MICROCURIE/ML AVERAGED OVER A YEAR AS MEASURED AT THE STACK.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

AIRBORNE RELEASE + CONCENTRATION, MAXIMUM + REACTOR, RESEARCH + ARGON + STACK + WASTE DISPOSAL, GAS + TECHNICAL SPECIFICATIONS + TRIGA (RRI) + RADIOACTIVITY RELEASE + DEPARTMENT OF THE INTERIOR

046736
 VERMONT YANKEE CONTAINMENT INERTING (AMENDMENT 12 TO DOCKET 50-271)
 VERMONT YANKEE NUCLEAR POWER CORPORATION
 31 PAGES, LETTER - VERMONT YANKEE NUCLEAR POWER CORPORATION TO U.S. ATOMIC ENERGY COMMISSION - MAY 22, 1970, DOCKET 50-271, TYPE--BWR, MFG--G.E., AE--EBASCO

THE FOREGOING DISCUSSION CLEARLY INDICATES THAT INERTING OF THE VERMONT YANKEE CONTAINMENT IS NOT REQUIRED BECAUSE ONLY NEGLIGIBLE QUANTITIES OF HYDROGEN WOULD BE EVOLVED AS A RESULT OF THE ZIRCONIUM-WATER REACTION ASSOCIATED WITH THE WORSE CONCEIVABLE LOSS-OF-COOLANT ACCIDENT. ALSO, AS INERT ATMOSPHERE IS NO SOLUTION TO THE PROBLEM OF HYDROGEN EVOLVED GRADUALLY DUE TO RADIOLYSIS OF COOLING WATER, BECAUSE OXYGEN AS WELL AS HYDROGEN IS PRODUCED BY RADIOLYSIS. MOREOVER, THERE ARE SERIOUS OPERATIONAL SAFETY PROBLEMS ASSOCIATED WITH AN INERT ATMOSPHERE. THEREFORE, THE VERMONT YANKEE CONTAINMENT WILL NOT BE INERTED UNLESS THIS ACTION IS REQUIRED OFFICIALLY BY THE USAEC.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

NRC QUESTION + REACTOR, BWR + EXPLOSION + FIRE + HYDROGEN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + WATER + ZIRCONIUM + VERMONT YANKEE (BWR) + CONTAINMENT ATMOSPHERE, INERT

047278
 FLETCHER, W.D. + BELL, H.J. + MARCHESI, R.T. + GALLAGHER, J.L.
 POST LOCA HYDROGEN GENERATION IN PWR CONTAINMENTS
 WESTINGHOUSE ELECTRIC CORPORATION, PITTSBURGH, PENNSYLVANIA
 2 PAGES, 1 FIGURE, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, 13(1), PP. 203-204 (JULY 1970)

THE PRODUCTION OF HYDROGEN DUE TO THE RADIOLYSIS OF REACTOR CONTAINMENT SPRAY SOLUTIONS HAS BEEN INVESTIGATED. EXPERIMENTAL RESULTS INDICATE A CONSERVATIVE RATE OF HYDROGEN PRODUCTION DUE TO SUMP SOLUTION RADIOLYSIS OF 0.30 MOLECULES/100 EV OF ENERGY ABSORBED BY THE SOLUTION. EXPERIMENTAL STUDIES OF CORE SOLUTION RADIOLYSIS HAVE SHOWN THE EXTENT OF HYDROGEN PRODUCTION FROM THIS SOURCE IS LIMITED BY THE ATTAINMENT OF A STEADY-STATE HYDROGEN CONCENTRATION IN THE SOLUTION PASSING THROUGH THE CORE. BASED ON EXPERIMENTAL DATA, AN ANALYTIC MODEL WAS DERIVED WHICH CONSERVATIVELY APPROXIMATES THE HYDROGEN PRODUCTION PROCESS AS IT WOULD OCCUR IN THE NUCLEAR PLANT SHOULD A HYPOTHETICAL DESIGN BASIS ACCIDENT OCCUR. THE SIGNIFICANCE OF OTHER SOURCES OF HYDROGEN IN THE POSTACCIDENT ENVIRONMENT ALSO IS DISCUSSED.

AVAILABILITY - W.D. FLETCHER, WESTINGHOUSE ELECTRIC CORPORATION, NES-PWR SYSTEMS DIVISION, P.O. BOX 355, PITTSBURGH, PENNSYLVANIA 15230

CONTAINMENT SPRAY + EXPLOSION + HYDROGEN + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + ANALYTICAL MODEL + ACCIDENT, DESIGN BASIS

055277

055277 *CONTINUED*
HYDROGEN CONTROL FOLLOWING LOCA AT PEACH BOTTOM 2 AND 3
PHILADELPHIA ELECTRIC COMPANY, PENNSYLVANIA
DUCKET-50277-43 +. 11 PAGES, LETTER - PHILADELPHIA ELECTRIC COMPANY TO DIVISION OF REACTOR LICENSING (AEC) -
MARCH 16, 1972, DUCKET 50-277, TYPE--BWR, WFO--G.E., AE--BECHTEL

STATES THAT NITROGEN MAKEUP WILL BE USED TO MAINTAIN OXYGEN CONCENTRATIONS IN THE CONTAINMENT
HELON 54 AFTER 4 LOCA. BACKFIT OF ADDITIONAL HYDROGEN CONTROL CAPABILITY SHOULD NOT BE NECESSARY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

HYDROGEN + ACCIDENT, LOSS OF COOLANT + CONTAINMENT ATMOSPHERE, INERT + PEACH BOTTOM 2 (BWR) + PEACH BOTTOM 3
(EAK)

059361
FAILURES OF IRRADIATION CONTAINERS
U.S. ATOMIC ENERGY COMMISSION, DIVISION OF REACTOR LICENSING
RCF-70-13 +. 3 PAGES, AUGUST 11, 1970

PRESSURE BUILDUP CAUSED THE RUPTURE OF SEVERAL POLYETHYLENE CONTAINERS IN WHICH POWDERED
GEOLOGICAL SAMPLES HAD BEEN IRRADIATED FOR EIGHT HOURS AND LEFT TO COOL FOR 15 HOURS AT A
RESEARCH REACTOR FACILITY. THE PRESSURE BUILDUP RESULTED FROM HYDROGEN PRODUCED BY THE
RADIOLYTIC DECOMPOSITION OF POLYETHYLENE. THE RUPTURE RESULTED IN THE RELEASE OF BETWEEN 3 AND 4
MILLICURIES OF INSOLUBLE SODIUM-24 TO THE IMMEDIATE AREA, MINOR RADIATION EXPOSURE, INGESTION
AND SPREAD OF RADIOACTIVE CONTAMINATION OCCURRED.

AVAILABILITY - DUDLEY THOMPSON, USAEC, DIVISION OF REACTOR LICENSING, WASHINGTON, D.C. 20545

ACCIDENT, RADIOISOTOPE + IRRADIATION TESTING + PLASTICS

060355
DEACKOFF LP + FEINSTEIN JG + FANASEE RE
POST-LOCA CONTAINMENT HYDROGEN GENERATION, METHODS FOR CALCULATING AND CONTROLLING HYDROGEN ACCUMULATION
STONE AND WEBSTER ENGINEERING CORPORATION
2 PAGES, 3 FIGURES, 2 REFERENCES, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, 13(SUPPL.), PP. 10-11
(SEPTEMBER 3, 1970)

DISCUSSES A COMPUTER PROGRAM, COMHYU, WHICH CALCULATES THE GENERATION OF HYDROGEN GAS IN
CONTAINMENT FOLLOWING THE CEA. THE USE OF A CATALYTIC RECOMBINER IS REVIEWED. BY DIVERTING A
SMALL PORTION OF THE FLOW FROM A CONTAINMENT SPRAY PUMP THROUGH AN EJECTOR, MOTIVE FORCE IS
PROVIDED TO CIRCULATE A PORTION OF THE CONTAINMENT ATMOSPHERE THROUGH A SUITABLE CLEANUP AND
HEATING SYSTEM AND THEN THROUGH THE CATALYTIC RECOMBINER. NO CONTROLS ARE REQUIRED FOR THE
OPERATION.

AVAILABILITY - L. P. DEACKOFF, STONE AND WEBSTER ENGINEERING CORPORATION, P.O. BOX 2325, BOSTON, MASSACHUSETTS
02107

COMPUTER PROGRAM + HYDROGEN + SYSTEM DESCRIPTION + ACCIDENT, DESIGN BASIS + JACOBS + RECOMBINERS

060369
O/MARA AL
PAPER V-3 - HYDROGEN RECYCLE
STONE AND WEBSTER ENGINEERING CORPORATION
2 PAGES, 1 FIGURE, 4 REFERENCES, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, 13 (SUPPL.), PG. 20-21
(SEPTEMBER 3, 1970)

DISCUSSES THE SCHEME WHICH INVOLVES THE REUSE OF COOLANT HYDROGEN AND ASSOCIATED FISSION GAS TO
REDUCE TO SIZE OF DECAY TANKS AND TO LESSEN THE REQUIREMENT FOR A RECOMBINER WITHOUT REDUCING
OVERALL SAFETY.

AVAILABILITY - R. L. O/MARA, STONE AND WEBSTER ENGINEERING CORPORATION, P. O. BOX 2325, BOSTON, MASSACHUSETTS
02107

HYDROGEN + WASTE TREATMENT, GAS + WASTE DISPOSAL, GAS + OFF GAS + RECOMBINERS

060384
FALK CF + MICHELS LR
PAPER VII-5 - DESIGN FOR CONTROL
GENERAL ELECTRIC COMPANY, SAN JOSE, CALIFORNIA
2 PAGES, 2 TABLES, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, 13(SUPPL.), PG. 30-32 (SEPTEMBER 3, 1970)

DESCRIBES METHODS TO REDUCE RADIOACTIVITY RELEASES. DISCUSSES CATALYTIC RECOMBINERS AND CHARCOAL
ADSORBERS.

AVAILABILITY - C. F. FALK, GENERAL ELECTRIC COMPANY, 175 CURTNER AVENUE, SAN JOSE, CALIFORNIA 95125

REACTOR, BWR + CONTROL SYSTEM + WASTE DISPOSAL + WASTE TREATMENT + CHARCOAL ADSORBER + CHARCOAL + WASTE
MANAGEMENT + RADIOACTIVITY RELEASE + OFF GAS + FILTERS + RECOMBINERS

061578
FLETCHER WD + REIL MJ + MARCHESE RT + GALLAGHER JL
POST-LCCA HYDROGEN GENERATION IN PWR CONTAINMENTS
WESTINGHOUSE ELECTRIC CORPORATION, PITTSBURGH, PA
8 PAGES, NUCLEAR TECHNOLOGY, 10(4), PG. 420-427 (APRIL 1971)

EXPERIMENTAL RESULTS INDICATE A CONSERVATIVE RATE OF HYDROGEN PRODUCTION DUE TO SUMP SOLUTION
RADIOLYSIS OF 0.30 MOLECULE/100 EV OF ENERGY ABSORBED BY THE SOLUTION. EXPERIMENTAL STUDIES OF
CCPE SOLUTION RADIOLYSIS HAVE SHOWN THE EXTENT OF HYDROGEN PRODUCTION FROM THIS SOURCE IS
LIMITED BY THE ATTAINMENT OF A STEADY-STATE HYDROGEN CONCENTRATION IN THE SOLUTION PASSING
THROUGH THE CORE. BASED ON EXPERIMENTAL DATA, AN ANALYTIC MODEL WAS DERIVED WHICH
CONSERVATIVELY APPROXIMATES THE HYDROGEN PRODUCTION PROCESS AS IT WOULD OCCUR IN THE NUCLEAR
PLANT SHOULD A HYPOTHETICAL DESIGN BASIS ACCIDENT (DBA) OCCUR. THE SIGNIFICANT OTHER SOURCE OF
HYDROGEN IN THE POST-ACCIDENT ENVIRONMENT IS DISCUSSED ALSO.

CONTAINMENT SPRAY + HYDROGEN + ACCIDENT, LOSS OF COOLANT + ANALYTICAL MODEL + PRODUCTION + PRODUCTION, RATE

067098
HIGH RADIATION LEVEL ABOVE PCC
UNIVERSITY OF MISSOURI-ROLLA
5 PAGES, LETTER - UNIVERSITY OF MISSOURI-ROLLA TO DIVISION OF REACTOR LICENSING (AEC) - MARCH 4, 1971, DOCKET
50-123

ROUTINE INSPECTION REVEALED RADIATION LEVELS WHICH EXCEEDED THE TECH. SPEC. LIMIT OF 5 MR/HR.
INVESTIGATION REVEALED RADIATION LEVELS UP TO 10 MR/HR RESULTING FROM N-16 IN CORE EFFLUENT. TO
MIX THE CORE EFFLUENT BETTER, THE ORIGINAL DIFFUSER WAS LOWERED 3 FEET AND A SECOND DIFFUSER WAS
INSTALLED 3 FEET BELOW THIS. THE RESULTING RADIATION LEVEL ABOVE THE POOL WAS LOWERED TO BELOW 3
MR/HR. TO AVOID A RECURRENCE, COMPLETE GRID MEASUREMENTS WILL BE MADE EVERY 6 MONTHS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
CHARGE \$2.00

NITROGEN + TECHNICAL SPECIFICATIONS + RADIATION SAFETY AND CONTROL + RADIOACTIVITY RELEASE + REACTOR, POOL
TYPE + OPERATING EXPERIENCE + COLLEGES AND UNIVERSITIES + RADIATION PROFILE + MIXING ZONE

063134
RADIOACTIVITY RELEASE FROM PLASTIC VIALS
WASHINGTON STATE UNIVERSITY, PULLMAN, WASHINGTON
5 PAGES, LETTER TO DIVISION OF REACTOR LICENSING FROM WASHINGTON STATE UNIVERSITY, APRIL 2, 1971, DOCKET NO.
50-27

RADIOACTIVE FISSION PRODUCTS WERE RELEASED TO THE ROOM DURING IRRADIATION OF URANIUM OXIDE
SAMPLES IN DOUBLY SEALED POLYETHYLENE VIALS. THE VIALS WERE TESTED TO BE LEAK TIGHT BEFORE AND
AFTER THE EXPERIMENT. THE RELEASE AMOUNTED TO 125 MICROCURIES. TWO PERSONS WERE EXPOSED TO 2.4
TIMES 10 MINUS 8 MICROCURIES PER ML FOR 5 MINUTES WHILE MAKING SURVEYS. THE ACTIVITY PROBABLY
DIFFUSED THROUGH THE PLASTIC. FUTURE VIALS WILL BE MADE FROM HIGH PURITY QUARTZ.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
CHARGE \$2.00

REACTOR, RESEARCH + URANIUM OXIDE + TRIGA (KX) + RADIOISOTOPE + FAILURE, DESIGN ERROR + IRRADIATION FACILITY +
OPERATING EXPERIENCE + PLASTICS + COLLEGES AND UNIVERSITIES + RADIATION EFFECT + RADIATION EXPOSURE

063248
HYDROGEN FLAMMABILITY CONTROL SYSTEM IN A BOILING WATER REACTOR (SPECIAL REPORT 14, DRESDEN 3)
COMMONWEALTH EDISON COMPANY, CHICAGO, ILLINOIS
47 PAGES, 5 FIGURES, 4 TABLES, REPORT TO DIVISION OF REACTOR LICENSING FROM COMMONWEALTH EDISON COMPANY, MAY
24, 1971, DOCKET NO. 50-249

THE REPORT SUPPLIES THE ADDITIONAL INFORMATION REQUESTED BY DRL. COMMONWEALTH EDISON REVIEWED
THE REPORT AND BELIEVES THAT, IN ACCORDANCE WITH 10 CFR 50.109, SUCH A HYDROGEN-CONTROL SYSTEM
SHOULD NOT BE REQUIRED. AS A RESULT OF THEIR REVIEW OF THE RADIOLYTIC HYDROGEN QUESTION, AS
DESCRIBED IN AMENDMENT NO. 24, THE COMPANY INTENDS TO (1) INSTALL MONITORING EQUIPMENT IN THE
DRYWELL AND SUPPRESSION CHAMBER TO MONITOR HYDROGEN CONCENTRATIONS, AND (2) DEVELOP PROCEDURES
FOR VENTING THE CONTAINMENT ATMOSPHERE FOLLOWING A LOSS-OF-COOLANT ACCIDENT TO MAINTAIN HYDROGEN
CONCENTRATIONS WITHIN ACCEPTABLE LIMITS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
CHARGE \$2.00

REACTOR, BWR + CONTAINMENT + CONTROL SYSTEM + FIRE + HYDROGEN + REPORT, SAR + VENTILATION SYSTEM + DRESDEN 3
(BWR) + BACKFIT + CONCENTRATION

063362
CANNIEMER WA + FITZMAN RL
AN EVALUATION OF THE APPLICABILITY OF EXISTING DATA TO THE ANALYTICAL DESCRIPTION OF A NUCLEAR REACTOR
ACCIDENT
BATTIELE, COLUMBUS LABORATORIES, COLUMBUS, OHIO

063362 *CONTINUED*
BNI-1904, 24 PAGES, 2 FIGURES, 29 REFERENCES, APRIL 1971

THIS STUDY IS RESTRICTED TO PRESSURIZED-WATER AND BOILING-WATER NUCLEAR STEAM SUPPLY SYSTEMS, IN WHICH THE LIMITING POSTULATED ACCIDENT CONSIDERED FOR SAFETY ANALYSES IS THE LOSS-OF-COOLANT OR BLOWDOWN SITUATION. IN THIS LOW-PROBABILITY EVENT, THE INTEGRITY OF THE PRIMARY COOLANT SYSTEM IS BREACHED BY SOME INITIATING MECHANISM, LEADING TO THE OPENING OF THE SYSTEM TO THE CONTAINMENT ATMOSPHERE. THE SIZE OF THE OPENING CAN BE POSTULATED TO RANGE FROM THE SIZE OF A CONTROL-ROD HOUSING, FOR EXAMPLE, TO THAT RESULTING FROM A CATASTROPHIC FAILURE OF THE PRESSURE VESSEL, BUT THE EVENT MOST COMMONLY CONSIDERED FOR THE DESIGN IS THE DOUBLE-ENDED FAILURE OF ONE OF THE LARGE COOLANT PIPES IN THE PRIMARY SYSTEM. ALTHOUGH THE LARGE PIPE BREAK IS THE DESIGN BASIS, A SPECTRUM OF PIPE BREAK SIZES IS ANALYZED TO HELP ENSURE ADEQUATE EMERGENCY PROTECTION IN THOSE CASES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

*REACTOR, BWR + COMPUTER PROGRAM + CONTAINMENT + HEAT TRANSFER + HYDROGEN + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + REACTOR KINETICS + THERMAL ANALYSIS + ACCIDENT MODEL + BLOWDOWN + ACCIDENT, DESIGN BASIS + EMERGENCY COOLING SYSTEM

063771
SAFETY GUIDE 7 - CONTROL OF COMBUSTIBLE GAS CONCENTRATIONS IN CONTAINMENT FOLLOWING A LOSS OF COOLANT ACCIDENT
U.S. ATOMIC ENERGY COMMISSION, WASHINGTON, D.C.
LETTER TO SAFETY GUIDE RECIPIENTS +. 3 PAGES, (APRIL 9, 1971)

GENERAL DESIGN CRITERION 41 REQUIRES THAT SYSTEMS TO CONTROL HYDROGEN, OXYGEN, AND OTHER SUBSTANCES WHICH MAY BE RELEASED INTO THE REACTOR CONTAINMENT BE PROVIDED AS NECESSARY TO CONTROL THEIR CONCENTRATIONS FOLLOWING POSTULATED ACCIDENTS TO ENSURE THAT CONTAINMENT INTEGRITY IS MAINTAINED. THIS GUIDE DESCRIBES AN ACCEPTABLE METHOD OF IMPLEMENTING THIS CRITERION.

AVAILABILITY - U.S. ATOMIC ENERGY COMMISSION, DIRECTORATE OF REGULATORY STANDARDS, WASHINGTON, D.C. 20545

REACTOR, BWR + EXPLOSION + FIRE + HYDROGEN + NRC DESIGN CRITERIA + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + OXYGEN + REACTOR, PWR + CONTAINMENT INTEGRITY + CORROSION + PRESSURE, INTERNAL + NRC REGULATORY GUIDE

065546
RADIOACTIVE OFF-GAS RELEASE AT DRESDEN-1, CAUSED BY HYDROGEN EXPLOSION
COMMONWEALTH EDISON COMPANY, CHICAGO, ILLINOIS
DOCKET-50010-92 +. 5 PAGES, LETTER TO DIVISION OF REACTOR LICENSING FROM COMMONWEALTH EDISON COMPANY, DOCKET 50-10, TYPE--BWR, MFG--G.E., AE--BECHTEL

ON AUG. 12, 1971, TWO RUPTURE DISKS WERE BLOWN IN THE AIR-EJECTOR VENT PIPE, CAUSING HIGH RADIATION IN THE TURBINE BUILDING. THE RELEASE RESULTED FROM PRESSURE BUILDUP CAUSED BY IGNITION OF RADIOLYTIC HYDROGEN AND OXYGEN, POSSIBLY CAUSED BY A STATIC CHARGE IN THE OFF-GAS FILTERS. GROUNDED FILTERS ARE BEING SOUGHT. NO OFF-SITE ENVIRONMENTAL EFFECTS HAVE BEEN DETECTED. THERE WAS SOME ON-SITE CONTAMINATION WITHIN 100 FT. OF VENT AREA BY SHORT-LIVED NUCLIDES. TWO PERSONS ENTERING THE AREA IN FULL PROTECTIVE CLOTHING RECEIVED 18 MILLIREMS. EVALUATION OF DATA IS CONTINUING. ALL SAFETY SYSTEMS PERFORMED SATISFACTORILY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

AIRBORNE RELEASE + REACTOR, BWR + DRESDEN 1 (BWR) + EXPLOSION + FISSION PRODUCT RELEASE + HYDROGEN + OXYGEN + SURVEY, ENVIRONMENT + CONTAMINATION + PERSONNEL EXPOSURE, RADIATION + PRESSURE RELIEF + RADIOACTIVITY RELEASE + FAILURE, DESIGN ERROR + OFF GAS

065842
PIEPER H
THE RADIOLYSIS OF WATER UNDER THE INFLUENCE OF IONIZING RADIATION IN WATER COOLED NUCLEAR REACTORS
5 PAGES, VGB FEEDWATER CONFERENCE, ESSEN, PAGE 59-63, (IN GERMAN) 1970

DISCUSSES THE BREAKDOWN OF WATER IN TERMS OF LINEAR ENERGY TRANSFER AND SOME OF THE EFFECTS OF AMMONIA ADDITION. THE AUTHOR CONCLUDES THAT THE EXPERIENCE OF RECENT YEARS WITH LARGE NUCLEAR POWER STATIONS OPERATING BOILING AND PRESSURIZED WATER REACTORS HAVE SHOWN THAT MANY OF THE RESULTS FROM THE FUNDAMENTAL RESEARCH ON RADIOLYTIC BREAKDOWN OF WATER WERE TOO PESSIMISTIC WHEN APPLIED TO LARGE SCALE PLANTS. IN THE AUTHOR'S OPINION, THE PROBLEM OF RADIOLYSIS HAS BEEN SATISFACTORILY SOLVED AND CAN BE OVERCOME BY MAINTAINING A HIGHER COOLING WATER PURITY AND BY USING PLANT FOR RECOMBINING THE ELECTROLYTIC GAS.

WATER + REACTOR, LWR + RADIOLOGY + RADIATION EFFECT

067344
URANIUM MILL TAILING PROBLEM -- JCAE HEARING
19 PAGES, ATOMIC ENERGY CLEARING HOUSE, 17144, PP. 35-53 (NOVEMBER 1, 1971)

HEARING CONCERNED ITSELF WITH 3 QUESTIONS - WHO IS RESPONSIBLE FOR REMOVING TAILINGS, AT WHAT RADIATION LEVEL SHOULD TAILING BE REMOVED, AND EXISTING HEALTH HAZARD. REP. ASPINALL, CHAIRMAN OF SUBCOMMITTEE, POINTED OUT THAT SURGEON GENERAL OF U.S. PUBLIC HEALTH SERVICE AND ASST. ADMINISTRATOR, EPA, HAVE CLARIFIED THERE IS NO IMMEDIATE THREAT TO PUBLIC HEALTH. REP. HOLIFIELD

067344 *CONTINUED*

POINTED OUT THAT EXPOSURES WERE ONLY MILLIONTHS OF AN R PER HOUR. AMAX CORP. OFFICIAL TESTIFIED TO COMPANY'S ACTIONS ON FIRST NOTIFICATION OF EXPOSURE. COMMISSIONER LARSON REMARKED AEC HAD DECLARED IN 1958 THAT IT HAD NO CONTROL OVER REMOVAL OF TAILINGS FROM MINING OPERATION, THAT FEDERAL GOVERNMENT HAS NO LEGAL RESPONSIBILITY. NUMEROUS COLORADO OFFICIALS TESTIFIED, THE MAJORITY EXPRESSING ALARM, CRITICISM, AND CONCERNS OF PEOPLE OF GRAND JUNCTION.

CONGRESSIONAL ACTIVITY + URANIUM + RADON + POPULATION EXPOSURE + RADIOACTIVITY RELEASE + AGENCY, STATE + DATA COLLECTION + INDUSTRY, MINING + RADIATION EXPOSURE + AGENCY, MUNICIPAL + AGENCY, FEDERAL + LEGALISTICS + SPOKESMAN, AEC + SPOKESMAN, FEDERAL + SPOKESMAN, STATE + CONGRESSMAN

C68294

SUPPLEMENT TO SAFETY GUIDE 7 - CONTROL OF COMBUSTIBLE GAS CONCENTRATIONS IN CONTAINMENT FOLLOWING A LOSS OF COOLANT ACCIDENT

U.S. ATOMIC ENERGY COMMISSION, WASHINGTON, D.C.

1 PAGE, SUPPLEMENT TO SAFETY GUIDE 7, OCTOBER 27, 1971

PROVIDES GUIDANCE TO APPLICANTS AND LICENSEES REGARDING THE POSSIBLE BACKFITTING OF COMBUSTIBLE GAS CONTROL SYSTEMS TO PLANTS ALREADY LICENSED. THIS SUPPLEMENT DOES NOT REPRESENT A REQUIREMENT FOR BACKFITTING; SUCH REQUIREMENTS WILL BE FORMULATED ON AN INDIVIDUAL CASE BASIS PURSUANT TO 10 CFR 50.109.

AVAILABILITY - U.S. ATOMIC ENERGY COMMISSION, DIRECTORATE OF REGULATORY STANDARDS, WASHINGTON, D.C. 20545

HYDROGEN + WASTE TREATMENT, GAS + PLANT PROTECTIVE SYSTEM + COMBUSTION + GAS + BACKFIT + NRC REGULATORY GUIDE

068353

WILSON JF

ELECTRICAL HYDROGEN RECOMBINER FOR WATER REACTOR CONTAINMENTS

WESTINGHOUSE NUCLEAR ENERGY SYSTEMS, PENNSYLVANIA

WCAP-7820 + 25 PAGES, DECEMBER 1971

DOCUMENTS A PRESENTATION TO THE AEC ON MAY 5, 1971, ON AN ELECTRICAL HYDROGEN RECOMBINER BEING DEVELOPED BY WESTINGHOUSE TO PREVENT HYDROGEN IN A REACTOR CONTAINMENT FROM REACHING FLAMMABLE CONCENTRATIONS. ANALYTICAL WORK, PROOF-OF-PRINCIPLE TESTS PERFORMED AND DESCRIBED IN THIS REPORT SHOW THAT THE HYDROGEN GENERATED AFTER A LOSS-OF-COOLANT ACCIDENT CAN BE PREVENTED FROM REACHING FLAMMABLE LIMITS. INCLUDES DESCRIPTIONS OF THE DESIGN WITH TYPICAL PARAMETERS FOR A PROTOTYPE AND THE PLANNED PROTOTYPE TESTING PROGRAM FOR VERIFICATION OF PERFORMANCE.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D.C. 20545, (10 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

CONTAINMENT + HYDROGEN + REACTOR, PWR + SYSTEM DESCRIPTION + RECOMBINERS

068568

BRADLEY RF

RADIOLYSIS OF LIQUID WASTE DURING BEDROCK STORAGE

DU PONT DE NEMOURS (E.I.) AND COMPANY, SAVANNAH RIVER LABORATORY, AIKEN, SOUTH CAROLINA

DP-1264 + 24 PAGES, 7 FIGURES, 7 TABLES, 8 REFERENCES, AUGUST 1971

A PROPOSED METHOD FOR LONG-TERM CONTAINMENT OF RADIOACTIVE WASTE PRODUCED AT THE SAVANNAH RIVER PLANT IS STORAGE IN VAULTS EXCAVATED IN CRYSTALLINE ROCK 1500 FT BENEATH THE SURFACE OF THE PLANT. RADIOLYSIS OF THE WASTE TO FORM GASES WILL OCCUR DURING STORAGE OF THE WASTE. THIS REPORT SUMMARIZES TEST WITH SYNTHETIC WASTES TO DEVELOP DESIGN DATA ON THE RADIOLYTIC GAS EVOLUTION RATES. THESE TESTS SHOWED THAT A VAPOR VOLUME OF ABOUT 15% OF THE TOTAL SEALED VOLUME WOULD BE SUFFICIENT TO KEEP THE PRESSURE IN THE STORAGE VAULT BELOW THE SURROUNDING 1500-FT HYDROSTATIC PRESSURE. THESE TESTS ALSO PROVIDE PART OF THE BASIC DATA NECESSARY TO PREDICT THE BEHAVIOR OF THE GASES AND THE LIQUID WASTE OVER THE ABOUT 1000 YEARS OF STORAGE NECESSARY FOR THE DECAY OF SR-90 AND CS-137 TO INAPPROPRIATE LEVELS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

WASTE STORAGE + SAVANNAH RIVER PLANT + WASTE MANAGEMENT + RADIATION SAFETY AND CONTROL + WASTE DISPOSAL, BEDROCK + SAFETY EVALUATION + HYDROSTATICS

C69231

REVISIONS TO PSAR AND RESPONSES TO AEC QUESTION

COMMONWEALTH EDISON COMPANY

DOCKET-50254-36 + 30 PAGES, AMENDMENT 23 TO QUAD CITIES 1 AND 2 LICENSE APPLICATION, MAY 11, 1971, DOCKET 50-254/265, TYPE-BWR, MFG-G.E., AE-SGT + LUNDY

CONTAINS ADDITIONAL RESPONSES TO 11 ITEMS QUESTIONED BY ACRS. THE SUBJECTS INCLUDE MAXIMUM FLOODS, LIQUID-RADIOACTIVE-WASTE TREATMENT, FUFI-CASK DROP, VIBRATION TESTING, INSTRUMENT LINES, SHIELDING PIPE-WHIP ANALYSIS, CORE COOLING, FAILURE TO SCRAM, COMBUSTIBLE-GAS CONTROL, AND PRESSURIZATION TEMPERATURE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

NRC QUESTION + REACTOR, BWR + SHIPPING CONTAINER + WASTE TREATMENT, LIQUID + STRESS ANALYSIS + FAILURE, SCRAM

050231 *CONTINUED*
MECHANISM + SHIELDING + QUAD CITIES 1 (HWR) + REPORT, PSAR + SAFETY ANALYSIS + VIBRATION ANALYSIS + FLOOD + QUAD CITIES 2 (HWR)

070233
CONTROL OF COMBUSTIBLE GAS CONCENTRATION IN THE MILLSTONE CONTAINMENT VESSEL
MILLSTONE POINT COMPANY, HARTFORD, CONNECTICUT
Docket-50245-12H +. 15 PAGES, 3 FIGURES, 2 TABLES, LETTER TO DIVISION OF REACTOR LICENSING FROM MILLSTONE POINT COMPANY, DOCKET 50-245, APRIL 28, 1972, TYPE--HWR, MFG--G.E., AE--EBASO

CONTAINS DETAILED INFORMATION ON THE CONTROL OF RADIOLYTIC GAS CONCENTRATION FOLLOWING A LOCA AT MILLSTONE 1. INCLUDES A DETAILED ANALYSIS SUPPORTING THE CONCLUSIONS. CONTAINMENT INERTING MUST BE USED TO CONTROL OXYGEN CONCENTRATION TO LIMITS SPECIFIED IN THE SAFETY GUIDE. IF 1% METAL-WATER REACTION VALUE SPECIFIED IN THE ECCS CRITERIA IS USED, CONTAINMENT INERTING IS NOT NECESSARY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PHR + HAZARDS ANALYSIS + CONTAINMENT ATMOSPHERE, INERT + MILLSTONE POINT 1 (HWR) + CONCENTRATION

072365
PANTIN P + ALASCHKA JT + HUBER RA
METHANE DIFFUSION - AN EXAMINATION OF THE COMMERCIAL ADVANCED GAS-COOLED REACTORS
UNITED KINGDOM ATOMIC ENERGY AUTHORITY, HARWELL, ENGLAND
11 PAGES, JOURNAL OF THE BRITISH NUCLEAR ENERGY SOCIETY, 1013, PP. 237-247 (JULY 1971)

THE ADDITION OF A MIXTURE OF METHANE AND CARBON MONOXIDE TO THE CARBON DIOXIDE COOLANT OF A COMMERCIAL ADVANCED GAS-COOLED REACTOR IS ONE SUGGESTED METHOD FOR INHIBITING THE RATE OF RADIOLYTIC CORROSION OF THE GRAPHITE MODERATOR BY THE COOLANT GAS. HOWEVER, UNDER CERTAIN CIRCUMSTANCES IN-PIPE MASS TRANSPORT EFFECTS CAN LEAD TO A MARKED REDUCTION OF THE METHANE CONCENTRATION, WITHIN THE PORES OF A GRAPHITE MODERATOR BLOCK IN A COMMERCIAL AGR. A MATHEMATICAL MODEL BASED ON AN EARLIER MODEL USED IN SAFETY STUDIES OF MAGNOX REACTORS IS DEVELOPED TO ESTIMATE THESE EFFECTS QUANTITATIVELY.

REACTOR, GCF + ANALYTICAL MODEL + CORROSION + EXAMINATION + MODEL TESTING

072440
FOCUSED CLATHR. OF COMBUSTIBLE-GAS CONCENTRATION IN PEACH BOTTOM 2 AND 3
PHILADELPHIA ELECTRIC COMPANY
Docket-50277-2B +. 1 PAGE, LETTER - PHILADELPHIA ELECTRIC COMPANY TO DIRECTORATE OF LICENSING (AEC) - JUNE 12, 1972, DOCKET 50-277, TYPE--BWR, MFG--G.E., AE--BECHTEL

PROVIDES ADDITIONAL INFORMATION ABOUT CONTROLLING COMBUSTIBLE-GAS CONCENTRATIONS. INCLUDES INITIAL OXYGEN CONCENTRATION IN THE CONTAINMENT, POTENTIAL POST-LOCA SOURCES OF OXYGEN, STEAM CONCENTRATIONS AS A FUNCTION OF TIME, OPERABILITY OF THE STANDBY GAS-TREATMENT PLANT, DESCRIPTION OF THE NITROGEN-DILUTION SYSTEM, AND ANALYSIS OF THE BLOWDOWN FORCES FROM THE DISCHARGE LINE TO THE TORUS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + CONTAINMENT INSTRUMENTATION + EXPLOSION + ACCIDENT, LOSS OF COOLANT + STEAM + CONTAINMENT INTEGRITY + NITROGEN + PEACH BOTTOM 2 (HWR) + CONCENTRATION + PEACH BOTTOM 3 (BWR) + STANDBY GAS TREATMENT

072718
GODDARD FW
SPONTANEOUS COMBUSTION, OXIDATION, AND PYROLYSIS OF COMBUSTIBLE SOLID WASTES CONTAINING TRANSURANUM ELEMENTS
IN COMBUSTIBLE AND NON-COMBUSTIBLE CONTAINERS
OAK RIDGE NATIONAL LABORATORY, TENNESSEE
ORNL-4788 +. 30 PAGES, 6 FIGURES, 1 TABLE, 10 REFERENCES, MAY 1972

AN EVALUATION OF THE FEASIBILITY OF STORING ALPHA WASTES WITHOUT PRETREATMENT (SUCH AS INCINERATION) IN A FINAL REPOSITORY. A SERIES OF HEATING TESTS WAS CARRIED OUT TO STUDY THE OXIDATION AND PYROLYSIS OF TYPICAL COMBUSTIBLE SOLID WASTES IN SMALL COMBUSTIBLE AND NONCOMBUSTIBLE CONTAINERS AT TEMPERATURES OF 90 TO 215 C. FOR PERIODS OF TIME RANGING FROM 10 TO 205 HR. THE GENERAL CONCLUSIONS DRAWN FROM THESE TESTS ARE - (1) COMBUSTIBLE WASTES IN COMBUSTIBLE CONTAINERS SHOULD NOT BE ACCEPTED AT A FINAL REPOSITORY; (2) COMBUSTIBLE WASTES IN SEALED NONCOMBUSTIBLE CONTAINERS, SUCH AS DOT 17C AND DOT 17H SPECIFICATION METAL DRUMS OR EQUIVALENTS, SHOULD BE ACCEPTABLE AT A FINAL REPOSITORY; (3) THE QUANTITY OF GASES EVOLVED DURING HEATING OF THESE WASTES CAN BE REDUCED SUBSTANTIALLY BY ADDING A GETTER SUCH AS CAO.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CALCIUM + ALPHA EMITTER + OXIDATION + CYIDE + PLUTONIUM + WASTE DISPOSAL + PYROLYTIC + COMBUSTION + INCINERATION + TRANSURANUM ELEMENT + SAFETY EVALUATION + SOLID

072749

072749 *CONTINUED*
 NUCLEAR POWER -- AEC STATEMENT ON FUEL ROD FLATTENING
 1 PAGE, ATOMIC ENERGY CLEANING HOUSE, 18(31), P. 3 (JULY 31, 1972)

INSPECTION OF FUEL USED IN CINNA N-POWER PLANT REVEALED THAT A SMALL PERCENTAGE OF ROUND FUEL ELEMENTS HAD FLATTENED SECTIONS AFTER BEING IN CORE FOR FULL CYCLE. SUCH FUEL RODS COULD BE MORE SUSCEPTIBLE TO SMALL PEPPERCATIONS, RESULTING IN MORE THAN NORMAL RADIOACTIVITY BEING RELEASED WITHIN COOLING SYSTEM. ALSO COULD RESULT IN HIGHER THAN EXPECTED TEMPERATURES IN SOME OF FUEL RODS. AEC IS STUDYING (1) EXTENT THIS TYPE FUEL (MADE BY ALL MANUFACTURERS) IS BEING USED IN OTHER OPERATING PLANTS OR IS PLANNED FOR USE, (2) WHETHER ALL FUEL RODS OF THIS TYPE EXHIBIT SAME BEHAVIOR, AND (3) WHAT CORRECTIVE ACTION SHOULD BE TAKEN. PENDING COMPLETION OF STUDY, CINNA IS OPERATING AT 82% OF FULL POWER. FUEL OF THIS TYPE IS ALSO BEING USED AT POINT BEACH 1, ROBINSON 2, AND INDIAN POINT 2.

PRESSURE, EXTERNAL + FAILURE, FUEL ELEMENT + DESIGN STUDY + RADIOACTIVITY RELEASE + FAILURE, CLADDING + ZIRCALOY + INDIAN POINT 2 (PWR) + ROBINSON 2 (PWR) + FUEL ROD + CINNA (PWR) + AGENCY, AEC + POWER PLANT, NUCLEAR

075033
 RADIOLYTIC GAS IN THE DRESDEN 1 OFF-GAS LINE
 COMMONWEALTH EDISON COMPANY
 DOCKET-50010-120 +. 3 PAGES, LETTER - COMMONWEALTH EDISON COMPANY TO DIRECTORATE OF LICENSING (AEC) - SEPTEMBER 22, 1972, DOCKET 50-10, TYPE--BWR, MFG--G.E., AE--BECHTEL

DURING AUG. 1971, DIAPHRAGMS IN THE OFF-GAS HOLDUP SYSTEM RUPTURED FROM OVERPRESSURE. OVER A PERIOD OF 17 MONTHS (JAN. 1971 TO MAY 1972) THE PERCENTAGE OF RADIOLYTIC GAS WAS DETERMINED FOR NUMEROUS OFF-GAS SAMPLES. EVEN CONSIDERING EXPERIMENTAL SCATTER, NO RELATIONSHIP WAS FOUND BETWEEN PRIMARY-TO-SECONDARY LC/C RATIO AND THE PERCENTAGE OF RADIOLYTIC GAS IN THE SAMPLES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, BWR + DRESDEN 1 (BWR) + SAMPLING + REACTOR POWER + OFF GAS + CORRELATION

075250
 SAFETY GUIDES -- FOUR MORE FROM AEC
 1 PAGE, NUCLEAR NEWS, 15(17), P. 22 (SEPTEMBER 1972)

THIS BRINGS TO 27 THE NUMBER OF GUIDES CONCERNING SPECIFIC SAFETY-RELATED FEATURES OF WATER-COOLED N-POWER PLANTS. GUIDES ARE NOT REGULATORY REQUIREMENTS; USE WILL SIMPLY EXPEDITE LICENSING REVIEW PROCESS. TITLES OF NEW GUIDES -- ASSUMPTIONS USED FOR EVALUATING THE POTENTIAL RADIOLOGICAL CONSEQUENCES OF A PWR GAS STORAGE TANK FAILURE; ASSUMPTIONS USED FOR EVALUATING POTENTIAL RADIOLOGICAL CONSEQUENCES OF A FUEL HANDLING ACCIDENT IN THE FUEL HANDLING AND STORAGE FACILITY FOR PWR AND BWR; QUALITY GROUP CLASSIFICATIONS AND STANDARDS; ULTIMATE HEAT SINK. THE COMMISSION ANNOUNCED THAT A NUMBER OF OTHER GUIDES ARE BEING DEVELOPED (TITLES GIVEN).

REACTOR, BWR + CODES AND STANDARDS + ACCIDENT, CONSEQUENCES + FAILURE + FUEL HANDLING + REACTOR, PWR + FUEL STORAGE + WASTE DISPOSAL, GAS + HEAT SINK + STORAGE CONTAINER + RADIOACTIVITY RELEASE + QUALITY ASSURANCE + AGENCY, AEC + POWER PLANT, NUCLEAR + NRC REGULATORY GUIDE

075855
 CONTAINMENT-ATMOSPHERE DILUTION SYSTEM FOR FITZPATRICK PLANT
 POWER AUTHORITY OF THE STATE OF NEW YORK
 DOCKET 50333-58 +. 14 PAGES, LETTER - POWER AUTHORITY OF THE STATE OF NEW YORK TO DIRECTORATE OF LICENSING (AEC), OCT. 2, 1972, DOCKET 50-333, TYPE--BWR, MFG--G.E., AE--STONE + WEBSTER

ANSWERS 12 AEC QUESTIONS ABOUT THE PROPOSED CONTAINMENT-ATMOSPHERE DILUTION SYSTEM. CONCERNS THE OXYGEN CONCENTRATION, MIXING PROBLEMS, RADIOLYTIC GAS GENERATION RATES, NITROGEN DILUTION SYSTEM, SAMPLING, AND TESTING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
 REACTOR, BWR + FITZPATRICK (BWR) + TESTING + SAMPLING + CONTAINMENT ATMOSPHERE, INERT + CONCENTRATION

076182
 LINCHE S + CARLSON F
 CHEMICAL PROBLEMS IN NUCLEAR REACTORS
 9 PAGES, 10 REFERENCES, SVENSK KEMISK TIDSKRIFT, 79(2), PP. 113-121 (1967)

SOME OF THE MOST IMPORTANT CHEMICAL PROBLEMS ASSOCIATED WITH THE OPERATION OF NUCLEAR REACTORS COOLED AND MODERATED BY WATER OR STEAM ARE REVIEWED. THE RADIOCHEMICAL REACTIONS OF THE COOLANT IN PRESSURIZED AND BOILING WATER REACTORS ARE PRESENTED. THE BEHAVIOR OF CORROSION PRODUCTS IN REACTOR SYSTEMS ARE DISCUSSED WITH RESPECT TO THE BUILDUP OF RADIOACTIVITY IN OUTER PARTS OF THE PRIMARY SYSTEM AND DEPOSITION ON FUEL ELEMENT SURFACES. PROBLEMS REGARDING THE PURIFICATION OF WATER AND STEAM ARE BRIEFLY CONSIDERED. (IN SWEDISH)

REACTOR, BWR + CHEMICAL REACTION + REACTOR, PWR + CHEMICAL KINETICS + COOLANT CHEMISTRY + IRRADIATION TESTING

076551
DESIGN PRECLUDES HYDROGEN ACCUMULATING AT SURRY
VIRGINIA ELECTRIC AND POWER COMPANY
2 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), NOV. 29, 1972, DOCKETS 50-280/281, TYPE--PWR, MFG--WEST.,
AF--STONE AND WEBSTER

THE DESIGN OF THE INTERIOR CONTAINMENT STRUCTURE PRECLUDES ACCUMULATION OF SUBSTANTIALLY DIFFERENT CONCENTRATIONS OF HYDROGEN IN THE SUBCOMPARTMENTS AS COMPARED TO THE WELL MIXED OPEN PORTIONS OF THE CONTAINMENT. EACH STEAM-GENERATOR CUBICLE IS FITTED WITH SHIELD BLOCKS AT THE 48 FT 4 IN. LEVEL WHICH ARE REMOVED DURING NORMAL OPERATION. THE OPENING IN THE TOP OF EACH STEAM GENERATOR CUBICLE IS APPROXIMATELY 300 SQ. FT. IN AREA. SIMILARLY THE OPENING IN THE TOP OF THE PRESSURIZER CUBICLE IS APPROXIMATELY 100 SQ. FT. IN AREA. DIFFUSION CALCULATIONS INDICATE THAT MIXING OF THE ATMOSPHERE WILL MAINTAIN CONCENTRATIONS BELOW FLAMMABLE LIMITS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

CONTAINMENT DESIGN + HYDROGEN + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + SURRY 1 (PWR) + SURRY 2 (PWR)

076595
HYDROGEN CONTROL SYSTEM NOT REQUIRED AT DRESDEN 1
U.S. ATOMIC ENERGY COMMISSION, DIRECTORATE OF LICENSING
2 PAGES, LETTER TO COMMONWEALTH EDISON COMPANY, NOVEMBER 29, 1972, DOCKET 50-10, TYPE--BWR, MFG--G.E., AE--DETREL

BASED UPON OUR REVIEW AND ANALYSIS OF THE HYDROGEN PRODUCTION FOLLOWING THE LOCA, WE CONCLUDE THAT A HYDROGEN CONTROL SYSTEM IS NOT REQUIRED FOR DRESDEN UNIT 1. WE FURTHER CONCLUDE THAT THE CAPABILITY FOR MEASURING THE HYDROGEN CONCENTRATION AND FOR MIXING THE ATMOSPHERE IN THE CONTAINMENT FOLLOWING A LOCA SHOULD BE PROVIDED. THIS CAPABILITY IS CONSIDERED NECESSARY TO ASSURE THAT HYDROGEN CONCENTRATION IS UNIFORM THROUGHOUT THE CONTAINMENT VOLUME AND THAT THE HYDROGEN CONCENTRATION CAN BE DETERMINED FOLLOWING AN ACCIDENT. YOU ARE REQUESTED TO SUBMIT YOUR PLANS FOR INCORPORATING THE NECESSARY EQUIPMENT FOR MIXING THE CONTAINMENT ATMOSPHERE AND FOR MEASURING THE HYDROGEN CONCENTRATION IN THE CONTAINMENT.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + CONTAINMENT DESIGN + DRESDEN 1 (BWR) + HYDROGEN + ACCIDENT, LOSS OF COOLANT

076647
AMENDMENT 22 TO LICENSE APPLICATION FOR KEWAUNEE
WISCONSIN PUBLIC SERVICE CORP.
DOCKET-50305-59 -- 149 PAGES, AMENDMENT 22 TO FSAR FOR KEWAUNEE NUCLEAR POWER PLANT TO DIRECTORATE OF LICENSING (AEC), NOV. 29, 1972, DOCKET 50-305, TYPE--PWR, MFG--WEST., AE--PIONEER SERV.

TRANSMITS REVISED PAGES FOR INSERTION INTO THE FINAL SAFETY-ANALYSIS REPORT. INCLUDES A DESCRIPTION OF THE REVISED MEANS OF HYDROGEN CONTROL.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

HYDROGEN + REACTOR, PWR + REPORT, SAR + KEWAUNEE (PWR)

077129
MATUSEK JM + KUNZ CR + PAPERIELLO CJ
CHARACTERIZATION OF RADIOGASES FROM NUCLEAR FACILITIES
NEW YORK STATE DEPARTMENT OF HEALTH
PAPER NO. 22 -- PAPER PRESENTED AT THE 18TH ANNUAL HEALTH PHYSICS SOCIETY MEETING, HELD IN MIAMI BEACH, FLORIDA, JUNE 17, 1973 (SEE CCHN-730603--)

THE RADIOLOGICAL SCIENCES LABORATORY OF THE NEW YORK STATE DEPARTMENT OF HEALTH IS CONDUCTING A STUDY TO CHARACTERIZE THE GASEOUS RADIOACTIVE EFFLUENTS FROM NUCLEAR FACILITIES. AT THIS TIME, HOLD-UP TANKS, COVER-GAS, STRIP-GAS AND STACK EFFLUENT SAMPLES FROM TWO PWR'S, A BWR AND A GAS-COOLED REACTOR HAVE BEEN ANALYZED. GASEOUS SPECIES ARE CHROMATOGRAPHICALLY SEPARATED, THEN COUNTED IN GAS PROPORTIONAL COUNTING SYSTEMS. SPECTROMETRIC MEASUREMENTS HAVE RESULTED IN THE IDENTIFICATION AND QUANTIFICATION OF H-3 (AS HYDROGEN GAS, WATER AND METHANE), C-14 (AS METHANE AND CARBON DIOXIDE), RADIOCARBON, RADIOKRYPTON, RADIOXENON AND RADIOIODINE. EXPERIENCE IN SAMPLE COLLECTION, HANDLING, AND ANALYSIS ARE DISCUSSED WITH REGARD TO APPENDIX I REQUIREMENTS, PARTICULARLY WITH REGARD TO REPORTING REQUIREMENTS IMPOSED BY SAFETY GUIDE 21.

AVAILABILITY - JOHN M. MATUSEK, NEW YORK STATE DEPARTMENT OF HEALTH, ALBANY, NEW YORK 12201

CARBON + EFFLUENT + CHROMATOGRAPHY + IODINE + KRYPTON + MPC + REGULATION + TRITIUM + XENON + ARGON + MONITOR, GAS + ANALYTICAL TECHNIQUE + GAS + SPECTROMETRY + POWER PLANT, NUCLEAR + NRC REGULATORY GUIDE

077575
DOMINEY DL + PHELPS BL
GRAPHITE CORROSION IN MAGNETIC REACTORS
1 PAGE, CFSR DIGEST, 24(5), P. 5 (MAY 1972)

077579 *CONTINUED*

DISCUSSES THE REACTIONS BETWEEN THE CO₂ COOLANT AND THE GRAPHITE MODERATOR OF MAGNOX REACTORS AS POTENTIAL LIMITING FACTORS IN REACTOR LIFE. THE MODERATOR CORROSION OF REACTORS IS ENTIRELY DUE TO THE RADIOLYTIC BREAKDOWN OF THE CO₂ COOLANT WITHIN THE GRAPHITE PORES WHERE AN ACTIVE SPECIES ATTACKS THE GRAPHITE AFTER MIGRATING TO THE PORE SURFACE. FACTORS CONTROLLING THE RATE OF RADIOLYTIC ATTACK ARE ENUMERATED. ADEQUATE DATA AND TECHNIQUES EXIST FOR PREDICTING WEIGHT LOSSES IN ANY REGION OF THE MODERATOR THROUGHOUT REACTOR LIFE.

REACTOR, GCR + GRAPHITE + CARBON DIOXIDE + UNITED KINGDOM + CORROSION

077580

LIND R

GRAPHITE CORROSION IN ADVANCED GAS-COOLED REACTORS
1 PAGE, CEBG DIGEST, 24(5), P. 5 (MAY 1972)

RADIOLYTICALLY INDUCED ATTACK OF AN AGR GRAPHITE MODERATOR IS UNACCEPTABLY HIGH WITH A PURE CO₂ COOLANT. THE AEA INVESTIGATION OF THE REACTION INDICATED THAT THE RATE OF CORROSION COULD BE CONTROLLED TO AN ACCEPTABLE LEVEL BY MAINTAINING A SMALL FRACTION OF METHANE IN THE COOLANT. THE MECHANISM OF THE RADIOLYTIC ATTACK AND ITS INHIBITION ARE DISCUSSED. SINCE THE INHIBITOR IS ITSELF DESTROYED BY RADIATION ITS CONCENTRATION VARIES THROUGH A GRAPHITE BLOCK LEADING TO UNEVEN CORROSION. METHODS OF OVERCOMING THIS ARE DESCRIBED.

GRAPHITE + CARBON DIOXIDE + CORROSION + AGR (GCR)

078092

GARIGLIANI NUCLEAR POWER STATION - OPERATIONS REPORT FOR 1ST QUARTER OF 1972

ENTE NAZIONALE PER L'ENERGIE ELETTRICA, ROME

TIC-26210 + 19 PAGES, FIGURES, TABLES, REFERENCES, MARCH 31, 1972

ONE SHUTDOWN (MAR. 15, 1972) BECAUSE OF BURSTED RUPTURE DIAPHRAGMS IN THE VENT PIPE FOR THE NONCONDENSABLES THAT ISSUE FROM THE STEAM EJECTORS. BURST WAS DUE TO EXPLOSIVE RECOMBINATION OF RADIOLYTICALLY GENERATED HYDROGEN AND OXYGEN. STATION ON LINE BY MAR. 17.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + EXPLOSION + HYDROGEN + REPORT, OPERATIONS + OXYGEN + GARIGLIANI (BWR) + REACTOR SHUTDOWN

078216

ZITTEL HE

RADIOLYTIC HYDROGEN GENERATION AFTER LOSS-OF-COOLANT ACCIDENTS IN WATER-COOLED POWER REACTORS

OAK RIDGE NATIONAL LABORATORY, TENN.

9 PAGES, 2 TABLES, 4 FIGURES, 8 REFERENCES, NUCLEAR SAFETY-13(6), PP. 459-467 (NOVEMBER-DECEMBER 1972)

THE RADIOLYTIC GENERATION OF HYDROGEN FROM THE PRESSURE-SUPPRESSION COOLANT LIQUID FOLLOWING A LOSS-OF-COOLANT ACCIDENT IN LIGHT-WATER-COOLED POWER REACTORS IS AN IMPORTANT CONSIDERATION SINCE IT COULD CONCEIVABLY RESULT IN A HAZARDOUS CONDITION. STUDIES CARRIED OUT IN THIS LABORATORY ON THE PROBABLE RADIOLYTIC HYDROGEN GENERATION IN BOTH THE PWR AND BWR ACCIDENT CASES HAVE BEEN INSTRUMENTAL IN ESTABLISHING A BASE FROM WHICH TO CONSIDER THIS POINT. A REVIEW OF THE EXPERIMENTAL WORK AND THE CONCLUSIONS ARISING FROM THE WORK ARE GIVEN.

REACTOR, BWR + CHEMICAL REACTION + HYDROGEN + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + ACCIDENT MODEL

078304

CONTROLLING COMBUSTIBLE GAS IN THE HATCH-1 PRIMARY CONTAINMENT AFTER LOCA

GEORGIA POWER COMPANY

4 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), DECEMBER 4, 1972, DOCKET 50-321, TYPE--BWR, MFG--G.E., AE--SSI

PROVIDES OFF-SITE DOSES FROM PURGING ALONE AS A CONTROL METHOD AND PLANS FOR AN ADDITIONAL MEANS OF CONTROL OF COMBUSTIBLE GASES AFTER A LOCA. PROPOSES ADDITION OF NITROGEN TO THE CONTAINMENT TO REDUCE THE OXYGEN AND HYDROGEN CONCENTRATION TO SAFE LEVELS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + CONTROL + DOSE CALCULATION, EXTERNAL + CONTAINMENT ATMOSPHERE, INERT + HATCH 1 (BWR) + CONCENTRATION

078937

ZITTEL HE + LUPICA SB + BATE LC

IMPROVED BASE-BORATE REACTOR SAFETY SPRAY SOLUTION FOR RADIOLYTIC HYDROGEN SUPPRESSION

U.S. PATENT 3,691,084 + SEPTEMBER 12, 1972

AS A NEW COMPOSITION OF MATTER, WATER OR AN AQUEOUS SOLUTION OF SODIUM HYDROXIDE CONTAINING UP TO 3000 PPM BORON AS THE BORATE, SAID WATER OR SOLUTION HAVING A PH IN THE RANGE 5.8 TO 12.1, SAID WATER OR SOLUTION CONTAINING A REAGENT SELECTED FROM THE GROUP CONSISTING OF NA₂MOO₄, NA₂CrO₄, NA₂WO₄, AND NAVO₃ AT A CONCENTRATION OF 1 X 10⁻⁶ TO 0.002 M, WHICH IS EFFECTIVE TO

SUPPRESS HYDROGEN FORMATION RESULTING FROM IRRADIATION OF SAID SOLUTION IN A NUCLEAR REACTOR.

...the ...

the 1990s, the number of people in the world who are under 15 years of age is expected to increase from 1.1 billion to 1.5 billion. The number of people aged 65 and over is expected to increase from 250 million to 450 million. The number of people aged 15 and over is expected to increase from 3.5 billion to 4.5 billion. The number of people aged 15 and over is expected to increase from 3.5 billion to 4.5 billion. The number of people aged 15 and over is expected to increase from 3.5 billion to 4.5 billion.

DEESON SPECIAL REPORTS 14 (GUAD-CITIES SPECIAL REPORT 7, SUPPLEMENT 2)

BUCKET-50237-300 +. 41. PAGES. LETTER WITH ATTACHED SUPPLEMENT, 2 TO LARSEN SPECIAL REPORT NO. 14 TO

DIRECTORATE OF LICENSING (REC), FEB. 20, 1973; DOCKETS 5C-237/249/254/265, TYPE--BWR, MFG--G.E., AF--SCT AND LUNDY

TRANSMITS RESPONSES TO 11 AEC QUESTIONS CONCERNING THE PROPOSED CONTAINMENT ATMOSPHERIC DILUTION FOR COPENHAGEN 2 AND 3 AND QUAD CITIES 1 AND 2. INCLUDES SOURCES OF OXYGEN, TIME TO START NITROGEN ADDITION, STEAM CONCENTRATION AS A FUNCTION OF TIME, AND LONG-TERM PRESSURE TRANSIENTS.

12. 1992年12月10日，在《中国日报》发表署名文章，题为《中国：从“韬光养晦”到“有所作为”》。

REACTOR, BWR + DILUTION + ACCIDENT, LOSS OF COOLANT + CONTAINMENT SYSTEM, OPERATION + DRESDEN 3 (BWR) + DRESDEN 2 (BWR) + QUAD CITIES 1 (BWR) + CONTAINMENT ATMOSPHERE, INERT + PRESSURE TRANSIENT + QUAD CITIES 2 (BWR)

JENKINS

CARL HIDGE NATIONAL LABORATORY, TENNESSEE

ORNL-TM-2717 +. 99 PAGES, TABLES, FIGURES, REFERENCES, MARCH 1972

IMPORTANT RADICLYSIS PRODUCTS INCLUDE H₂, O₂, AND POSSIBLE ClO₃ AND BrO₃. MOST OF THE ClO₃ AND BrO₃ WILL DECOMPOSE TO HALIDES AND O₂ AT THE HIGH TEMPERATURES AROUND A CAN; MG(AR03)2 IF PRESENT MAY GIVE RISE TO SOME Br₂. NEARLY ALL OF THE H₂ AND THE ACCOMPANYING OXIDIZED SPECIES, ARE FORMED WITHIN THE MIGRATING BRINE INCLUSIONS BY THE RADIATIONS, ABSORBED WITHIN THE BRINE AND BY DISSOLUTION OF THE INTERSTITIAL CHLORINE AND TRAPPED ELECTRONS FROM THE IRRADIATED SOLID SALT. THE BRINE IS RICH IN MGCL₂ (2.3 TO 3M), AND HYDROLYSIS OF THE MGCL₂ AROUND A CAN WILL PRODUCE HCL.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CHEMICAL REACTION + OXIDATION + THERMAL EXPERIMENT + CHEMICAL KINETICS + WASTE DISPOSAL, SALT + SALT

DETECTION IN OFF-GAS SYSTEM AT VERMONT YANKEE (AD-T3-27)

VERMONT YANKEE NUCLEAR POWER CORPORATION

3 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), SEPTEMBER 17, 1973, DOCKET 50-271, TYPE--BWR, MFG--G.E., AE--
-FRASCO

ON SEPTEMBER 9, DURING OPERATION AT 65% POWER, AN APPARENT DETONATION IN THE OFF-GAS SYSTEM FRACTURED THE AIR-EJECTOR RUPTURE DISC. THERE WAS NO EVIDENCE OF LIGHTNING OR ELECTRICAL STORM. A SIMILAR DETONATION HAD OCCURRED ON SEPTEMBER 3. THE PLANT WAS SHUT DOWN, AND THE RUPTURE DISC WAS REPLACED. ALL ASSOCIATED INSTRUMENTS WERE FOUND TO BE IN CALIBRATION. GROUND CONNECTIONS THROUGHOUT THE SYSTEM WERE INSPECTED, AND THE HOLDUP LINE WAS INSPECTED IN 2 PLACES. OTHER TESTS WERE MADE, BUT NO CAUSE FOR THE EXPLOSION WAS FOUND. A CONTINUOUS AIR PURGE WAS INTRODUCED TO REDUCE HYDROGEN CONCENTRATION BELOW 1%.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

* FACTOR, BWP + FAILURE, COMPONENT + EXPLOSION + FAILURE + MODIFICATION + OFF GAS + VERMONT YANKEE (BWR) + FLOW
+ PRESSURE TRANSIENT + PIPES AND PIPE FITTINGS

ROGERS WM + LECHTERT RH

CATALYTIC RECOMBINERS FOR BOILING WATER REACTORS - FACTORS AFFECTING THEIR DESIGN, PERFORMANCE AND COST

ENGELHARD, INDUSTRIES

5 PAGES, 5 FIGURES, 2 REFERENCES, NUCLEAR ENGINEERING INTERNATIONAL, 18(208), PP. 711-715 (SEPTEMBER, 1973)

FOR THE BENEFIT OF THOSE FACING THE PROSPECT OF SPECIFYING, PURCHASING, AND OPERATING CATALYTIC RECOMBINERS FOR NUCLEAR POWER PLANT OFF-GAS SYSTEMS WE CAN STATE THAT THE FOLLOWING FACTORS WILL HAVE A SIGNIFICANT EFFECT ON THEIR DESIGN, PERFORMANCE, AND COST: CHOICE OF DILUENT; CONDENSING OR NONCONDENSING CATALYST TYPE SELECTED - PELLETIZED, HONEYCOMB OR WIRE MESH; PREHEAT TEMPERATURE; EFFLUENT SPECIFICATIONS; AIR IN-LEAKAGE SPECIFICATIONS; PRESSURE DROP SPECIFICATIONS; VESSEL MATERIALS SELECTED; NUMBER OF RECOMBINEF STAGES USED.

REACTOR, PHW + HYDROGEN + SYSTEM DESCRIPTION + CATALYST + RECOMBINERS

085028

095828 *CONTINUED*
MULFORD PNR * MUELLER BA
MEASUREMENTS OF HELIUM RELEASE FROM MATERIALS CONTAINING 228-PuM2
LOS ALAMOS SCIENTIFIC LABORATORY, NEW MEXICO
LA-2215 +. 11 PAGES, 2 TABLES, 12 FIGURES, 6 REFERENCES, JULY 1973

DESCRIBES MEASUREMENTS OF ISOTHERMAL HELIUM RELEASE RATES VS. TIME FOR FIVE MATERIALS CONTAINING
60% 228-PuM2, PLASMA TORCH, MICROSPHERES, AND 1/4 BY 1/4 IN. PELLETS OF MIXTURES WITH THORIA AND
ZRO2 WERE EXAMINED. THE PURPOSE WAS TO AID IN THE ENGINEERING EVALUATION OF POTENTIAL FUELS FOR
RADIOISOTOPIC HEAT SOURCES. CONCLUDES NO PROVEN MODEL EXISTS FOR DESCRIBING HELIUM RELEASE.
SIMPLE DIFFUSION THEORY IS INADEQUATE. A TRAPPING MODEL MAY WORK BETTER.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

COMPARISON, THEORY AND EXPERIENCE * FOCUS DIFFUSION * HELIUM * RADIOISOTOPE * PLUTONIUM DIOXIDE * ISOTOPIC
GENERATOR

C98338
REVISIONS TO THE SAR
GEORGIA POWER COMPANY
DOCKET 50-321-69 +. 152 PAGES, AMENDMENT 30 TO HATCH LICENSE APPLICATION, FEBRUARY 5, 1973, DOCKET 50-321.
TYPE--LWR, MFG--G.E., AE--SSI

CONTAINS NEW AND REVISED PAGES TO THE FINAL SAR CONCERNING CONTROL OF COMBUSTIBLE GAS AFTER A
LOCA. REACTOR BUILDING CRANE, STARTUP AND POWER TEST PROGRAM, AND PIPING CODES.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR * HYDROGEN * ACCIDENT, LOSS OF COOLANT * PROCEDURES AND MANUALS * REPORT, SAR * CONTROL * REACTOR
STARTUP TESTING * HATCH 1 (BWR) * CRANE

087459
POST-LOCA HYDROGEN CONTROL SYSTEM
DETROIT EDISON COMPANY
20 PAGES, LETTER WITH ATTACHED REPORT TO DIRECTORATE OF LICENSING (AEC), NOVEMBER 26, 1973, DOCKET 50-341.
TYPE--BWR, MFG--G.E., AE--SGT. & LUNDY

GIVES DETAILS OF THE DESIGN BASES, SPECIFIC FEATURES, SYSTEMS, AND EQUIPMENT WHICH WILL BE USED
FOR POST-LOCA COMBUSTIBLE GAS CONTROL AT FERM1 2.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
CHARGE \$2.00

REACTOR, BWR * HYDROGEN * ACCIDENT, LOSS OF COOLANT * ENGINEERED SAFETY FEATURE * FERM1 2 (BWR) * RECOMBINERS

088789
HYDROGEN RECOMBINATION IN MEDICAL THERAPY SHUTTER AT MIT REACTOR
MASSACHUSETTS INSTITUTE OF TECHNOLOGY RESEARCH REACTOR
3 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), FEBRUARY 21, 1974, DOCKET 50-20

AN APPARENT HYDROGEN RECOMBINATION OCCURRED IN THE STORAGE TANK FOR WATER USED IN THE MEDICAL
THERAPY SHUTTER WHILE MODIFICATIONS WERE BEING MADE TO THE TANK. AS A PIPE WAS BEING WELDED TO
THE TANK, A LARGE VOLUME OF GAS RUSHED FROM THE TANK. NO INJURIES, NO DAMAGE, AND NO
CONTAMINATION OCCURRED. THE TANK IS NORMALLY BLANKETED WITH HELIUM. THE EXPLOSION RESULTED WHEN
AN ARC WAS STRUCK BY THE WELDER. APPARENTLY HYDROGEN HAD COLLECTED IN THE TANK AS A RESULT OF
RADIOLYTIC DECOMPOSITION OF WATER IN THE SHUTTER TANK. BETTER HYDROGEN CONTROL WILL BE INITIATED.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
CHARGE \$2.00

EXPLOSION * FAILURE * HYDROGEN * REACTOR, RESEARCH * MODIFICATION * STORAGE CONTAINER * REACTOR TEST FACILITY
* FAILURE, ADMINISTRATIVE CONTROL * MITR (RR) * COLLEGES AND UNIVERSITIES

090252
GANT PL * POTES BG * BRUNDAGE RS
METHOD AND APPARATUS FOR MONITORING SIMULTANEOUSLY TWO ENERGY LEVELS OF RADIOACTIVITY IN A GAS
U.S. PATENT 3,746,861 +. 10 PAGES, DEC. 23, 1970

A METHOD AND APPARATUS FOR DETECTING, DISTINGUISHING, AND INDICATING LOW-LEVEL ACTIVITY OF
RADIOACTIVE GASES, SUCH AS TRITIUM AND/OR KRYPTON-85, IN A SELECTED GAS, EVEN IN THE PRESENCE OF
ELECTRONEGATIVE GASES ARE DESCRIBED. THE APPARATUS CONSISTS OF A DETECTION CHAMBER OF A TYPE
WHICH IS ENERGY SELECTIVE THROUGH INCLUSION OF PLURAL IONIZATION COLLECTOR CIRCUITS PROVIDING TWO
SEPARATE DETECTOR OUTPUTS. THE TWO DETECTOR OUTPUTS ARE APPLIED THEN TO PARALLEL SIGNAL
PROCESSING CHANNELS WHICH SERVE TO SEPARATE DETECTED ENERGY THROUGH PULSE AMPLITUDE
DISCRIMINATION AND/OR COINCIDENCE SELECTION TO DETERMINE ABSOLUTE QUANTITIES OF RADIOACTIVE
EVENTS FOR SELECTED CONTAMINANTS IN THE GAS SAMPLE.

AVAILABILITY - THE U.S. PATENT OFFICE, DEPT. OF COMMERCE, WASHINGTON, D.C.

040257 *CONTINUED*
UNITED STATES + PATENT + RADIATION MONITORS

030090
UNPLANNED RELEASE OF GASEOUS RADIOACTIVITY AT INDIAN POINT 2
CONSOLIDATED EDISON COMPANY
3 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), MAY 1, 1974, DOCKET 50-247, TYPE--PWR, MFG--WEST., AE--
UNITED ENCL

CAUSE - PUMP SEAL LEAK. WHILE THE REACTOR WAS OPERATING AT 874 POWER, PERIODIC RADIOGAS SPIKES UP TO 3500 CPM WERE NOTED ON THE PLANT VEAT GAS MONITOR RECORDER. THE SAMPLE PUMP SEAL LOCATED IN THE HYDROGEN/OXYGEN GAS ANALYZER PANEL WAS LEAKING. THE PUMP WAS REPLACED WITH ONE HERMETICALLY SEALED TO PREVENT A RECURRENCE. THE ESTIMATED RELEASE WAS 0.9 CI OF XE AND KR AND 1.8 MICROCURIES OF I-131.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

ATOMS RELEASE + FAILURE + REACTOR, PWR + SAMPLING + MODIFICATION + FAILURE, DESIGN ERROR + SEAL + INDIAN POINT 2 (PWR) + LEAK + PUMPS

011460
JAHM H
HYDROGEN PRODUCTION IN CONTAINMENT AFTER A LOSS-OF-COOLANT ACCIDENT IN LIGHT-WATER REACTORS
TECHNISCHE UNIVERSITÄT MÜNCHEN, WEST GERMANY
MKA-117 +. 56 PAGES, FIGURES, MARCH 1973 (REPT. IN GERMAN)

GIVES A SHORT GENERAL VIEW OF THE RADIOLYSIS PROBLEM. DESCRIBES THE CODE RADI 1, DEVELOPED AT TPA, AS WELL AS SOME CURVES OF IMPORTANT PARAMETERS AND RESULTS. (IN GERMAN)

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

COMPUTER PROGRAM + HYDROGEN + ACCIDENT, LOSS OF COOLANT + OXYGEN + COOLING

092134
REVISIONS TO THE SAR
EDISON COMPANY
DOCKET 50293-230 +. 41 PAGES, AMENDMENT 35 TO PILGRIM LICENSE APPLICATION, JANUARY 28, 1974, DOCKET 50-293, TYPE--PWR, MFG--G.E., AE--RECHTEL

REVISES THE FINAL SAR BY DESCRIBING THE MEANS AND CONTROLS PROVIDED FOR LIMITING COMBUSTIBLE GAS CONCENTRATIONS IN THE CONTAINMENT FOLLOWING THE LOCA. THIS IS ACHIEVED BY PROVIDING REDUNDANT MEANS OF NITROGEN SUPPLY TO THE CONTAINMENT, NEW EQUIPMENT, AND PIPING IN ACCORDANCE WITH CODES AND UPGRADING SYSTEMS IN OTHER AREAS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, PWR + CONTAINMENT + HYDROGEN + ACCIDENT, LOSS OF COOLANT + REPORT, SAR + CONTROL + MODIFICATION + PILGRIM (PWR)

097171
SAMUEL WA + GREER JS
INVESTIGATION OF METHODS FOR ARRESTING DETONATIONS IN GAS MIXTURES
MSA RESEARCH CORP., EVANS CITY, PA.
MSAR-67-187 +. 61 PAGES, NOVEMBER 2, 1967

AN INVESTIGATION OF METHODS FOR INHIBITING AND ARRESTING DETONATIONS IN H-O SYSTEMS IS REPORTED. AN INHIBITION-ARRESTING SYSTEM HAS BEEN EVOLVED THAT SHOULD COST LESS THAN ONE-SEVENTH AS MUCH AS AIR DILUTION. THE PROJECTED COMPARATIVE COSTS ARE \$800,000 VERSUS \$4,850,000. WHEN A SIMULATED CAVERN EFFLUENT WAS DILUTED WITH STEAM TO APPROXIMATELY ONE AND THREE-QUARTER TIMES ITS ORIGINAL VOLUME, IT WOULD NOT DETONATE. THE RESULTING (MISB 2) CONCENTRATION WAS 17.5%, AND ALTHOUGH A FLAMMABLE MIXTURE, A HURDLE WITH ONLY NINE INCHES OF WATER HEAD WAS EFFECTIVE AS A FLAME BARRIER.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

EXPLOSION + HYDROGEN + OXYGEN + FLOWSHAPE + SAFETY EVALUATION

097172
GREER JS + RANKIN RL
LIMITS OF HYDROGEN-OXYGEN-NITROGEN-STEAM MIXTURES
MSA RESEARCH CORP., EVANS CITY, PA.
MSAR-68-109 +. 43 PAGES, JUNE 11, 1968

THE COMBUSTION LIMITS OF STEAM-DILUTED HYDROGEN-OXYGEN MIXTURES WERE DETERMINED AT 1150 PSIG IN A 0.5 CU FT STAINLESS STEEL TEST CELL. GAS SAMPLES WERE EXTRACTED AT TEMPERATURE TO ESTABLISH THE COMPOSITION OF COMBUSTIBLE MIXTURES. TEMPERATURE AND PRESSURE EXCURSIONS WERE RECORDED THROUGHOUT MOST OF THE TESTS. A STOICHIOMETRIC HYDROGEN-OXYGEN MIXTURE CONFINED AT 950 F AND

097172 *CONTINUED*

1150 PSIG BECOMES COMBUSTIBLE WHEN THE MIXTURE CONTAINS BETWEEN 60 AND 95% STEAM. AN EXCESS OF HYDROGEN IN MIXTURES CONTAINED AT 950 F INCREASED THE COMBUSTION LIMIT TO >95% STEAM. ESTABLISHING THE COMBUSTION LIMITS OF HYDROGEN-OXYGEN MIXTURES AT 950 F RESOLVES INTO A PROBLEM OF PREVENTING THERMAL INITIATION IN THE MIXTURE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

HYDROGEN + OXYGEN + STEAM + COMBUSTION + SAFETY EVALUATION

097173

HYDROGEN PRODUCTION IN LIGHT WATER REACTORS
TECHNISCHE UNIV. MUENCHEN, GARCHING, F.R.G. GERMANY
NP-19937 +. 253 PAGES, JUNE 1973 (IN GERMAN)

THE RECENT STATE OF KNOWLEDGE CONCERNING HYDROGEN PRODUCTION IN LWR'S AS WELL AS OTHER DIRECTLY CONNECTED PROBLEMS IS REVIEWED. THUS THE PRODUCTION OF OXYGEN IS DEALT WITH ALSO. AN ATTEMPT IS MADE TO DEFINE THE EFFECT OF VARIOUS PARAMETERS OF CHEMICAL AND PHYSICAL NATURE ON THE RADICLYSIS. PROBLEMS OF METAL REACTIONS, GAMMA-RAY ABSORPTION, AND THE COMBUSTIBILITY OF HYDROGEN-AIR (STEAM) MIXTURES ARE ALSO TREATED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

BIBLIOGRAPHY + REACTOR, BWR + HYDROGEN + METAL WATER REACTION + OXYGEN + REACTOR, PWR + STEAM + COMBUSTION

097177

SIEGLER M + MOORE GE
FLAME RECOMBINATION OF OXYGEN AND HYDROGEN
GENERAL ELECTRIC COMPANY
11 PAGES, CHEM. ENG. PROG., SYMP. SERIES, 66(104), PP. 1-11 (1970)

THE DESIGN OBJECTIVES AND COMBUSTION PRINCIPLES ARE DISCUSSED FOR DISPOSAL BY FLAME RECOMBINATION OF THE RADIOLYTIC OFF-GAS FROM A WATER-COOLED NUCLEAR REACTOR. THE OFF-GAS IS MAINLY A STOICHIOMETRIC HYDROGEN-OXYGEN MIXTURE. IT IS SHOWN THAT THE CHARACTERISTICS OF THE WATER-COOLED POROUS PLUG BURNER ARE NOT ONLY CONSISTENT WITH BUT APPEAR NECESSARY TO MEET BOTH THE BASIC AND PRACTICAL REQUIREMENTS OF THE PROBLEM. THE DEVELOPMENT OF THE COMPONENTS FOR A SAFE, RELIABLE AND RELATIVELY INEXPENSIVE RECOMBINER IS DESCRIBED. A VERSATILE FACILITY WAS BUILT FOR TESTING OF COMPLETE BURNER SYSTEMS AS WELL AS RELATED SAFETY SYSTEMS.

DESIGN CRITERIA + HYDROGEN + OXYGEN + COMPONENTS + SAFETY EVALUATION + RECOMBINERS

097710

BAKER L + LIMATAINEN RC
THE TECHNOLOGY OF NUCLEAR REACTOR SAFETY (VOL. 2). CHAPTER 17 - CHEMICAL REACTIONS
ARGONNE NATIONAL LABORATORY, ILLINOIS
104 PAGES, PP. 419-523, PUBLISHED BY THE MIT PRESS, CAMBRIDGE; 1973

MANY OF THE ELEMENTS POSSESSING DESIRABLE NUCLEAR PROPERTIES, I.E., ALUMINUM, ZIRCONIUM, AND URANIUM, RANK HIGH IN THE ELECTROCHEMICAL SERIES. THE REACTION OF THESE ELEMENTS WITH OXIDIZING AGENTS SUCH AS WATER AND OXYGEN IS, FORTUNATELY, SLOW AT NORMAL TEMPERATURES. IT WAS FEARED, HOWEVER, THAT RAPID OR EXPLOSIVE REACTIONS MIGHT BE INITIATED AS A RESULT OF ACCIDENTAL OVERHEATING. SUMMARIZING THE PRESENT STATE OF KNOWLEDGE REGARDING THE INITIATION OF RAPID OR EXPLOSIVE CHEMICAL REACTIONS IS THE PRINCIPAL PURPOSE OF THIS CHAPTER. THIS DISCUSSION IS ALSO CONCERNED WITH SLOWER CORROSION-LIKE REACTIONS WHICH CAN AFFECT THE SAFETY OF OPERATION OF NUCLEAR REACTORS. INDIVIDUAL CHEMICAL REACTIONS ARE DISCUSSED FROM A FUNDAMENTAL POINT OF VIEW.

ALLOY + ALUMINUM + EXPLOSION + FUEL MELTDOWN + HYDROGEN + METAL WATER REACTION + ZIRCONIUM + STEEL, STAINLESS
+ CORROSION + COMBUSTION + MAGNESIUM + RECOMBINERS

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STAINLESS-CLAD TRIGA FUEL ELEMENTS SUBJECT TO LARGE REACTIVITY INSERTIONS AND LOW-TEMPERATURE GAS-COOLED REACTOR TEST PROGRAM - APPROACH TO POWER AND FULL POWER OPERATIONS	027479 P 13 007761 P 7 027274 P 26 014444 P 2 020473 P 21 044175 P 2 007745 P 7 023544 P 17 024273 P 12 027276 P 14 012171 P 17 027400 P 14 025326 P 12 000252 P 13 006470 P 2
STAINLESS-CLAD TRIGA FUEL ELEMENTS SUBJECT TO LARGE REACTIVITY INSERTIONS AND LOW-TEMPERATURE GAS-COOLED REACTOR TEST PROGRAM - APPROACH TO POWER AND FULL POWER OPERATIONS	027479 P 13 007761 P 7 027274 P 26 014444 P 2 020473 P 21 044175 P 2 007745 P 7 023544 P 17 024273 P 12 027276 P 14 012171 P 17 027400 P 14 025326 P 12 000252 P 13 006470 P 2
STAINLESS-CLAD TRIGA FUEL ELEMENTS SUBJECT TO LARGE REACTIVITY INSERTIONS AND LOW-TEMPERATURE GAS-COOLED REACTOR TEST PROGRAM - APPROACH TO POWER AND FULL POWER OPERATIONS	027479 P 13 007761 P 7 027274 P 26 014444 P 2 020473 P 21 044175 P 2 007745 P 7 023544 P 17 024273 P 12 027276 P 14 012171 P 17 027400 P 14 025326 P 12 000252 P 13 006470 P 2
STAINLESS-CLAD TRIGA FUEL ELEMENTS SUBJECT TO LARGE REACTIVITY INSERTIONS AND LOW-TEMPERATURE GAS-COOLED REACTOR TEST PROGRAM - APPROACH TO POWER AND FULL POWER OPERATIONS	027479 P 13 007761 P 7 027274 P 26 014444 P 2 020473 P 21 044175 P 2 007745 P 7 023544 P 17 024273 P 12 027276 P 14 012171 P 17 027400 P 14 025326 P 12 000252 P 13 006470 P 2
STAINLESS-CLAD TRIGA FUEL ELEMENTS SUBJECT TO LARGE REACTIVITY INSERTIONS AND LOW-TEMPERATURE GAS-COOLED REACTOR TEST PROGRAM - APPROACH TO POWER AND FULL POWER OPERATIONS	027479 P 13 007761 P

[illegible]

TO LARGE REACTIVITY INSERTIONS AND LONG-TERM STABILITY OF U-238-SUB-1.7 STAINLESS-CLAD TRIGA FUEL ELEMENTS SUBJECTED 007755 P 2

9. RECOMBINERS

JO4628
HYDROGEN EVOLUTION WITHIN CONTAINMENT IN PWR-TYPE PLANTS. FINAL REPORT
NUCLEAR UTILITY SERVICES. WASHINGTON
44 PAGES. REFERENCES- JUNE 18, 1965, NYC-3420-2- CFSTI

ONE OF MORE OF THE MODIFICATIONS MADE TO THE PWR-TYPE PLANT DURING THE SUMMER 1964 ANTARCTIC SEASON
HAD ELIMINATED THE HYDROGEN EVOLUTION TO CONTAINMENT. THE MAJOR EFFORT UNDER THIS CONTRACT WAS
IN COMING BY TEST, WHICH OF WHAT COMBINATION OF MODIFICATIONS RESULTED IN THE REDUCTION OF
HYDROGEN EVOLUTION SO THAT 1) THE DESIGN OF FUTURE PLANTS WILL BE SUCH THAT NO HYDROGEN WILL BE
EVOLVED FROM SHEET METAL AND 1) NO FUTURE MODIFICATIONS TO THE PWR-TYPE PLANT WILL RESULT IN THE
RESUMPTION OF THE EVOLUTION OF HYDROGEN. IT WAS SUBSEQUENTLY DECIDED THAT THE TEST PROGRAM BE
DEFERRED AND THAT IT NOT BE PERFORMED UNDER THIS CONTRACT. ACCORDINGLY, THIS FINAL REPORT
PRESENTS THE WORK ACCOMPLISHED UNDER THE CONTRACT TOGETHER WITH THE RECOMMENDED TEST PROGRAM.

CONTAINMENT, PRESSURE SUPPRESSION, HYDROGEN, OXYGEN, REACTOR, PWR, RADIOLYTIC GAS, CONTAINMENT, WATER
FILLED, PWR TYPE, REACTOR, WILLYS

JO7707
MCINTOSH JR
A THREE-STEP EVALUATION OF MILD STEEL AT THE HEAVY WATER COMPOUNDS TEST REACTOR
SANDHIA RIVER PLANT. C. L. DUMPTON OF AMMOX AND COMPANY
21 PAGES, 4 FIGURES, 3 TABLES, 7 REFERENCES. AMERICAN NUCLEAR SOCIETY CONFERENCE ON REACTOR OPERATING
EXPERIENCE, JANUARY 1961 (LONG, WIDMANN, JULY 24-25, 1961, AND TRANSACTIONS, SUPPLEMENT TO VOLUME 8, PAGE 11

ARE THE PIPING INSIDE THE REACTOR VESSEL, INCLUDING 50 TUBES, IS MILD STEEL. VESSEL IS MILD
STEEL CLAD WITH 70% STAINLESS STEEL. DEUTERIUM GAS WAS ADDED TO AID RECOMBINATION. ADHERENT
MAGNETITE FILM WAS PRODUCED DIFFICULTLY IN INITIAL FUNCTIONAL TESTS. STEAM-GENERATOR TUBES
FILLED FROM OXYGEN, NITROGEN, SECONDARY SIDE. RADIATION MEASUREMENTS SHOW MOST OF COOLANT SYSTEM
CONTAMINATION IS FROM CAUC. DESSITIVE TEN FUEL-ELEMENT FAILURES.

FAILURE, FUEL ELEMENT, LEAKAGE, JMW, PWR, REACTOR, PWR, REACTOR, TEST, OPERATING EXPERIENCE
SUMMARY, COMPOSITION, COOLANT CHEMISTRY, FAILURE, TUNING, STEAM GENERATOR

JO7974
RANKIN M, STUBBS JR, HARTING M, BISHOP JR
ULTRAPURIFICATION OF GASES BY MEANS OF RECENTLY DEVELOPED CATALYSTS
WATER PLANT, WINDMILL PLANT, WINDMILL PLANT
OAK RIDGE NATIONAL LABORATORY
44 PAGES, 7 FIGURES, 14 REFERENCES, APRIL 1, 1966, TRANSLATED FROM CHEM. TECHN. 17,
PAGES 467-468, 1966

PROTECTIVE GASES, SUCH AS H_2 , N_2 , AND NOBLE GASES, ARE BEING EMPLOYED IN EVER-INCREASING
QUANTITIES IN THE CHEMICAL INDUSTRY, LAMP FACTORIES, SEMI-CONDUCTOR PLANTS, AS WELL AS IN
METALLURGY. THESE MUST BE FREE FROM IMPURITIES, PARTICULARLY OXYGEN. ALTHOUGH THE REMOVAL OF
SMALL CONCENTRATIONS OF OXYGEN FROM H_2 OR N_2 -CONTAINING GASES IS CARRIED OUT MOST ADVANTAGEOUSLY
WITH NOBLE METAL CATALYSTS (E.G., LEUVA-CATALYST 7748, 0.5 PERCENT Pd ON GAMMA-AL₂O₃ AT ROOM
TEMPERATURE, OXYGEN REMOVAL FROM INERT GASES (N_2 AND NOBLE GASES) IS PERFORMED CHIEFLY BY
OXIDATION OF THE METALLIC CONSTITUENTS OF PURIFYING AGENTS. IN THE PAST YEAR, THE CATALYST GROUP
OF YEN LEUVA-WINE DISCOVERED A NICKEL CATALYST, DESIGNATED 6525, WHOSE OXYGEN-ABSORPTION POWER
AT ROOM TEMPERATURE IS SEVERAL TIMES GREATER THAN THE USUAL COPPER CATALYSTS. THE PREPARATION,
REDUCTION, AND STABILIZATION OF NICKEL CATALYSTS ON AN AL₂O₃ BASE, USED FOR HYDROGENATION OF
PHENOL, HAS BEEN REPORTED. ALTHOUGH THE NICKEL-CHROMIUM OXIDE COMBINATION SEEMS TO BE ESPECIALLY
SUITABLE, M. GREGSON FAILED TO PLACE EMPHASIS ON IT IN THE JOURNAL, CATALYSTS. AN ACTIVE NICKEL-
CHROMIUM OXIDE CATALYST WAS ALSO DEVELOPED IN THE LEUVA PLANT WHICH HAS BEEN DESIGNATED CATALYST
6540. THE PROPERTIES OF CATALYSTS 6525 AND 6540 HAVE BEEN INVESTIGATED IN THEIR ACTION ON THE
ULTRAPURIFICATION OF GASES.

CHEMICAL REACTION, DECONTAMINATION, HYDROGEN, NOBLE GAS, OXIDATION, OXYGEN, CHEMICAL KINETICS, CHEMICAL
EQUILIBRIUM

JO7909
HARRIS PA
HWP BLANKET PROCESSING STUDIES OF O_2 - H_2 HAZARDS IN A LOOP PRESSURIZED
OAK RIDGE NATIONAL LABORATORY
OAK-2508, 70 PAGES, REFERENCES, SEPTEMBER 25, 1959, CFSTI, 51.01 MF, 52.60 PS

RESULTS OF EXPERIMENTS MADE UNDER CONDITIONS PROPOSED FOR HOMOGENEOUS REACTOR BLANKET-PROCESSING
LOOP STUDIES INDICATED THAT SPONTANEOUS H_2 + O_2 REACTIONS WILL NOT OCCUR FREQUENTLY TO SERIOUSLY
HAMPER OPERATION FOR REASONABLE STEADY-STATE PERIODS AND WILL NOT RESULT IN HAZARDOUS EQUIPMENT
FAILURES. CALCULATED (H_2 - O_2) CONCENTRATIONS BELOW LITERATURE VALUES FOR EXPLOSIVE CONCENTRATION
LIMITS WERE DETONATED WITH AN IGNITION COIL. THIS RESULT WAS PROBABLY DUE TO SEGREGATION OF
GASES, WHICH WOULD BE EXPECTED FROM THE TEST-SYSTEM GEOMETRY. THE PRESSURIZER WAS NOT DAMAGED IN
MORE THAN 25 DETONATION REACTIONS, SOME OF WHICH WERE FOR 200 PSI H_2 PLUS 100 PSI O_2 , WITH NO
DILUENT, AT ROOM TEMPERATURE. RECORDED PRESSURE PEAKS INDICATED THAT PRESSURE RISES WOULD BE
LESS THAN 1600 PSI IN OTHER LOOP COMPONENTS. THE PCRA PRESSURES WOULD BE WITHIN THE TEST LIMIT
OF THE PUMP-FORCE (1400 PSI) AND OF ALL OTHER LOOP COMPONENTS.

EXPLOSION, REACTOR, HOMOGENEOUS, HRT (RE), HYDROGEN, OXYGEN, OUT OF PILE EXPERIMENT, HAZARDS ANALYSIS

009731
LAZZARINI E
ON THE DISTRIBUTION OF SOME FISSION PRODUCTS BETWEEN CORE AND RECOMBINER OF L54M REACTOR - PART 4 - DECAY
PROBABILITY OF KR-89 AND KR-90 IN RECOMBINER
CENTRO STUDI NUCLEARI DELLA CASACCIA, ROME, ITALY
3 PAGES, 2 TABLES, 1 FIGURE, ENERGIA NUCLEARE 12(12) - 625-627 (DECEMBER 1965)

THE PROBABILITIES THAT KR-89 AND KR-90 DECAY IN THE RECOMBINER OF L54M REACTOR WERE MEASURED BY
DETERMINING THE AMOUNTS OF SR-89 AND SR-90 IN THE RECOMBINER WATER. THESE PROBABILITIES,
TOGETHER WITH THOSE PREVIOUSLY OBTAINED FOR XE-137, XE-140 AND XE-141, ARE PLOTTED AGAINST THE
HALF-LIVES OF THE NUCLIDES AND INTERPOLATED WITH CALCULATED FUNCTIONS. THE AGREEMENT BETWEEN
EXPERIMENTAL AND THEORETICAL BEHAVIOURS IS DISCUSSED.

FISSION GAS RELEASE + KRYPTON + NOBLE GAS + STRONTIUM + WATER + XENON + FISSION PRODUCT TRANSPORT

009732
LAZZARINI E + SANGIUST V + TERRANI M + TERRANI S
ON THE DISTRIBUTION OF SOME FISSION PRODUCTS BETWEEN CORE AND RECOMBINER OF L54M REACTOR - PART 3 -
DETERMINATION OF THE TURNOVER TIME OF RECOMBINER WATER AND BUILDUP OF CS-137 AND BA-140 AND CE-141 IN IT
CENTRO STUDI NUCLEARI DELLA CASACCIA, ROME, ITALY
5 PAGES, 2 FIGURES, 1 TABLE, ENERGIA NUCLEARE 12 (11) - 593-597 (NOVEMBER 1965)

THE BUILD-UP OF FISSION PRODUCTS IN THE RECOMBINER WATER OF L54M REACTOR WHEN IT IS OPERATING AT
MAXIMUM POWER WAS STUDIED. THE TURNOVER TIME OF THE RECOMBINER WATER WAS MEASURED AND THE
PROBABILITIES THAT XE-137, XE-140 AND XE-141 DECAY IN IT WERE ALSO DETERMINED. AN EXPRESSION FOR
THESE PROBABILITIES WAS OBTAINED IN FUNCTION OF THE TRANSPORT TIME OF GASEOUS FISSION PRODUCTS
FROM THE CORE TO THE RECOMBINER AND OF THEIR TRANSIT TIME THROUGH THE RECOMBINER WATER. THESE
TIME INTERVALS WERE DEDUCED FROM THE PROBABILITIES, EXPERIMENTALLY DETERMINED, THAT XE-137, XE-
140 AND XE-141 DECAY IN RECOMBINER WATER. VALUES OF 6.2 AND 1.9 SEC, RESPECTIVELY, WERE FOUND.

BARIUM + CERIUM + CESIUM + FISSION GAS RELEASE + FISSION PRODUCT, VOLATILE + NOBLE GAS + WATER + XENON +
FISSION PRODUCT TRANSPORT

015529
LAZZARINI E ET AL
ON THE DISTRIBUTION OF SOME FISSION PRODUCTS BETWEEN CORE AND RECOMBINER OF L54M REACTOR. PART 5. EFFECT OF
CU-2+ CONCENTRATION IN THE FUEL ON THE ESCAPE PROBABILITY OF IODINE
CENTRO STUDI NUCLEARI ENRICO FERMI, MILAN, ITALY
2 PAGES, 1 TABLE, 10 REFERENCES, ENERGIA NUCLEARE, 13(2), PAGES 82 TO 84 (FEBRUARY, 1966)

COPPER IONS IN THE FUEL OF L54M REACTOR DISPLACE THE IODINE FROM ELEMENTARY FORM TO OTHERS.
PERHAPS IODINE AND IODATE, WHICH HAVE NEGLIGIBLE VAPOUR PRESSURE, AS A CONSEQUENCE, THE TRANSFER
OF IODINE FROM CORE TO RECOMBINER IS LOWERED BY COPPER IONS IN THE FUEL.

CHEMICAL REACTION + FISSION PRODUCT RELEASE + FISSION PRODUCT, IODINE + REACTOR, HOMOGENEOUS + REACTOR,
RESEARCH + COPPER + ITALY + FISSION PRODUCT RETENTION

017890
LICENSE APPLICATION AND PROPOSED TECHNICAL SPECIFICATIONS FOR BYU L-77 REACTOR
BRIGHAM YOUNG UNIVERSITY, PROVO, UTAH
BYU-NUC-001 + 10 PAGES, 1 FIGURE, 2 TABLES, JULY 22, 1966, DOCKET NO. 50-262

BYU APPLIES FOR A FACILITY LICENSE AND CONSTRUCTION PERMIT FOR A 10-MW REACTOR. THE CORE IS HOUSED
IN A PARTIALLY EVACUATED S.S. SPHERE SURROUNDED BY 3 LAYERS OF SHIELDING AND A WATER SHIELD.
MAXIMUM EXCESS REACTIVITY IS 0.5%. A GAS RECOMBINER IN THE CORE RECOMBINES DECOMPOSED WATER FROM
THE AQUEOUS FUEL SOLUTION (20% ENRICHED URANYL SULFATE, 30 LITERS OR LESS). CONTROL RODS ARE
ALUMINUM-CLAD CADMIUM.

AVAILABILITY - USAEC PUBLIC DOCUMENT RCCM, WASHINGTON, D. C.

CADMIUM + REACTIVITY, EXCESS + REACTOR, HOMOGENEOUS + REACTOR, TRAINING + CONSTRUCTION PERMIT PROCESS +
TECHNICAL SPECIFICATIONS + SHIELDING + WATER BOILER (RR) + CONTROL RODS

024134
SELECTED ELK RIVER OPERATING EXPERIENCE
RURAL COOPERATIVE POWER ASSOCIATION
VUS-326 + 54 PAGES, 5 FIGURES, 2 TABLES, ELK RIVER REACTOR OPERATIONS SAFETY ANALYSIS PROGRESS REPORT TO
RURAL COOPERATIVE POWER ASSOCIATION, MONTHLY REPORT NO. 16, OCTOBER 1, TO OCTOBER 31, 1966

(PP. 5-11) PLATINIZED HONEYCOMB CATALYST SHOULD BE SUBSTITUTED FOR PELLETS IN THE RECOMBINER
BECAUSE THE HONEYCOMB TYPE IS INSENSITIVE TO FLOW, TEMPERATURE, AND MOISTURE. (PG 20-26)
VARIATION OF IODINE IN THE COOLANT WITH TIME INDICATES THAT ABOUT 9 G OF U-235 IS GIVING THIS
ACTIVITY. (PG 27-29) A LOSS OF 10% OF THE CENTRAL-CONTROL-ROD WORTH RESTRICTS ITS LIFETIME TO
4.6 EFP YEARS. LIFETIME BY B4C PELLET SWELLING OR HELIUM RELEASE EXCEEDS THAT. THE REGULATING
ROD SHOULD BE EXCHANGED FOR A BANKED ROD EVERY 2 EFP YEARS AT THE TECH.-SPEC. CONTROL-ROD
INSPECTION.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VIRGINIA \$3.00

024134 *CONTINUED*
COPY, \$0.65 MICROFICHE

ACTIVITY BUILDUP + REACTOR, BWR + CONTROL ROD BURNUP + ELK RIVER (BWR) + STEEL, STAINLESS + REPORT, OPERATIONS ANALYSIS + MAIN COOLING SYSTEM

028800
CHEMICAL SURVEILLANCE OF THE CAROLINAS-VIRGINIA TUBE REACTOR
WESTINGHOUSE ELECTRIC CORPORATION
CVNA-285 +. 149 PAGES, FIGURES, TABLES, REFERENCES, AUGUST 1967

GENERAL STUDY DEALING WITH DEGRADATION OF D2O (USE D2 INSTEAD OF H2 GAS TO SUPPRESS RADIOLYSIS), FLUORIDE PICKUP IN MODERATOR FROM INSULATION, ADDITION OF ALKALI TO REDUCE CRUD AND SURFACE FILM BUILDUP, AND FAILURE OF PIPE IN THE SWEEP GAS SYSTEM (CAUSED BY CHLORIDES FROM RECOMBINER PALLADIUM PELLETS).

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151, \$3.00 COPY, \$0.65 MICROFICHE

REACTOR, BWR + FAILURE, PIPE + REACTOR, PRESSURE TUBE + REACTOR, PWR + FLUORINE + OPERATING EXPERIENCE SUMMARY + CRUD + COOLANT CHEMISTRY + REPORT, OPERATIONS ANALYSIS + RADIOLYTIC GAS + STRESS CORROSION + CHLORIDE

030505
REVISIONS TO PSAR
INDIANA AND MICHIGAN ELECTRIC COMPANY
30 PAGES, FIGURES, TABLES, AMENDMENT 11 TO COOK 1 AND 2 LICENSE APPLICATION, NOVEMBER 27, 1968, DOCKET 50-315/316

CONTAINS REVISION PAGES FOR PSAR, REFLECTING ADDITIONAL INFORMATION PRESENTED IN AMENDS. 8, 9, AND 10. REVISIONS TO 3 AEC QUESTIONS ARE INCLUDED (CONCERN CORROSION AND SURVEILLANCE PROGRAM FOR CONTAINMENT LINER, PERFORMANCE AND DESCRIPTION OF RECOMBINER, AND QUALITY-CONTROL PROGRAM).

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

NRC QUESTION + HYDROGEN + REACTOR, PWR + CORROSION + RADIOLYTIC GAS + REPORT, PSAR + QUALITY ASSURANCE + CONTAINMENT LINER + SURVEILLANCE PROGRAM + COOK 1 (PWR) + COOK 2 (PWR)

030509
R AND C, AND QUALITY CONTROL
INDIANA AND MICHIGAN ELECTRIC COMPANY
41 PAGES, FIGURES, TABLES, AMENDMENT 10 TO COOK 1 AND 2 LICENSE APPLICATION, NOVEMBER 14, 1968, DOCKETS 50-315/316

ADDITIONAL INFORMATION ON (1) QUALITY-CONTROL PROGRAM, (2) GADWELD SPLICING AND TESTING PROCEDURES, (3) SEISMIC-DESIGN CRITERIA, (4) RECOMBINER DESIGN AND ASSOCIATED R AND D, (5) PORTS FOR CONTAINMENT LINER INSPECTION, (6) CONTAINMENT-SPRAY R AND D, AND (7) FIXED INCORE DETECTORS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

CONTAINMENT SPRAY + DESIGN CRITERIA + HYDROGEN + INSTRUMENT, IN CORE + METAL WATER REACTION + REACTOR, PWR + PROCEDURES AND MANUALS + TESTING + WELDING + MODIFICATION + RADIOLYTIC GAS + EXAMINATION + REPORT, PSAR + QUALITY ASSURANCE + EARTHQUAKE ENGINEERING + R AND D PROGRAM + CONTAINMENT LINER + COOK 1 (PWR) + COOK 2 (PWR)

030683
MOCHIZUKI K + MAKINO K
CONTROL OF THE OFF-GASES AND ITS PROBLEMS IN JPDR
JAPAN ATOMIC ENERGY RESEARCH INSTITUTE
6 PAGES, GENSHIRYOKU KOGYO 13(5), PAGES 27-32 (MAY 1967), (IN JAPANESE)

THE OFF-GASES OF JPDR (JAPAN POWER DEMONSTRATION REACTOR) INCLUDE HYDROGEN AND NITROGEN (RADIOACTIVE) IN THE GAS AFTER THE MAIN CONDENSER, ARGON-41 FROM ARGON IN THE AIR, AND FISSION-PRODUCT GASES (KR, XE, ETC.) WHEN THE FUEL IS RUPTURED. ALTHOUGH NONRADIOACTIVE, THE HYDROGEN MAY BURN OR EXPLODE IN THE PIPING. IT IS, THEREFORE, NECESSARY TO CONTROL IT, ESPECIALLY IN THE JPDR WHERE OFF-GAS STORAGE TANKS ARE INCORPORATED. CONTROL METHODS AND PROBLEMS ARE DESCRIBED.

FIRE + FISSION PRODUCT RELEASE + FAILURE, FUEL ELEMENT + HYDROGEN + KRYPTON + NOBLE GAS + REACTOR SAFETY SYSTEM + XENON + ARGON + NITROGEN + FISSION PRODUCT RETENTION + RADIATION MONITORS

035179
SELECTED ELK RIVER OPERATING EXPERIENCE
RURAL COOPERATIVE POWER ASSOCIATION
COO-651-50 +. 25 PAGES, OPERATING REPORT NO. 58, AUGUST 1967, DOCKET 115-1, TYPE--BWR, MFG--A.C., AE--SGT + LUNOV

AUGUST 23 SCHEDULED SHUTDOWN INCLUDED THE FOLLOWING - INVESTIGATE AND CORRECT PRIMARY SYSTEM

035179 *CONTINUED*

LEAKAGE OF 40 GAL/DAY REPAIR LEAK ON FORMER DECAY HEAT PUMP DISCHARGE CHECK VALVE, CLEAN SUPERHEATER AIR HEATER, PERFORM TESTS AS REQUIRED BY ERR TECHNICAL SPECIFICATION. AFTER 18 HR AND 7 MIN., THE REACTOR WAS RETURNED TO SERVICE. *** RECOMBINER PERFORMANCE WAS IMPROVED BY REPLACING PLATINIZED ALUMINUM PELLETT CATALYST WITH PLATINIZED HONEYCOMB CERAMIC DISKS. EFFICIENCY WAS MAINTAINED DURING PRESSURE AND TEMPERATURE CHANGES, AND SUPERHEAT TEMPERATURES ARE NEARLY TWICE AS HIGH.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, BWR + MAINTENANCE AND REPAIR + REPORT, OPERATIONS + TESTING + MODIFICATION + MAIN COOLING SYSTEM + PLATINUM + LEAK

035182

PRESELECTED ELK RIVER OPERATING EXPERIENCE
RURAL COOPERATIVE POWER ASSOCIATION

COO-651-46 + 36 PAGES, OPERATING REPORT NO. 56, JUNE 1967, DOCKET 115-1, TYPE--BWR, MFG--A.C., AE--SGT + LUNDY

(1) REACTOR RELOADED WITH 152 ELEMENTS INSTEAD OF 148, TO REDUCE HEAT FLUX AND ELEMENT EXPOSURE. ROD POSITIONS AT CRITICALITY WERE WITHIN 0.3 INCH OF THAT CALCULATED. (2) PLANT MODIFICATIONS INCLUDED EVAPORATOR MOISTURE SEPARATOR RELOCATION TO IMPROVE CARRYOVER, REMOVAL OF OBSOLETE GAS-RECOMBINER PIPING AND VALVES, AND INSTALLATION OF SEPARATE SERVICE WATER HEADER TO CONTAINMENT. (3) CONTAINMENT LEAK RATE WAS WITHIN ACCEPTABLE LIMITS. EIGHT MINOR LEAKS AT PRIMARY SYSTEM HYDRO TESTED AT 1375 PSIG AND 270 F. REACTOR VESSEL NOW HAS HAD 35.78 PRESSURE-TEMPERATURE CYCLES. (5) IN JUNE, 0.137 CURIE OF B-G ACTIVITY WAS RELEASED TO MISSISSIPPI RIVER, AND 0.055 CURIE KENTUCKY BURIAL.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, BWR + ELK RIVER (BWR) + MAINTENANCE AND REPAIR + REPORT, OPERATIONS + PRESSURE VESSELS + TEST, PRESSURE VESSEL + TEST, LEAK RATE + WASTE DISPOSAL, LIQUID + REACTOR STARTUP TESTING + MODIFICATION + REFUELING

035445

INDIAN POINT 3 SAFETY EVALUATION
USAFEC DIVISION OF REACTOR LICENSING

30 PAGES, AEC SAFETY EVALUATION - INDIAN POINT 3 CONSTRUCTION PERMIT - FEBRUARY 20, 1969, DOCKET 50-286, TYPE--PWR, MFG--WEST., AE--UNITED ENGR.

CONCISE DESCRIPTION AND EVALUATION OF THE SITE, PRINCIPAL PLANT FEATURES, IMPORTANT SAFETY CONSIDERATIONS, ACCIDENT ANALYSIS, R-AND-D PROGRAM, AND QUALITY-ASSURANCE PROGRAM. EFFECT OF TORNADOES ON SPENT-FUEL STORAGE PIT IS BEING EVALUATED. R AND D ON CLAD DEFORMATION AND EFFECT ON ECCS UNDER SIMULATED LOSS-OF-COOLANT CONDITIONS IS BEING CONDUCTED. ADDITIONAL RESEARCH WILL BE CONDUCTED ON REMOVAL OF ORGANIC IODIDES BY IMPREGNATED CHARCOAL AT HIGH RELATIVE HUMIDITY. A FLAME RECOMBINER WILL BE USED TO DISPOSE OF RADIOLYTIC HYDROGEN.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

FILTER EFFICIENCY + REACTOR, PWR + FUEL STORAGE + CONSTRUCTION PERMIT PROCESS + CHARCOAL + ORGANIC IODIDE + REGULATION, AEC + RADIOLYTIC GAS + FAILURE, CLADDING + SAFETY PRINCIPLES AND PHILOSOPHY + SYSTEM DESCRIPTION + DESTRUCTIVE WIND + SAFETY EVALUATION + R AND D PROGRAM + INDIAN POINT 3 (PWR)

037324

SUPPLEMENT 5 TO PRELIMINARY SAFETY ANALYSIS REPORT
CONSOLIDATED EDISON COMPANY OF NEW YORK

AMENDMENT 5 TO INDIAN POINT 3 LICENSE APPLICATION, OCT. 30, 1968, DOCKET 50-286, TYPE--PWR, MFG--WEST., AE--UNITED ENGR.

CONSISTS OF REPLACEMENT PAGES FOR SUPPLEMENT 1 AND RESPONSES TO QUESTIONS POSED BY DRL AT A MEETING ON OCT. 11, 1968. SUPPLEMENTAL INFORMATION CONCERNS IMPROVEMENTS TO ECCS, INITIAL TESTING PROGRAM, QUALITY ASSURANCE, DESCRIPTION OF HYDROGEN PRODUCTION AND RECOMBINER OPERATION, CONTAINMENT-SPRAY PROGRAM, LOCA PROTECTION, OFF-SITE-DOSE-EVALUATION MODEL, THERMAL SHOCK TO PRESSURE VESSEL, AND INSTRUMENTS.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00 COPY, \$0.65 MICROFICHE

NRC QUESTION + DOSE + HYDROGEN + ACCIDENT, LOSS OF COOLANT + PRESSURE VESSELS + REACTOR, PWR + THERMAL MECHANICAL EFFECT + ANALYTICAL MODEL + INSTRUMENT, CONTROL + HAZARDS ANALYSIS + TEST, PREOPERATIONAL + REPORT, PSAR + QUALITY ASSURANCE + INDIAN POINT 3 (PWR) + OFF SITE + EMERGENCY COOLING SYSTEM

040884

SUPPLEMENTAL INFORMATION FOR PSAR
INDIANA AND MICHIGAN ELECTRIC COMPANY

30 PAGES, FIGURES, TABLES, AMENDMENT 10 TO COOK 1 AND 2 LICENSE APPLICATION, NOVEMBER 4, 1968, DOCKETS 50-

040884 *CONTINUED*
315/316, TYPE--PWR, MFG--WEST., AE--UTILITY

SUPPLEMENTAL INFORMATION CONCERNS QUALITY ASSURANCE, CADWELD SPLICING AND TESTING PROCEDURES, SEISMIC DESIGN CRITERIA, RECOMBINER DESIGN, PARTS FOR CONTAINMENT LINER INSPECTION, ICE CONDENSER DOORS, CONTAINMENT SPRAY, AND FIXED IN-CORE DETECTORS.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00
COPY, \$0.65 MICROFICHE

CONTAINMENT SPRAY + INSTRUMENT, IN CORE + REACTOR, PWR + CONTAINMENT CONSTRUCTION + WELDING + REPORT, PSAR + QUALITY ASSURANCE + CONTAINMENT, ICE CONDENSER + CONTAINMENT LINER + COOK 1 (PWR) + COOK 2 (PWR) + SEISMIC DESIGN

043999
WILSON JF
ELECTRIC HYDROGEN RECOMBINER FOR PWR CONTAINMENTS
WESTINGHOUSE NUCLEAR ENERGY SYSTEMS, PENNSYLVANIA
WCAP-7820 (SUPPL. 1) +. 50 PAGES, FIGURES, TABLES, MAY 1972

THE WESTINGHOUSE ELECTRIC CORPORATION DEVELOPED A NEW TYPE OF HYDROGEN RECOMBINER DESIGN FOR USE IN REACTOR CONTAINMENTS FOLLOWING A POSTULATED LOSS-OF-COOLANT ACCIDENT WHERE SUCH EQUIPMENT IS NEEDED TO MEET THE REQUIREMENTS OF AEC SAFETY GUIDE 7. THE RECOMBINER USES ELECTRIC-RESISTANCE HEATERS TO HEAT A CONTINUOUS FLOW OF CONTAINMENT ATMOSPHERE ABOVE THE HYDROGEN-OXYGEN REACTION TEMPERATURE, THEREBY CAUSING THE HYDROGEN TO COMBINE WITH THE OXYGEN WHICH IS BEING PROCESSED BY THE RECOMBINER. THUS, THE RECOMBINER CAN BE USED TO MAINTAIN THE HYDROGEN CONCENTRATION IN THE CONTAINMENT AIR AT SAFE LEVELS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

HYDROGEN + REACTOR, PWR

045167
DEACTIVATION OF HOMOGENEOUS LIQUID REACTOR
IIT RESEARCH INSTITUTE
2 PAGES, LETTER - IIT RESEARCH INSTITUTE TO DIVISION OF REACTOR LICENSING (AEC) - MAY 15, 1970

DEACTIVATED REACTOR CAN BE TREATED AS BY-PRODUCT MATERIAL IF CONTROL CONSOLE IS DISCONNECTED, CONTROL RODS AND MOTORS REMOVED, REACTOR CORE AND RECOMBINER DRAINED, FUEL, LIQUID, AND GASEOUS WASTES REMOVED, AND TUBING TO CORE INTERIOR SEVERED AND SEALED. AEC WILL APPROVE A CONTRACTOR TO DO THIS WORK.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, HOMOGENEOUS + BYPRODUCT MATERIAL + REGULATION, AEC + DECOMMISSIONING + CONTROL RODS

054952
REVISIONS TO PSAR AND RESPONSES TO AEC QUESTION
TENNESSEE VALLEY AUTHORITY, CHATTANOOGA, TENNESSEE
DOCKET-50390-9 +. 100 PAGES, AMENDMENT 3 TO WATTS BAR 1 AND 2 LICENSE APPLICATION, FEBRUARY 2, 1972, DOCKETS 50-390/391, TYPE--PWR, MFG--WEST., AE--TVA

CONTAINS REVISED PAGES TO PSAR CONCERNING WASTE-DISPOSAL AND RADIATION-PROTECTION SYSTEM AND A NEW SECTION ON HYDROGEN RECOMBINERS. INCLUDES RESPONSES TO 75 AEC QUESTIONS CONCERNING SITING, LEAK DETECTION, IN-SERVICE INSPECTION, CONTAINMENT DESIGN, ENGINEERED SAFETY FEATURES, WASTE MANAGEMENT, AND STAFFING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

NRC QUESTION + DESIGN CRITERIA + REACTOR, PWR + SITING, REACTOR + WASTE DISPOSAL + WASTE MANAGEMENT + REPORT, PSAR + MAIN COOLING SYSTEM + SURVEILLANCE PROGRAM + ENGINEERED SAFETY FEATURE + WATTS BAR 1 (PWR) + WATTS BAR 2 (PWR)

059373
REPORT ON INDIAN POINT 2 APPLICATION TO OPERATE
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS, WASHINGTON, D.C.
1 PAGE, LETTER - ADVISORY COMMITTEE ON REACTOR SAFEGUARDS TO U.S. ATOMIC ENERGY COMMISSION - SEPTEMBER 23, 1970, DOCKET 50-247, TYPE--PWR, MFG--WEST., AE--UNITED ENGR

TO CONTROL THE CONCENTRATION OF HYDROGEN WHICH COULD BUILD UP IN THE CONTAINMENT FOLLOWING A POSTULATED LOSS-OF-COOLANT ACCIDENT, THE APPLICANT HAS PROVIDED REDUNDANT FLAME RECOMBINER UNITS WITHIN THE CONTAINMENT, BUILT TO ENGINEERED SAFETY FEATURE STANDARDS. A CONSERVATIVE METHOD OF DEFINING PRESSURE VESSEL FRACTURE TOUGHNESS SHOULD BE EMPLOYED. NOTED THE NEED FOR STUDIES ON FURTHER MEANS OF PREVENTING COMMON FAILURE MODES FROM NEGATING SCRAM ACTION, AND OF POSSIBLE DESIGN FEATURES TO MAKE TOLERABLE THE CONSEQUENCES OF FAILURE TO SCRAM DURING ANTICIPATED TRANSIENTS.

059373 *CONTINUED*
 AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

HYDROGEN + PRESSURE VESSELS + REACTOR, PWR + REACTOR SAFETY SYSTEM + ACRS + INDIAN POINT 2 (IPWR) + STRESS STRAIN DATA + OPERATING LICENSE PROCESS + FAILURE MODE ANALYSIS

040355
 DEACKOFF LP + FEINSTEIN JG + PANASEE RE
 POST-DBA CONTAINMENT HYDROGEN GENERATION, METHODS FOR CALCULATING AND CONTROLLING HYDROGEN ACCUMULATION
 STONE AND WEBSTER ENGINEERING CORPORATION
 2 PAGES, 3 FIGURES, 2 REFERENCES, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, 13(SUPPL.), PP. 10-11
 (SEPTEMBER 3, 1970)

DISCUSSES A COMPUTER PROGRAM, CORHYD, WHICH CALCULATES THE GENERATION OF HYDROGEN GAS IN CONTAINMENT FOLLOWING THE CBA. THE USE OF A CATALYTIC RECOMBINER IS REVIEWED. BY DIVERTING A SMALL PORTION OF THE FLOW FROM A CONTAINMENT SPRAY PUMP THROUGH AN EJECTOR, MOTIVE FORCE IS PROVIDED TO CIRCULATE A PORTION OF THE CONTAINMENT ATMOSPHERE THROUGH A SUITABLE CLEANUP AND HEATING SYSTEM AND THEN THROUGH THE CATALYTIC RECOMBINER. NO CONTROLS ARE REQUIRED FOR THE OPERATION.

AVAILABILITY - L. P. DEACKOFF, STONE AND WEBSTER ENGINEERING CORPORATION, P.O. BOX 2325, BOSTON, MASSACHUSETTS 02107

COMPUTER PROGRAM + HYDROGEN + RADIOLYTIC GAS + SYSTEM DESCRIPTION + ACCIDENT, DESIGN BASIS + JACOBS

060369
 O/MARA RL
 PAPER V-3 - HYDROGEN RECYCLE
 STONE AND WEBSTER ENGINEERING CORPORATION
 2 PAGES, 1 FIGURE, 4 REFERENCES, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, 13 (SUPPL.), PG. 20-21
 (SEPTEMBER 3, 1970)

DISCUSSES THE SCHEME WHICH INVOLVES THE REUSE OF COOLANT HYDROGEN AND ASSOCIATED FISSION GAS TO REDUCE TO SIZE OF DECAY TANKS AND TO LESSEN THE REQUIREMENT FOR A RECOMBINER WITHOUT REDUCING OVERALL SAFETY.

AVAILABILITY - R. L. O/MARA, STONE AND WEBSTER ENGINEERING CORPORATION, P. O. BOX 2325, BOSTON, MASSACHUSETTS 02107

HYDROGEN + WASTE TREATMENT, GAS + WASTE DISPOSAL, GAS + RADIOLYTIC GAS + OFF GAS

060384
 FALK CF + MICHELS LR
 PAPER VII-5 - DESIGN FOR CONTROL
 GENERAL ELECTRIC COMPANY, SAN JOSE, CALIFORNIA
 3 PAGES, 2 TABLES, TRANSACTIONS OF THE AMERICAN NUCLEAR SOCIETY, 13(SUPPL.), PG. 30-32 (SEPTEMBER 3, 1970)

DESCRIBES METHODS TO REDUCE RADIOACTIVITY RELEASES. DISCUSSES CATALYTIC RECOMBINERS AND CHARCOAL ADSORBERS.

AVAILABILITY - C. F. FALK, GENERAL ELECTRIC COMPANY, 175 CURTNER AVENUE, SAN JOSE, CALIFORNIA 95125

REACTOR, PWR + CONTROL SYSTEM + WASTE DISPOSAL + WASTE TREATMENT + CHARCOAL ADSORBER + CHARCOAL + WASTE MANAGEMENT + RADIOACTIVITY RELEASE + RADIOLYTIC GAS + OFF GAS + FILTERS

068353
 WILSON JF
 ELECTRICAL HYDROGEN RECOMBINER FOR WATER REACTOR CONTAINMENTS
 WESTINGHOUSE NUCLEAR ENERGY SYSTEMS, PENNSYLVANIA
 WCAP-7620 +, 25 PAGES, DECEMBER 1971

DOCUMENTS A PRESENTATION TO THE AEC ON MAY 5, 1971, ON AN ELECTRICAL HYDROGEN RECOMBINER BEING DEVELOPED BY WESTINGHOUSE TO PREVENT HYDROGEN IN A REACTOR CONTAINMENT FROM REACHING FLAMMABLE CONCENTRATIONS. ANALYTICAL WORK, PROOF-OF-PRINCIPLE TESTS PERFORMED AND DESCRIBED IN THIS REPORT SHOW THAT THE HYDROGEN GENERATED AFTER A LOSS-OF-COOLANT ACCIDENT CAN BE PREVENTED FROM REACHING FLAMMABLE LIMITS. INCLUDES DESCRIPTIONS OF THE DESIGN WITH TYPICAL PARAMETERS FOR A PROTOTYPE AND THE PLANNED PROTOTYPE TESTING PROGRAM FOR VERIFICATION OF PERFORMANCE.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

CONTAINMENT + HYDROGEN + REACTOR, PWR + RADIOLYTIC GAS + SYSTEM DESCRIPTION

073649
 ELECTRIC HYDROGEN RECOMBINER PLANNED FOR SURRY 1 AND 2 CONTAINMENT
 VIRGINIA ELECTRIC AND POWER COMPANY

073649 *CONTINUED*
DOCKET-50280-80 P., 2 PAGES, LETTER - VIRGINIA ELECTRIC AND POWER COMPANY TO DIRECTORATE OF LICENSING (AEC) - AUGUST 18, 1972, DOCKETS 50-280/281, TYPE--PWR, MFG--WEST., AE--SOTNE + WEBSTER

AFTER REVIEWING THE AVAILABLE SYSTEMS FOR CONTROLLING THE HYDROGEN CONCENTRATION AFTER A LOCA, THE UTILITY DECIDED THAT AN ELECTRIC HYDROGEN RECOMBINER WOULD BE BETTER THAN A CATALYTIC RECOMBINER. THE ELECTRIC RECOMBINER WILL CONSIST OF A VERTICAL DUCT CONTAINING SHEATHED RESISTANCE HEATERS. THE CONTAINMENT ATMOSPHERE IS HEATED BY NATURAL CONVECTION FLOW SUFFICIENTLY TO REACT HYDROGEN AND OXYGEN. TWO FULL-CAPACITY RECOMBINERS WILL BE INSTALLED INSIDE THE CONTAINMENT. CONTROLS AND POWER WILL BE FROM OUTSIDE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

HYDROGEN + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + ELECTRIC POWER + PLANT PROTECTIVE SYSTEM + CONTAINMENT STRUCTURE + MODIFICATION + SURRY 1 (PWR) + SURRY 2 (PWR)

074110
MICHELS LR + HORTON NR
IMPROVED BWR OFF GAS SYSTEMS
GENERAL ELECTRIC COMPANY, ATOMIC POWER EQUIPMENT DEPARTMENT
20 PAGES, 9 FIGURES, 5 TABLES, 6 REFERENCES, PAPER PRESENTED AT THE 12TH ANNUAL USAEC AIR CLEANING CONFERENCE, OAK RIDGE, TENNESSEE, AUGUST 28-31, 1972

ALL LIGHT WATER REACTORS IN GENERAL PRODUCE RADIOACTIVE FISSION, ACTIVATION, AND CORROSION PRODUCTS WHICH ARE EVENTUALLY DISCHARGED FROM THE VARIOUS PLANT SYSTEMS. IN A BWR, THE POTENTIAL RELEASE PATHS FOR GASEOUS EFFLUENTS INCLUDE THE STEAM JET AIR EJECTOR OFFGAS SYSTEM, THE GLAND SEAL SYSTEM, THE MECHANICAL VACUUM PUMP AND MISCELLANEOUS BUILDING VENTS. OF THESE, THE OFFGAS SYSTEM PROCESSES THE LARGEST QUANTITY OF RADIOACTIVE MATERIAL. THE IMPROVED OFFGAS SYSTEM COMPRISES CATALYTIC RECOMBINERS WHICH REDUCE GAS VOLUME BY REMOVING THE RADIOLYTIC HYDROGEN AND OXYGEN PLUS DYNAMIC CHARCOAL ADSORBERS WHICH OPERATE AT AMBIENT TEMPERATURE AND PROVIDE SELECTED HOLDUP TO PERMIT KP AND KE DECAY AND TRAPPING OF DAUGHTERS WITHIN THE CHARCOAL MATRIX. G.E.'S NEWEST OFFGAS SYSTEM FEATURES CATALYTIC RECOMBINERS ALONG WITH DESICCANT TYPE AIR DRIERS AND DYNAMIC CHARCOAL ADSORBERS OPERATED IN THE RANGE FROM 0 F TO -40 F.

AVAILABILITY - L. R. MICHELS, GENERAL ELECTRIC COMPANY, ATOMIC POWER EQUIPMENT DEPARTMENT, SAN JOSE, CALIFORNIA

AIR CLEANING + REACTOR, BWR + DESIGN CRITERIA + HYDROGEN + KRYPTON + XENON + CHARCOAL + OFF GAS + CRYOGENICS

076355
MODIFIED OFF-GAS SYSTEM FOR DRESDEN AND QUAD CITIES
COMMONWEALTH EDISON COMPANY
DOCKET 50237-276 P., 16 PAGES, LETTER WITH ATTACHED SPECIAL REPORT NO. 4A TO DIRECTOR OF REACTOR PROJECTS (AEC), NOV. 8, 1972, DOCKETS 50-237/249/254/265, TYPE--BWR, MFG--G.E., AE--SGT AND LUNDY

TRANSMITS REPORT DESCRIBING MODIFICATIONS BEING MADE TO DRESDEN 2 AND 3 AND QUAD CITIES 1 AND 2 OFF-GAS SYSTEMS. MODIFICATION CONSISTS OF THE ADDITION OF GENERAL ELECTRIC'S CATALYTIC-RECOMBINER CHARCOAL-BED SYSTEM. THE DESIGN BASIS WILL BE A CURIE REDUCTION FACTOR OF 40 RELATIVE TO EXISTING SYSTEM, ASSUMING THAT AIR IN-LEAKAGE IS 18.5 SCFH.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + DRESDEN 3 (BWR) + WASTE TREATMENT, GAS + DRESDEN 2 (BWR) + DESCRIPTION + OFF GAS + SYSTEM DESCRIPTION + QUAD CITIES 1 (BWR) + QUAD CITIES 2 (BWR)

081127
REVISIONS TO THE PSAR AND RESPONSES TO AEC QUESTIONS
NIAGARA MOHAWK POWER CORP.
DOCKET-50410-194 P., 334 PAGES, AMENDMENT 5 TO NINE MILE POINT PSAR, JAN. 10, 1973, DOCKET 50-410, TYPE--BWR, MFG--G.E., AE--STONE AND WEBSTER

CONTAINS REVISED PAGES TO THE PRELIMINARY SAR CONCERNING CONTROL OF PRIMARY-CONTAINMENT, OFF-GAS SYSTEM, CONTAINMENT DESIGN, SEISMIC DESIGN FOR STRUCTURE, STRESS ANALYSIS, CLASSIFICATION OF COMPONENTS, COMPUTER PROGRAMS, AND ANALYTICAL MODELS USED. INCLUDES RESPONSES TO AEC QUESTIONS CONCERNING THE SAME TOPICS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

AEC QUESTION + REACTOR, BWR + CODES AND STANDARDS + COMPUTER PROGRAM + DESIGN CRITERIA + DILUTION + ANALYTICAL MODEL + WASTE TREATMENT, GAS + ANALYTICAL TECHNIQUE + OFF GAS + CONTAINMENT ATMOSPHERE, INERT + REPORT, PSAR + SEISMIC DESIGN + NINE MILE POINT 2 (BWR)

091413
REVISIONS TO THE SAR CORP: COMMONWEALTH EDISON COMPANY
DOCKET 50299-83 P., 170 PAGES, AMENDMENT 25 TO EDISON STATION PSAR, JANUARY 1973, DOCKETS 50-299/304, TYPE--PWR, MFG--WEST., AE--SGT + LUNDY

CONTAINS REVISED PAGES TO THE FINAL SAR CONCERNING THE FUEL, STARTUP SOURCES, FUEL-SURVEILLANCE PROGRAM, POST-TENSIONED CONTAINMENT, THERMAL RECOMBINER, AND IN-CORE INSTRUMENTATION. INCLUDES

091417 *CONTINUED*
REVISED ANSWERS TO AEC QUESTIONS CONCERNING QUALITY-ASSURANCE PROGRAM, SEISMIC INSTRUMENTATION,
AND CONTAINMENT DESIGN.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

CONTAINMENT DESIGN + FUEL INTEGRITY + INSTRUMENT, IN CORE + REACTOR, PWR + REPORT, SAR + SOURCE, RADIATION +
CONCRETE, PRESTRESSED + QUALITY ASSURANCE + SURVEILLANCE PROGRAM + ZION 1 (PWR) + ZION 2 (PWR) + SEISMIC
DESIGN + FUEL DENSIFICATION + FUEL ELEMENTS

011486
QUAD CITIES MODIFIED OFF-GAS SYSTEM
COMMONWEALTH EDISON CO.
1 PAGE, LETTER TO DIRECTORATE OF LICENSING (AEC), JUNE 13, 1973, DOCKETS 90-254/265, TYPE--BWR, MFG--G.E., AE--
SGT & LUNDY

IN KEEPING WITH THE AS-LOW-AS-PRACTICAL GUIDELINE IT NOW APPEARS DESIRABLE TO INSTALL PART OF
PLANNED NEW EQUIPMENT IN THE OFF-GAS SYSTEM BEFORE ALL IS COMPLETED. INSTALLATION OF THE
RECOMBINER IS ESTIMATED TO REDUCE THE RELEASE RATE BY A FACTOR OF 2 AND SHOULD BE COMPLETED BY
MID-JULY.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
CHARGE \$2.00

AIRBORNE RELEASE + RELEASE RATE + WASTE TREATMENT, GAS + WASTE DISPOSAL, GAS + MODIFICATION + REACTOR +
RADIOACTIVITY RELEASE + OFF GAS + QUAD CITIES 1 (BWR) + QUAD CITIES 2 (BWR)

094269
PUCERS WM + LECHERT RH
CATALYTIC RECOMBINERS FOR BOILING WATER REACTORS - FACTORS AFFECTING THEIR DESIGN, PERFORMANCE AND COST
ENGELHARD INDUSTRIES
5 PAGES, 5 FIGURES, 2 REFERENCES, NUCLEAR ENGINEERING INTERNATIONAL, 18(208), PP. 711-715 (SEPTEMBER 1973)

FOR THE BENEFIT OF THOSE FACING THE PROSPECT OF SPECIFYING, PURCHASING, AND OPERATING CATALYTIC
RECOMBINERS FOR NUCLEAR POWER PLANT OFF-GAS SYSTEMS WE CAN STATE THAT THE FOLLOWING FACTORS WILL
HAVE A SIGNIFICANT EFFECT ON THEIR DESIGN, PERFORMANCE, AND COST: CHOICE OF DILUENT: CONDENSING
OR NONCONDENSING; CATALYST TYPE SELECTED - PELLETIZED, HONEYCOMB OR WIRE MESH; PREHEAT
TEMPERATURE; EFFLUENT SPECIFICATIONS; AIR IN-LEAKAGE SPECIFICATIONS; PRESSURE DROP SPECIFICATIONS;
VESSEL MATERIALS SELECTED; NUMBER OF RECOMBINER STAGES USED.

REACTOR, BWR + HYDROGEN + RADIOLYTIC GAS + SYSTEM DESCRIPTION + CATALYST

087406
WILSON JF
ELECTRIC HYDROGEN RECOMBINER FOR PWR CONTAINMENTS - EQUIPMENT QUALIFICATION REPORT
WESTINGHOUSE ELECTRIC CORPORATION
NCAP-78201(SUPPL.2) +. 50 PAGES, FIGURES, TABLES, OCTOBER 1973

WESTINGHOUSE HAS DEVELOPED AN ELECTRIC HYDROGEN RECOMBINER FOR INSTALLATION INSIDE REACTOR
CONTAINMENTS FOR USE FOLLOWING A POSTULATED LOSS-OF-COOLANT ACCIDENT WHERE SUCH EQUIPMENT IS
NEEDED TO MEET THE REQUIREMENTS OF AEC SAFETY GUIDE 7. THIS RECOMBINER HAS NO MOVING PARTS AND
DOES NOT REQUIRE ANY PIPING, VALVES, PUMPS OR SYSTEMS WHICH OTHERWISE WOULD BE REQUIRED IF THE
RECOMBINER WERE INSTALLED OUTSIDE THE CONTAINMENT. THIS REPORT DESCRIBES THE EXTENSIVE TESTING
PERFORMED ON A PRODUCTION UNIT RECOMBINER WITH ITS ASSOCIATED POWER SUPPLY AND CONTROL EQUIPMENT.
THESE TESTS SHOW THAT THE ELECTRIC HYDROGEN RECOMBINER WILL SATISFACTORILY PERFORM ALL ITS
INTENDED FUNCTIONS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
CHARGE \$2.00

CONTAINMENT + ACCIDENT, LOSS OF COOLANT + REACTOR, PWR + TESTING + TEST, PROOF + R AND D PROGRAM + COMPONENT
DESCRIPTION

087459
POST-LOCA HYDROGEN CONTROL SYSTEM
DETROIT EDISON COMPANY
20 PAGES, LETTER WITH ATTACHED REPORT TO DIRECTORATE OF LICENSING (AEC), NOVEMBER 28, 1973, DOCKET 50-341,
TYPE--BWR, MFG--G.E., AE--SGT. & LUNDY

GIVES DETAILS OF THE DESIGN BASES, SPECIFIC FEATURES, SYSTEMS, AND EQUIPMENT WHICH WILL BE USED
FOR POST-LOCA COMBUSTIBLE GAS CONTROL AT FERM1 2.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
CHARGE \$2.00

REACTOR, BWR + HYDROGEN + ACCIDENT, LOSS OF COOLANT + RADIOLYTIC GAS + ENGINEERED SAFETY FEATURE + FERM1 2
(PWR)

088817
 ZION SPECIAL REPORT NO. 6 - HYDROGEN RECOMBINER FUNCTIONAL TEST REPORT
 COMMONWEALTH EDISON COMPANY
 25 PAGES, LETTER WITH ATTACHED REPORT TO DIRECTORATE OF LICENSING (AEC), FEBRUARY 5, 1974, DOCKET 50-295, TYPE--
 -PWR, MFG--WEST., AE--SGT. & LUNDY

THE FUNCTIONAL TEST PROCEDURES AND TEST RESULTS FOR THE ZION HYDROGEN RECOMBINERS ARE PRESENTED.
 THE TESTS CONSISTED OF A FULL FLCW AND TEMPERATURE DEMONSTRATION TEST PERFORMED AT THE VENDORS
 SHOP BEFORE SHIPMENT. THE UNITS OPERATED IN ACCORDANCE WITH REQUIREMENTS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00

HYDROGEN + REACTOR, PWR + TESTING + TEST, PROOF + ZION 1 (PWR) + ZION 2 (PWR)

089262
 REVISIONS TO THE SAR
 PHILADELPHIA ELECTRIC COMPANY
 50 PAGES, AMENDMENT 29 TO PEACH BOTTOM 2 AND 3 LICENSE APPLICATION, OCTOBER 1, 1973, DOCKET 50-277/278, TYPE--
 BWR, MFG--G.E., AE--BECHTEL

CONTAINS NEW AND REVISED PAGES TO THE FINAL SAR CONCERNING FUEL AND RELATED CHANGES MODIFICATIONS
 TO THE OFF GAS PIPING AND RECOMBINER SYSTEM, MINOR UPGRADING OF RADIATION ZONES, RELIEF VALVE
 CHANGES CONCERNING RESPONSE TIMES AND THE NUMBER OF VALVES TO OPEN AT EACH PRESSURE SET POINT,
 AND REMOVAL OF THE DEEP-BED CHARCOAL FILTER IN THE CAD SYSTEM VENT LINE.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00

REACTOR, BWR + REPORT, SAR + CHARCOAL ADSORBER + RESPONSE TIME + MODIFICATION + OFF GAS + PEACH BOTTOM 2 (BWR)
 + PEACH BOTTOM 3 (BWR) + VALVES + PIPES AND PIPE FITTINGS + FILTERS

089801
 MOORE GE + TOMLINSON LH
 BURNER-FLAME ARRESTER FOR BURNING OFF-GAS FROM A BOILING WATER REACTOR POWER PLANT
 U.S. PATENT 3,740,313 + 4 PAGES, JULY 1, 1971

A COOLED POROUS PLUG DEVICE IN COMBINATION WITH A CONTINUOUS IGNITION SOURCE IS USED FOR BURNING
 OFF EXPLOSIVE MIXTURES OF CONTAMINATED RADIOLYTIC HYDROGEN-OXYGEN GAS FLOW DISCHARGED FROM THE
 STEAM TURBINE CYCLE OF A BOILING WATER NUCLEAR POWER REACTOR. OPTIONAL USE OF A SECOND COOLED
 POROUS PLUG IS SHOWN, THE SECOND POROUS PLUG BEING LOCATED DOWNSTREAM OF THE BURNER TO FUNCTION
 AS A HEAT EXCHANGER TO COOL THE COMBUSTION PRODUCTS FOR CONTROLLED CONDENSATION OF THE WATER
 VAPOR.

AVAILABILITY - THE U.S. PATENT OFFICE, DEPT. OF COMMERCE, WASHINGTON, D.C.

REACTOR, BWR + EXPLOSION + HYDROGEN + OXYGEN + POROUS MEDIA + IGNITION + PATENT + ENGINEERED SAFETY FEATURE +
 SAFETY DEVICE

090403
 THREE MILE ISLAND 2 FINAL SAFETY ANALYSIS REPORT
 METROPOLITAN EDISON COMPANY
 500 PAGES, FINAL SAFETY ANALYSIS REPORT, VOL. 1, THREE MILE ISLAND, APRIL 4, 1974, DOCKET 50-320, TYPE--PWR,
 MFG--B&W, AE--BURNS & ROE

DESCRIBES IN 10 VOLUMES A PWR DESIGNED TO OPERATE AT COPE POWER LEVELS UP TO 2772 MWT. GROSS
 ELECTRICAL OUTPUT WILL BE 959 MW. THE MORE SIGNIFICANT DESIGN REVISIONS SINCE THE PSAR INCLUDE
 THE FOLLOWING. THE FUEL ASSEMBLY UTILIZES INCONEL SPACER GRIDS SUPPORTED BY THE CONTROL ROD
 GUIDE TUBES AND CENTER INSTRUMENT TUBE RATHER THAN STAINLESS STEEL GRIDS SUPPORTED BY AN EXTERNAL
 STAINLESS STEEL PERFORATED CAN. EIGHT OF THE 69 CONTROL RODS WILL NOW CONTAIN NEUTRON ABSORBER
 FOR ONLY A PORTION OF THEIR LENGTH. BURNABLE POISON ROD ASSEMBLIES HAVE BEEN ADDED TO THE FIRST
 CYCLE.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00

FLUX DISTRIBUTION + REACTOR, PWR + REPORT, SAR + VENTILATION SYSTEM + MODIFICATION + SHIELDING + EMERGENCY
 COOLING + CONTAINMENT LINER + THREE MILE ISLAND 2 (PWR) + CONTROL RODS + FUEL ELEMENTS

091955
 MCGUIRE PLANT SITE VISIT AND ACRS SUBCOMMITTEE MEETING, JUNE 4, 1971
 USAEC, ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
 27 PAGES, MEETING HELD IN CHARLOTTE, NORTH CAROLINA, JUNE 7, 1971

HIGHLIGHTS OF THE MEETING INCLUDE (1) THE CLASS 1 EMERGENCY WATER SUPPLY POND ALONG WITH LAKE
 NORMAN MEETS DRL REQUIREMENTS, (2) THERE IS DISAGREEMENT ON THE CRITERIA FOR THE ISOLATION VALVES
 WHICH PROTECT THE RHR SYSTEM FROM OVERPRESSURIZATION, (3) POST-LOCA HYDROGEN RECOMBINATION IS TO
 BE ACCOMPLISHED WITH THE NEW WESTINGHOUSE HEATER-TYPE RECOMBINER.

C91955 *CONTINUED*
 AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

HYDROGEN + EMERGENCY COOLING + COOLING POND + MCGUIRE 2 (PWR) + MCGUIRE 1 (PWR) + ACPS MINUTES + WESTINGHOUSE

092322
 HENRIE JO + GREGOR FE + MONKALA JW
 POST-LOCA HYDROGEN RECOMBINER SYSTEM FOR LWR NUCLEAR PLANTS
 ATOMICS INTERNATIONAL + DETROIT EDISON COMPANY
 11 PAGES, PAPER NO. 105, PRESENTED AT THE 36TH ANNUAL AMERICAN POWER CONFERENCE, HELD IN CHICAGO, ILLINOIS, APRIL 29-MAY 1, 1974

PROVIDES A BRIEF DISCUSSION OF RECOMBINERS AND DESCRIBES THE THERMAL RECOMBINERS SELECTED FOR FERM1-2. THE SYSTEM WILL REMOVE 3 SCFM OF OXYGEN AND 6 SCFM OF HYDROGEN. THE RECOMBINER CAUSES WATER FORMATION BY HEATING THE REACTIVE GASES TO ABOUT 1300 F. AT THIS TEMPERATURE, THE REACTION IS 99% COMPLETE IN 0.5 SECONDS.

AVAILABILITY - CONFERENCE DIRECTOR, AMERICAN POWER CONFERENCE, ILLINOIS INSTITUTE OF TECHNOLOGY, CHICAGO, ILLINOIS 60616 (\$25/COPY)

REACTOR, BWR + CONTAINMENT + HYDROGEN + REACTOR, PWR + SYSTEM DESCRIPTION

C92374
 WILSON JF
 ELECTRIC HYDROGEN RECOMBINER FOR PWR CONTAINMENTS
 WESTINGHOUSE ELECTRIC CORPORATION
 WCAP-7920 (SUPPL. 4) +. 12 PAGES, 2 FIGURES, 4 REFERENCES, MAY 1974

RESULTS ARE GIVEN OF TWO TESTS PERFORMED ON THE PRODUCTION RECOMBINER. A HYDROGEN TEST CONFIRMED THE SUCCESSFUL RECOMBINATION OF HYDROGEN WITH ATMOSPHERIC OXYGEN. A TEN DAY SPRAY TEST WAS CONDUCTED BY SPRAYING SODIUM TETRABORATE SPRAY ON THE RECOMBINER WHILE IT WAS OPERATING AT RECOMBINER TEMPERATURE. THE TEST SHOWED THIS TYPE OF ENVIRONMENT DOES NOT EFFECT RECOMBINER OPERATION.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, PWR + TESTING + TEST, PROOF + TEST, SYSTEM OPERABILITY

032407
 CONTROL OF COMBUSTIBLE GAS CONCENTRATION IN CONTAINMENT - WPPSS NO. 2
 WASHINGTON PUBLIC POWER SUPPLY SYSTEM
 24 PAGES, LETTER WITH REPORT TO DIRECTORATE OF LICENSING (AEC), APRIL 29, 1974, DOCKET 50-397, TYPE--BWR, MFG--G.E., WF--BURNS & ROE

PRESENTS INFORMATION RELATED TO THE DESIGN OF THE HYDROGEN CONTROL SYSTEM FOR WPPSS NO. 2. A SERIES OF CALCULATIONS WERE PERFORMED TO ESTABLISH THE CAPACITY OF A RECOMBINER SYSTEM FOR THE CONTROL OF GASES IN A BWR CONTAINMENT FOLLOWING A LOCA. CALCULATIONS INDICATE THAT THE TOTAL REQUIRED RECOMBINER FLOW RATE IS 80 SCFM.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + HYDROGEN + ACCIDENT, LOSS OF COOLANT + DESIGN STUDY + FLOW + HANFORD 2 (BWR)

034367
 RECOMBINER OUTLET HYDROGEN ANALYZER TRIP AT MONTICELLO
 NORTHERN STATES POWER COMPANY
 2 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), JULY 2, 1976, DOCKET 50-263, TYPE--BWR, MFG--G.E., AE--BECHTEL

CAUSE - DESIGN ERROR. DURING A REACTOR STARTUP, THE MODIFIED OFF GAS HOLDUP SYSTEM WAS BEING TESTED. A RECOMBINER TRIP WAS INADVERTENTLY TRIPPED. ALL THREE OUTLET HYDROGEN ANALYZERS WERE FOUND TRIPPED FROM LOW FLOW CAUSED BY AN ACCUMULATION OF MOISTURE IN THE COMMON SAMPLE LINE. LESS OF ALL THREE DID NOT CAUSE THE TRIP BECAUSE THE DESIGN CONSIDERED LOSS OF ALL TO BE A HIGHLY IMPROBABLE EVENT. THE CONTROL CIRCUIT WAS MODIFIED TO INCLUDE THIS TRIP. A MOISTURE SEPARATOR WAS ADDED TO THE SAMPLE LINES.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + CONTROL SYSTEM + FAILURE + HYDROGEN + CHEMICAL ANALYSIS + MODIFICATION + FAILURE, DESIGN ERROR + OFF GAS + MONTICELLO (BWR)

097177
 SIEGLER P + MOORE GE

097177 *CONTINUED*
 FLAME RECOMBINATION OF OXYGEN AND HYDROGEN
 GENERAL ELECTRIC COMPANY
 11 PAGES, CHEM. ENG. PROGR., SYMP. SERIES, 66(104), PP. 1-11 (1970)

THE DESIGN OBJECTIVES AND COMBUSTION PRINCIPLES ARE DISCUSSED FOR DISPOSAL BY FLAME RECOMBINATION OF THE RADIOLYTIC OFF-GAS FROM A WATER-COOLED NUCLEAR REACTOR. THE OFF-GAS IS MAINLY A STOICHIOMETRIC HYDROGEN-OXYGEN MIXTURE. IT IS SHOWN THAT THE CHARACTERISTICS OF THE WATER-COOLED POROUS PLUG BURNER ARE NOT ONLY CONSISTENT WITH BUT APPEAR NECESSARY TO MEET BOTH THE BASIC AND PRACTICAL REQUIREMENTS OF THE PROBLEM. THE DEVELOPMENT OF THE COMPONENTS FOR A SAFE, RELIABLE AND RELATIVELY INEXPENSIVE RECOMBINER IS DESCRIBED. A VERSATILE FACILITY WAS BUILT FOR TESTING OF COMPLETE BURNER SYSTEMS AS WELL AS RELATED SAFETY SYSTEMS.

DESIGN CRITERIA + HYDROGEN + OXYGEN + RADIOLYTIC GAS + COMPONENTS + SAFETY EVALUATION

097178
 MIZUMOTO A + TANI J
 CATALYTIC RECOMBINATION FOR OXYGEN AND HYDROGEN IN OFF-GAS OF NUCLEAR POWER PLANTS
 OSAKA OXYGEN INDUSTRIES LTD., JAPAN
 7 PAGES, KODANSU GASU, 9(2), PP. 486-492 (APRIL, 1972) (IN JAPANESE)

A SERIES OF EXPERIMENTS WERE PERFORMED TO OBTAIN DESIGN DATA FOR THE CATALYTIC RECOMBINATOR OF OXYGEN AND HYDROGEN IN THE OFF-GAS FROM NUCLEAR POWER PLANTS. OBJECTIVE, METHOD, AND RESULT OF THE EXPERIMENTS ARE DESCRIBED. 0.3 WT % PALLADIUM-ALUMINA SPHERICAL CATALYZER OF DIAMETER 3.2 APPROXIMATELY 6.4 MM WAS USED AS SAMPLE. THE RECOMBINATION EXPERIMENT WAS PERFORMED WITH THE VOL % OF OXYGEN RANGING FROM 0.85 TO 2.2 AND THAT OF HYDROGEN FROM 1.1 TO 4.0. AS A RESULT OF THE RECOMBINATION, REMAINDER OF THE HYDROGEN WAS BELOW 1 PPM IN ALL CASES. TEMPERATURE OF THE CATALYZER, ON THE OTHER HAND, ROSE TO 190 TO 490 C. DEPENDING ON THE INITIAL CONTENT OF THE OXYGEN AND HYDROGEN. MECHANICAL STRENGTH AND ACTIVITY OF THE CATALYZER WERE ALSO TESTED UNDER VARIOUS CONDITIONS. THE RESULTS SHOW THAT PERFORMANCE OF THE CATALYZER DOES NOT WORSE, IF THE TEMPERATURE IS KEPT BELOW 500 C.

HYDROGEN + OXYGEN + CATALYST

097182
 HENRIE JD
 CONDENSER-TYPE GAS COMBINER
 U.S. PATENT 3,755,075 +, 10 PAGES, AUGUST 28, 1973

A CONDENSER-TYPE GAS COMBINER, INTENDED PRIMARILY FOR USE WITH NUCLEAR REACTORS, IS DESIGNED WHEREIN HYDROGEN AND OXYGEN ARE RECOMBINED AT LOW PRESSURES USING A CONDENSER AS A DRIVING FORCE TO TRANSPORT THE HYDROGEN AND OXYGEN GASES THROUGH A CATALYTIC BED. TWO EMBODIMENTS ARE DESCRIBED FOR USE WITH WATER-BOILER (HOMOGENEOUS AND LARGE BOILING-WATER REACTORS.)

AVAILABILITY - THE U.S. PATENT OFFICE, DEPT. OF COMMERCE, WASHINGTON, D.C.

REACTOR, BNR + DESIGN CRITERIA + HYDROGEN + OXYGEN + PATENT + CONDENSER + CATALYST

097710
 BAKER L + LIMATAINEN RC
 THE TECHNOLOGY OF NUCLEAR REACTOR SAFETY (VOL. 2). CHAPTER 17 - CHEMICAL REACTIONS
 ARGONNE NATIONAL LABORATORY, ILLINOIS
 104 PAGES, PP. 419-523, PUBLISHED BY THE MIT PRESS, CAMBRIDGE, 1973

MANY OF THE ELEMENTS POSSESSING DESIRABLE NUCLEAR PROPERTIES, I.E., ALUMINUM, ZIRCONIUM, AND URANIUM, RANK HIGH IN THE ELECTROMOTIVE SERIES. THE REACTION OF THESE ELEMENTS WITH OXIDIZING AGENTS SUCH AS WATER AND OXYGEN IS, FORTUNATELY, SLOW AT NORMAL TEMPERATURES. IT WAS FEARED, HOWEVER, THAT RAPID OR EXPLOSIVE REACTIONS MIGHT BE INITIATED AS A RESULT OF ACCIDENTAL OVERHEATING. SUMMARIZING THE PRESENT STATE OF KNOWLEDGE REGARDING THE INITIATION OF RAPID OR EXPLOSIVE CHEMICAL REACTIONS IS THE PRINCIPAL PURPOSE OF THIS CHAPTER. THIS DISCUSSION IS ALSO CONCERNED WITH SLOWER CORROSION-LIKE REACTIONS WHICH CAN AFFECT THE SAFETY OF OPERATION OF NUCLEAR REACTORS. INDIVIDUAL CHEMICAL REACTIONS ARE DISCUSSED FROM A FUNDAMENTAL POINT OF VIEW.

ALLOY + ALUMINUM + EXPLOSION + FUEL MELTDOWN + HYDROGEN + METAL WATER REACTION + ZIRCONIUM + STEEL, STAINLESS
 + CORROSION + COMBUSTION + RADIOLYTIC GAS + MAGNESIUM

KEYWORD INDEX

A COLLECTION OF KEYWORDS IS USED TO DENOTE THE MAIN SAFETY RELATED POINTS COVERED IN EACH ARTICLE. THE FOLLOWING INDEX IS AN ALPHABETICAL LISTING OF THE KEYWORDS GIVING REFERENCES TO EACH ARTICLE WHICH WAS KEYED TO IT.

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#RECOMBINER OUTLET HYDROGEN ANALYZER	TIME OF RECOMBINER WATER AND BUILDUP OF CS-137 AND BA-140	009732 P 2
#CHEMICAL SURVEILLANCE OF THE CAROLINAS-VIRGINIA	TRIP AT MONTICELLO*	096367 P 10
RECOMBINER OF L54M REACTOR - PART 3 - DETERMINATION OF THE	TUBE REACTOR*	028870 P 3
#CONDENSER-	TURNOVER TIME OF RECOMBINER WATER AND BUILDUP OF CS-137	009732 P 2
#HYDROGEN EVOLUTION WITHIN CONTAINMENT IN PH-	TYPE GAS COMBINER*	007182 P 11
	TYPE PLANTS, FINAL REPORT*	006628 P 1
CATALYSTS*	# ULTRAPURIFICATION OF GASES BY MEANS OF NEWLY DEVELOPED	007274 P 1
	#PAPER V-3 - HYDROGEN RECYCLE*	040369 P 6
	#PAPER VII-5 - DESIGN FOR CONTROL*	040364 P 6
#CHEMICAL SURVEILLANCE OF THE CAROLINAS-	VIRGINIA TUBE REACTOR*	028800 P 3
#MCGUIRE PLANT SITE	VISIT AND ACRS SUBCOMMITTEE MEETING, JUNE 4, 1971*	091955 P 9
#THE TECHNOLOGY OF NUCLEAR REACTOR SAFETY I	VOL. 2). CHAPTER 17 - CHEMICAL REACTIONS*	007710 P 11
- PART 3 - DETERMINATION OF THE TURNOVER TIME OF RECOMBINER	WATER AND BUILDUP OF CS-137 AND BA-140 AND CE-141 IN 17*	009732 P 2
#A THREE-YEAR EVALUATION OF MILD STEEL AT THE HEAVY	WATER COMPONENTS TEST REACTOR*	007737 P 1
#ELECTRICAL HYDROGEN RECOMBINER FOR	WATER REACTOR CONTAINMENTS*	048353 P 4
#BURNER-FLAME ARRESTER FOR BURNING OFF-GAS FROM A BOILING	WATER REACTOR POWER PLANT*	049801 P 9
PERFORMANCE AND COST*	WATER REACTORS - FACTORS AFFECTING THEIR DESIGN,	048266 P 8
#CATALYTIC RECOMBINERS FOR BOILING	WITHIN CONTAINMENT IN PH-TYPE PLANTS, FINAL REPORT*	006628 P 1
#HYDROGEN EVOLUTION	MPPSS NO. 2*	092407 P 10
#CONTROL OF COMBUSTIBLE GAS CONCENTRATION IN CONTAINMENT -		
COMPONENTS TEST REACTOR*	#A THREE- YEAR EVALUATION OF MILD STEEL AT THE HEAVY WATER	007707 P 1
TEST REPORT*	# ZION SPECIAL REPORT NO. 6 - HYDROGEN RECOMBINER FUNCTIONAL	088817 P 9

10. CONTAINMENT INERTING

033114
HYDROGEN GENERATION IN A BOILING WATER REACTOR
COMMONWEALTH EDISON COMPANY
50269-39 +. 52 PAGES, 23 FIGURES, 12 TABLES, 11 REFERENCES, AMENDMENT 23 TO DRESDEN 3 LICENSE APPLICATION,
AUGUST 24, 1970, DOCKET 50-249

EVALUATES THE POTENTIAL HYDROGEN GENERATION AND ITS SUBSEQUENT ACCUMULATION IN THE PRIMARY CONTAINMENT OF A LARGE BWR FOLLOWING A POSTULATED LOSS-OF-COOLANT ACCIDENT. THE REPORT INCLUDES THE APPLICATION OF EXPERIMENTAL TEST DATA TO A TYPICAL 3440-MWT NUCLEAR POWER PLANT AND A GENERIC EVALUATION OF THE EFFECTS OF THE PERTINENT PARAMETERS SUCH AS METAL-WATER REACTION, BREAK AREA, AND RADIOLYTIC DECOMPOSITION RATE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ATMOSPHERIC RELEASE + HYDROGEN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + VENTILATION SYSTEM + ZIRCONIUM + DRESDEN 3 (BWR) + RADIOLYTIC GAS + THEORETICAL INVESTIGATION + GAS

004198
FURTAO, VC + KNEIP, TJ + EISENBUD, M
MEASUREMENT OF LOW LEVELS OF I-131 IN REACTOR ATMOSPHERES
NEW YORK UNIVERSITY MEDICAL CENTER, N.Y.
ATD-CONF-69-357-006 +. 27 PAGES, 4 FIGURES, 5 TABLES, 15 REFERENCES, 1969

DISCUSSED A CHARCOAL FILTER AND DESCRIBED ITS EFFECTIVENESS IN REACTOR CONTAINMENT ATMOSPHERES FOR REMOVING I-131.

IODINE + CHARCOAL + MONITOR, ENVIRONMENTAL + FILTER DESIGN + CONTAINMENT FILTERING SYSTEM + EQUIPMENT DESIGN

011231
MFP - MONTICELLO NUCLEAR GENERATING PLANT - FACILITY DESCRIPTION AND SAFETY ANALYSIS REPORT - VOLUME I
MONTICELLO STATES POWER COMPANY
333 PAGES, FIGURES, TABLES, AUGUST 1968, DOCKET NO. 50-263, PDR

SINGLE-CYCLE BWR (SIMILAR TO DRESDEN 2), 1469 MW(TH) INITIAL OPERATING POWER, WITH DESIGN FOR 1674. ZIRCALOY-CLAD FUEL, TWO CONTROLLED-RECIRCULATION-FLOW LOOPS FEEDING 20 JET PUMPS, PRESSURE-SUPPRESSION CONTAINMENT, 13 ENGINEERED SAFEGUARDS. ALL NEUTRON MONITORS ARE IN THE CORE. CONTAINMENT INERT ATMOSPHERE WILL PREVENT HYDROGEN-OXYGEN REACTION AFTER LOSS OF COOLANT. DURING CONTAINMENT ISOLATION, STEAM IS RELIEVED TO THE SUPPRESSION POOL (RCIC). VARIOUS ACCIDENTS CONSIDERED. ALL LEAKAGE IS ASSUMED TO BE COLLECTED BY BUILDING-EXHAUST SYSTEM, FILTERED BY A STANDBY SYSTEM, AND DISCHARGED UP THE STACK. THUS, CFF-SITE DOSES ARE WELL BELOW 10 CFR 100 SPECIFICATIONS.

REACTOR, BWR + REPORT, SAR + ENGINEERED SAFETY FEATURE

011366
QUAD-CITIES STATION, UNIT 1 - PLANT DESIGN ANALYSIS, VOLUME 1
COMMONWEALTH EDISON COMPANY, CHICAGO
14 PAGES, 3 REFERENCES, 1 TABLE, PAGES V-1-16 TO 31, DOCKET NO. 50-254, MAY 31, 1966 PDR

IMMEDIATELY AFTER THE MAJOR PIPE RUPTURE, THE TEMPERATURE OF THE WATER IN THE SUPPRESSION CHAMBER APPROACHES 130 F, AND THE MAXIMUM SYSTEM PRESSURE APPROACHES 99 PSIG DURING THE BLOWDOWN OF THE PRIMARY COOLANT INTO THE DRYWELL. THE CONTAINMENT PRESSURE IS A FUNCTION OF THE METAL-WATER REACTION RATE. ALTHOUGH THE CORE-COOLING SYSTEMS ARE ASSUMED NOT TO FUNCTION IN ORDER TO PROVIDE A BASIS FOR METAL-WATER REACTIONS, ONE OF THE TWO CONTAINMENT COOLING SYSTEMS IS ASSUMED TO FUNCTION NORMALLY. THE DRYWELL SPRAY IS SUFFICIENT TO TRANSPORT THE DECAY HEAT, THE HEAT STORED IN THE CORE, AND ANY HEAT RESULTING FROM THE METAL-WATER REACTION TO THE WET-CELL IN THE FORM OF HOT LIQUID. THE ENERGY TRANSPORTED TO THE WATER IN THE SUPPRESSION CHAMBER IS REMOVED FROM THE CONTAINMENT SYSTEM BY HEAT EXCHANGERS. TO OBVIATE THE POSSIBILITY OF AN ENERGY RELEASE WITHIN THE PRIMARY CONTAINMENT FROM A HYDROGEN-OXYGEN REACTION UNDER CONDITIONS MORE SEVERE THAN CAN CURRENTLY BE FORESEEN, THE DESIGN INCLUDES AN INERTING SYSTEM TO REDUCE THE OXYGEN CONCENTRATION OF THE ATMOSPHERE WITHIN THE PRIMARY CONTAINMENT.

REACTOR, BWR + CHEMICAL REACTION + CONTAINMENT SPRAY + CONTAINMENT, PRESSURE SUPPRESSION + HYDROGEN + METAL WATER REACTION + OXYGEN + ZIRCALOY + CLAD CITIES 1 (BWR) + REPORT, PSAR

011671
MERIKER RP
CRACKS IN OF WATER VAPOR IN THE GALLERIES
ATOMIC INTERNATIONAL
NAA-5F-MEXU-2434 +. 8 PAGES, JANUARY 23, 1958, CFSTI 51-80 FS

EXPERIMENTS WERE CONDUCTED TO DETERMINE THE AMOUNT OF WATER CONDEASING IN THE GALLERIES AT SRE. THE AMOUNT WAS DEEMED GREAT ENOUGH TO CONSTITUTE A FIRE HAZARD IN EVENT OF A SODIUM LEAK. THE FOLLOWING RECOMMENDATIONS FOR CONTROL OF THE GALLERY ATMOSPHERE WATER CONTENT WERE MADE - (A) APPLY A SEALANT OR STAINLESS LINER ON THE GALLERY WALLS TO MINIMIZE ENTRY OF GROUND WATER THROUGH THE CONCRETE, (B) INSTALL A DEHUMIDIFIER THAT WILL PRECIPITATE THE MOISTURE FASTER THAN IT ENTERS, (C) CIRCULATE THE NITROGEN COVER GAS THROUGH A DESSICANT, (D) PROVIDE A DEVICE TO CONTINUALLY MEASURE THE MOISTURE CONTENT OF THE GALLERY ATMOSPHERE.

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011671 *CONTINUED*
 REACTOR, GRAPHITE MODERATED + REACTOR, INEP + METAL WATER REACTION + SNF (RE) + WATER VAPOR

014368
 STEVENSON CE + PAIGE JM + HOLCOMB WF + KLYFFER JD
 STARTUP EXPERIENCE WITH THE EBR-II FUEL CYCLE FACILITY-1, MANIPULATORS AND PROCESS AUXILIARIES
 ARGONNE NATIONAL LABORATORY
 1 PAGE, AHS TRANSACTIONS 8(2) PAGE 612 (1965 WINTER MEETING)

THE FACILITY PROVIDES FOR PROCESSING 40-PERCENT-ENRICHED U FUEL AND REFABRICATION OF RADIOACTIVE FUEL ELEMENTS. EXPERIENCE WITH EQUIPMENT IN INERT ATMOSPHERES AND INTERMITTENT EXPOSURE TO RADIATION IS DISCUSSED. EXPERIENCE WITH MASTER-SLAVE MANIPULATORS AND MANIPULATORS HAS BEEN VERY GOOD. MINOR DIFFICULTIES OCCURRED WITH LIMIT SWITCHES AND CLUTCH ADJUSTMENTS. ELECTRIC-MOTOR BRUSH WEAR WAS INITIALLY HIGH, BUT THE BRUSH MATERIALS CONTAINING POLYDISULFIDE WERE OPERATIVE WITHOUT SERIOUS WEAR. TRANSFER OPERATIONS BETWEEN THE AIR- AND ARGON-ATMOSPHERE CELLS CONSUMED A LOT OF TIME. ELECTRICAL BREAKDOWN WITH MINERAL-INSULATED (MGI) CONDUITS OCCURRED IN FEEDERS TO EQUIPMENT IN THE ARGON-ATMOSPHERE CELL (PROBABLY DUE TO THE LOWER DIELECTRIC CONSTANT OF ARGON). HIGH RATES OF WEAR OCCURRED ON PISTON RINGS FOR COMPRESSORS OPERATING ON THE DRY ARGON USED TO POWER THE PNEUMATIC EQUIPMENT. SHIELD WINDOWS HAVE SHOWN NO LOSS IN LIGHT TRANSMITTANCE. 1000-WATT MERCURY VAPOR LIGHTS SHOWED A 50 PERCENT DECREASE IN OUTPUT AFTER 23,000 HOURS.

ERP 1 AND 2 (RE) + FAILURE, EQUIPMENT + FABRICATION + MIT CELL + OPERATING EXPERIENCE SUMMARY + FAILURE, INSTRUMENT + REMOVE MANIPULATING AND VIEWING + FUEL REPROCESSING + FUEL CONVERSION + PYROCHEMICAL + FUEL ELEMENTS

016445
 VOLUME I, SECTION VI - ADDITIONAL ENGINEERED SAFEGUARDS.
 JERSEY CENTRAL POWER AND LIGHT COMPANY, MORRISTOWN, NEW JERSEY
 22 PAGES, 1 TABLE, FACILITY DESCRIPTION AND SAFETY ANALYSIS REPORT, JANUARY 25, 1967, DOCKET NO. 50-219

THE 7 SAFEGUARDS (CONTROL-ROD VELOCITY LIMITER, CONTROL-ROD HOUSING SUPPORT, STANDBY LIQUID CONTROL SYSTEM, STEAM-LINE FLOW RESTRICTORS, STANDBY CORE COOLING, CONTAINMENT SPRAY COOLING, AND CONTAINMENT NITROGEN ATMOSPHERE) HAVE DESIGN BASES, DESCRIPTION, DESIGN ANALYSIS, AND SURVEILLANCE AND TESTING SUMMARIZED.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

REACTOR, BWR + CONTAINMENT SPRAY + CORE SPRAY + OYSTER CREEK (BWR) + REACTOR DESCRIPTION + REPORT, SAR + SHUTDOWN SYSTEM, SECONDARY + ORIFICE + ENGINEERED SAFETY FEATURE

016449
 VOLUME I, SECTION VI, CONTAINMENT SYSTEM.
 NIAGARA MOHAWK POWER CORPORATION, SYRACUSE, N. Y.
 76 PAGES, 28 FIGURES, 10 TABLES, FINAL SAFETY ANALYSIS REPORT, NINE MILE POINT, JUNE 1967, DOCKET NO. 50-220

BOTH CHAMBERS ARE INITIALLY AT 2 PSIG FROM THE NITROGEN INERTING SYSTEM. RUPTURE OF THE LARGEST PIPE CAUSES A PEAK DRYWELL PRESSURE OF 34 PSIG/270 F AT 2 SEC, OR 50 PSIG IF A SMALL LEAK HAS PREVIOUSLY FORCED THE NITROGEN INTO THE SUPPRESSION CHAMBER. AFTER BLOWDOWN, BOTH CHAMBERS EQUILIBRATE AT 22 PSIG BECAUSE OF THE NITROGEN. WITHOUT CORE SPRAY, HYDROGEN GENERATION PRODUCES A BRIEF 25-PSIG PRESSURE PEAK AT 1000 SEC. GUARD PIPES SURROUND HIGH-PRESSURE PIPES AT PENETRATION TO PROTECT THE CONTAINMENT. CLOSED-PENETRATION, SLEEVES SURROUNDING PIPES AND INSTRUMENT LEADS HAVE LEAK-TEST CONNECTIONS. DEFLECTOR PLATES PROTECT AGAINST MISSILES, WHICH COULD BREAK DRYWELL VENTS TO SUPPRESSION CHAMBER. CONTAINMENT CAN BE FLOODED BY A CONNECTION BETWEEN FIREWATER AND FEEDWATER. COMPUTER ANALYSIS MADE OF SEISMIC ACTION ON REACTOR VESSEL AND ON SECONDARY CONTAINMENT BUILDING.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

REACTOR, BWR + CONTAINMENT DESIGN + CONTAINMENT, PRESSURE SUPPRESSION + MISSILE GENERATION AND PROTECTION + NINE MILE POINT (BWR) + REACTOR DESCRIPTION + REPORT, SAR + VIBRATION ANALYSIS + CONTAINMENT PENETRATION, ELECTRICAL + CONTAINMENT PENETRATION, PIPE + PENETRATIONS, PRIMARY CONTAINMENT

016450
 VOLUME I, SECTION VII, ENGINEERED SAFEGUARDS
 NIAGARA MOHAWK POWER CORPORATION, SYRACUSE, N. Y.
 51 PAGES, 16 FIGURES, 2 TABLES, FINAL SAFETY ANALYSIS REPORT, NINE MILE POINT, JUNE 1967, DOCKET NO. 50-220

VOLUME IV CONTAINS DETAILS OF PRESSURE SUPPRESSION, CORE SPRAY, AND CONTAINMENT SPRAY SYSTEM. SECTION VII SUMMARIZES ENGINEERED-SAFEGUARDS SYSTEMS (CORE SPRAY, CONTAINMENT SPRAY, LIQUID POISON INJECTION, CONTROL-ROD-VELOCITY LIMITER, CONTROL-ROD HOUSING SUPPORT, STEAM-FLOW RESTRICTORS, CONTAINMENT INERT ATMOSPHERE, EMERGENCY VENTILATION AND FILTRATION) BY DESCRIBING DESIGN BASIS, SYSTEM DESIGN, DESIGN EVALUATION, AND TESTS AND INSPECTION.

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

REACTOR, BWR + CONTAINMENT SPRAY + CORE SPRAY + NINE MILE POINT (BWR) + REACTOR DESCRIPTION + REPORT, SAR + CONTAINMENT FILTERING SYSTEM + SHUTDOWN SYSTEM, SECONDARY + ORIFICE + ENGINEERED SAFETY FEATURE

315531
 FENLAND JH
 EXPLOSION SUPPRESSION BY ROOM HEATING
 LOS ALAMOS SCIENTIFIC LAB., N. MEXICO
 LA-UC-4592 + CONF-470201-2 +. 5 PAGES, FROM SYMPOSIUM ON THE IMPACT OF LOW COST NUCLEAR POWER AND CHEMICAL INDUSTRY, HOUSTON, TEXAS, FEBRUARY 22, 1967

MUCH VOLUMES GREATER THAN 100,000 CU. FT ARE INERTED, BOTH CONCRETE (HIGH PRESSURE) AND SHEET METAL (LOW-PRESSURE) ROOMS. LEAK SEALING AND RELIEF-VALVE CLOSURE WERE PROBLEMS. A SPECIAL RELIEF DEVICE CONSISTS OF ALWAYS-OPEN PNEUMATICALLY OPERATED LOUVERS, CLOSED AFTER A PRESSURE SURGE BLOWS OUT A DOWNSTEAM PANEL - THUS THE SURGE IS RELEASED, BUT HYDROGEN IS CONTAINED TO PREVENT EXPLOSION MIXING OUTSIDE THE BUILDING. THE SYSTEM HAS BEEN IN OPERATION FOR 6 YEARS, AND ABOUT 200 TESTS ON NUCLEAR ROCKETS PERFORMED. MANY LEAKS WITH HYDROGEN AS HIGH AS 12% HAVE NOT PRODUCED FIRE OR EXPLOSION.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, NATIONAL BUREAU OF STANDARDS, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VIRGINIA, 63.00 COPY, 10.65 MICROFICHE

EXPLOSION + HYDROGEN + CONTAINMENT ISOLATION + OPERATING EXPERIENCE SUMMARY + NUCLEAR ROCKET + VALVES

022110
 ATTICHIFF AB
 SAFETY EXPERIENCE AND THE CONTROL OF HAZARDS IN HOT CELL OPERATIONS AT HARWELL
 USAEC, HEARNS (HARWELL)
 1 PAGE, ANS TRANSACTIONS 1012, PAGE 679, NOV, 1967, PRESENTED AT THE 1967 WINTER MEETING OF THE AMERICAN NUCLEAR SOCIETY, CHICAGO, ILLINOIS, NOVEMBER 9-9, 1967

THE ATOMIC ENERGY RESEARCH ESTABLISHMENT AT HARWELL, ENGLAND, HAS TWO MAJOR ACTIVE-HANDLING BUILDINGS, ONE TO PROVIDE A GENERAL-PURPOSE SERVICE AND THE OTHER FOR SPECIALIZED ACTIVE-HANDLING WORK ASSOCIATED WITH THE METALLURGICAL RESEARCH PROGRAM. THIS PAPER DESCRIBES SOME OF THE INCIDENTS THAT HAVE OCCURRED SINCE THE BUILDINGS WENT INTO SERVICE IN 1957 AND GIVES EXAMPLES OF SOME OF THE EQUIPMENT AND METHODS THAT HAVE BEEN DEVELOPED TO ENSURE THAT PROPER CONTROL OF THE HAZARDS IS MAINTAINED.

ADMINISTRATIVE CONTROL + FIRE + HOT CELL + COMPLIANCE + OPERATING EXPERIENCE SUMMARY + HARWELL

023482
 DRESCHE 2 AND 3 FINAL SAFETY ANALYSIS REPORT
 COMMONWEALTH EDISON COMPANY
 450 PAGES, TABLES, FIGURES, REFERENCES, NOVEMBER 17, 1967, DOCKETS 50-237 AND 249, TYPE--BWR, MFG.--G.E., AE--SGI + LUNDY

SAR IS FOR OPERATION OF 2 BWRs (2527 MWt/809 MWe). PLANT DESIGN AND ANALYSIS REPORTS WERE FOR 2255 MWt/715 MWe OPERATION. **VOL. 1 COVERS (1) SUMMARY, (2) SITE, (3) REACTOR, (4) COOLANT SYSTEM, (5) CONTAINMENT, AND (6) ENGINEERED SAFEGUARDS. ** STEAM-LINE FLOW RESTRICTORS LIMIT FLOW TO 175%. INSTALLED GYNNELL INERT ATMOSPHERE EQUIPMENT WILL NOT BE USED, AS EMERGENCY CORE COOLING ALLOWS ONLY A NEGLIGIBLE VOLUME OF HYDROGEN FORMED FROM METAL-WATER REACTIONS. EXCLUSION RADIUS IS ABOUT 0.5 MILE. NEAREST POPULATION CENTER IS JOLIET, ILL. (14 MILES).

AVAILABILITY - USAEC PUBLIC DOCUMENT ROOM, WASHINGTON, D. C.

REACTOR, BWR + REPORT, SAR + DRESCHE 2 (BWR) + POWER UPGRATING

024282
 ROYER VS + KEMPER JS + GIBBENS JP
 PEACH BOTTOM OPERATING EXPERIENCE DURING THE APPROACH TO POWER
 PHILADELPHIA ELECTRIC COMPANY, DELTA, PENN.
 13 PAGES, ABSTRACT IN ANS TRANSACTIONS, 1011, PAGE 319, PRESENTED AT THE ANS MEETING, SAN DIEGO, CALIF., JUNE 12-15, 1967, DOCKET 50-171

AFTER A BRIEF DESCRIPTION OF THE PLANT, FAILURES AND THE CORRECTIVE MEASURES ARE DISCUSSED. FAILURES INCLUDED STRESS-CORROSION CRACKING OF STEAM-GENERATOR TUBES, A TUBE-TO-SHELL LEAK IN A REGENERATIVE HEAT EXCHANGER RESULTING IN HIGH COOLANT ACTIVITY CAUSED BY ICE PLUGGING IN THE TUBES, HIGH HELIUM TEMPERATURE ON THE EXIT FROM STEAM GENERATOR DUE TO INADEQUATE BAFFLING, RUPTURED DIAPHRAGM ON A STEAM-GENERATOR DUMP VALVE, DUE TO POOR MATERIAL, SAMPLE CORROSION FROM THE CONTAINMENT INERT ATMOSPHERE, PIPE-INSULATION FIRE DUE TO WRONG APPLICATION, AND SEIZURE OF A BOILER-FEED PUMP WHEN A SAMPLE TAP BROKE OFF AND THE DE-HEATER PRESSURE WAS LOST.

FAILURE, EQUIPMENT + FIRE + PEACH BOTTOM 1 (HTGR) + OPERATING EXPERIENCE SUMMARY + CORROSION + MATERIAL + REACTOR STARTUP EXPERIENCE + FAILURE, DESIGN, ERROR + STRESS CORROSION + QUALITY ASSURANCE + MAIN COOLING SYSTEM + FAILURE, TUBING + STEAM GENERATOR + REACTOR, HTGR + PUMPS + VALVES + HEAT EXCHANGERS

024509
 COOPER CONTAINMENT ATMOSPHERIC CONTROL SYSTEM
 CONSUMERS PUBLIC POWER DISTRICT
 2 PAGES, 1 FIGURE, PAGES VI-6-1 AND VI-6-2 OF VOLUME 1 OF COOPER NUCLEAR STATION PRELIMINARY SAFETY ANALYSIS REPORT, JULY 27, 1967, DOCKET 50-298, TYPE--BWR, MFG.--G.E., AF--BURNS + RCE

024509 *CONTINUED*

(SECTION VI-6) - LIQUID NITROGEN WILL BE CONVERTED TO THE GASEOUS FORM AND BE FORCED INTO THE SUPPRESSION CHAMBER DURING CONTINUOUS OPERATION. IT WILL BE FORCED INTO THE DRY WELL THROUGH THE VACUUM BREAKERS AND MIXED BY THE VENTILATION FANS. ANALYSIS OF METAL-WATER REACTION FOLLOWING A LOSS-OF-COOLANT ACCIDENT SHOWS THAT THE RESULTANT HYDROGEN WOULD BE ONLY 1.6% IN AIR, BELOW THE FLAMMABILITY LIMIT OF 5%. (SECTION V.2.3.4) - THE MAKEUP OF THE CONTAINMENT INERT ATMOSPHERE IS MONITORED AS A FURTHER INDICATION THAT ALL PENETRATIONS ARE SEALED DURING OPERATION.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VIRGINIA \$3.00 COPY, \$0.65 MICROFICHE

REACTOR, BWR + CONTAINMENT DESIGN + HYDROGEN + ACCIDENT, LOSS OF COOLANT + REPORT, PSAR + CONTAINMENT LEAK MONITOR + COOPER (BWR)

025718

MILLSTONE FINAL SAFETY ANALYSIS REPORT, VOLUME I
CONNECTICUT LIGHT AND POWER COMPANY + HARTFORD ELECTRIC LIGHT COMPANY + WESTERN MASS. ELECTRIC COMPANY
275 PAGES, FIGURES, TABLES, REFERENCES, MARCH 1968, DOCKET 50-245, TYPE--BWR, MFG--G.E., AE--EBASCO

EXPECTED READY FOR FUEL LOADING IN MARCH 1969. REPORT FOR 2011 MWTM RATHER THAN PREVIOUS 1730, AND THE MAXIMUM OFF-SITE THYROID DOSE WAS CALCULATED AS FOLLOWS - ROD DROPOUT (0.2 MRAD), FUEL-ELEMENT-DROPPAGE (13 MRAD), STEAM-LINE RUPTURE (280 MRAD), AND LOSS OF COOLANT (0.43 MRAD). SECTION II - ON-SITE METEOROLOGY COMPILED AUGUST 65-67 INDICATES FUMIGATION INLAND AVERAGELY 258, BEING 51.44 JUNE-AUGUST. SECTION III - REACTOR CORE. SECTION IV - REACTOR COOLANT SYSTEM, INCLUDES AN ISOLATION CONDENSER INSTEAD OF RELIEF TO SUPPRESSION POOL. SECTION V - CONTAINMENT INERT ATMOSPHERE WILL NOT BE NEEDED BECAUSE EMERGENCY CORE-COOLING SYSTEM PREVENTS SIGNIFICANT METAL-WATER REACTION.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151, \$3.00 COPY, \$0.65 MICROFICHE

REACTOR, BWR + DOSE + LAPSE RATE, STABLE + REPORT, SAR + WIND STATISTICS + OFF SITE + MILLSTONE POINT 1 (BWR)

025992

JAMRGG AR
APPARATUS FOR CONTROLLING THE ATMOSPHERE OVER A NUCLEAR REACTOR
U.S. PATENT 3,282,793 +. 4 PAGES, 2 FIGURES, NOVEMBER 1, 1966

APPARATUS FOR PROVIDING AIR ATMOSPHERE DIRECTLY OVER A REACTOR INSIDE LARGER ARGON-FILLED CHAMBER COMPRISED OF AXIALLY COLLAPSIBLE BELLOWS WITH ONE END SEALED TO REACTOR AND OTHER END TO OPENING IN TOP OF CHAMBER. BELLOWS PROTECTS CONTROL-ROD ELECTRICAL CONNECTIONS AND PERMITS DIRECT-CONTACT-MAINTENANCE CONTROL-ROD DRIVES. REACTOR COVER CAN BE RAISED, COLLAPSING BELLOWS, FOR REPLACEMENT OF FUEL ELEMENTS.

AVAILABILITY - THE U.S. PATENT OFFICE, DEPARTMENT OF COMMERCE, WASHINGTON, D. C., 25 CENTS PER COPY

CONTAINMENT + CONTAINMENT DESIGN + REACTOR, LMC + MAINTENANCE AND REPAIR + CONTAINMENT STRUCTURE + PATENT + CONTAINMENT PENETRATION, ELECTRICAL + CONTROL ROD DRIVE MECHANISMS

030261

GE-BWR TOPICAL REPORTS
GENERAL ELECTRIC COMPANY
1 PAGE, ATOMIC ENERGY CLEARING HOUSE 15(2), PAGE 14, JAN. 13, 1969

FILED AT PCR. INCLUDES (APED-5460) DESIGN AND PERFORMANCE OF GE-BWR JET PUMPS. (APED-5654) CONSIDERATIONS PERTAINING TO CONTAINMENT INERTING. (APED-5696) TORNADO PROTECTION OF SPENT FUEL STORAGE POOL. (APED-5703) DESIGN AND ANALYSIS OF CONTROL ROD DRIVE REACTOR VESSEL PENETRATIONS. (APED-5706) IN CORE NEUTRON MONITORING SYSTEM FOR GE-BWRS.

REACTOR, BWR + INSTRUMENT, IN CORE + PRESSURE VESSELS + FUEL STORAGE + DESIGN STUDY + SYSTEM DESCRIPTION + PUMP, JET + DESTRUCTIVE WIND + CONTAINMENT PENETRATION, PIPE + CONTROL ROD DRIVE MECHANISMS

030521

CURRENT DESIGN STATUS
JERSEY CENTRAL POWER AND LIGHT COMPANY
9 PAGES, AMENDMENT 7 TO OYSTER CREEK 1 LICENSE APPLICATION, AUGUST 22, 1967, DOCKET 50-219, TYPE--BWR, MFG--G.E., AE--BURNS + ROE

UPDATES THE SUPPLEMENTAL DESIGN REPORT OF MAY 31, 1965. TO PROTECT AGAINST H-O REACTION, AN INERTING SYSTEM FOR CONTAINMENT, USING N₂, WILL BE USED. NO CONTAINMENT LEAK MONITORING SYSTEM WILL BE PROVIDED, BUT N₂ MAKEUP CAN BE USED. A ROD-WORTH-MINIMIZER DESIGN HAS BEEN SELECTED TO MAINTAIN PRE-ESTABLISHED CONTROL-ROD PATTERNS DURING OPERATION. OTHER TOPICS ARE - CORE THERMAL DESIGN AND DESIGN STATUS OF POOL COOLING, CONTAINMENT, CONTROL ROD DRIVE, INTERLOCKS, IODINE ABSORPTION, LEAK TESTING, MANUAL SCRAM, METAL-WATER REACTION, SPRAY PUMPS, RECIRCULATION FLOW, AND SPRAY SYSTEMS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

030521 *CONTINUED*
 FACTORY, DNR * CONTAINMENT DESIGN * CONTAINMENT SPRAY * DESIGN CRITERIA * OYSTER CREEK (BWR) * CONTAINMENT
 CONSTRUCTION * MITROCHE * MODIFICATION * CONTAINMENT LEAK MONITOR * ENGINEERED SAFETY FEATURE * CONTROL ROD
 DRIVE MECHANISMS

030503
 D-1 APPROVED TECHNICAL SPECIFICATIONS FOR OYSTER CREEK 1
 JEFFREY CENTRAL POWER AND LIGHT COMPANY
 75 PAGES, FIGURES, TABLES, APPENDIX A - TECHNICAL SPECIFICATIONS AND BASES FOR OYSTER CREEK 1, DECEMBER 23,
 1968, DOCKET 50-219, TYPE--DNR, MFG--G.F., AE--BURNS & ROE

ANALYSIS INDICATES THAT ONE OF 21 STANDBY LIQUID CONTROL SYSTEMS MAY BE OUT OF SERVICE FOR 1/3
 THE TEST INTERVAL (10 DAYS) IF OTHER SYSTEM CHECKED DAILY. REACTIVITY ANOMALIES MAY REACH 1
 PERCENT NEARER REPORTING TO AEC. UNIDENTIFIED COOLANT LEAKAGE MAY BE 5 GPM, TOTAL 25 GPM.
 ***CONTAINMENT HEATING TO LESS THAN 1 PERCENT OF REQUIRED FOLLOWING STARTUP TEST PROGRAM AND
 INITIAL POWER DEMONSTRATION, PRIMARILY TO PROVIDE ADDITIONAL SAFETY MARGIN. ***TESTING INTERVAL
 FOR PROTECTIVE INSTRUMENTS IS BASED ON FAILURE-RATE DATA (LOCAL DATA TO BE USED). EXAMINATION
 SCHEDULE FOR PRIMARY COOLANT PIPING AND REACTOR VESSEL COMPONENTS INCLUDED. ***SUPERVISOR
 QUALIFICATIONS LISTED.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00

REACTION, DNR * INSTRUMENT, PROTECTIVE * METAL WATER REACTION * OYSTER CREEK (BWR) * RELIABILITY ANALYSIS *
 TECHNICAL SPECIFICATIONS * EXAMINATION * TEST INTERVAL * SURVEILLANCE PROGRAM * ENGINEERED SAFETY FEATURE *
 SAFETY MARGIN * STAFFING * PIPES AND PIPE FITTINGS

032289
 KNAPP NJ * COONEY NJ
 PEACH BOTTOM 1 EXPERIENCE WITH INERT CONTAINMENT ATMOSPHERE OBTAINED BY BURNING PROPANE IN AIR
 PHILADELPHIA ELECTRIC COMPANY
 5 PAGES, 2 FIGURES, 2 TABLES, 1 REFERENCE, NUCLEAR SAFETY 10(2), PAGES 171-175 (MARCH-APRIL 1969)

INITIAL DESIGN FOR OBTAINING INERT GAS PROVED UNDESIRABLE FOR TWO REASONS. SMALL AMOUNTS OF
 CHEMICAL CONTAMINANTS (NO AND NO₂) ATTACKED METAL SURFACES AND INSTRUMENTATION, ALSO, POOR
 RELIABILITY OF THE SYSTEM AND THE REQUIRED FREQUENT MAINTENANCE WOULD PROBABLY HAVE RESULTED IN
 FREQUENT PLANT SHUTDOWNS TO KEEP WITHIN TECHNICAL-SPECIFICATION REQUIREMENTS. A TEMPORARY
 SUBSTITUTE SYSTEM THAT UT, AND A PERMANENT VERSION OF THAT SYSTEM WAS INSTALLED IN THE SUMMER OF
 1968. ALTHOUGH THIS SYSTEM HAS HIGHER OPERATING COSTS, A NONCORROSIVE AND HIGHLY RELIABLE SYSTEM
 HAS BEEN ACHIEVED.

FAILURE, EQUIPMENT * MAINTENANCE AND REPAIR * PEACH BOTTOM 1 (HTGR) * REACTOR, POWER * OPERATING EXPERIENCE
 SUMMARY * CORROSION * CRYOGENICS * REACTOR, HTGR

032294
 PROVISIONAL OPERATING LICENSE FOR SEFOR
 U.S. ATOMIC ENERGY COMMISSION
 40 PAGES, PROVISIONAL OPERATING LICENSE FOR SEFOR, MARCH 4, 1969, DOCKET 50-231

ALLOWS 1-MW OPERATION WITHOUT USING REACTIVITY EXCURSION DEVICE FOR INITIAL TESTING PENDING FULL-
 POWER EVALUATION. TECHNICAL SPECIFICATION DOES NOT INCLUDE PASSES FOR EACH SPECIFICATION.
 ***WASTE GAS EFFLUENT LIMITS USE CURIE SUMMATION IN GROUPS RATHER THAN SPECIFYING AN ISOTOPE.
 DAILY RECORD OF FLOW, TEMPERATURE, POWER, AND REACTIVITY SHALL BE ANALYZED MONTHLY FOR
 UNEXPLAINED TRENDS. SHORT-TERM CHANGES REQUIRE 50% POWER REDUCTION AND MANAGEMENT NOTIFICATION.
 ELABORATE CONTAINMENT-LEAKAGE LIMITS GIVE ALLOWABLE LEAK RATES FOR PENETRATIONS, SPECIFY DOWNPOT
 AND FREON CONTENT, ATMOSPHERE HEATUP RATE.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00

REACTOR, FAST * REACTOR, LWR * WASTE DISPOSAL, GAS * TECHNICAL SPECIFICATIONS * REACTOR, PULSED * SEFOR (RE)
 * REACTIVITY EFFECT, ANOMALOUS * LEAK RATE * CONTAINMENT PENETRATION, ELECTRICAL * OPERATOR ACTION

032326
 SELECTED YANKEE OPERATING EXPERIENCE
 YANKEE ATOMIC ELECTRIC COMPANY
 7 PAGES, OPERATION REPORT NO. 90, MARCH 19, 1969, DOCKET 50-29, TYPE--PWR, MFG--WEST., AE--STONE & WEBSTER

ON FEB. 19, BORON WAS DECREASED FROM 84 PPM TO 0.1, AND PH FROM 5.93 TO 7.7. (69-1) ON FEB. 13,
 WASTE-SYSTEM COVER WAS FOUND TO BE 4% O₂ AND 32% H₂. A DISCHARGE OF GAS ENABLED ADDITION OF N₂.
 CAUSE OF AIR IN LEAKAGE NOT FOUND. (69-2) DURING WASTE-GAS RELEASE FEB. 21, A 1-CC/MIN GAS LEAK
 WAS FOUND IN DECAV-GAS SYSTEM. CEILING EXHAUST FAN PROVIDED DILUTION. *** REACTOR SHUT DOWN 26
 HR FOR OPERATOR TRAINING.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00

REPORT, OPERATIONS * OXYGEN * REACTOR, PWR * YANKEE ROWE (PWR) * COVER GAS * WASTE DISPOSAL, GAS * STORAGE
 CONTAINER * LEAK

034699
ROBINSON RA + SCHAICH RW
CURIUM SOURCE FABRICATION FACILITY
OAK RIDGE NATIONAL LABORATORY, TENN.
7 PAGES, 8 FIGURES, PP. 49-55 OF PROCEEDINGS OF 16TH CONFERENCE ON REMOTE SYSTEMS TECHNOLOGY, 1969

THE CURIUM SOURCE FABRICATION FACILITY THAT WAS DESIGNED AT OAK RIDGE NATIONAL LABORATORY FOR PREPARING AND ENCAPSULATING MULTIGRAM QUANTITIES OF CM-242 AND CM-244 IS DESCRIBED. AFTER WORK IN CONNECTION WITH THE SNAP PROGRAM INDICATED THAT AN INERT-ATMOSPHERE CONDITION WOULD BE DESIRABLE BECAUSE OF AN OXIDATION PROBLEM, THE CELLS WERE FIRST TEMPORARILY CONVERTED AND THEN PERMANENTLY CONVERTED TO INERT-ATMOSPHERE UNITS. THE CHANGES THAT WERE INVOLVED ARE DESCRIBED. REPL 34699 ABSTRACTS THE CURIUM SOURCE FABRICATION FACILITY THAT WAS DESIGNED AT OAK RIDGE NATIONAL LABORATORY FOR PREPARING AND ENCAPSULATING MULTIGRAM QUANTITIES OF CM-242 AND CM-244 IS DESCRIBED. AFTER WORK IN CONNECTION WITH THE SNAP PROGRAM INDICATED THAT AN INERT-ATMOSPHERE CONDITION WOULD BE DESIRABLE BECAUSE OF AN OXIDATION PROBLEM, THE CELLS WERE FIRST TEMPORARILY CONVERTED AND THEN PERMANENTLY CONVERTED TO INERT-ATMOSPHERE UNITS. THE CHANGES THAT WERE INVOLVED ARE DESCRIBED.

AVAILABILITY - J.O. LUDLOW, ARGONNE NATIONAL LAB., 9700 S. CASS AVE., ARGONNE, ILLINOIS 60439

ENERGY SOURCE + FABRICATION FACILITY + HOT CELL + ALPHA EMITTER + REACTOR, SPACE + ORNL + CURIUM + RADIOISOTOPE + SNAP (SR) + REMOTE MANIPULATING AND VIEWING + TRANSURANIUM PROGRAM

034730
LUDLOW JO + COLEMAN LF + ECKELS TA + GRAAE JE + ROSS LE + SLAWECKI MA
STARTUP-UP OF SHIELDED FUEL EVALUATION FACILITY
ARGONNE NATIONAL LAB., ARGONNE, ILL.
6 PAGES, 7 FIGURES, 1 TABLE, 1 REFERENCE, PP. 56-61 OF PROCEEDINGS OF 16TH CONFERENCE ON REMOTE SYSTEM TECHNOLOGY, 1969

A SHIELDED FUEL EVALUATION FACILITY HAS BEEN BUILT FOR STUDIES OF IRRADIATED CERAMIC FUELS REQUIRING A HIGH-PURITY HELIUM ATMOSPHERE. THE SYSTEMS REQUIRED FOR FACILITY OPERATION HAVE BEEN TESTED AND, AFTER SOME CORRECTIONS, OPERATE SATISFACTORILY. REMOTE INSTALLATION OF MANIPULATOR SLAVE ARMS REVEALED SOME NEEDED CHANGES IN HANDLING EQUIPMENT. LIGHTING IN THE FACILITY IS SUFFICIENT FOR A OPERATION. THE FACILITY IS NOW READY FOR A HELIUM ATMOSPHERE AND FINAL LEAK TESTING. REPL 34700 ABSTRACTS SHIELDED FUEL EVALUATION FACILITY HAS BEEN BUILT FOR STUDIES OF IRRADIATED CERAMIC FUELS REQUIRING A HIGH-PURITY HELIUM ATMOSPHERE. THE SYSTEMS REQUIRED FOR FACILITY OPERATION HAVE BEEN TESTED AND, AFTER SOME CORRECTIONS, OPERATE SATISFACTORILY. REMOTE INSTALLATION OF MANIPULATOR SLAVE ARMS REVEALED SOME NEEDED CHANGES IN HANDLING EQUIPMENT. LIGHTING IN THE FACILITY IS SUFFICIENT FOR A OPERATION. THE FACILITY IS NOW READY FOR A HELIUM ATMOSPHERE AND FINAL LEAK TESTING.

AVAILABILITY - J.O. LUDLOW, ARGONNE NATIONAL LAB., 9700 S. CASS AVE., ARGONNE, ILLINOIS 60439

CERAMICS + ANL + HELIUM + REACTOR + REMOTE MANIPULATING AND VIEWING + IRRADIATION FACILITY + FUEL ELEMENTS

034703
DOE WB + JACKSON WD
SOME CONTAINMENT BOX EXPERIENCE AT ARGONNE NATIONAL LABORATORY
ARGONNE NATIONAL LAB., ARGONNE, ILLINOIS
5 PAGES, 3 FIGURES, 2 TABLES, 3 REFERENCES, PP. 83-87 OF PROCEEDINGS OF 16TH CONFERENCE ON REMOTE SYSTEMS TECHNOLOGY, 1969

INERT-GAS CONTAINMENT BOXES WERE USED IN BETA-GAMMA-CAVES FOR HANDLING PLUTONIUM-CONTAINING IRRADIATED FUELS. CALCULATION OF THE TOXICITY OF THE FUEL RELATIVE TO PREVIOUSLY HANDLED URANIUM FUELS SHOWED THERE SHOULD BE LITTLE INCREASE IN HAZARD. POSITIVE GAS PRESSURE WAS THEN USED IN THE BOX TO MAINTAIN ATMOSPHERE PURITY EVEN IN THE PRESENCE OF BOX LEAKS. RADIATION SURVEYS AFTER THIS KIND OF OPERATION SHOWED NEGLIGIBLE ESCAPE OF PLUTONIUM INTO THE CAVE.

AVAILABILITY - W.B. DOE/W.D. JACKSON, ARGONNE NATIONAL LABORATORY, 9700 S. CASS AVENUE, ARGONNE, ILLINOIS 60439

GLCVC BOX + HOT CELL + PLUTONIUM + ANL + REACTOR + EXAMINATION + REMOTE MANIPULATING AND VIEWING + ALPHA FACILITIES + OPERATING EXPERIENCE + FUEL ELEMENTS

034704
HAMPSON DC + SALES WL + COLEMAN LF
OPERATING EXPERIENCE WITH AN ARGON ATMOSPHERE AT THE FUEL CYCLE FACILITY
ARGONNE NATIONAL LAB., ARGONNE, ILLINOIS
21 PAGES, 11 FIGURES, 6 TABLES, 8 REFERENCES, PP. 91-111 OF PROCEEDINGS OF 16TH CONFERENCE ON REMOTE SYSTEMS TECHNOLOGY, 1969

A LARGE (66,000 FT³) ARGON-ATMOSPHERE (95% ARGON, 5% NITROGEN, LESS THAN 100 PPM WATER OR OXYGEN) CELL HAS BEEN OPERATED SUCCESSFULLY IN HIGH RADIATION FIELDS FOR OVER FIVE YEARS WITHOUT HUMAN ACCESS TO THE CELL. SINCE THIS SUCCESSFUL OPERATION IS PARTIALLY A RESULT OF TESTS AND EXPERIMENTS THAT WERE CONDUCTED PRIOR TO AND DURING THE DESIGN PHASE OF THE FACILITY, SUMMARIES OF THESE TESTS ARE INCLUDED WHERE APPROPRIATE.

AVAILABILITY - D.C. HAMPSON, ARGONNE NATIONAL LABORATORY, P.O. BOX 2528, IDAHO FALLS, IDAHO 83401

034704 *CONTINUED*
DESIGN CRITERIA + NPTS + ARGON + REMOTE MANIPULATING AND VIEWING + EQUIPMENT + FUEL REPROCESSING + OPERATING EXPERIENCE + PYROCHEMICAL

034712
EVANS EA + HANSON JE + CUNNINGHAM GW
TREVOS IN IRRADIATED FUELS AND MATERIALS EXAMINATION
BATTTELLE MEMORIAL INST., PACIFIC NORTHWEST LAB., RICHLAND, WASHINGTON, U.S. ATOMIC ENERGY COMMISSION,
WASHINGTON, D.C.
2 PAGES, PP. 215-217 OF PROCEEDINGS OF 15TH CONFERENCE ON REMOTE SYSTEMS TECHNOLOGY, 1969

REFLECTIONS ON THE TRENDS IN IRRADIATED FUELS AND MATERIALS EXAMINATIONS SHOW THAT POST-IRRADIATION EXAMINATIONS ARE BECOMING MORE COMPLICATED, AND MORE DETAIL AND PRECISION ARE CONTINUOUSLY BEING DEMANDED FROM THEM. BECAUSE WE ARE ON THE THRESHOLD OF A DRAMATIC INCREASE IN THE SHEER NUMBER OF VERY WELL CHARACTERIZED FUEL AND MATERIAL SPECIMENS, CONSIDERABLE THOUGHT AND EMPHASIS MUST BE GIVEN TO REMOTE SYSTEMS TECHNOLOGY TO OBTAIN THE MAXIMUM INFORMATION FROM THESE IRRADIATION EXPERIMENTS.

AVAILABILITY - E.A. EVANS, BATTTELLE MEMORIAL INSTITUTE, PACIFIC NORTHWEST LAB., P.O. BOX 999, RICHLAND, WASHINGTON 99352

HOT CELL + MEASUREMENT + REACTOR + IRRADIATION TESTING + REMOTE MANIPULATING AND VIEWING

034881
HYDROGEN CONTROL EQUIPMENT AT DRESDEN 2 AND 3
COMMONWEALTH EDISON COMPANY
DOCKET-50249-118 * 15 PAGES, LETTER - COMMONWEALTH EDISON COMPANY TO DIVISION OF REACTOR LICENSING (AEC) -
FEBRUARY 22, 1972, DOCKET 50-249, TYPE--BWR, MFG--WEST., AE--SGT + LUNDY

PROPOSES A SOLUTION TO CONTROLLING THE COMBUSTIBLE GASES WITHIN THE CONTAINMENT FOLLOWING A LOSS-OF-COOLANT ACCIDENT. METHOD CONSISTS OF SIMPLY ADDING NITROGEN TO DILUTE THE OXYGEN CONCENTRATION BELOW THE FLAMMABILITY LIMIT. THE CONTAINMENT PRESSURE WILL INCREASE DUE TO THE NITROGEN ADDITION BUT WILL BE LIMITED OR CONTROLLED BY LEAKAGE.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + HYDROGEN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + DRESDEN 3 (BWR) + DRESDEN 2 (BWR) + RADIOLYTIC GAS

036777
ACRS REPORT ON DRESDEN 2 LICENSE APPLICATION
8 PAGES, ACRS REPORT ON DRESDEN 2 APPLICATION FOR LICENSE TO OPERATE AT 2527 MWt, SEPTEMBER 10, 1969, DOCKET 50-237, TYPE--BWR, MFG--G.E., AE--SGT + LUNDY

ACRS BELIEVES THAT THE CONTAINMENT SHOULD BE INERTED DURING OPERATION TO ELIMINATE RISKS DUE TO ACCIDENT-GENERATED HYDROGEN. LEAK RATE THROUGH STEAM LINE ISOLATION VALVES DURING ACCIDENT SHOULD BE REDUCED. SINGLE FAILURE CRITERION OF AUTOMATIC PRESSURE RELIEF SYSTEM SHOULD BE MET. MEANS ARE NEEDED TO PREVENT COMMON FAILURE MODES FROM NEGATING SCRAM ACTION. ONE MEMBER DISAGREED WITH COMMITTEE RECOMMENDATION FOR INERT ATMOSPHERE DURING OPERATION BECAUSE (1) OTHER SAFEGUARDS ARE SUFFICIENTLY DIVERSE AND REDUNDANT TO PROTECT PUBLIC, (2) AN INERT ATMOSPHERE DISCOURAGES INSPECTIONS FOR LEAKS OR ABNORMALITIES, AND (3) THE INERTING GAS IS A REAL DANGER TO ANYONE ENTERING CONTAINMENT EVEN AFTER PURGING.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + HYDROGEN + CONTAINMENT ISOLATION + REACTOR SAFETY SYSTEM + ACRS + DRESDEN 2 (BWR) + PRESSURE RELIEF + REDUNDANCE + OPERATING LICENSE PROCESS + SINGLE FAILURE CRITERION + ENGINEERED SAFETY FEATURE + VALVES

039592
VERMONT YANKEE CONTAINMENT AND COMBUSTIBLE GASES
VERMONT YANKEE NUCLEAR POWER CORPORATION
DOCKET-50271-77 * 13 PAGES, LETTER - VERMONT YANKEE NUCLEAR POWER CORPORATION TO DIVISION OF REACTOR LICENSING (AEC) - FEBRUARY 15, 1972, DOCKET 50-271, TYPE--BWR, MFG--G.E., AE--EBASCO

DISCUSSES THE CONTROL OF COMBUSTIBLE GASES WHICH COULD BE PRESENT IN THE CONTAINMENT AFTER A HYPOTHETICAL LOSS-OF-COOLANT ACCIDENT. CONTAINMENT VENTING AND INERTING ARE THE METHODS DISCUSSED.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + HYDROGEN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + VENTILATION SYSTEM + RADIOLYTIC GAS + VERMONT YANKEE (BWR)

G40409

040409 *CONTINUED*
 ACRS CONCERNS ABOUT PILGRIM NUCLEAR POWER STATION
 U.S. ATOMIC ENERGY COMMISSION, DIVISION OF REACTOR LICENSING
 4 PAGES, LETTER - DIVISION OF REACTOR LICENSING (AEC) TO BOSTON EDISON COMPANY - APRIL 15, 1971, DOCKET 50-293, TYPE--BWR, MFG--G.E., AE--BECHTEL

THE ACRS LISTS ITEMS TO BE RESOLVED BEFORE ISSUANCE OF AN OPERATING LICENSE. THESE INCLUDE THE FOLLOWING - THE DESIGN AND OPERATION OF AN EVAPORATOR FOR CONCENTRATING LIQUID WASTE SHOULD BE SUBMITTED FOR REVIEW. LOWER OPERATING LIMITS FOR GASEOUS AND PARTICULATE RADIOACTIVITY RELEASE SHOULD BE SET, AND EQUIPMENT MODIFIED TO MEET THEM. REACTOR CONTAINMENT SHOULD BE INERTED DURING NORMAL OPERATION. HYDROGEN CONCENTRATION SHOULD BE CONTROLLED BY METHOD OTHER THAN PURGING. PERFORMANCE OF THE EMERGENCY CORE-COOLING SYSTEM USING RECENT DATA SHOULD BE CALCULATED. CONSIDER BETTER ACCESS FOR IN-SERVICE INSPECTION OF VESSEL WELDS. CHANGE LOCATION OF AN ELECTRIC POWER LINE.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + EMERGENCY POWER, ELECTRIC + PRESSURE VESSELS + WASTE TREATMENT + WELDS + ACRS + OPERATING LICENSE PROCESS + PILGRIM (BWR) + CORE REFLOODING SYSTEM + SURVEILLANCE PROGRAM + EMERGENCY COOLING SYSTEM

044327
 HUNTER MC + SCHAICH RS + SETARD JA
 SAFETY ANALYSIS OF ISOTOPE ALPHA HANDLING FACILITY
 OAK RIDGE NATIONAL LABORATORY, TENNESSEE
 ORNL-TM-2065, 55 PAGES, FIGURES, TABLES, REFERENCES, MARCH 1970

A CRITICAL REVIEW OF HAZARDS ASSOCIATED WITH OPERATION IS PRESENTED. THE PHYSICAL FACILITIES, OPERATIONS, AND OPERATING PROCEDURES FOR THE PLANT ARE DESCRIBED. ANALYSES WERE MADE OF THE OPERATIONAL HAZARDS, AND IT IS SHOWN THAT THE PRIMARY AND SECONDARY CONTAINMENT FEATURES OF THE FACILITY ARE ADEQUATE TO CONTAIN THE RADIOACTIVE CONTAMINATION.

AVAILABILITY - CLEARINGHOUSE FOR FEDERAL SCIENTIFIC AND TECHNICAL INFORMATION, SPRINGFIELD, VA. 22151 \$3.00 COPY, 80,80 MICROFILM

ALPHA RADIATION + OPERATION + SOURCE, NEUTRON + HAZARDS ANALYSIS + CONTAINMENT STRUCTURE + REPORT, OPERATIONS ANALYSIS + RADIOCHEMICAL PLANT SAFETY + CONTAINMENT, WATER FILLED + EQUIPMENT DESIGN + ALPHA FACILITIES + SAFETY ANALYSIS + TRANSURANIUM PROGRAM + SOURCE, MULTIPLE

044452
 FAILURE OF OPERATORS AIR SUPPLY IN INERTED ROOM
 U.S. ATOMIC ENERGY COMMISSION
 DOE-70-4, 3 PAGES, MAY 26, 1970

EMERGENCY BOTTLE ON HIS BACK SUPPLIED AIR TO OPERATOR BUT HE HAD DIFFICULTY IN BREATHING DUE TO NEGATIVE PRESSURE IN THE SUIT CAUSED BY MALFUNCTION OF THE VACUUM-CONTROL VALVES. HE CALLED FOR HELP. STANDBY OPERATORS PULLED HIM TO A FRESH AIR ZONE AND REMOVED MASK. *** ICE HAD PLUGGED THE AIR LINE IN THE REFRIGERATION SECTION OF THE SUPPLY UNIT. LINT HAD STUCK IN THE VALVE MECHANISM OF THE SUIT VACUUM CONTROL VALVES. *** NEW-TYPE MOISTURE TRAPS AND A BYPASS LINE AROUND THEM WERE INSTALLED. TRAINING PROGRAM WAS REVISED TO COVER THIS TYPE OF ACCIDENT.

AVAILABILITY - DUDLEY THOMPSON, USAEC, DIVISION OF REACTOR LICENSING, WASHINGTON, D.C. 20545

FAILURE, EQUIPMENT + REACTOR, LMR + MAINTENANCE AND REPAIR + AIR + INCIDENT, EQUIPMENT + INCIDENT + FAILURE, DESIGN ERROR + INCIDENT, NONNUCLEAR + FAILURE, SIMULTANEOUS + OPERATING EXPERIENCE + OPERATOR ACTION + VALVE, CHECK + SAFETY DEVICE + COOLING DEVICE

044738
 VERMONT YANKEE CONTAINMENT INERTING (AMENDMENT 12 TO DOCKET 50-271)
 VERMONT YANKEE NUCLEAR POWER CORPORATION
 31 PAGES, LETTER - VERMONT YANKEE NUCLEAR POWER CORPORATION TO U.S. ATOMIC ENERGY COMMISSION - MAY 22, 1970, DOCKET 50-271, TYPE--BWR, MFG--G.E., AE--EBASCO

THE FOREGOING DISCUSSION CLEARLY INDICATES THAT INERTING OF THE VERMONT YANKEE CONTAINMENT IS NOT REQUIRED BECAUSE ONLY NEGLIGIBLE QUANTITIES OF HYDROGEN WOULD BE EVOLVED AS A RESULT OF THE ZIRCONIUM-WATER REACTION ASSOCIATED WITH THE WORSE CONCEIVABLE LOSS-OF-COOLANT ACCIDENT. ALSO, AS INERT ATMOSPHERE IS NO SOLUTION TO THE PROBLEM OF HYDROGEN EVOLVED GRADUALLY DUE TO RADIOLYSIS OF COOLING WATER, BECAUSE OXYGEN AS WELL AS HYDROGEN IS PRODUCED BY RADIOLYSIS. MOREOVER, THERE ARE SERIOUS OPERATIONAL SAFETY PROBLEMS ASSOCIATED WITH AN INERT ATMOSPHERE. THEREFORE, THE VERMONT YANKEE CONTAINMENT WILL NOT BE INERTED UNLESS THIS ACTION IS REQUIRED OFFICIALLY BY THE USNRC.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

NRC QUESTION + REACTOR, BWR + EXPLOSION + FIRE + HYDROGEN + ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + WATER + ZIRCONIUM + RADIOLYTIC GAS + VERMONT YANKEE (BWR)

055277

055277 *CONTINUED*
HYDROGEN CONTROL FOLLOWING LOCA AT PEACH BOTTOM 2 AND 3
PHILADELPHIA ELECTRIC COMPANY, PENNSYLVANIA
DOCKET-50277-43 +. 11 PAGES, LETTER - PHILADELPHIA ELECTRIC COMPANY TO DIVISION OF REACTOR LICENSING (AEC) -
MARCH 16, 1972, DOCKET 50-277, TYPE--BWR, MFG--G.E., AE--BECHTEL

STATES THAT NITROGEN MAKEUP WILL BE USED TO MAINTAIN OXYGEN CONCENTRATIONS IN THE CONTAINMENT
BELOW 5% AFTER A LOCA, BACKFIT OF ADDITIONAL HYDROGEN CONTROL CAPABILITY SHOULD NOT BE NECESSARY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
HYDROGEN + ACCIDENT, LOSS OF COOLANT + RADIOLYTIC GAS + PEACH BOTTOM 2 (BWR) + PEACH BOTTOM 3 (BWR)

059599
CONTAINMENT INSTRUMENT AIR LEAK
COMMONWEALTH EDISON COMPANY
DOCKET-50237-129 +. 2 PAGES, LETTER - COMMONWEALTH EDISON COMPANY TO DIVISION OF REACTOR LICENSING (AEC) -
JANUARY 8, 1971, DOCKET 50-237, TYPE--BWR, MFG--G.E., AE--SGT + LUNDY

AN INSTRUMENT AIR LEAK WAS SUSPECTED WHEN THE PRIMARY PRESSURE ROSE AND OXYGEN CONTENT INCREASED
TO 5 PERCENT, SO THE REACTOR WAS SHUT DOWN. THE SUSPECTED LEAK WAS LOCATED IN A PIPE NIPPLE TO
THE MAIN-STEAM-ISOLATION-VALVE PILOT VALVE. THE FAILURE WOULD NOT IMPAIR OPERATION OF THE VALVE.
THE LEAK WAS REPAIRED AND SYSTEM RETURNED TO NORMAL.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
REACTOR, BWP + FAILURE, PIPE + CONTAINMENT INTEGRITY + AIR + DRESDEN 2 (BWR) + LEAK + OPERATING EXPERIENCE

060101
CONCEPTUAL SYSTEM DESIGN DESCRIPTION FOR THE INERT GAS RECEIVING AND PROCESSING SYSTEM, NO. 82, FAST FLUX
FACILITY
BATTELLE NORTHWEST LABORATORY, RICHLAND, WASHINGTON
BNWL-500(VOL.82) +. 201 PAGES, DECEMBER 4, 1968

DESCRIBES THE VARIOUS INERT GAS SYSTEMS CONCEIVED TO FULFILL THE REQUIREMENTS OF THE FFTF OVERALL
CONCEPTUAL SYSTEMS DESIGN DESCRIPTION. SUMMARIZES AND DESCRIBES THE INERT GAS SYSTEMS DESIGN
CONCEPTS AND THE WORK WHICH LED TO SELECTION OF THE CONCEPTS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161
NOBLE GAS + REACTOR, TEST + COVER GAS + FFTF (TR) + DESIGN STUDY + SYSTEM DESCRIPTION

062299
TECH.-SPEC. CHANGE CONCERNING INSTRUMENTATION OF REACTOR PROTECTION SYSTEM
U. S. ATOMIC ENERGY COMMISSION, DIVISION OF REACTOR LICENSING
1 PAGE, LETTER - DIVISION OF REACTOR LICENSING (AEC) TO THE MILLSTONE POINT COMPANY - MARCH 26, 1970, DOCKET
50-245, TYPE--BWR, MFG--G.E., AE--ERASCO

ALTHOUGH THE TECH. SPECS. PRESENTLY PERMIT THE BYPASS OF THE HIGH DRYWELL PRESSURE SCRAM,
EMERGENCY CORE COOLING SYSTEMS (ECCS), HIGH DRYWELL PRESSURE INITIATION, AND CONTAINMENT
ISOLATION FUNCTIONS DURING CONTAINMENT INERTING AND DEINERTING PROCESSES, THE PROPOSED CHANGE
PROVIDES THE ADDED ADVANTAGE OF NOT BYPASSING THE ECCS DRYWELL PRESSURE INITIATION AND WOULD
PROVIDE ADDITIONAL INTELLIGENCE TO THE OPERATOR ON CONTAINMENT PRESSURE DURING THIS PERIOD.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
CHARGE \$2.00

REACTOR, BWR + REACTOR SAFETY SYSTEM + TECHNICAL SPECIFICATIONS + INSTRUMENT, PRESSURE + MILLSTONE POINT 1
(BWR)

063801
HIGH CONCENTRATION OF ARGON-41 IN REACTOR BUILDING
U. S. ATOMIC ENERGY COMMISSION, WASHINGTON, D.C.
PDF 71-9 +. 6 PAGES, MAY 21, 1971

A GAS CYLINDER CONTAINING A MIXTURE OF ARGON AND CARBON DIOXIDE INSTEAD OF PURE CO2 WAS CONNECTED
TO THE PURGE SYSTEM AT A RESEARCH REACTOR BY MISTAKE. THE RESULTING ACTIVATION OF THE ARGON LED
TO CONCENTRATIONS OF AR-41 INSIDE THE REACTOR CONTAINMENT IN EXCESS OF PERMISSIBLE LIMITS,
RESULTING IN SHUTDOWN OF THE REACTOR AND EVACUATION OF THE BUILDING. NO SIGNIFICANT EXPOSURES
OF WORKERS TO RADIOACTIVITY.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM
CHARGE \$2.00

FAILURE, OPERATOR ERROR + REACTOR, RESEARCH + ACTIVATION PRODUCT + ARGON + FAILURE, INSTALLATION ERROR +
OPERATING EXPERIENCE

065894
 CLEMENT TM
 ON-STREAM ANALYSIS AND CONTROL OF NUCLEAR ATMOSPHERE IN WATER-COOLED GRAPHITE MODERATED REACTORS
 2 PAGES, IMKO, PAGE 39-40, 1970

AN INTEGRATED ON-STREAM ANALYSIS AND CONTROL SYSTEM HAS BEEN APPLIED TO THE GAS SYSTEMS ON THE NUCLEAR PRODUCTION REACTORS AT RICHLAND, WASHINGTON. THE ATMOSPHERE SURROUNDING THE MODERATOR IN A GRAPHITE MODERATED, WATER-COOLED, NUCLEAR PRODUCTION REACTOR IS USED PRIMARILY TO PROTECT THE GRAPHITE FROM OXIDATION, TO DETECT WATER LEAKS, AND TO REMOVE MOISTURE WHEN LEAKS DO OCCUR. THE AUTHOR DESCRIBES THE ON-STREAM COMPOSITION ANALYSIS TO MEASURE THE CO₂, N₂, CO, O₂, AND MOISTURE CONTENT OF THE CIRCULATING ATMOSPHERE BY CHROMATOGRAPHIC AND SORPTION HYGROMETER TECHNIQUES. AUTOMATIC DIFFERENTIAL PRESSURE CONTROL INSTRUMENTATION HAS BEEN ADDED THAT IS CAPABLE OF CONTROLLING THE GAS ATMOSPHERE AT PRESSURES OF LESS THAN .01 INCH OF WATER. ADDED TO THIS FEATURE IS THE CAPABILITY FOR MANUAL COMPOSITION CONTROL.

CONTAINMENT ANALYSIS + CONTROL SYSTEM + HANFORD (PR) + INSTRUMENT, CONTROL

065920
 LANDOW EW + HIRSCH PR
 DESIGN OF THE HOT FUEL EXAMINATION FACILITY ARGON SYSTEM
 ARGONNE NATIONAL LABORATORY, ARGONNE, ILLINOIS
 4 PAGES, PROCEEDINGS OF 17TH CONFERENCE ON REMOTE SYSTEMS TECHNOLOGY, PAGE 196-200, NOVEMBER 1969

THE ARGON ATMOSPHERE SYSTEM FOR THE MAIN CELL OF THE HOT FUEL EXAMINATION FACILITY (HFEF) PROVIDES THE CONTROLLED ENVIRONMENT NECESSARY FOR IRRADIATED FUEL EXAMINATIONS. THE SYSTEM REGULATES CELL PRESSURE, TEMPERATURE, OXYGEN LEVELS (25 PPM), AND MOISTURE LEVELS (50 PPM). THE DESIGN INCLUDES BACKUP SUBSYSTEMS TO PREVENT LARGE CELL PRESSURE EXCURSIONS AND TO MAINTAIN COOLING OF THE REACTOR FUEL SUBASSEMBLIES EVEN IF BOTH THE PRINCIPAL POWER AND EMERGENCY POWER SYSTEMS FAIL. IN-CELL HEAT LOAD IS 120 KW (410,000 BTU/H). CELL COOLING FLOW RATE IS 16,000 CFM. ANTICIPATED AIR IN-LEAKAGE RATE TO THE ENTIRE CELL IS 0.01 CFM. PURIFICATION LOOP FLOW RATE IS 200 CFM.

CONTROL SYSTEM + CONTAINMENT REFERENCE MEASURING SYSTEM + ENVIRONMENT + IRRADIATION FACILITY + FUEL ELEMENTS

070233
 CONTROL OF COMBUSTIBLE GAS CONCENTRATION IN THE MILLSTONE CONTAINMENT VESSEL
 MILLSTONE POINT COMPANY, HARTFORD, CONNECTICUT
 DOCKET-50245-128 +. 15 PAGES, 2 FIGURES, 2 TABLES, LETTER TO DIVISION OF REACTOR LICENSING FROM MILLSTONE POINT COMPANY, DOCKET 50-245, APRIL 28, 1972, TYPE--BWR, MFG--G.E., AE--EBASCO

CONTAINS DETAILED INFORMATION ON THE CONTROL OF RADIOLYTIC GAS CONCENTRATION FOLLOWING A LOCA AT MILLSTONE 1. INCLUDES A DETAILED ANALYSES SUPPORTING THE CONCLUSIONS. CONTAINMENT INERTING MUST BE USED TO CONTROL OXYGEN CONCENTRATION TO LIMITS SPECIFIED IN THE SAFETY GUIDE. IF 1% METAL-WATER REACTION VALUE SPECIFIED IN THE ECCS CRITERIA IS USED, CONTAINMENT INERTING IS NOT NECESSARY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT, LOSS OF COOLANT + METAL WATER REACTION + REACTOR, PWR + HAZARDS ANALYSIS + RADIOLYTIC GAS + MILLSTONE POINT 1 (BWR) + CONCENTRATION

071389
 CONTAINMENT ATMOSPHERE DILUTION AT COOPER
 NEBRASKA PUBLIC POWER DISTRICT
 DOCKET-50298-32 +. 5 PAGES, LETTER - NEBRASKA PUBLIC POWER DISTRICT TO DIVISION OF REACTOR LICENSING (AEC) - MAY 15, 1972, DOCKET 50-298, TYPE--BWR, MFG--G.E., AE--BURNS + ROE

BRIEF DISCUSSION OF THE DILUTION SYSTEM FOR MAINTAINING THE OXYGEN LEVEL BELOW 5% FOLLOWING A LOSS-OF-COOLANT ACCIDENT. CONTAINMENT PURGING THROUGH THE STANDBY GAS-TREATMENT SYSTEM WILL PROVIDE AN ALTERNATIVE IF THE DILUTION SYSTEM DOES NOT PERFORM PROPERLY.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + HYDROGEN + ACCIDENT, LOSS OF COOLANT + COOPER (BWR)

073479
 STARTUP AT NINE MILE POINT DELAYED - NO SUPPLY OF NITROGEN FOR INERTING
 NIAGARA MOHAWK POWER CORPORATION
 DOCKET-50220-101 +. 2 PAGES, LETTER - NIAGARA MOHAWK POWER CORPORATION TO DIVISION OF REACTOR LICENSING (AEC) - AUGUST 1, 1972, DOCKET 50-220, TYPE--BWR, MFG--G.E., AE--NIAGARA MOHAWK

PLANT WAS SHUTDOWN DUE TO INCREASING RECIRCULATION SYSTEM VALVE PACKING LEAKAGE WITHIN THE DRYWELL. FOLLOWING REPACKING OF VALVES UNIT WAS RESTARTED AND PRESSURE REACHED 110 PSIG AT 0700 JULY 30. NITROGEN-GAS SUPPLIER WAS HAVING DIFFICULTIES GETTING DRIVERS FOR TWO TRUCKLOADS OF NITROGEN. ONE TRUCKLOAD RECEIVED IN MORNING OF JULY 31, AND AT 1345 DRYWELL ATMOSPHERE WAS REDUCED TO LESS THAN 5% OXYGEN.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

073479 *CONTINUED*
 REACTOR, BWR + CONTAINMENT, PRESSURE SUPPRESSION + NINE MILE POINT (BWR) + NITROGEN + FAILURE, ADMINISTRATIVE CONTROL + MAIN COOLING SYSTEM + LEAK + OPERATING EXPERIENCE + VALVES

074244
 REVISIONS TO THE FSAR FOR JAMES A. FITZPATRICK NUCLEAR POWER PLANT
 POWER AUTHORITY OF THE STATE OF NEW YORK
 DOCKET-50333-76 +. 63 PAGES, AMENDMENT 20 TO FSAR FOR JAMES A. FITZPATRICK NUCLEAR POWER PLANT, JAN. 8, 1973.
 DOCKET 50-333, TYPE--BWR, MFG--G.E., AE--STONE AND WEBSTER

CONTAINS REVISED PAGES TO THE FINAL SAR CONCERNING CONTAINMENT ATMOSPHERE CONTROL AND DILUTION, CONTAINMENT ISOLATION, AND PRIMARY CONTAINMENT LEAKAGE. INCLUDES INFORMATION REQUESTED BY AEC CONCERNING PROCEDURES FOR LEAK DETECTION (DRYWELL TO SUPPRESSION CHAMBER).

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + ACCIDENT, LOSS OF COOLANT + CONTAINMENT ISOLATION + REPORT, SAR + FITZPATRICK (BWR) + VENTILATION SYSTEM + CONTAINMENT VACUUM BREAKER + CONTAINMENT LEAKAGE CONTROL + MAIN COOLING SYSTEM + LEAK

075345
 CRACK IN THE ATMOSPHERIC CONTROL SYSTEM PIPING AT MILLSTONE POINT
 THE MILLSTONE POINT COMPANY, CONNECTICUT
 DOCKET-50245-162 +. 1 PAGE, LETTER - THE MILLSTONE POINT COMPANY TO DIRECTORATE OF REGULATORY OPERATIONS (AEC)
 - SEPTEMBER 6, 1972, DOCKET 50-245, TYPE--BWR, MFG--G.E., AE--EBASCO

WHILE ATMOSPHERIC CONTROL SYSTEM VALVES WERE BEING LEAK-TESTED, A CRACK WAS FOUND IN THE 18-IN. HEADER WHERE THE 6-IN. NITROGEN INERTING LINE JOINS IT. THE CRACK BEGINS IN THE JOINT WELD AND EXTENDS INTO THE 18-IN. PIPE FOR ABOUT 15 IN.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + FAILURE, PIPE + WELDING + FLOW + LEAK + TEST, LEAK + MILLSTONE POINT 1 (BWR) + PIPES AND PIPE FITTINGS

075855
 CONTAINMENT-ATMOSPHERE DILUTION SYSTEM FOR FITZPATRICK PLANT
 POWER AUTHORITY OF THE STATE OF NEW YORK
 DOCKET 50333-58 +. 14 PAGES, LETTER - POWER AUTHORITY OF THE STATE OF NEW YORK TO DIRECTORATE OF LICENSING (AEC), OCT. 2, 1972, DOCKET 50-333, TYPE--BWR, MFG--G.E., AE--STONE + WEBSTER

ANSWERS 12 AEC QUESTIONS ABOUT THE PROPOSED CONTAINMENT-ATMOSPHERE DILUTION SYSTEM. CONCERNS THE OXYGEN CONCENTRATION, MIXING PROBLEMS, RADIOLYTIC GAS GENERATION RATES, NITROGEN DILUTION SYSTEM, SAMPLING, AND TESTING.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + FITZPATRICK (BWR) + TESTING + SAMPLING + RADIOLYTIC GAS + CONCENTRATION

076386
 VALVE FAILURE AT VERMONT YANKEE
 VERMONT YANKEE NUCLEAR POWER CORPORATION
 2 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), NOV. 7, 1972, DOCKET 50-271, TYPE--BWR, MFG--G.E., AE--FBASCO

AS A RESULT OF VALVE MALFUNCTIONS IN THE CONTAINMENT AIR SAMPLING SYSTEM, TESTING FREQUENCY WAS TEMPORARILY INCREASED TO ONCE PER SHIFT. DURING A TEST, ONE VALVE CLOSED TOO SLOWLY. ANOTHER REQUIRED TWO ATTEMPTS TO CLOSE. PISTON RINGS HAD BEEN REMOVED FROM THE FIRST VALVE TO INCREASE CLEARANCE. AFTER THE VALVE BODY WAS CLEANED, THE VALVE CLOSED PROPERLY. PISTON RINGS WILL BE REMOVED FROM THE OTHER 7 VALVES OF THIS TYPE DURING THE NEXT SHUTDOWN. THESE VALVES ARE NOT REQUIRED TO ISOLATE THE PRIMARY FROM THE SECONDARY CONTAINMENT.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + FAILURE + CONTAINMENT ISOLATION + MONITOR, SAMPLING + TEST, SYSTEM OPERABILITY + VERMONT YANKEE (BWR) + PNEUMATIC SYSTEM + VALVES

076628
 CONTAINMENT-ATMOSPHERE-DILUTION SYSTEM FOR FITZPATRICK
 POWER AUTHORITY OF THE STATE OF NEW YORK
 6 PAGES, LETTER WITH ATTACHMENT TO DIRECTORATE OF LICENSING (AEC), NOV. 2, 1972, DOCKET 50-333, TYPE--BWR, MFG--G.E., AE--STONE + WEBSTER

BRIEF DISCUSSION OF THE NITROGEN INERTING, PURGING, AND MAKEUP CAPABILITY TO BE USED TO LIMIT THE CONTAINMENT OXYGEN LEVEL.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM

076628 *CONTINUED*
CHARGE \$2.00

REACTOR, BWR + DILUTION + FITZPATRICK (BWR) + STANDBY GAS TREATMENT

077952
OXYGEN SAMPLING SYSTEMS FOR DRESDEN AND QUAD CITIES
COMMONWEALTH EDISON COMPANY
2 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), JAN. 26, 1973, DOCKETS 50-237/249/254/265, TYPE--BWR, MFG--G.E., AE--SGT AND LUNDY

STATES THAT THE ISOLATION VALVES FOR THE OXYGEN SAMPLING SYSTEM WILL BE LUBRICATED DURING EVERY REFUELING OUTAGE. THIS SHOULD PRECLUDE FAILURE TO CLOSE.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + OXYGEN + CONTAINMENT ISOLATION + DRESDEN 3 (BWR) + CHEMICAL ANALYSIS + DRESDEN 2 (BWR) + MONITOR + QUAD CITIES 1 (BWR) + QUAD CITIES 2 (BWR) + VALVES

078304
CONTROLLING COMBUSTIBLE GAS IN THE HATCH-1 PRIMARY CONTAINMENT AFTER LOCA
GEORGIA POWER COMPANY
4 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), DECEMBER 4, 1972, DOCKET 50-321, TYPE--BWR, MFG--G.E., AE--SSI

PROVIDES OFF-SITE DOSES FROM PURGING ALONE AS A CONTROL METHOD AND PLANS FOR AN ADDITIONAL MEANS OF CONTROL OF COMBUSTIBLE GASES AFTER A LOCA. PROPOSES ADDITION OF NITROGEN TO THE CONTAINMENT TO REDUCE THE OXYGEN AND HYDROGEN CONCENTRATION TO SAFE LEVELS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + ACCIDENT, LCSS CF COOLANT + CONTROL + DOSE CALCULATION, EXTERNAL + RADIOLYTIC GAS + HATCH 1 (BWR) + CONCENTRATION

079061
CRACK IN ATMOSPHERIC CONTROL SYSTEM HEADER AT MILLSTONE POINT
THE MILLSTONE POINT CO.
3 PAGES, LETTER TO DIRECTORATE OF REGULATORY OPERATIONS (AEC), FEB. 20, 1973, DOCKET 50-245, TYPE--BWR, MFG--G.E., AE--EBASCO

TWO CRACKS WERE FOUND IN THE 18-IN. ATMOSPHERIC CONTROL SYSTEM HEADER AT WELD JOINTS. THE CRACKS RESULTED FROM EXCESSIVELY COLD METAL TEMPERATURES CREATING THERMAL STRESSES. DUCTILITY WAS ALSO REDUCED SO THAT BRITTLE FRACTURE OCCURRED. THE CONTROL SYSTEM FOR CRYOGENIC SERVICE DID NOT FUNCTION PROPERLY, ALLOWING COLD NITROGEN TO ENTER THE PIPE. MODIFICATIONS WERE MADE TO PREVENT RECCURENCE. THE CRACKS WERE BEVELED ALONG THEIR ENTIRE LENGTH AND WELDED.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + BRITTLE FRACTURE + CONTROL SYSTEM + MAINTENANCE AND REPAIR + FAILURE, PIPE + FAILURE, DESIGN ERROR + CRYOGENICS + MILLSTONE POINT 1 (BWR)

079126
REVISIONS TO PSAR AND RESPONSES TO AEC QUESTIONS
NIAGARA MOHAWK POWER CORP.
DOCKET-50410-16 +. 161 PAGES, AMENDMENT 4 TO PSAR FOR NINE MILE POINT, UNIT 2, DEC. 7, 1972, DOCKET 50-410, TYPE--BWR, MFG--G.E., AE--STCNE AND WEBSTER

CONTAINS REVISED PAGES TO THE PRELIMINARY SAR CONCERNING MAKEUP-WATER-TREATMENT SYSTEM, CONTAINMENT-INERTING SYSTEM, AND ELECTRIC POWER SYSTEM. INCLUDES RESPONSES TO AEC QUESTIONS CONCERNING EMERGENCY POWER, FUEL STORAGE, SHIPPING CASK, POWER-CONVERSION SYSTEM, AND SEISMIC DESIGN.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

NRC QUESTION + REACTOR, BWR + EMERGENCY POWER, ELECTRIC + MISSILE GENERATION AND PROTECTION + SHIPPING CONTAINER + FUEL STORAGE + ELECTRIC POWER + REACTOR COOLANT + STORAGE CONTAINER + REPORT, PSAR + TURBINE + SEISMIC DESIGN + NINE MILE POINT 2 (BWR)

079530
DRESDEN SPECIAL REPORTS 14 (QUAD-CITIES SPECIAL REPORT 7, SUPPLEMENT 2)
COMMONWEALTH EDISON COMPANY
DOCKET-50237-300 +. 41 PAGES, LETTER WITH ATTACHED SUPPLEMENT 2 TO DRESDEN SPECIAL REPORT NO. 14 TO DIRECTORATE OF LICENSING (AEC), FEB. 20, 1973, DOCKETS 50-237/249/254/265, TYPE--BWR, MFG--G.E., AE--SGT AND LUNDY

079530 *CONTINUED*
TRANSMITS RESPONSES TO 11 AEC QUESTIONS CONCERNING THE PROPOSED CONTAINMENT ATMOSPHERIC DILUTION FOR CRESOEN 2 AND 3 AND QUAD CITIES 1 AND 2. INCLUDES SOURCES OF OXYGEN, TIME TO START NITROGEN ADDITION, STEAM CONCENTRATION AS A FUNCTION OF TIME, AND LONG-TERM PRESSURE TRANSIENTS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + DILUTION + ACCIDENT, LOSS OF COOLANT + CONTAINMENT SYSTEM, OPERATION + DRESDEN 3 (BWR) + DRESDEN 2 (BWR) + RADIOLYTIC GAS + QUAD CITIES 1 (BWR) + PRESSURE TRANSIENT + QUAD CITIES 2 (BWR)

079847
COMPLETION OF STARTUP PROGRAM AT QUAD CITIES 1 AND 2
COMMONWEALTH EDISON CO.
1 PAGE, LETTER TO DIRECTORATE OF LICENSING (AEC), MARCH 21, 1973, DOCKETS 50-254/262, TYPE--BWR, MFG--G.E., AE--SGT+LUNDY

THE STARTUP TEST PROGRAMS WERE COMPLETED AT QUAD CITIES 1 AND 2, AND THEIR PRIMARY CONTAINMENTS WERE INVERTED. STARTUP-DATA PROCESSING IS UNDERWAY.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (108 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, BWR + REACTOR STARTUP TESTING + QUAD CITIES 1 (BWR) + QUAD CITIES 2 (BWR)

080488
CALIBRATION OF VENTILATION-EXHAUST MONITORING SYSTEM AT QUAD CITIES
COMMONWEALTH EDISON CO.
3 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), MARCH 29, 1973, DOCKETS 50-254/265, TYPE--BWR, MFG--G.E., AE--SGT+LUNDY

DURING PURGING OF THE CONTAINMENT ATMOSPHERE TO THE REACTOR BUILDING VENT STACK AFTER A CONTROLLED SHUTDOWN OF UNIT 1, SAMPLES WERE OBTAINED FOR ISOTOPIC ANALYSIS. THE COMPOSITION WAS ESSENTIALLY 60% XE-133 AND 40% XE-135. THE RESULTS WERE USED TO CORRELATE THE ACTIVITY WITH THE MONITOR READINGS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (108 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, BWR + MONITOR, STACK + VENTILATION SYSTEM + INSTRUMENT CALIBRATION + MONITORING SYSTEM, RADIATION + QUAD CITIES 1 (BWR) + QUAD CITIES 2 (BWR)

081127
REVISIONS TO THE PSAR AND RESPONSES TO AEC QUESTIONS
NIAGARA MOHAWK POWER CORP.
DOCKET-50410-19+. 534 PAGES, AMENDMENT 5 TO NINE MILE POINT PSAR, JAN. 10, 1973, DOCKET 50-410, TYPE--BWR, MFG--G.E., AE--STONE AND WEBSTER

CONTAINS REVISED PAGES TO THE PRELIMINARY SAR CONCERNING CONTROL OF PRIMARY-CONTAINMENT, OFF-GAS SYSTEM, CONTAINMENT DESIGN, SEISMIC DESIGN FOR STRUCTURE, STRESS ANALYSIS, CLASSIFICATION OF COMPONENTS, COMPUTER PROGRAMS, AND ANALYTICAL MODELS USED. INCLUDES RESPONSES TO AEC QUESTIONS CONCERNING THE SAME TOPICS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

NRC QUESTION + REACTOR, BWR + CODES AND STANDARDS + COMPUTER PROGRAM + DESIGN CRITERIA + DILUTION + ANALYTICAL MODEL + WASTE TREATMENT, GAS + ANALYTICAL TECHNIQUE + OFF GAS + REPORT, PSAR + SEISMIC DESIGN + NINE MILE POINT 2 (BWR) + RECOMBINERS

081535
PROPOSED CONTAINMENT-AIR-DILUTION SYSTEM FOR VERMONT YANKEE
VERMONT YANKEE NUCLEAR POWER CORP.
4 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), JUNE 4, 1973, DOCKET 50-271, TYPE--BWR, MFG--G.E., AE--FRASCO

SUBMITS PLANS FOR THE DESIGN AND INSTALLATION OF A CONTAINMENT-AIR-DILUTION SYSTEM TO BE CONNECTED DURING THE SECOND REFUELING OUTAGE. THE SYSTEM INCLUDES NITROGEN SUPPLY AND CONTAINMENT VENTING FACILITIES AS WELL AS OXYGEN- AND HYDROGEN-MONITORING EQUIPMENT. THE SUPPLY TANK WILL BE ADEQUATE FOR THE FIRST 7 DAYS OF REQUIRED OPERATION. ELECTRIC HEATERS ARE PROVIDED TO MAINTAIN THE GAS OUTLET TEMPERATURE ABOVE 50 F TO AVOID POSSIBLE BRITTLE FRACTURE OF THE PIPING.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (108 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, BWR + DILUTION + HYDROGEN + CONTROL + AIR + MODIFICATION + EQUIPMENT DESIGN + VERMONT YANKEE (BWR) + INSTALLATION

082941
 REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS
 NEBRASKA PUBLIC POWER DISTRICT, COLUMBUS
 DOCKET-50298-71 +. 30 PAGES, AMENDMENT 19 TO COOPER LICENSE APPLICATION, MARCH 23, 1973, DOCKET 50-298, TYPE--
 BWR, MFG--G.E., AE--BURNS & ROE

CONTAINS ADDED INFORMATION FOR THE FINAL SAR CONCERNING FUEL-CASK-DROP ACCIDENTS. INCLUDES NEW
 AND REVISED RESPONSES TO AEC QUESTIONS CONCERNING POPULATION DISTRIBUTIONS, CONTAINMENT-
 ATMOSPHERE DILUTION, AND THE RADWASTE SYSTEM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

ACCIDENT + NRC QUESTION + REACTOR, BWR + HYDROGEN + REPORT, SAR + SHIPPING CONTAINER + WASTE TREATMENT +
 CONTROL + POPULATION DISTRIBUTION + COOPER (BWR) + FUEL ELEMENTS

083208
 AIRBORNE RELEASE AT QUAD CITIES 1 AND 2
 COMMONWEALTH EDISON
 6 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), AUGUST 11, 1973, DOCKET 50-254/265, TYPE--BWR, MFG--G.E.,
 AE--SGT & LUNDY

WITH UNIT 2 IN COLD SHUTDOWN AND UNIT 1 IN A CONTROLLED SHUTDOWN MODE, PREPARATIONS WERE MADE TO
 ENTER THE DRYWELL. BASED ON A DRYWELL AIR SAMPLE, INITIAL PURGING WAS THROUGH THE SGTs FOR 4
 HOURS FOR ADDED SAFETY ALTHOUGH NOT REQUIRED. HOWEVER, WHEN THE VENT-STACK SAMPLE CARTRIDGES
 WERE ANALYZED, THE I-131 RELEASE RATE FOR THE PREVIOUS DAY HAD EXCEEDED THE LIMIT. A REVIEW OF
 THE INCIDENT REVEALED SEVERAL CAUSES. THE METHOD USED TO ESTIMATE THE RELEASE RATE DID NOT
 CONSIDER RELEASES FROM THE REACTOR BUILDING. OTHER ACTIVITIES, SUCH AS A SCRAM, OCCURRED DURING
 VENTING WITHOUT RESAMPLING. DE-INERTING PROCEDURES WILL BE REVIEWED.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00)

AIRBORNE RELEASE + REACTOR, BWR + FAILURE + FAILURE, OPERATOR ERROR + IODINE + PROCEDURES AND MANUALS +
 SAMPLING + RADIOACTIVITY RELEASE + FAILURE, ADMINISTRATIVE CONTROL + QUAD CITIES 1 (BWR) + QUAD CITIES 2 (BWR)

083209
 AIRBORNE RELEASE OF IODINE AT QUAD CITIES 1 AND 2
 COMMONWEALTH EDISON
 4 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), AUGUST 16, 1973, DOCKET 50-254/265, TYPE--BWR, MFG--G.E.,
 AE--SGT & LUNDY

DURING STARTUP OF UNIT 1 WHILE UNIT 2 WAS OPERATING AT 530 MWE, THE UNIT-1 DRYWELL WAS VENTED
 THROUGH THE SGTs AFTER SAMPLING. ONE MINOR STEAM LEAK HAD BEEN REPORTED. WHEN THE VENT-STACK
 SAMPLE CARTRIDGES WERE ANALYZED THE NEXT DAY, THE RELEASE RATE WAS SHOWN TO HAVE EXCEEDED
 LIMITS. THE REACTOR-BUILDING VENTILATION SYSTEM FANS WERE THEN TURNED OFF AND THE ASGTs WAS
 INITIATED. THE VERY CONSERVATIVE RELEASE LIMITS, PLUS NOT BEING ABLE TO ADEQUATELY REMOVE THE
 I-131 FROM THE BUILDING WITH THE SGTs, COMPOUNDS THE PROBLEM. THE LIMITS ARE BEING REVIEWED.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00)

AIRBORNE RELEASE + REACTOR, BWR + FAILURE + IODINE + REACTOR COOLANT + RADIOACTIVITY RELEASE + QUAD CITIES 1
 (BWR) + LEAK + QUAD CITIES 2 (BWR)

083210
 PRIMARY-CONTAINMENT-ATMOSPHERE INERTING AT QUAD CITIES 1 AND 2
 COMMONWEALTH EDISON
 3 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), AUGUST 17, 1973, DOCKET 50-254/265, TYPE--BWR, MFG--G.E.,
 AE--SGT & LUNDY

ON AUG. 4 AND 5, BOTH UNITS WERE BROUGHT BACK TO POWER FROM COLD CRITICAL. THE CAPACITY OF THE ON-
 SITE NITROGEN STORAGE TANK IS NOT GREAT ENOUGH TO INERT BOTH, SO A LOAD OF NITROGEN WAS ORDERED
 FOR DELIVERY SHORTLY AFTER THE SECOND UNIT WAS STARTED. THE DELIVERY TRUCK WAS STOPPED ON THE
 HIGHWAY FOR BEING OVERWEIGHT, THUS DELAYING DELIVERY IN TIME TO MEET THE 24-HR LIMIT FOR
 INERTING. THE IMPORTANCE OF PROMPT DELIVERY WAS STRESSED TO THE SUPPLIER.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM
 CHARGE \$2.00)

REACTOR, BWR + FAILURE + TRANSPORTATION AND HANDLING + NITROGEN + QUAD CITIES 1 (BWR) + QUAD CITIES 2 (BWR) +
 CONCENTRATION

083867
 REVISIONS TO THE SAR AND RESPONSE TO AEC QUESTION
 CAROLINA POWER & LIGHT CO.
 DOCKET-50324-71 +. 660 PAGES, AMENDMENT 16 TO BRUNSWICK 1 AND 2 LICENSE APPLICATION, APRIL 2, 1973, DOCKET 50-
 324/325, TYPE--BWR, MFG--G.E., AE--UE+C

083867 *CONTINUED*

CONTAINS NEW AND REVISED PAGES TO THE FINAL SAR CONCERNING POWER GENERATION, CONTAINMENT-AIR MIXING, CORE CHARACTERISTICS, WASTE TREATMENT, AND ABNORMAL OPERATING TRANSIENTS. INCLUDES RESPONSES TO AEC QUESTIONS CONCERNING STANDBY LIQUID CONTROL SYSTEM, ECCS, VACUUM BREAKERS, ISOLATION VALVES, PRESSURE TRANSIENT EFFECTS, RADIOACTIVITY RELEASE RATES, EMERGENCY ELECTRIC POWER SYSTEM, FUEL HANDLING, AND IN-SERVICE INSPECTION PROGRAM.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

NRC QUESTION + REACTOR, BWR + EMERGENCY POWER, ELECTRIC + CONTAINMENT ISOLATION + RELEASE RATE + REPORT, SAR + WASTE DISPOSAL + WASTE TREATMENT + CONTAINMENT VACUUM BREAKER + REACTOR PHYSICS + BRUNSWICK 1 (BWR) + BRUNSWICK 2 (BWR) + EMERGENCY COOLING SYSTEM + VALVES

085410

REVISIONS TO THE SAR

NIAGARA MOHAWK POWER CORPORATION

230 PAGES, AMENDMENT 12 TO NINE MILE POINT 2 LICENSE APPLICATION, JUNE 15, 1973, DOCKET 50-410, TYPE--BWR, MFG--G.E., AE--STONE & WEBSTER

CONTAINS NEW AND REVISED PAGES TO THE PRELIMINARY SAR CONCERNING THE PRIMARY-CONTAINMENT ATMOSPHERIC-CONTROL SYSTEM, RADWASTE SYSTEMS, SITE-BOUNDARIES DOSE FOR ACCIDENT, CONCRETE MIXES, AND STRESS CALCULATIONS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

ACCIDENT + REACTOR, BWR + CONCRETE + DESIGN CRITERIA + HYDROGEN + WASTE DISPOSAL + WASTE TREATMENT + CONTROL + POPULATION EXPOSURE + REPORT, PSAR + NINE MILE POINT 2 (BWR)

086335

REVISIONS TO THE SAR AND RESPONSES TO AEC QUESTIONS

GEORGIA POWER COMPANY

DOCKET-50321-68 +. 222 PAGES, AMENDMENT 28 TO HATCH LICENSE APPLICATION, JANUARY 26, 1973, DOCKET 50-321, TYPE--BWR, MFG--G.E., AE--SSI

CONTAINS NEW AND REVISED PAGES TO THE FINAL SAR CONCERNING WIND STATISTICS, CONTAINMENT INERTING, APRM TRIPS, ROD SEQUENCE CONTROL SYSTEM, ELECTRIC POWER SYSTEMS, VENTILATION SYSTEM, RADIATION PROTECTION, QUALITY ASSURANCE PROGRAM (OPERATIONAL), AND EMERGENCY PROCEDURES. INCLUDES NEW AND REVISED RESPONSES TO AEC QUESTIONS CONCERNING OPERATIONAL TRANSIENTS, MATERIALS FOR THE MAIN COOLING SYSTEM, SAFETY RELATED EQUIPMENT, OFF SITE ELECTRIC POWER, RADWASTE SYSTEM, PROTECTION OF THE CONTROL ROOM, AND ACCIDENT ANALYSIS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

NRC QUESTION + REACTOR, BWR + CONTROL SYSTEM + REPORT, SAR + ELECTRIC POWER + RADIATION SAFETY AND CONTROL + WIND STATISTICS + QUALITY ASSURANCE + MAIN COOLING SYSTEM + HATCH 1 (BWR) + CONTROL ROOM

088092

EXCESS OXYGEN IN TORUS ATMOSPHERE FROM OPERATOR ERROR AT OYSTER CREEK (AD 50-219/74/61) CORP: JERSEY CENTRAL POWER AND LIGHT COMPANY

4 PAGES, LETTER TO DIRECTORATE OF REGULATORY OPERATIONS, REGION 1 (AEC), JANUARY 23, 1974, DOCKET 50-219, TYPE--BWR, MFG--G.E., AE--BURNS & ROE

FOLLOWING A ROUTINE STARTUP THE TORUS ATMOSPHERE WAS INERTED WITH NITROGEN TO 4.8% OXYGEN AS INDICATED ON THE OXYGEN RECORDER. THE ANALYZER ZERO HAD SHIFTED SO THAT THE CONCENTRATION ACTUALLY WAS 6.2% WHICH EXCEEDS THE 5% LIMIT. DUE TO A MISUNDERSTANDING OF THE DUTY SHIFT FOREMAN, AN ATTEMPT WAS MADE TO INERT THE DRYWELL TO LESS THAN 1% OXYGEN. THIS USED UP THE AVAILABLE NITROGEN. REACTOR POWER WAS REDUCED TO 50% AND A TEMPORARY WAIVER OF LIMITS WAS OBTAINED UNTIL MORE NITROGEN COULD BE DELIVERED, 48 HOURS LATER.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM CHARGE \$2.00

REACTOR, BWR + FAILURE + FAILURE, OPERATOR ERROR + OXYGEN + OYSTER CREEK (BWR) + CONCENTRATION + REACTOR STARTUP + TORUS.

088096

TEMPORARY TECHNICAL SPECIFICATION CHANGE AT OYSTER CREEK

JERSEY CENTRAL POWER & LIGHT COMPANY

2 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), JANUARY 22, 1974, DOCKET 50-219, TYPE--BWR, MFG--G.E., AE--BURNS & ROE

TECH SPECS REQUIRE THAT THE PRIMARY CONTAINMENT ATMOSPHERE SHALL BE REDUCED TO LESS THAN 5% OXYGEN WITH NITROGEN GAS WITHIN 24 HR. AFTER THE REACTOR IS IN RUN MODE. AFTER A STARTUP COMMENCED, IT BECAME APPARENT THAT A DELIVERY OF NITROGEN COULD NOT BE OBTAINED AS SCHEDULED BECAUSE OF ILLNESS. NO ALTERNATE SUPPLY WAS AVAILABLE. THE UTILITY REQUESTS A 48 HR WAIVER OF THIS REQUIREMENT UNTIL NITROGEN IS RECEIVED. THE REACTOR WILL BE OPERATED AT 50% POWER.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, 108 CENTS/PAGE -- MINIMUM

088096 *CONTINUED*
CHARGE \$2.00

REACTOR, BWR + FAILURE + OYSTER CREEK (BWR) + TRANSPORTATION AND HANDLING + NITROGEN + CONCENTRATION

088620
TUXEN-MEYER H
SURVEY OF APPLIED INSTRUMENT SYSTEMS FOR USE WITH LIGHT WATER REACTOR CONTAINMENTS
AKTIEBOLAGET ATOMENERGI, SWEDEN
AE-475 +. 20 PAGES, FIGURES, JUNE 1973

DATA CONCERNING THE INSTRUMENTATION, TESTING PRACTICES AND MONITORING PROCEDURES RELATING TO BWR AND PHR CONTAINMENT ATMOSPHERES ARE TABULATED. QUESTIONNAIRES WERE SUBMITTED TO A REPRESENTATIVE SELECTION OF REACTOR USERS IN THE USA, WEST GERMANY AND SWEDEN WHO HAD EITHER RECENTLY STARTED OPERATION OR WERE ON THE POINT OF TAKING DELIVERY OF NEW PLANT. COMPILATION OF THE ANSWERS IN TABLE FORM REVEALS SURPRISING DIFFERENCES BETWEEN THE DIFFERENT INSTRUMENT ARRAYS AS REGARDS THE DESIGN CRITERIA EMPLOYED AND THE TECHNICAL SOLUTIONS TO WHICH THESE LEAD. ONE CONSEQUENCE OF THE SURVEY IS TO INDICATE THE NEED FOR FURTHER INFORMATION REGARDING INSTRUMENTATION PHILOSOPHY. THIS IS DEMONSTRATED IN THE PENULTIMATE SECTION OF THE REPORT BY THE FORMULATION OF A NEW SERIES OF QUESTIONS.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

REACTOR, BWR + CONTAINMENT INSTRUMENTATION + REACTOR, PHR + REACTOR, LWR + TEST, INSTRUMENT RESPONSE + TEST, SYSTEM OPERABILITY + SURVEY + PERFORMANCE

089502
CONTAINMENT OXYGEN CONCENTRATION HIGH AT QUAD CITIES 2
COMMONWEALTH EDISON COMPANY
2 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), MARCH 21, 1974, DOCKET 50-265, TYPE--BWR, MFG--G.E., AE--SGT & LUNDY

CAUSE - LEAK IN PNEUMATIC SYSTEM. WITH THE UNIT OPERATING AT 778 MWt, THE PRIMARY CONTAINMENT OXYGEN CONCENTRATION WAS FOUND TO BE 5.5%. NITROGEN WAS ADDED UNTIL THE OXYGEN CONCENTRATION WAS REDUCED TO 5%, THE UPPER LIMIT. THE HIGH CONCENTRATION RESULTED FROM AIR-IN-LEAKAGE INTO THE DRYWELL PNEUMATIC SYSTEM. ALL FLANGE BOLTS AND OTHER FITTINGS ON THE SYSTEM WERE TIGHTENED. SAMPLE RESULTS INDICATED THAT THE LEAK HAD BEEN STOPPED.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, BWR + FAILURE + OXYGEN + FAILURE, MAINTENANCE ERROR + LEAK + PNEUMATIC SYSTEM + QUAD CITIES 2 (BWR) + CONCENTRATION

090411
AMENDS FULL TERM LICENSE APPLICATION
NIAGARA MOHAWK POWER CORPORATION
DOCKET-50220-192 +. 129 PAGES, AMENDMENT 1 TO FULL TERM OPERATING LICENSE APPLICATION, NOVEMBER 23, 1973, DOCKET 50-220, TYPE--BWR, MFG--G.E., AE--NIAGARA MOHAWK

RESPONDS TO QUESTIONS CONCERNING CHANGES TO THE TECH SPECS, CONFORMANCE WITH CURRENT REGULATORY GUIDES, PLANNED MODIFICATIONS, CONTAINMENT ATMOSPHERE DILUTION SYSTEM, HEAT UP AND COOL DOWN RATES OF PRESSURE VESSEL, AND THE SURVEILLANCE CAPSULE WITHDRAWAL SCHEDULE.

AVAILABILITY - NATIONAL TECHNICAL INFORMATION SERVICE, U. S. DEPARTMENT OF COMMERCE, SPRINGFIELD, VA. 22161

NRC QUESTION + REACTOR, BWR + NINE MILE POINT (BWR) + PRESSURE VESSELS + LICENSE APPLICATION + TECHNICAL SPECIFICATIONS + OPERATING LICENSE PROCESS + SURVEILLANCE PROGRAM + FRACTURE TOUGHNESS + THERMAL TRANSIENT + NRC REGULATORY GUIDE

090412
AMENDS FULL TERM LICENSE APPLICATION
JERSEY CENTRAL POWER AND LIGHT COMPANY
25 PAGES, LETTER WITH ATTACHED SUPPLEMENT 6 TO DIRECTORATE OF LICENSING (AEC), NOVEMBER 21, 1973, DOCKET 50-219, TYPE--BWR, MFG--G.E., AE--BURNS & ROE

RESPONDS TO QUESTIONS CONCERNING POTENTIAL POST-LOCA OXYGEN SOURCES, OXYGEN CONCENTRATIONS, WEIGHT OF ZIRCONIUM IN THE CORE, AND CONTAINMENT ATMOSPHERE MIXING.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (08 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

NRC QUESTION + REACTOR, BWR + HYDROGEN + OXYGEN + OYSTER CREEK (BWR) + ZIRCONIUM + CONTROL + LICENSE APPLICATION + OPERATING LICENSE PROCESS + FLOW, MIXING + CONCENTRATION

094521
CONTAINMENT OXYGEN CONCENTRATION CUT OF LIMITS AT DRESDEN 3

094521 *CONTINUED*
COMMONWEALTH EDISON COMPANY
1 PAGE, LETTER TO DIRECTORATE OF LICENSING (AEC), JULY 22, 1974, DOCKET 50-249, TYPE--BWR, MFG--G.E., AE--SGT
& LUNDY

CAUSE - INSUFFICIENT NITROGEN. FOLLOWING A STARTUP, INERTING OF THE DRYWELL WAS TERMINATED BECAUSE THE NITROGEN STORAGE TANK LEVEL HAD DECREASED TO THE LOWER LIMIT. ADDITIONAL NITROGEN HAD BEEN ORDERED BUT THE VENDOR LOST THE ORDER. THE OXYGEN CONCENTRATION MET LIMITS 28 HOURS AFTER STARTUP INSTEAD OF THE REQUIRED 24 HOURS WHEN ADDITIONAL NITROGEN WAS RECEIVED.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (108 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, BWR + FAILURE + OXYGEN + ACCIDENT, TRANSPORTATION + DRESDEN 3 (BWR) + NITROGEN + CONCENTRATION + REACTOR STARTUP + TORUS

097131
PRIMARY CONTAINMENT ATMOSPHERE OUT OF LIMITS AT PILGRIM
HOUSTON EDISON COMPANY, MASSACHUSETTS
3 PAGES, LETTER TO DIRECTORATE OF LICENSING (AEC), NOVEMBER 15, 1974, DOCKET 50-293, TYPE--BWR, MFG--G.E., AE--JECHTEL

CAUSE - OPERATOR ERROR. PRIMARY CONTAINMENT ATMOSPHERIC OXYGEN CONCENTRATION WAS DETERMINED TO BE 5.37% BY VOLUME WHILE THE REACTOR WAS AT 90% POWER. THE UPPER LIMIT IS 5%. PURGING OF THE SUPPRESSION CHAMBER WITH NITROGEN WAS STARTED. AN INTERMITTENT DC ELECTRICAL GROUND HAD OCCURRED IN THE CONTROL CIRCUIT OF A VACUUM BREAKER. THE VALVE WAS STROKED SEVERAL TIMES. SINCE THE SUPPRESSION CHAMBER PRESSURE WAS LESS THE REACTOR BUILDING PRESSURE, AIR FLOWED IN INCREASING THE OXYGEN CONCENTRATION. OPERATORS WARNED TO CHECK THE CONCENTRATION OFTEN DURING TRANSIENT AND NON-ROUTINE OPERATIONAL PERIODS.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (108 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, BWR + FAILURE + FAILURE, OPERATOR ERROR + PILGRIM (BWR) + CONCENTRATION

097145
OXYGEN CONCENTRATION NOT MEASURED ON SCHEDULE AT ARNOLD
IOWA ELECTRIC LIGHT AND POWER CO., CEDAR RAPIDS
2 PAGES, LETTER TO DIRECTORATE OF REGULATORY OPERATIONS (AEC), REGION III, NOVEMBER 8, 1974, DOCKET 50-331, TYPE--BWR, MFG--G.E., AE--COMMONWEALTH ASSOC.

CAUSE - PROCEDURE MISFILED. THE PRIMARY CONTAINMENT OXYGEN CONCENTRATION IS TO BE MEASURED TWICE A WEEK. THE PROCEDURE FOR THIS WAS SENT OUT ONCE A WEEK. AFTER THE FIRST TEST WAS PERFORMED, THE PROCEDURE SHOULD HAVE BEEN PLACED IN THE FILE DATED OCTOBER 21. INADVERTENTLY, IT WAS PLACED IN THE FILE DATED OCTOBER 28. PROCEDURES HAVE BEEN REVISED TO PROVIDE A SEPARATE PROCEDURE FOR EACH TEST.

AVAILABILITY - NRC PUBLIC DOCUMENT ROOM, 1717 H STREET, WASHINGTON, D. C. 20545, (108 CENTS/PAGE -- MINIMUM CHARGE \$2.00)

REACTOR, BWR + FAILURE + FAILURE, OPERATOR ERROR + TESTING + TEST INTERVAL + ARNOLD (BWR)

KEYWORD INDEX

A COLLECTION OF KEYWORDS IS USED TO DENOTE THE MAIN SAFETY RELATED POINTS COVERED IN EACH ARTICLE. THE FOLLOWING INDEX IS AN ALPHABETICAL LISTING OF THE KEYWORDS GIVING REFERENCES TO EACH ARTICLE WHICH WAS KEYED TO IT.

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