BIOMEDICAL & ENVIRONMENTAL NEEDS OF
DIRECTORATE OF LICENSING

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VIEWGRAPH NOTES USED BY J. J. DAVIS
AT 11/10/72 ACBM MEETING

REPOSITORY 326 US Atomic Energy Commission
COLLECTION Biology & Medicine
BOX No. 2
FOLDER 9

BIOLOGICAL EFFECTS FROM ENTRAINMENT THROUGH COOLING SYSTEMS AND ECOLOGICAL SIGNIFICANCE

- Impacts on species
- *Impacts on aquatic populations and fisheries resources
- Nutrient materials in discharge waters and their impact

DESIGN AND SITING OF WATER INTAKE AND DISCHARGE STRUCTURES TO MINIMIZE ENTRAPMENT AND ENTRAINMENT

- *Swimming behavior response to water velocity
- *Ecological considerations in selection of intake and outfall sites
- Develop and test design and operation of intake and discharge structures

IMPACTS TO AQUATIC ENVIRONMENTS FROM HEAT EFFLUENTS

- Ecological effects from small ΔT on water bodies
- *Impact on biota of elevated temperatures in limited segments of environment
- *Optimum and tolerance temperature for important species through life cycle
- *Cold shock
- *Rate change tolerances of important species through life cycle
- Behavioral responses of important species through life cycle
- Relationships of temperature to health and condition of aquatic organisms
- Thermal effects on species diversity and species composition of the ecosystem

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TOXICITY OF BIOCIDES AND OTHER CHEMICAL WASTES FROM NUCLEAR POWER FACILITIES

·Test existing toxicological information and relate to field conditions

*·Toxicological tolerances of actual species that are exposed

·Chronic effects

·Dose-time effects and recovery capabilities

IMPACT OF COOLING TOWER RELEASES ON LOCAL ECOLOGY

*·Effects of salt drift on terrestrial and marshland habitats

·Climatic effects

*·Ecological impacts from blowdown wastes

"ECOLOGICAL HEALTH"

*·Criteria of "Ecological Health"

·Develop and test methods to measure stability and weaknesses of ecosystems

·How and when will ecosystems succumb to environmental pressures

PREDICTION OF ENVIRONMENTAL EFFECTS AT THE POPULATION LEVEL

·Comparative information of dynamics and catastrophic thresholds of natural populations

·Develop and test models to predict environmental impacts on natural populations

·Methods for measuring impacts on population density

·Long-term effects of sustained low-level radiation on man and other biota

·Develop cytogenetic tests for important species

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BEHAVIORAL INFORMATION ON IMPORTANT SPECIES

- Tropistic responses to nuclear facilities' wastes under natural conditions
- Feasibility of using behavioral responses as sensitive indicators of effects from nuclear facilities' waste products
- *Use of knowledge of behavioral characteristics to reduce impacts on important species
- Use of knowledge of behavioral characteristics to help predict impact on sports and commercial fisheries

PLUTONIUM

- Doses from internal deposition as a function of isotopic, chemical and physical form
- Identification of critical pathways

  Pu-238, -239, -240, -241, -242
  Cm-242, -244
  Am-241, -243
  Np-239

- Atmospheric transport - resuspension
- Translocation in terrestrial environments
- Behavior in aquatic environments
- Chemical and physical change from environmental exposure
- Change in biological availability with environmental exposure

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- Conduct modest study to demonstrate cycling and long-term distribution in natural aquatic and terrestrial environments

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- Definitive data to settle bioaccumulation controversy
- Bases to define cycling and fate in ecosystems and biosphere

REGIONAL PLANNING FOR NUCLEAR POWER FACILITIES

Objectives:

- Capability to predict and assess additive, synergistic, or antagonistic environmental effects of multiple nuclear power facilities and impacts from other sources
- Number and size of plants that can be safely located in specific regions
- Distribution of sites within a region
- Precautions, peculiar to a region, that need consideration during construction, operation, and decommissioning

R&D Requirements:

- Methods to predict and evaluate effects on fish and wildlife from multiple environmental impacts
- Synergistic effects on fish and wildlife of waste products from nuclear plants in combination with stresses and wastes from other sources
- *Basis for predicting dispersion and impact of radionuclides, thermal and chemical discharges
- Technical basis and methods for predicting regional weather modifications from single and multiple power plant effluents
- Use of models in regional models
- Regional demonstration programs

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COASTAL ENVIRONMENT SURVEY METHODOLOGY

Development, Testing, Evaluation and Standardization of Survey Methods and Instrumentation

*·Diagnostic parameters for site selection

·Scope and extent of preconstruction siting surveys

·Scope and extent of post-operation environmental monitoring programs
- near zone vs. far zone monitoring

·Instrumentation and methodology
- continuous monitoring vs. periodic measurements
- remote systems (buoys and telemetering)

COASTAL METEOROLOGY

·On-shore atmospheric transport and depositions from facility

·Evaluation of "buffer zone"

·Transport velocities of gaseous and particulate wastes

·Interaction of marine aerosols with plant effluents

COASTAL ECOLOGY

Impact of Thermal Wastes and Reactor Structures on Coastal Ecology

·Effects of thermal wastes on population structure

·Effects of thermal wastes on preditor-prey relationships

·Immediate versus long-term effects of reactor and breakwater structures on population structure

·Impact of off-shore reactor operation on near-shore habitats

·Mechanical effects of cooling systems on biota

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COASTAL ZONE PHYSICAL OCEANOGRAPHY

Advective and Diffusive Circulation of Heat and Wastes in Near-shore Waters

- On-shore transport from facility
- Coastal entrainment
- Mixing layer mechanics and transport across thermocline
- Impact of regional upwelling on dispersion of plant effluents
- Impact of thermal effluents on local upwelling

COASTAL ZONE CHEMICAL OCEANOGRAPHY

- Immediate chemical interactions between power plant wastes and marine waters
- Time related changes in chemical behavior affecting biological impacts of plant wastes
- Test specific activity concept for predicting fate of radionuclides
- Evaluate validity of specific activity approach for specific radionuclides compared to critical pathway approach

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