DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C.

MAR 29 1957

IN REPLY REFER TO:

MEMORANDUM FOR: THE SECRETARY OF DEFENSE

SUBJECT: Request for Authority to Construct and Equip a Pilot Production Line - U. S. Army Ionizing Radiation Center

1. It is requested that the Army be authorized to establish a pilot production plant for radiation preservation of foods at the Sharpe General Depot, Lathrop, California. The best cost estimate that can be developed at this time is approximately $4,000,000 which will provide for constructing and equipping the Army (non-nuclear) portion of the pilot plant.

2. The Atomic Energy Commission has programmed $3,000,000 FY 1957 funds for the nuclear reactor and is in the process of negotiating a contract for its final design and construction.

3. A team of representatives from the Department of the Army and the Atomic Energy Commission reviewed potential areas throughout the United States and surveyed and evaluated 25 Government-owned sites. Of those meeting the established criteria, Sharpe General Depot was finally selected as the most acceptable. Continuous use of this facility requires that it be located in maximum year around food producing areas. In addition, the exclusion area required to meet the safety requirements for the reactor precludes the conversion of any existing Government facilities. Therefore, new construction is required.

4. The purpose of this facility is to determine the economy and feasibility of radiation preservation of foods by mass production and to provide the basis for the development and tooling of industry to meet future requirements of the military.

5. More detailed information on cost estimates, capacity, description of the facility, justification for the facility and expected savings resulting from the use of irradiated foods by the military is contained in the attached project request, six copies of which are being forwarded as a means of facilitating review by the interested elements of your office.

Wilber M. Brucker.

Wilber M. Brucker
Secretary of the Army

1 Incl
Project Request (6 cys)

Food Irradiation Jan 1, 1957 - Dec 1959

PROJECT REQUEST FOR PROVISION OF PRODUCTION FACILITIES FUNDS
(EXEMPT FROM REPORTS CONTROL BY PROVISION OF PAR 17d, AR 335-15)

DATE: FEB 25 1957

1. Request that Provision of Production Facilities Funds be approved in the amount of $4,000,000 for use by Quartermaster Corps on the project described below:

a. Name and Location of Facility - U.S. Army Ionizing Radiation Center, Sharpe General Depot, Lathrop, California.

b. Government-owned facilities to be operated by civilian contractor.

c. Name and address of operator - Contractor to be selected upon approval of this project.

d. End item to be produced - Economic, commercial feasibility and production prototype data on irradiated foods.

e. Funds are required for construction of the facilities, acquisition of food processing equipment and relevant technical consultations.

f. The processing operations to be performed and the facilities to be provided for these operations are briefly described as follows:

The purpose of this measure is to establish a Pilot Production Line to be operated by a civilian contractor to determine the feasibility and economics of irradiating a large variety of foods by mass production in order to preserve them for extended periods without refrigeration.

g. Estimated time required to complete this project from the date of funding is 24 months.

2. Information covering the items to be produced at this facility, the current and mobilization requirements therefor, and the capacity which will be available, is as follows:

a. A large variety of foods will be irradiated by the proposed facility in order to determine the feasibility and economics of mass production.

b. This pilot plant will produce new items not commercially available.

c. Since the items to be produced by this plant are new and have not as yet been accepted as standard items of issue, no current or mobilization requirements are available. However, once adopted, these products will replace items for which substantial requirements exist.

d. The maximum capacity of this plant will be 1,000 tons of food per month. (See Incl. #1 for justification for the need for this capacity).

3. Reasons for selecting this site are:

a. Meets reactor safety requirements established by Atomic Energy Commission.

b. Located within maximum yearly food producing area essential to continuous operation of the line.

c. Does not interfere with Depot operation.

d. Can readily be severed from the Depot for lease to industry in the future.

4. Adequate labor, power, fuel, water, sewage disposal, housing, rail and highway transportation are available and were important considerations in the selection of the site.

5. The estimated cost breakdown of the facilities described in paragraph 1 is shown in Inclosure #2.

6. a. Justification for this project:

(1) There are no existing commercial facilities for pilot or mass production of irradiated foods. Research in the uses of atomic energy and its by-products during the past several years has developed to the point where a large-scale industrial application lies in the not-too distant future. The application of ionizing radiation to the preservation of foods is an outstanding example. The Quartermaster Corps' program of research into food preservation, in cooperation with industrial and independent scientific organizations, has shown the application of ionizing radiation to food preservation to be highly promising. This pilot production line will provide a basis for the development of techniques and procedures and for tooling of the industrial economy to meet the requirements of food preservation in this manner. The prime objectives of this plant are:

(a) To provide a facility to determine the feasibility and economics of mass production. This facility will provide a manufacturing pilot production prototype to determine the ability to mass produce irradiated foods at an economical cost.

(b) To determine which specific foods or other items should be irradiated by electron bombardment and which items should be treated by gamma rays for the most effective preservation, economical production rate and cost, with due consideration to the nutritive value and acceptability of the food.

(c) To provide a source of supply of irradiated foods to be used by the Surgeon General for testing the effects on the nutritive values of the food, and by The Quartermaster General to test for acceptance and palatability.

(d) To develop a more nutritive, acceptable and better quality diet for combat troops at lower cost.

(e) To develop products that will increase mobility and capability for sustained operations by all military departments. To keep pace with the n[ ]oncepts of ground warfare a r[ ]n is required that will adequately sustain troops for extended periods of time with a minimum of handling, refrigeration during shipment and storage, and food losses. Use of food preserved by radiation will solve many of these problems.

(2) The maximum capacity of this plant will be 1,000 tons of food per month.

(3) Savings to be realized:

(a) Saving in shipping costs - A preliminary estimate has been developed which indicates that the yearly net savings during peacetime as a result of reduced shipping costs to the Far East Theater would amount to approximately $20 to $25 per man per year.

(b) Saving in refrigeration costs - Based on current capacity and utilization of refrigeration facilities in CONUS, the cost of refrigeration to the Army amounts to more than $5 per man per year.

(c) Decrease in requirements for new refrigeration units as replacement. Yearly worldwide savings are estimated at 1¼ million dollars.

(d) Reduction in the requirements for heavy gauge tin plate steel containers which are necessary for currently sterilized canned foods.

(e) Reduction of loss of foods from insects, bacteria, etc., and from the monotony of eating non-perishable type rations in the field.

(f) Decrease in logistics and maintenance support requirements, i.e., repair parts for refrigeration equipment, refrigeration repairman, fuel and/or electricity for refrigerator operation.

b. Basis for Estimated Cost:

(1) Preliminary cost estimates were developed as follows:

(a) Construction - By informal discussion with Corps of Engineers. The final concept and preliminary design of the plant have not been completed. See Inclosure 2 for a brief description of this plant. Detailed cost estimates for construction will not be available until approximately April 1957.

(b) Equipment - By discussion between QM technologists and various machinery manufactors and food processors. A complete detailed list of processing equipment will not be available until approximately May 1957.

(2) See Inclosure 3 for breakdown of cost estimates. Except for Government overhead, all items will be procured by contractual service.

c. Officer approving cost estimate is:

Colonel W. D. Jackson

7. Subcontracting - Since the basis for this pilot production is to determine feasibility and economics of mass production of the items, precise control and timing for each step in the production process are essential, thus prohibiting extensive subcontracting.

8. Government-Owned Production Equipment and Facilities:

Existing facilities of the Department of Defense and other Government agencies have been investigated and considered in lieu of new construction. A team composed of Department of the Army and Atomic Energy Commission representatives surveyed and evaluated approximately 24 Government-owned sites. Because the safety requirements for the reactor and year around availability of food were the major factors in the site selection for this facility, new construction was determined to be most economical and practicable to assure that the prime objectives of this pilot production plant are met. A review with Office, Chief of Engineers, Ordnance Corps and Chemical Corps reveals no Government-owned industrial facilities are available for conversio

9. Several companies were approached to finance this plant. Since this is a completely new field of food processing, many companies are extremely interested. However, because of the high cost of construction, lack of production cost data, techniques, and the risks involved in the expected results, industry is not willing to finance this operation. As directed by the Subcommittee on Research and Development to the Joint Congressional Committee on Atomic Energy, Quartermaster Corps is maintaining a dominant position in this radiation preservation field and is spearheading the program until industry is in a position to fulfill military requirements.

10. A careful review of all pertinent factors has been made and the proposal as outlined above is believed to be most advantageous to the Government. Further, scheduled requirements cannot be satisfied at less overall cost to the Government because of non-availability of Government or commercial sources of supply.

11. Prior and Future Funding:

The following is a breakdown of total funds programmed for the non-nuclear portion of the pilot line.

FY-56	Preliminary Design	P&P 4251	$200,000	Project Approved	Contract Awarded
FY-57	Design and Construction of Linear Accelerator	P&P 4251	850,000	"	"
FY-57	Pilot Plant for Irradiated Foods	P&P 4211	2,660,000		
FY-58	Pilot Plant for Irradiated Foods	P&P 4211	1,420,000		
		TOTAL:	$4,850,000		

Funds in the amount of $2,580,000 are required in FY-57 for construction of the non-nuclear portion of the Center and for management and consulting contracts. Funds in the amount of $1,420,000 are required in FY-58 to complete the Center and for purchase of food processing equipment.

12. Coordination: The program for radiation preservation of foods has been coordinated with the following agencies:

Atomic Energy Commission
Department of State
Department of Commerce
Department of Agriculture
Department of Interior
Department of Health Education and Welfare
All Technical Services of the Army
Department of Air Force
Department of Navy

JUSTIFICATION FOR PLANT CAPACITY

1. A capacity of one thousand tons of irradiated food per month is required for:

a. Volume production data and economic analysis.

b. Engineering design data to scale up the commercial size production.

2. This figure of 1,000 tons per month is a reasonable rate of production required to provide the volume necessary for essential cost data and engineering design information. Although this peak capacity will not be utilized continuously, it is an essential design requirement. Current production lines (canning, freezing, etc.) produce at a rate of 15 tons per hour per line. The figure of 1,000 tons per month is equivalent to a rate of less than two tons an hour based on a 24-hour day - 28-day month. Since this pilot production line will be a pioneer effort in the new food processing field, it is essential to provide economic cost data that is adequately representative of anticipated mass production techniques. If the magnitude of industry risk is to be reduced in adopting this process, ample evidence must be presented on the question of processing cost. It is particularly important in this instance, since a revolutionary new method is being introduced which is completely foreign to present-day commercial practice. Guidance offered at the 8 June 1956 hearings before the Congressional Subcommittee on Research and Development of the Joint Committee on Atomic Energy was to the effect that the Army should proceed as fast as possible to prove that the irradiated foods are not harmful and to show how cheaply they can be irradiated.

3. It is essential that this peak rate of production be available so that large volume shipments of highly perishable foods can be handled in simulated production methods and techniques. These highly perishable commodities cannot be subjected to refrigeration or other holding techniques without introducing variables which will effect both the quality and cost analysis, thus destroying the validity of the pilot plant data.

4. Other considerations affecting determination of 1,000 tons/month requirement:

Studies performed by the Oak Ridge School of Reactor Technology has indicated that the optimum design for a reactor to be used as a high intensity gamma processing facility would dictate a minimum size of 10 - 17 megawatts. This size reactor will provide the most efficient utilization of the gamma source. Further, it has been estimated that the output of such a reactor will provide the capability of processing 1,000 tons/month at the required dose level of two million reps.

BRIEF DESCRIPTION OF THE PLANT

This plant consists of a food processing area, linear accelerator, nuclear reactor, and administration and laboratory space. The building is to be permanent type, austere construction.

FOOD PROCESSING AREA

1. This portion will be single-story, providing space for a minimum of two food processing lines, one of which will be in an area refrigerated for handling meats and other perishable foods. Areas will be provided for receiving and handling of raw and processed food materials, for the storage of packaging materials, storage of stand-by processing equipment, locker rooms, boilers, refrigerating machines, maintenance shop, waste disposal systems, etc.

2. The food processing lines will be as multi-purpose as possible, and provision will be made for substitution of equipment for quick change-over for the processing of the various foods as they become available during the harvest season. Each processing line will have a capacity equal to the rated capacity of the plant, which is 3,000 pounds of food per hour irradiated to a dose of two million rep. Food from any processing line will be transferred to a conveyor system that will carry the packages through the radiation zones of either the reactor or the accelerator. Preliminary designs indicate that the food processing areas and related facilities exclusive of office and laboratory space will be approximately 80,000 square feet.

GAMMA RADIATION SOURCE (NUCLEAR REACTOR)

3. Gamma radiation for the USAIRC will be furnished by the Food Irradiation Reactor (FIR) complex which will be furnished by the AEC. As presently envisaged, the facility consists of:

> "A fully enriched light-water cooled and moderated heterogeneous reactor core surrounded by a blanket of an indium salt in aqueous solution. The indium solution system includes the reactor blanket and gamma radiators; primary and auxiliary cooling water systems for removal of reactor heat; radiator cubicles into which the food is conveyed for irradiation; and buildings for housing the reactor, radiators, and operations personnel."

ELECTRON ACCELERATOR

4. The electron source being developed by Varian Associates consists of a linear accelerator, shielding, operating console, a conveyor system, and temperatur control and ventilation facilities for the shielded radiation chamber, and other ancillary equipment. The accelerator will be capable of delivering up to 15 kilowatts of electrons with a maximum energy of about 25 Mev. Through the use of strong magnetic fields the accelerated electron stream will be so directed as to permit exposure on both sides of the product simultaneously.

OFFICE AND LABORATORIES

5. Office space will be provided for the staff of the USAIRC and for the personnel of the commercial operating contractor. There will also be several laboratories and a conference room. Preliminary designs indicate a requirement of approximately 16,000 square feet for a sihgle-story office and laboratory area.

		This Request	Previously Approved	Total
1.	Land 0 Acres	0	0	0
2.	Building including Fixtures	$2,450,000	0	$2,450,000
3.	Processing Equipment including Installation	700,000	0	700,000
4.	Office & Laboratory Equipment	30,000	0	30,000
5.	Material Handling Equipment (Conveyors)	250,000	0	250,000
6.	Utilities: (Roads, Walks, Parking Areas, Railroads, Waterline Drainage, Sanitation & Power line and Facilities)	150,000	0	150,000
7.	Consultant & Management Contracts	215,000	0	215,000
8.	Government Overhead (Admin.)	205,000	0	205,000
			TOTALs	$4,000,000

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Advantage of Cobalt 60 as Radiation Sources

1. Penetrating radiation which permits homogeneous dose distribution.
2. Continuous maintenance-free operation.
3. No induced radioactivity from photo-neutron reaction.
4. Easily engineered facility.
5. Little danger of leakage or contamination.
6. Minimal operating costs (as compared to reactor).
7. Can be designed to withstand hazards of fire, flood, earthquake, or explosion.
8. No wastedisposal problems.
9. Large quantities can be produced at reasonable cost.
10. Versatile source geometry.
11. High specific activity.
12. No corrosion problems.
13. Reasonably long half-life.
14. Resale value of decayed sources.
15. Can be produced rapidly and in quantity.
16. Technology of production, encapsulation, the irradiator design, and if necessary, safety precautions already well developed.
17. No need to consider environmental contamination.
18. Need not be concerned with meteorological, hydrological or seismological characteristics of site.
19. Minimal exclusion area compared to reactor.
20. Some inventory immediately to start loading.