3.0 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the proposed action and the alternatives considered by the Department of Energy to recycle enriched uranium and provide uranium oxide-aluminum billets for extrusion into reactor fuel tubes.

3.1 Proposed Action

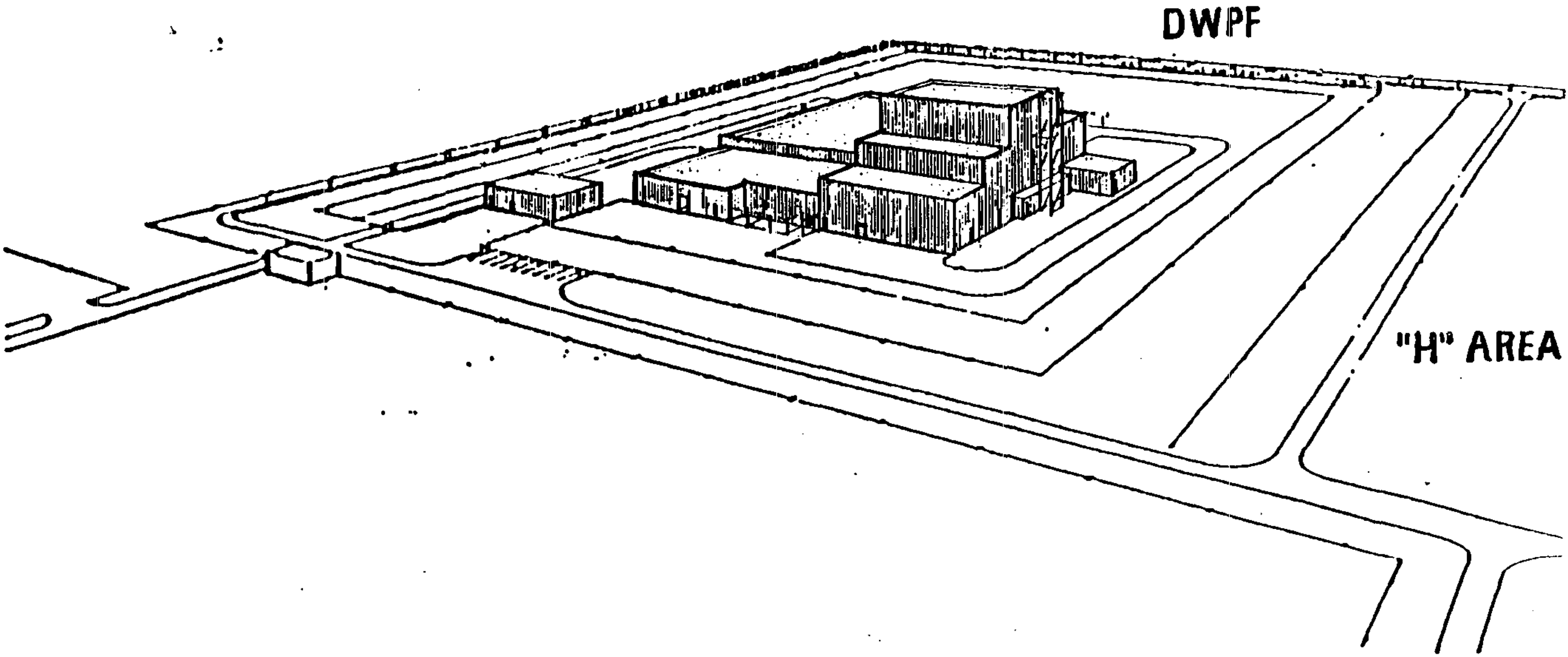
The proposed action is construction of a Fuel Production Facility (FPF) which will include a Powder Metallurgy (PM) facility and an Onsite Uranium Recycle (OSUR) facility for the production of uranium oxide-aluminum billets. A diagram of the FPF building is shown in Figure 3-1.

The new facility will recycle enriched uranium and produce uranium oxide-aluminum billets. It will replace the casting and machining process now used to form fuel billet cores with the PM process. The PM process will reduce existing environmental impacts, reduce fuel manufacturing costs, increase reactor productivity, reduce waste costs, improve personnel safety, improve security, eliminate offsite shipments of enriched uranium solution, and eliminate the risk of transportation accidents.

In the OSUR process, uranium oxide from Oak Ridge and the Idaho Chemical Processing Plant (ICPP) will be dissolved in nitric acid, diluted, and blended with SRP's low enriched uranyl nitrate solution. Then the uranium will be loaded on macroporous cation exchange resin which will be dried and then converted to U_3O_8 by combustion of the resin compounds.

In the PM process, U_3O_8 powder of the desired enrichment will be ground to a controlled particle size distribution. The amount of powder needed for one core will be blended with aluminum powder and compacted in an elastomeric mold, producing a finished core. The core will be assembled with aluminum billet components, and the billet will be welded closed. Groups of billets will be shipped to Building 321-M for extrusion into fuel tubes. The theoretical capacity of the OSUR process is 58 kg of uranium daily. On a seven-day, four-shift operation, this throughput should produce 16 metric tons of uranium per year, assuming a process yield of 90% and 85% attainment. The theoretical capacity of the P/M process is 40 cores per shift. At 98% yield and 90% attainment, the production rate should be 35 cores per shift.

FIGURE 3:1   FPF BUILDING LOCATION



The 78,000-square-foot building will contain a central processing area, an operating room, hardened vault, offices and necessary service facilities. The process wing will meet 0.17 g seismic resistance and will contain sensitive processing equipment housed in secondary enclosures or glove boxes to provide radiation shielding, containment, and filtered ventilation. Ventilation facilities, an exhaust stack, and process exhaust system will be provided. Safety systems, including nuclear incident monitors and fire detection-suppression systems, will be installed. A computer system will be provided to control process equipment and maintain an inventory of process materials. Security systems include a hardened entry control facility, double security fences, perimeter patrol road, computer system and electronic and video monitoring to protect Special Nuclear Material (SNM).

3.2 Alternatives

3.2.1 No Action/Continue Existing Operations without Constructing FPF

Under the no action alternative, there would be no change in existing SRP and OR facilities and operations for processing and conversion. Presently, the enriched uranyl nitrate product from SRP's Building 221-H operations contains the recovered enriched uranium from SRP reactor fuel. Recovery of this material is highly cost effective in that over $125 million per year of otherwise required feed material and separative work unit costs are avoided. However, it requires the transportation of large quantities of the slightly radioactive liquid uranyl nitrate solution between SRP at Aiken, SC, and the Y-12 Plant at Oak Ridge, TN, by tank truck. These shipments are required because the Y-12 Plant is the present processing and recovery facility and there are no facilities at SRP to convert uranyl nitrate to uranium oxide for fabrication of reactor fuel in SRP's Building 321-M operations. Only limited storage for uranyl nitrate exists at SRP or at OR. The Y-12 Plant also recovers highly-enriched uranium from scrap and reprocessed naval reactor fuel.

Total uranium releases to the environment from the Y-12 Plant at OR from 1944-84 were 13.36 curies of radioactivity for airborne emissions, 113.54 curies for liquid effluents, and 6,524.65 curies contained in solid waste. Total nonradioactive solid wastes disposed of from Y-12 in 1985 were 24,700,000 kg. These wastes included fly ash, sanitary and industrial wastes, scrap metal, tires, and batteries. The Y-12 releases related to SRP processing are estimated at 10% of total releases.

The no action alternative is not desirable because the liquid shipments between SRP and OR would continue and transportation accident potential would not diminish. The political, public relations, and operational implications of an environmental problem caused by spillage from a tank truck in transient are large (see Section 3.2.2). The no-action alternative is also not desirable because operations would not improve and environmental impacts would not decrease. Environmental releases from Y-12 and 321-M would continue to be generated at a level which is greater than that of the proposed FPF. SRP high-level waste would continue to be generated at a rate that is 15% higher than that of the proposed FPF. Fuel would continue to be produced using the casting process rather than the PM process that the FPF would use. PM allows lower U-235 content in the fuel, extending its ability to be recycled and thus avoiding the potential need to replace low-U-235 fuel with fresh high-U-235 fuel feed stocks. The no-action alternative would require upgrades in 321-M casting and machining operations to accommodate increased radiation dose potential caused by increasing U-232 in the fuel. Oak Ridge wastes would continue to be generated at present levels which are greater than those to be generated by the FPF. At Y-12, the radioactive waste, calcium fluoride slag, would continue to be generated by metal production at the 10 metric ton annual level (maximum throughput). The FPF would not generate calcium fluoride slag because no reduction to metal is required. Fuel recycle costs would continue to be more costly than the FPF due to the continuing transportation and OR facility upgrade costs.

3.2.2 Upgrade The Y-12 Facility at Oak Ridge

Under this alternative, the Y-12 Plant and fuel production facilities at Oak Ridge would be upgraded for processing and conversion of SRP reactor fuel. Uranium recovery would be continued at the Y-12 Plant. Shipments of liquid uranyl nitrate would continue between OR and SRP. These shipments have been made for almost 30 years without being involved in a transportation accident. Based on ICRP Publication 27, the probability of an accident during transportation is about 1E-05 per trip or one in 100,000 per trip. Nonradiological impacts from one shipment to OR are probabilities of 2.4E-04 for an injury and 1.4E-05 for a fatality. Based on ICRP Publication 26, the mortality impact for radiation-induced cancers from one shipment to OR is a probability of 3.8E-09. Under this alternative, shipping costs, waste generation, and the potential for adverse publicity would continue. They would be eliminated when the proposed FPF begins operation at SRP.

Under this alternative, extensive construction and upgrading would be required for the Y-12 process facilities to meet future standards. Upgrades would also be required in 321-M casting and machining processes to accommodate increased radiation dose potential caused by increasing U-232 in SRP fuel. OR operating costs and wastes would be reduced because recovery could be stopped when uranium oxide is produced. However, the Y-12 process is not customized for oxide production so unit recovery costs would remain higher than for FPF (OSUR) recovery at SRP. Since the facility will provide fuel cores for production operations for the SRP reactors, it is advantageous to build the new facility on the SRP site and thus eliminate the need for radioactive shipments between the two DOE sites.

3.2.3 Construct New Facility at an Alternate SRP Site

This alternative proposes to construct the new facility at an alternate SRP site in M-Area, adjacent to the existing fuel fabrication facilities. This alternative would require the onsite transportation of feed material seven miles from Building 221-H to the proposed M-Area site. The alternate SRP location would not be as desirable because of the higher risks involved in transporting uranium between SRP facilities. It would not be as efficient as locating the proposed facility adjacent to chemical separations facilities, Building 221-H, the source of the feed material. In addition, under this alternative, the proposed facility would be less than a mile from SRP site boundaries, making it nearer populated areas and more difficult to secure.