



Connecticut Yankee Decommissioning

Spent Fuel Pool Island Studies

GRPI

Revision 0

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Goals:

The goal of this effort is to produce a set of studies which develop conceptual options, cost estimates and recommendations for design of a Spent Fuel Island. The Island will contain all equipment, instrumentation, auxiliaries and electric power supplies necessary for the Island to be independent of support from the remainder of the plant. The purpose of establishing an Island is so that decommissioning activities in other areas of the plant can be conducted without disrupting any activities associated with care of spent fuel within the Island. This effort will also result in the establishment of new design and licensing bases for the Spent Fuel Pool Island.

Roles:

The following groups, as shown on the matrix below, will participate in the studies as defined in the Process section:

Group \ Study #	1	2	3	4	5	6	7	8	9
Mech. Eng.	X	X	X	x	X	X	x	x	x
Elect. Eng.	x		x	X	x	x	x	x	x
I&C Eng.	x			x	x	x	x	X	x
Struct./Civil Eng.	x		x	x	x	x	x	x	X
Reactor Eng.	x	x							
Operations				x		x		x	x
Security						x	X		x
Health Physics						x	x		
Cost Estimating			x	x	x	x	x	x	x

X = Lead Group x = Support group

The roles and responsibilities for personnel associated with the studies are as follows:

- The Engineering Director will appoint a study lead and support personnel for each of the studies.
- The study lead will be responsible for overall coordination, review and issuance of the study, although other assigned personnel may be responsible for writing sections of the report.

- The cost estimator is responsible for preparing estimates for various options within the study. The study lead is responsible for providing information and walk downs to the cost estimator.
- The final report will be prepared, reviewed and approved in accordance with Northeast Utilities Common Engineering Department Instructions (NUC EDI) Procedure 30020 "Engineering Reports" (Latest revision in effect at the time of publication).
- Plant Management is responsible for review and approval of the study.

Process:

The studies which are required for the design of the Spent Fuel Island are:

1. Spent Fuel Pool Licensing Basis/Design Basis: The LB/DB of the Spent Fuel Pool is comprised of information contained in the UFSAR, Technical Specifications calculations specification, docketed information and commitments provided to the NRC as well as information contained in the NRC's Safety Evaluation Reports. This study will review the above documents and establish a clear and concise summary of the LB/DB. This study will establish a basis from which changes to the Spent Fuel Pool Island can be made and properly evaluated.

2. Spent Fuel Pool Heatload/Heatup Study: Past calculations of spent fuel pool heat loads and heatups used very conservative assumptions on both the decay heat load and heat losses to ambient. Using these assumptions would result in over design of cooling systems and much faster than actual heatup rates, if cooling were assumed to be lost. The first part of this study is to determine the actual heat load in the spent fuel pool as a function of time. The heat load should be based on the number of assemblies in the pool and actual burnup of the pool's contents. The second part of the study will be to determine actual pool heatup rate (F/Hr.) and terminal temperature (if less than boiling) as a function of time since shutdown. A combination of analytical and test methods may be used for the two parts of this study. This study is not directly related to the design of the Island, but will serve as input into other studies

3. Spent Fuel Pool Cooling Study: The spent fuel pool is presently cooled by heat exchangers which are supplied water from a branch line off of the Service Water system. The Service Water pumps are sized to supply cooling for the entire plant during power operation and are therefore excessively large for the purpose of supplying water to just the spent fuel pool heat exchangers. Service Water piping also runs through several other plant buildings thereby complicating decommissioning of these buildings if Service Water was required to remain in operation. This study should address alternate ways of cooling the spent fuel pool which will not interfere with decommissioning activities and should include, but not necessarily be limited to:

- A water cooling system using smaller pumps in the plant intake and buried piping which bypasses existing plant buildings. This system would discharge to the existing canal, after cooling the heat exchangers.
- An air cooled system which would reject heat to atmosphere using fan coolers. Wet film heat exchangers should be considered since they are more efficient than dry exchangers, however, they do require a makeup water supply.

The proposed functional criteria for the Spent Fuel Pool Island is that the system shall be capable of maintaining the pool below 125 F during the most adverse expected environmental conditions with all cooling equipment available and below 140 F, assuming the most limiting active failure of any single component.

4. Electric Power Study: The electrical power distribution system runs through several other plant buildings thereby complicating decommissioning of these buildings. The emergency diesel generators, which are on the other side of the site from the spent fuel pool, also tie into the power distribution system. This study should present the means for divorcing the Spent Fuel Island from the remainder of the in plant electrical distribution system. As a minimum, the Island should be capable of being powered from one offsite and one onsite power source. Consideration should be given to moving the air cooled diesel generator, the EOF diesel generator or the security diesel generator to the vicinity of the Spent Fuel Pool, as the on site power source.

5. Winter Heating Study: The spent fuel building is presently heated by auxiliary steam from the auxiliary boilers. Auxiliary steam runs through several other plant buildings thereby complicating decommissioning of these buildings. The auxiliary boilers are also required to be in service as long as they are required to heat the Spent Fuel Building. This study should investigate alternate means of heating the Spent Fuel Building with the objective of minimizing heating costs. Options should include, but not be limited to:

- A small package boiler
- Using SFP heat and water to air heat exchangers for building heat
- Electric resistance heating
- Heat pumps, rejecting heat to atmosphere
- Heat pumps, rejecting heat to the SFP cooling system

The heating system will be capable of maintaining the building at a temperature to ensure that piping within the building will not freeze. A goal of 50 F would be appropriate for elevations below the Spent Fuel floor. In addition, the elevation above the Spent Fuel floor will be maintained at a temperature which will prevent condensation of humidity from the Spent Fuel Pool from condensing on surfaces.

6. Auxiliaries Study: The Spent Fuel Building is dependent on the remainder of the plant for services such as ventilation, make up water and radwaste processing. This study will identify all required auxiliaries and investigate the most cost effective means of supplying these services. The amount and type of services will also be dependent on the final results which are implemented from the other studies.

7. Security Study: The Spent Fuel Pool and its required support systems presently fall under the plant's security umbrella. Since many of the vital support systems which were once in other parts of the plant will be inside the Island, the security requirements for the Island may increase while the security requirements for other areas of the plant may decrease. Maintenance of the current Protected Area will interfere with decommissioning and may impose an expense which cannot be justified. This study will investigate means of providing access control to and protection for vital equipment within the Island. This study will be highly dependent on the implemented recommendations from other studies since the other studies will dictate the type and location of equipment which needs to be protected.

8. Instrumentation Study: Very little information on the Spent Fuel Pool status is currently supplied to the Control Room. The purpose of this study is to determine which process variables are important and need to be indicated in the Control Room. This study will also determine the optimum way of getting this information to the Control Room considering the present state of process technology. Any proposed modifications should consider the eventual abandonment of the Control Room, as discussed below, and the need for instrumentation in a new Control Station.

9. Control Room Abandonment Study: The Control Room is located in an area adjacent to the Turbine Deck. The need to maintain the control room for the sole purpose of monitoring the condition of the Spent Fuel Pool may at some point interfere with decommissioning activities. The purpose of this study is to determine the location and functional requirements (i.e. instrumentation heating, cooling, sanitary facilities, etc.,) for a Control Station which will monitor Spent Fuel Pool conditions. This study requires an interface with the instrumentation and security studies.

The Spent Fuel Island will most likely be established in several phases as decommissioning progresses. Since the Island will be built in several phases, prior planning is essential so that the phases will compliment, rather than be in conflict with, each other.

Interpersonal Relations:

The following interpersonal relationship guidelines should be used to improve efficiency of the project and prevent duplication of efforts:

- The study team should develop a liaison with Yankee personnel who have worked on similar areas for the Rowe decommissioning. Efforts should be taken to learn from Yankee's experiences.
- Decommissioning of nuclear power plants is relatively new with only limited industry experience. "Thinking outside the box" should therefore be encouraged and the study group should be open to new ideas.
- Members of a study group should maintain an open line of communications. Periodic meeting and self assessments within a study group is strongly encouraged.

- Since several of the above studies contain some degree of overlap, the group leads are encouraged to maintain an open line of communications so that efforts between groups are not duplicated. Periodic meetings between group leads is encouraged.
- The Spent Fuel Island will be established within the overall process outlined in the Decommissioning Plan. Personnel performing the studies need to be aware of the goals and schedules of the overall plan so that the formation of the Island will mesh with the overall plan. Discussions and meetings between the Spent Fuel Island study leads and the decommissioning plan leads are encouraged.