Connecticut Yankee Decommissioning

Heat-up Calculation for the Long Term Storage of Spent Nuclear Fuel

GRPI

Revision 0

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Goals:

The goal of this effort is to establish the present heat load and heat-up rate of the spent fuel pool for the actual inventory of stored fuel assemblies. The first part of this effort is to determine the actual heat load in the spent fuel pool as a function of time. This heat load will be based on the number of assemblies in the pool and the actual burnup of the stored assemblies. The second part of this effort will be to determine actual pool heat-up rate (°F/Hr.) and bulk pool temperature as a function of time at any point in the future. This will encompass steady state conditions and the assumed loss of forced cooling. The calculations performed will extend over a number of years.

The results of this effort will be input to conceptual options, cost estimates and recommendations for the establishment of the present and future design basis for the spent fuel pool. The purpose of establishing an accurate heat load/bulk pool temperature model is for modification of the spent fuel pool cooling design, to allow decommissioning activities in other areas of the plant to be conducted without adversely affecting the stored spent fuel. This effort will also result in the establishment of a new licensing basis for the spent fuel pool.

Roles:

The groups shown on the matrix below will participate in the work activities as defined in the Process Section:

Group \ Effort #	1	2	3	4	5	6	7	8	9	10	11	12	13	14
CY Design Eng.	L	L		L	L	L	L	L	s	L	L	L	L	s
CY Reactor Eng.	s	s	L	s	s	s	s	s	s	s	s	s	s	s
CY Tech. Supt Eng.	s	s					s	s	L	s	s	s	s	s
CY Operations	s										s	s	s	L
NUSCO Nuclear Eng.		s	s	s	s									
Nuclear Island Group.		s		s		s	s	s		s	s	s	s	s
Cost Estimating		s			s			s	s				s	
Licensing	s	s										s	s	s

L = Lead Group s = Support group

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

- The Engineering Director will appoint a Lead and support personnel for each of the work activities to ensure completion of work in a timely manner.

- The Lead will be responsible for overall coordination, review and issuance of information for each of the work activities.

- The cost estimator is responsible for preparing estimates for various options within the work activities. The Lead is responsible for providing information 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/PORC is responsible for review and approval of all results produced by the work activities.

Process:

The efforts required to produce the heat-up calculation for the long term storage of spent nuclear fuel are listed below:

1. Spent Fuel Pool Heat Calculation Licensing Basis/Design Basis: The LB/DB of the Spent Fuel Pool is comprised of information contained in the UFSAR, Technical Specifications, calculations, docketed information and commitments provided to the NRC as well as information contained in License Amendment 188. This effort will review the above documents and establish a clear and concise summary of the LB/DB. This effort will establish a basis from which changes to the Nuclear Island can be made and properly evaluated.

2. Evaluate which Code will0 be utilized for the heat-up calculation. Currenly there are several Codes utilized (ASB 9.2, ORIGEN). Establish a code accepted by the NRC, and which takes into account the actual fuel history.

3. Develop a detailed history of the individual fuel assemblies stored in the spent fuel pool.

4. Determine the current base heat load in the spent fuel.

5. Review the existing fuel storage pattern to ensure optimum cooling of the spent fuel assemblies to eliminate pool "hot spots".

6. Determine the spent fuel pool heat-up rate and bulk pool temperature as a function of time at any point in the future. This is required to determine long term cooling system requirements.
7. Determine the heat-up rate as a function of time for any assumed loss-of-forced cooling scenarios.

8. Review the applicability of applying technology to account for heat loss from the spent fuel pool to the environment as a function of pool temperature.

9. Review, or re-perform, the simulated loss of spent fuel pool cooling and subsequent heat-up rate of the spent fuel pool test.

10. Determine the time-to-boil as a function of bulk pool temperature and time since reactor shutdown and core offload.

11. Determine the required water makeup rate, if boiling should occur in the above situations.

12. Review existing, and determine if new, accident scenarios could be introduced by the implementation of the Nuclear Island.

13. Determine the format of the information to be presented and where the calculation will be maintained, (in-house or at a vendor facility).

14. When the final heat load is calculated, determine the impact to the NOP's, AOP's, and EOP's and present Licensing Basis.

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 meetings and self assessments within a study group are 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.