REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING BEAVER VALLEY UNIT Nos. 1 AND 2 LICENSE AMENDMENT REQUESTS Nos. 334 (UNIT 1) AND 205 (UNIT 2) :

The Licensee stated that the new strainers passively remove the debris through perforated stainless steel plates. The new fabricated strainer assembly design was chosen based on the largest available sump strainer area that would fit within the bounds of the existing sump area and to be compatible with the anticipated water level. There is no information included about the structural design of the new strainer assembly. The following additional information is requested.

Note: The following responses are applicable to Beaver Valley Unit 1 only.

1. **Clarify whether reviews and evaluations were performed and documented to determine the effects of any missiles, high energy lines and associated dynamic effects due to pipe whip and jet impingement on the modified and much larger strainer assemblies Discuss the potential pipe whip impact or jet impingement loads that may affect the new sump strainer assembly. Address if any pipe reroutes are required to accommodate the new strainer assemblies. Also, where piping has been rerouted, were evaluations performed for pipe whip and jet impingement effects based on new piping configuration and potential new targets that were not evaluated in the original design of the plant. Provide a summary of these evaluations to establish the structural integrity of the strainer assemblies.**

The following is a summary from the review performed as part of the engineering change package for the strainer modification which concluded that the new strainer is not subject to missiles, high energy lines and associated dynamic effects due to pipe whip and jet impingement.

The new sump strainer will be located on El. 692-11" of the containment; on the bottom floor of the containment and entirely outside of the crane wall. High energy systems such as Feedwater, Main Steam, Steam Generator Blowdown and Reactor Coolant piping, are isolated from the sump by major structural features such as walls and floors. The new containment sump strainer is to be located adjacent to the containment liner at El 692'-11". The BVPS design is such that the polar crane wall serves as a barrier between the reactor coolant loops and the containment liner. In addition, the refueling cavity walls, various structural beams, the operating floor, and the crane wall, enclose each reactor coolant loop into a separate compartment, thereby preventing an accident, which may occur in any loop, from affecting another loop or the containment liner. The portions of the steam and feedwater lines within the containment have been routed behind barriers which separate these lines from all reactor coolant piping. The barriers described above will withstand loadings caused by jet forces and pipe whip impact forces. This protection from the dynamic effects of pipe breaks is included in Section 5.2.6.3 of the BVPS UFSAR. The existing compartments and the crane wall provide protection from high energy line break effects for the new containment sump strainer assembly.

Components which are considered to have a potential for missile generation inside the reactor containment are the following:

- Control rod drive shaft, and the drive shaft and drive mechanism latched together
- Certain valves
- Temperature and pressure assemblies.

Due to the location and existing protection, a missile from the control rod drive shaft cannot impact the new strainer.

The design and licensing basis for valve stems as potential missiles include only those valves in the region where the pressurizer extends above the operating deck. Valves in this region are the pressurizer safety valves, the motor operated isolation valves in the relief line, the air-operated relief valves, and the air-operated spray valves. Due to their location these valve stems cannot impact the new strainer assembly.

Temperature elements are installed on the reactor coolant pumps close to the radial bearing assembly. Based on the locations of these assemblies, a postulated missile cannot impact the new strainer.

There were no piping reroutes required for the new BVPS Containment Sump Strainer design.

2. **Provide a simple sketch of the layout showing the arrangement for the modified containment sump strainer assembly.**

   A simplified sketch is provided as Figure 1.

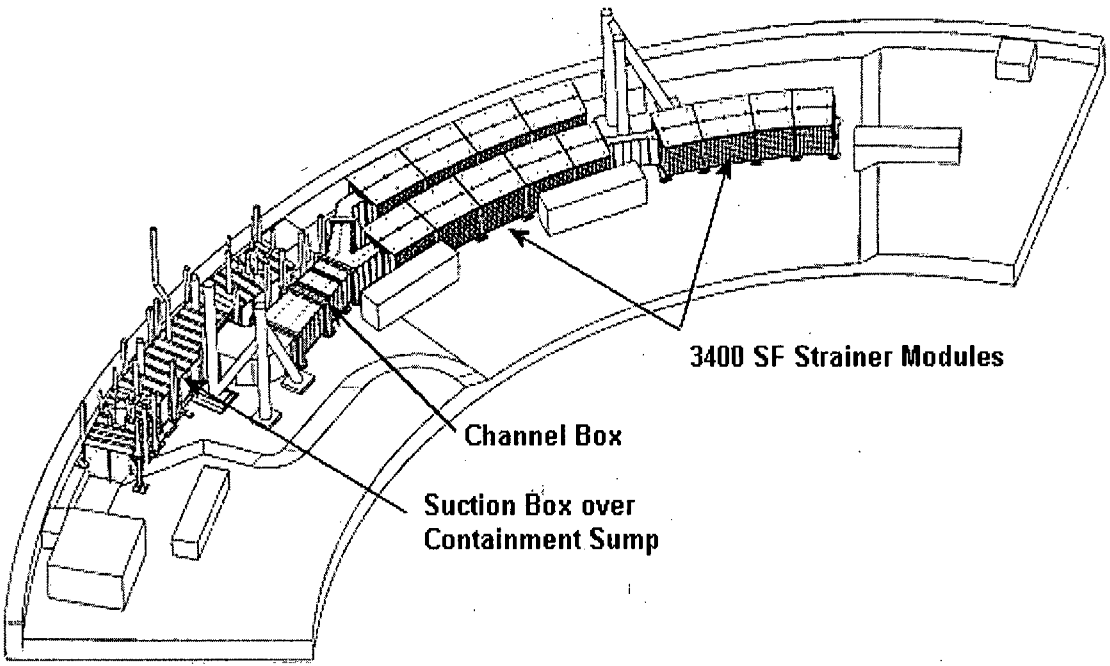

Figure 1

BEAVER VALLEY UNIT 1 CONTAINMENT SUMP STRAINER ASSEMBLY LAYOUT

3. **Briefly describe the load components (such as dead weight load, debris loads, hydrodynamic mass, thermal, seismic load, Loads due to differential pressure or head loss, loads due to any other dynamic effects, etc.) and load combinations that are used in the structural design of the modified sump strainer components and the floor mounted bolted connections.**

   The Code used for the design of the BVPS Unit 1 Containment strainer is the ASME Boiler and Pressure Vessel Code, Section III, Division 1-Subsection NF Supports, Edition 2004 incl. Addenda 2005.

   Load Combinations and Load Definitions are provided below which are included in the strainer structural analysis. Refer to Table 1.

Table 1
Strainer Load Combinations

Load Combination No.	Load Combinations
1	DL (pool dry)
2	DL + OBE (pool dry)
3	DL + SSE (pool dry)
4	DL + OBE (pool filled)
5	DL + SSE (pool filled)
6	DL + WD + OBE (pool filled) + DP
7	DL + WD + SSE (pool filled) + DP
8	DL + LL (pool dry)

Load Definitions:

DL Weight of strainers and supporting structure
WD Weight of debris
DP Differential pressure
OBE Operating Basis Earthquake
SSE Safe Shutdown Earthquake
LL Live Load

Hydrodynamic masses as well as loads due to sloshing are taken into account with the earthquake loads.

Temperature

Sliding joints are provided between ducts and supports, permitting differential expansion of the steel structure and concrete floor resulting in no significant temperature stresses. The temperature difference due to the temperature differential between the bottom (submerged in hot sump water) and the top of the strainer (exposed to cooler containment spray) also does not cause significant temperature stresses because the strainers are free to move in the vertical direction.

4. **Provide a summary of the structural adequacy evaluation of the modified sump strainer highlighting the design margins. Also, identify the design codes that were utilized in the structural design.**

The Code used for the design of the BVPS Unit 1 Containment strainer is the ASME Boiler and Pressure Vessel Code, Section III, Division 1-Subsection NF Supports, Edition 2004 incl. Addenda 2005.

All components are within their allowable stress limits. Table 2 provides a listing of the major structural components with their calculated percent margins.

Table 2
Strainer Design Margin Table

Component	Margin *
Strainer Modules	
SideWall	69%
Upper Cover Plate	34%
Lower Cover Plate	17%
Perforated Sheet	34%
Support Structure	16.5%
Duct Plate	40%
Anchor Plate	61%
Anchor Bolts	15%
Anchor Bolts – End Plate	2.7%
Channel Box	
Connection Duct Plates	3.2%
Suction duct	5.8%
Suction duct Anchor Bolts	Bounded by Strainer Modules
Suction Box	
Suction Box support Element	65%
Anchor Plates	63%
Back Side Plates	29%
Front Side Plates	33%
Top Plates	44%
Anchor Bolts	10%
Sheet	44%
Side Plate - Sheet	33%

* Margin shown is the margin to the design allowable