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Your ref: Docket No. 52-006
Our ref: DCP/NRC2492

May 22, 2009

Subject: AP1000 Response to Request for Additional Information (SRP 11)

Westinghouse is submitting a response to the NRC request for additional information (RAI) on SRP Section 11. This RAI response is submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in this response is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

Enclosure 1 provides the response for the following RAI(s):

RAI-SRP11.5-CHPB-01

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

Robert Sisk, Manager
Licensing and Customer Interface
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/Enclosure

1. Response to Request for Additional Information on SRP Section 11

D063
NRO

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ENCLOSURE 1

Response to Request for Additional Information on SRP Section 11

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP11.5-CHPB-01
Revision: 1

Question:

Section 11.5 states that the radiation monitoring system is designed in accordance with ANSI N13.1-1969. This standard has been updated in 1999 because the approach taken in the 1969 does not provide assurance that the sample in the effluent vent will be representative. The 1999 revision to ANSI N13.1 differs significantly from the earlier version in that it is now performance based. SRP 11.5 (2007) uses the 1999 standard as acceptance criteria. Please provide an evaluation that proves that the location of duct monitors and/or sampling points for airborne radioactivity are designed according to ANSI/HPS N13.1-1999 and provide a commitment in the DCD that the 1999 standard will be followed.

The 1969 standard does not provide assurance that the sample from the effluent vent is representative of the particulate matter and reactive vapors passing through the vent. Given that many important decisions pertaining to public and occupational exposure to radioactivity are made from the measurements, we need to use the new standard to ensure that the measurements are accurate.

10 CFR 52.63 allows for this change to the DCD. This information is necessary to provide adequate protection of the public health and safety.

Westinghouse Response:

The AP1000 is currently certified to ANSI N13.1-1969. There are limitations to the rule-based approach used in the 1969 version of the standard. However, we have concerns associated with overall application of the 1999 version of this standard and its preference for a specific single nozzle design. This newer version has never been used in the construction of a commercial nuclear power plant, and was developed without substantial input from the commercial sector. We believe that committing to the 1999 version would introduce an excessive degree of uncertainty into the AP1000 detailed design and construction process. Our objective in this response is to propose an alternative approach to address the limitations of ANSI N13.1-1969.

We recognize the importance of obtaining representative samples from the plant vent, which is the principal normal airborne release point for the AP1000. High level design guidance is provided in ANSI N13.1-1969 requiring re-examination of specific design recommendations as new information becomes available. Improvements have been made in the best practice for designing plant vent sampling systems that rely upon engineering principles to maximize representative sample extraction opportunities. We intend to design and implement the plant vent monitor in a fashion which draws upon these best practices.

We propose to maintain the certified AP1000 licensing basis which references ANSI N13.1-1969, while committing to and incorporating improved design practices and

features to provide representative sampling of the plant effluent. These improved design practices and features incorporate performance based criteria, and augment what is recommended by ANSI N13.1-1969. Performance testing of the plant vent sampling system and of the sample location is included, during plant startup.

The following design criteria for particulate and iodine collection will be applied to the design of the plant vent and vent sampling system to provide sampling efficiency:

- The sample extraction point will be located at a sufficient distance downstream of any perturbations or flow entry points to provide fully developed flow in the turbulent regime. Locating the sample extraction point seven to ten diameters from any perturbation or flow entry point enhances uniformity of conditions.
- The sample extraction point will be located between the discharge plane of a fan and the stack exit plane, and will not be located close the to the stack exit plane where wind effects may influence the velocity profile.
- The sample nozzles will be designed to provide high efficiency transmission ratios (80 to 130%) and an aspiration ratio of 0.80 to 1.50 over the expected normal and off-normal flow range for 10 micron Aerodynamic Diameter (AD) particles or the largest particle size of interest. The design goal is to maintain sub-isokinetic flow which will cause enrichment of the larger particles in the sample and provide a more representative sample at the monitoring point. Analyses will be performed to determine if a single nozzle is preferred over the expected range of operational conditions. A multi-point sampling design may be required to address off normal flow, configuration or release conditions.
- A continuous effluent flow rate measurement will be used.
- The effluent and sample flow rate will be measured with an accuracy of +/-10%..
- The sample line layout will be modeled in advance and will consider features to maximize particle transport efficiency.
    - Non-reactive materials will be used in the construction of sample lines to minimize losses of reactive components such as halogens.
    - Sample line deposition analyses will be performed. The design goal is to collect $\geq$ 50% of the largest sized particle of consequence.
    - The distances between the sampling nozzles and the sample collection stations will be minimized to the extent possible consistent with the overall requirements of the plant layout.
    - Long horizontal runs will be avoided.
    - The use of elbows will be prohibited and where bends are needed, long radius bends (at least 3.0 times the diameter) will be implemented.

- Heat tracing will be used, if needed, to avoid condensation of water or iodine within the sampling system.

- Confirmation testing to qualify the sample extraction location on the plant vent will be performed during plant startup. Velocity, aerosol and trace gas mapping at the sample extraction point will be performed in accordance with the methodology in 40CFR60, Appendix A, Method 1 for normal and off-normal flows will be performed.

  The testing will demonstrate that:

  - the level of the residual cyclonic flow will not materially impact the mixing of aerosols in the effluents nor degrade the performance of the sample nozzle(s),
  - the maximum tracer gas concentration at any point in the stack will not exceed the mean value by a factor that would invalidate the representativeness of the sample.
  - the stack gas velocity and the concentration of aerosol particles and tracer gas calculated Coefficients of Variations (COV) are appropriate for the sample extraction point.

  The quantitative test acceptance criteria are dependent on the final design of the sampling system. The acceptance criteria will be established prior to testing and will be defined in the test procedures.

  This set of confirmation tests will be performed for the first plant. For subsequent units, either these tests may be performed, or documentation may be used to justify that the plant vent geometry and the effluent flow conditions are the same or similar, and that these test results remain applicable

Design Control Document (DCD) Revision:

11.5.2.3.3 Liquid and Gaseous Effluent Monitors

Plant Vent Radiation Monitor

[7 paragraphs unchanged]

The normal range particulate, iodine, and radiogas detectors are deactivated automatically when the gas channel concentration exceeds the normal range. The sample flow bypasses the normal range detectors and a small portion is extracted for the accident range particulate and iodine sample filters and radiogas detectors. This prevents normal range detector damage and allows these detectors to be used to measure the concentrations after they decrease again to within the normal range detector ranges.

The following design criteria for particulate and iodine collection are applied to the design of the plant vent and vent sampling system:

- The sample extraction point is located at a sufficient distance downstream of perturbations or flow entry points to provide fully developed flow in the turbulent regime.

- The sample extraction point is located between the discharge plane of a fan and the stack exit plane, and is not located close the to the stack exit plane where wind effects significantly influence the velocity profile at the sampling location.

- The sample nozzles provide high efficiency transmission ratios (80 to 130%) and an aspiration ratio of 0.80 to 1.50 over the expected normal and off-normal flow range for 10 micron Aerodynamic Diameter (AD) particles.

- The sample line layout includes features to provide particle transport efficiency, including:

    - Non-reactive materials are used in the construction of sample lines.

    - Sample line deposition analyses are performed.

    - The distance between the sampling nozzles and the sample collection stations is minimized, within the requirements of the overall layout requirements.

    - Long horizontal runs are avoided.

    - Long radius bends are used.

    - Heat tracing is included if needed to avoid condensation of water or iodine.

11.5.7 Preoperational Testing

Confirmation testing on the plant vent will be performed during plant startup to qualify the sample extraction location.

Velocity profile mapping at the sample extraction point will confirm the velocity profile, including cyclonic flow, does not substantially affect flow mixing or sample nozzle performance, and is acceptable for obtaining a representative sample..

Performance testing with tracer gas and particulates will be performed over normal and selected off-normal flow conditions. Tracer gas and particulates testing will confirm an acceptably representative sample is obtained.

The quantitative test acceptance criteria are dependent on the final design of the sampling system. The acceptance criteria will be established prior to testing and will be defined in the test procedures.

This set of confirmation tests will be performed for the first plant. For subsequent units, either these tests may be performed, or documentation may be used to justify that the plant vent geometry and the effluent flow conditions are the same or similar, and that these test results remain applicable.

11.5.~~7~~8 Combined License Information

[Remainder unchanged]

14.2.9.2.18 Radiation Monitoring System Testing

[Existing text unchanged]

The preoperational testing discussed in section 11.5.7 is performed following successful completion of the testing described above.

PRA Revision:
None

Technical Report (TR) Revision:
None