

Industry Response to NRC Request for Detailed Information on the “Small” External Containment Filter Included in the Industry’s Evaluation Supporting the Containment Protection and Release Reduction of BWR with Mark I and Mark II Containments Rulemaking (CPRR Rulemaking) September 22, 2014

On August 27, 2014, by letter¹ to the Nuclear Energy Institute (NEI),² the NRC requested detailed information on the “small” external containment filter for BWR Mark I and II plants being included by the industry in its evaluation supporting the Containment Protection and Release Reduction of BWR with Mark I and Mark II Containments Rulemaking (CPRR Rulemaking).

For the “small filter,” the NRC requested a description of a small filter and how it differs from a “large filter.” Specifically, the NRC asked for:

- Technical specifications that were used to determine the costs³ of a small filter

Response: The term “small” was selected as a descriptor for this particular filter based upon a comparison of physical size and weight as compared to the bulk of filters evaluated. The reduction in both physical dimensions and weight (typically less than ½ the weight and a 35%+ reduction in external dimensions of height and diameter) facilitate installation, which was the primary driver for reduced cost.

- The decontamination factor (DF) as a function of particle size

Response: While the actual design is scalable, both in terms of size and ultimate capacity/performance (DF, aerosol loading, heat capacity), the performance parameters selected to optimize size include:

- DF for aerosols > 0.3um – 1000 or greater (vendor data supports higher than this)
- DF for elemental iodine – 100 or greater (vendor data supports higher than this)
- Aerosol loading capacity (total) – 160kg (the capacity is scalable)
- Decay heat capacity – 250kW (from active aerosols)- (the capacity is scalable)
- Heat capacity (steam) – 42 lbm/sec at 62 psig (the capacity is scalable)

¹ Letter, Jennifer Uhle (NRC) to Steven P. Kraft (NEI), *Request for Clarification and Supporting Basis for NEI Statements and Submitted Documents Related to the Filtering Strategies and Severe Accident Management of Boiling Water Reactors with Mark I And Mark II Containments*, August 27, 2014.

² The Nuclear Energy Institute (NEI) is the organization responsible for establishing unified industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all entities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel cycle facilities, nuclear materials licensees, and other organizations and entities involved in the nuclear energy industry.

³ On May 31, 2014, at NRC's request, NEI provided cost estimates for installation of both “large” and “small” external containment filters on BWR Mark I and II containments. (*See:* Letter, Steven P. Kraft (NEI) to Jennifer Uhle (NRC), *Initial Industry Response to Nuclear Regulatory Commission Request for Information Related to the Filtering Strategies and Severe Accident Management of Boiling Water Reactors with Mark I and II Containments Rulemaking*, May 31, 2014).

- Any operator actions that would be required and when they would need to occur

Response: Operator actions (assuming use of anticipatory venting prior to core damage) would include closure of bypass valve and opening of inlet/outlet valves and place the filter in standby mode ready to be used. Once the filter is in the vent flowpath, the first operator actions related to the filter itself would not be required for at least 24 hours of filter operation. These actions would be to add water to the filter. The assumption made in the estimate was that connections would be available, but a permanent water source not connected as part of design.

- Has a small filter been developed and constructed

Response: NEI has been informed by the relevant vendor that similar filter designs have been previously constructed and installed.

- Type of testing and validation that has been performed

Response: A test program for this filter type has been completed. Tests completed included proof of principle, flow distribution, 2 phase swell, aerosol DF (ASHRAE 52.2, testing capacity of filter "dry"), aerosols DF (underwater and actual vent configuration/conditions), loading capacity, iodine DF, and organic DF. Results of this testing confirmed that performance of the filter could exceed performance criteria. Details of the test results are proprietary.