Appendix A

SVEA-96 Optima2 Assembly Description

Similar to the SVEA-96 and SVEA-96+ designs, the SVEA-96 Optima2 assembly consists of 96 fuel rods arranged in four sub-assemblies. The sub-assemblies are separated by a double-walled cross in the channel that forms nine parallel flow channels – one square center channel (water cross), four identical rectangular gaps in the cross wings (water wings), and four geometrically identical sub-bundles. Each sub-bundle consists of 24 fuel rods in a 5x5-1 lattice. The SVEA-96 Optima2 fuel assembly is shown in Figure A-1.

The general objectives for the design of the SVEA-96 Optima2 fuel are improved nuclear performance, in particular shutdown margin, by the use of part-length rods. In addition, the SVEA-96 Optima2 design has been optimized to provide improved CPR performance, stability performance and reduced two-phase pressure drop. The major difference between the SVEA-96 Optima2 fuel and the SVEA-96+ fuel assembly design is the use of part-length fuel rods. The two fuel assembly designs have the same handle with spring and transition piece. The fuel channels have the same outer dimensions, and both designs have four sub-assemblies with a total of 96 fuel rods standing in the channel. The sub-bundles have the same general structural design. As shown in Figure A-2, three of the rods in each sub-bundle are part-length. Two of the part-length rods are two-thirds of the length of the full-length rods. These are placed adjacent to the central channel. The third part-length rod, which is one-third of the length of the full-length rods, is placed in the outer corner of the sub-bundle. Consequently, the lower part of the fuel assembly (Zone 1) consists of 96 fuel rods, the middle part (Zone 2) consists of 92 fuel rods, and the upper part (Zone 3) consists of 84 fuel rods.

The part-length rod positions are chosen to maximize the shutdown margin with a minimum number of part-length rods. All rods have the same outer diameter, which is slightly larger than the diameter of the SVEA-96+ design. Each sub-bundle is constructed as a separate unit with its own bottom tie plate and is equipped with two tie rods. There are eight tie rods that are connected to the bottom tie plate by threaded end plugs, extending through the plate, and nuts. Spacer capture rods secure the axial positions of the spacers by means of heads welded to the cladding tube above each spacer level. The spacers determine the radial positioning of the fuel rods. The rods are located axially by the lower tie plate. The tops of the rods are supported radially by an additional spacer in the plenum region or an upper tie plate.

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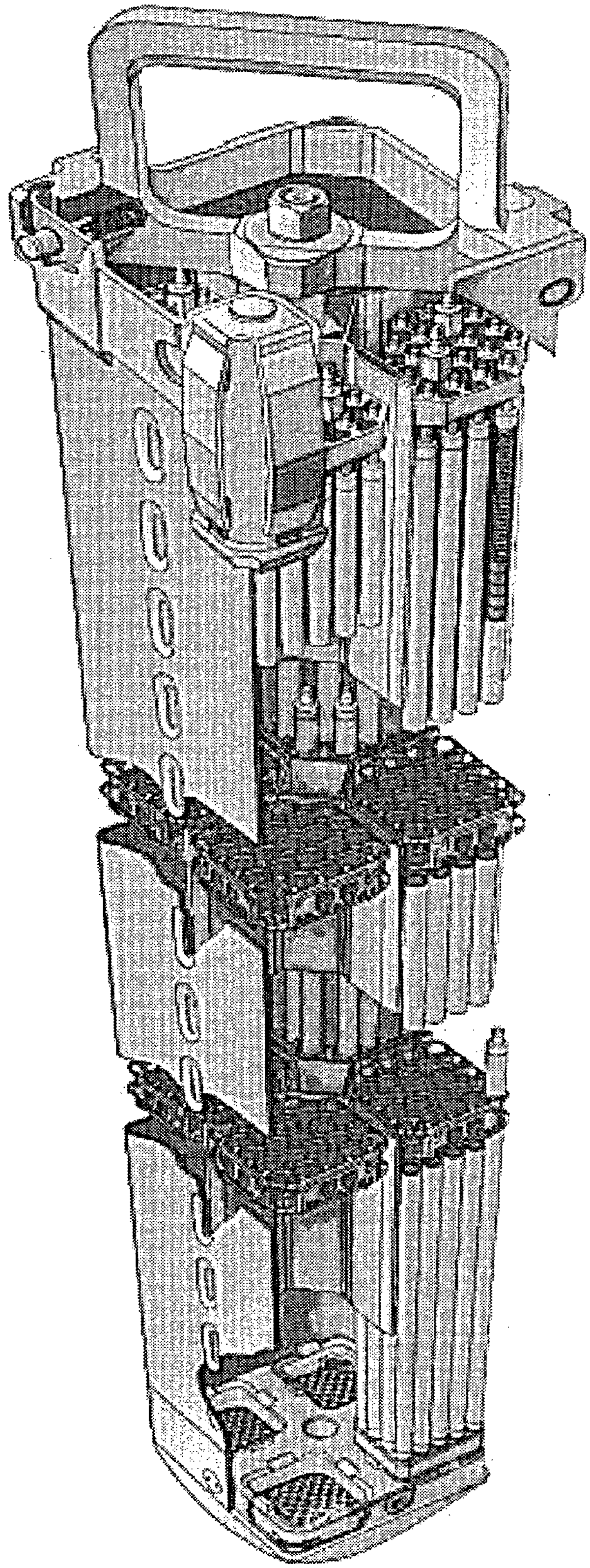

Figure A-1 SVEA-96 Optima2 Fuel Assembly

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Figure A-2 Cross Section of SVEA-96 Optima2 Assembly

APPENDIX B

SVEA 96 OPTIMA2 STEADY STATE CRITICAL POWER TEST DATA COSINE-PEAKED AXIAL POWER SHAPE

The data in this Appendix are provided as follows:

ID: The identity of the measurement point

P: The system pressure (bar)

T_{sub}: Subcooling temperature (K)

Flow: Mass flow rate (kg/s)

Power: Bundle power at dryout (kW)

Y/I: The ratio of the average local power for the 15 peripheral rods and the average local power for the 9 central rods

Rod: The rod(s) and thermocouples for which dryout was detected. Figure 3.3 shows the rod location in the sub-bundle, and Figure 3.7 shows the thermocouple (T/C) location. e.g., 107,2 indicates that dryout was detected on rod 7 in Figure 3.3 by a T/C at level 2 in Figure 3.7.

The nominal local power distribution map representative of the rod power distributions for the data listed above the map is printed on each page together with a critical power versus mass flow rate plot for the data provided above the map. If the local power distribution map is not printed, it has been shown for a previous test series.

It should be noted that the local power distribution may differ slightly for different points intended to have the same nominal distribution (e.g., AA4, AA5, etc.). The actual measured local power distributions were used for all points in the correlation development and validation process.

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APPENDIX C

SVEA 96 OPTIMA2 STEADY STATE CRITICAL POWER TEST DATA BOTTOM-PEAKED AXIAL POWER SHAPE

The data in this Appendix are provided as follows:

ID: The identity of the measurement point

P: The system pressure (bar)

T_{sub}: Subcooling temperature (K)

Flow: Mass flow rate (kg/s)

Power: Bundle power at dryout (kW)

Y/I: The ratio of the average local power for the 15 peripheral rods and the average local power for the 9 central rods

Rod: The rod(s) and thermocouples for which dryout was detected. Figure 3.3 shows the rod location in the sub-bundle, and Figure 3.8 shows the thermocouple (T/C) location. e.g., 107,2 indicates that dryout was detected on rod 7 in Figure 3.3 by a T/C at level 2 in Figure 3.8.

The nominal local power distribution map representative of the rod power distributions for the data listed above the map is printed on each page together with a critical power versus mass flow rate plot for the data provided above the map. If the local power distribution map is not printed, it has been shown for a previous test series.

It should be noted that the local power distribution may differ slightly for different points intended to have the same nominal distribution (e.g., AA4, AA5, etc.). The actual measured local power distributions were used for all points in the correlation development and validation process.

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APPENDIX D

SVEA 96 OPTIMA2 STEADY STATE CRITICAL POWER TEST DATA TOP-PEAKED AXIAL POWER SHAPE

The data in this Appendix are provided as follows:

ID: The identity of the measurement point

P: The system pressure (bar)

T_{sub}: Subcooling temperature (K)

Flow: Mass flow rate (kg/s)

Power: Bundle power at dryout (kW)

Y/I: The ratio of the average local power for the 15 peripheral rods and the average local power for the 9 central rods

Rod: The rod(s) and thermocouples for which dryout was detected. Figure 3.3 shows the rod location in the sub-bundle, and Figure 3.9 shows the thermocouple (T/C) location. e.g., 107,2 indicates that dryout was detected on rod 7 in Figure 3.3 by a T/C at level 2 in Figure 3.9.

The nominal local power distribution map representative of the rod power distributions for the data listed above the map is printed on each page together with a critical power versus mass flow rate plot for the data provided above the map. If the local power distribution map is not printed, it has been shown for a previous test series.

It should be noted that the local power distribution may differ slightly for different points intended to have the same nominal distribution (e.g., AA4, AA5, etc.). The actual measured local power distributions were used for all points in the correlation development and validation process.

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