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March 31, 2000

U.S. Nuclear Regulatory Commission
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Subject: USNRC Docket No. 71-9261; TAC No. L22085
HI-STAR 100 Transportation CoC 9261
License Amendment Request 9261-1, Supplement 6

References: 1. Holtec Project 5014
2. Holtec Letter to NRC dated November 24, 1999, LAR 9261-1

Dear Sir:

As discussed during our conversation with the NRC project manager today, a discrepancy has been discovered in the criticality model used in the analysis of the "QUAD+" fuel assembly which, in the above-referenced License Amendment Request, was proposed to be added to the authorized contents for the HI-STAR 100 transportation package. This discrepancy has been resolved by reducing the allowed maximum planar average enrichment for this assembly array/class such that the resulting k_{eff} for this array/class is essentially the same as previously reported in the proposed Safety Analysis Report (SAR). Attachment 1 to this letter provides the revised proposed CoC pages for this change and the revised draft SAR pages describing the criticality analysis.

If you have any questions or require additional information, please contact us.

Sincerely,

Brian Gutherman, P.E.
Licensing Manager

Approval:

K.P. Singh, Ph.D, P.E.
President and CEO

cc: Ms. Marissa Bailey, USNRC (w/attach.)

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Technical Concurrence:

Dr. Stefan Anton (Criticality Evaluation)



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Attachment 1
6 total pages, including this page

LAR 9261-1, SUPPLEMENT 6
REVISED COC AND DRAFT SAR PAGES

Appendix A-Certificate of Compliance No. 9261

Table A.3 (continued)
BWR FUEL ASSEMBLY CHARACTERISTICS (Note 1)

Fuel Assembly Array/Class	8x8B	8x8C	8x8D	8x8E	8x8F	9x9A	9x9B
Clad Material (Note 2)	Zr	Zr	Zr	Zr	Zr	Zr	Zr
Design Initial U (kg/assy.) (Note 3)	≤ 185	≤ 185	≤ 185	≤ 185	≤ 185	≤ 177	≤ 177
Maximum planar-average initial enrichment (wt.% ²³⁵ U)	≤ 4.2	≤ 4.2	≤ 4.2	≤ 4.2	≤ 3.6	≤ 4.2	≤ 4.2
Initial Maximum Rod Enrichment (wt.% ²³⁵ U)	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0
No. of Fuel Rods	63 or 64	62	60 or 61	59	64	74/66 (Note 5)	72
Clad O.D. (in.)	≥ 0.4840	≥ 0.4830	≥ 0.4830	≥ 0.4930	≥ 0.4576	≥ 0.4400	≥ 0.4330
Clad I.D. (in.)	≤ 0.4295	≤ 0.4250	≤ 0.4230	≤ 0.4250	≤ 0.3996	≤ 0.3840	≤ 0.3810
Pellet Dia. (in.)	≤ 0.4195	≤ 0.4160	≤ 0.4140	≤ 0.4160	≤ 0.3913	≤ 0.3760	≤ 0.3740
Fuel Rod Pitch (in.)	≤ 0.642	≤ 0.641	≤ 0.640	≤ 0.640	≤ 0.609	≤ 0.566	≤ 0.572
Design Active Fuel Length (in.)	≤ 150	≤ 150	≤ 150	≤ 150	≤ 150	≤ 150	≤ 150
No. of Water Rods (Note 11)	1 or 0	2	1 - 4 (Note 7)	5	N/A (Note 12)	2	1 (Note 6)
Water Rod Thickness (in.)	≥ 0.034	> 0.00	> 0.00	≥ 0.034	≥ 0.0315	> 0.00	> 0.00
Channel Thickness (in.)	≤ 0.120	≤ 0.120	≤ 0.120	≤ 0.100	≤ 0.055	≤ 0.120	≤ 0.120

Appendix A-Certificate of Compliance No. 9261

Table A.3 (continued)
BWR FUEL ASSEMBLY CHARACTERISTICS (Note 1)

Fuel Assembly Array/Class	8x8B	8x8C	8x8D	8x8E	8x8F	9x9A	9x9B
Clad Material (Note 2)	Zr	Zr	Zr	Zr	Zr	Zr	Zr
Design Initial U (kg/assy.) (Note 6 3)	≤ 185	≤ 185	≤ 185	≤ 180 ≤ 185	≤ 185	≤ 179 ≤ 177	≤ 179 ≤ 177
Maximum planar average initial enrichment (wt.% ²³⁵ U)	≤ 4.2	≤ 4.2	≤ 4.2	≤ 4.2	≤ 3.6	≤ 4.2	≤ 4.2
Initial Maximum Rod Enrichment (wt.% ²³⁵ U)	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0	≤ 5.0
No. of Fuel Rods	63 or 64	62	60 or 61	59	64	74/66 (Note 3 5)	72
Clad O.D. (in.)	≥ 0.4840	≥ 0.4830	≥ 0.4830	≥ 0.4930	≥ 0.4576	≥ 0.4400	≥ 0.4330
Clad I.D. (in.)	≤ 0.4250 ≤ 0.4295	≤ 0.4250	≤ 0.4190 ≤ 0.4230	≤ 0.4250	≤ 0.3996	≤ 0.3840	≤ 0.3810
Pellet Dia. (in.)	≤ 0.4160 ≤ 0.4195	≤ 0.4160	≤ 0.4110 ≤ 0.4140	≤ 0.4160	≤ 0.3913	≤ 0.3760	≤ 0.3740
Fuel Rod Pitch (in.)	0.636 0.641 ≤ 0.642	0.636 0.641 ≤ 0.641	≤ 0.640	≤ 0.640	≤ 0.609	≤ 0.566	0.569 ≤ 0.572
Design Active Fuel Length (in.)	≤ 150	≤ 150	≤ 150	≤ 150	≤ 150	≤ 150	≤ 150
No. of Water Rods (Note 11)	1 or 0	2	1 - 4 (Note 5 7)	5	N/A (Note 12)	2	1 (Note 4 6)
Water Rod Thickness (in.)	≥ 0.034	> 0.00	> 0.00	≥ 0.034	≥ 0.0315	> 0.00	> 0.00
Channel Thickness (in.)	≤ 0.120	≤ 0.120	≤ 0.120	≤ 0.100	≤ 0.055	≤ 0.120	≤ 0.120

Notes: 1. Initial uranium weights and all dimensions are design nominal values. Actual uranium weights may be higher, within the manufacturer's tolerance. Maximum and minimum dimensions are specified to bound variations in design nominal values among fuel assemblies within a given array/class.

2. Zr designates cladding material made from Zirconium or Zirconium alloys.

3. This assembly class contains 74 total rods, 66 full length rods and 8 partial length rods.

4. Square, replacing nine fuel rods.

5. Variable

6. Design initial uranium weight is the nominal uranium weight specified for each assembly by the fuel manufacturer or reactor user. For each BWR fuel assembly, the total initial uranium weight may be up to 1.5 percent higher than the design initial uranium weight due to manufacturer tolerances.

Table 6.1.2

BOUNDING MAXIMUM k_{eff} VALUES FOR EACH ASSEMBLY CLASS IN THE MPC-68

Fuel Assembly Class	Maximum Allowable Planar-Average Enrichment (wt% ^{235}U)	Maximum [†] k_{eff}
6x6A	2.7 ^{††}	0.7888 ^{†††}
6x6B [‡]	2.7 ^{††}	0.7824 ^{†††}
6x6C	2.7 ^{††}	0.8021 ^{†††}
7x7A	2.7 ^{††}	0.7974 ^{†††}
7x7B	4.2	0.9386
8x8A	2.7 ^{††}	0.7697 ^{†††}
8x8B	4.2	0.9416
8x8C	4.2	0.9425
8x8D	4.2	0.9403
8x8E	4.2	0.9312
8x8F	3.6	0.9153

Note: These calculations are for single unreflected, fully flooded casks. However, comparable reactivities were obtained for fully reflected casks and for arrays of casks.

- † The term "maximum k_{eff} " as used here, and elsewhere in this document, means the highest possible k-effective, including bias, uncertainties, and calculational statistics, evaluated for the worst case combination of manufacturing tolerances.
- †† This calculation was performed for 3.0% planar-average enrichment, however, the authorized contents are limited to maximum planar-average enrichment of 2.7%. Therefore, the listed maximum k_{eff} value is conservative.
- ††† This calculation was performed for a ^{10}B loading of 0.0067 g/cm², which is 75% of a minimum ^{10}B loading of 0.0089 g/cm². The minimum ^{10}B loading in the MPC-68 is 0.0372 g/cm². Therefore, the listed maximum k_{eff} value is conservative.
- ‡ Assemblies in this class contain both MOX and UO₂ pins. The composition of the MOX fuel pins is given in Table 6.3.4. The maximum allowable planar-average enrichment for the MOX pins is given in the specification of authorized contents, Chapter 1.

Table 6.2.25
 MAXIMUM K_{EFF} VALUES FOR THE 8X8F ASSEMBLY CLASS IN THE MPC-68
 (all dimensions are in inches)

8x8F (3.6% Enrichment, Boral ^{10}B minimum loading of 0.0279 g/cm ²)										
64 fuel rods, 4 rectangular water cross segments dividing the assembly into four quadrants, pitch=0.609, Zr clad										
Fuel Assembly Designation	maximum k_{eff}	calculated k_{eff}	standard deviation	cladding OD	cladding ID	cladding thickness	pellet OD	fuel length	water rod thickness	channel thickness
8x8F01	0.9153	0.9111	0.0007	0.4576	0.3996	0.0290	0.3913	150	0.0315	0.055
Dimensions Listed for Authorized Contents				0.4576 (min.)	0.3996 (max.)		0.3913 (max.)	150 (max.)	0.0315 (min.)	0.055 (max.)

Table 6.C.1 (continued)
 CALCULATIONAL SUMMARY FOR ALL CANDIDATE FUEL TYPES
 AND BASKET CONFIGURATIONS

MPC-68				
Fuel Assembly Designation	Maximum k_{eff}	Calculated k_{eff}	Std. Dev. (1-sigma)	EALF (eV)
8x8F01	0.9153	0.9111	0.0007	0.2143
9x9A01	0.9353	0.9310	0.0008	0.2875
9x9A02	0.9388	0.9345	0.0008	0.2228
9x9A03	0.9351	0.9310	0.0007	0.2837
9x9A04	0.9396	0.9355	0.0007	0.2262
B9x9A01	0.9417	0.9374	0.0008	0.2236
9x9B01	0.9368	0.9326	0.0007	0.2561
9x9B02	0.9377	0.9334	0.0008	0.2547
9x9B03	0.9416	0.9373	0.0008	0.2517
B9x9B01	0.9422	0.9380	0.0007	0.2501
9x9C01	0.9395	0.9352	0.0008	0.2698
9x9D01	0.9394	0.9350	0.0009	0.2625
9x9E01	0.9402	0.9359	0.0008	0.2249
9x9E02	0.9424	0.9380	0.0008	0.2088
9x9F01	0.9369	0.9326	0.0008	0.2954
9x9F02	0.9424	0.9380	0.0008	0.2088
10x10A01	0.9377	0.9335	0.0008	0.3170
10x10A02	0.9426	0.9386	0.0007	0.2159
10x10A03	0.9396	0.9356	0.0007	0.3169
B10x10A01	0.9457	0.9414	0.0008	0.2212
10x10B01	0.9384	0.9341	0.0008	0.2881
10x10B02	0.9416	0.9373	0.0008	0.2333