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Point Beach Nuclear Plant
Operated by Nuclear Management Company, LLC

NRC 2003-0051

10 CFR 50.12

June 27, 2003

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2
DOCKETS 50-266 AND 50-301
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING REQUEST FOR EXEMPTIONS TO 10 CFR 50.61, APPENDICES G AND H TO 10 CFR 50, AND APPROVAL OF PTS APPLICATION FOR PBNP UNIT 2 AND PROPOSED HEATUP AND COOLDOWN LIMIT CURVES (TAC NOS. MB7926 AND MB7927)

Reference: 1) Letter from NMC to NRC dated March 3, 2003 (NRC 2003-0018)

In reference 1, Nuclear Management Company, LLC (NMC), submitted a request for permanent exemption from certain requirements of 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Thermal Shock Events", 10 CFR 50, Appendix G, "Fracture Toughness Requirements", and 10 CFR 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements", for the Unit 2 reactor vessel. This request was submitted in accordance with the provisions of 10 CFR 50.12, "Specific Exemptions".

During teleconferences between Nuclear Regulatory Commission (NRC) staff and PBNP staff on May 8 and May 21, 2003, NRC staff requested additional information in support of the exemption request. The NMC response to the staff's questions are provided in Attachment 1 of this letter. Enclosure (a) provides supporting information for the staff's questions.

No changes to the initially proposed exemption result from this additional information.

This letter contains no new commitments or changes to existing commitments.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on June 27, 2003.

A.J. Cayia
Site Vice President

LAS/kmd

A008

Attachment: 1 Response to Requests for Additional Information

Enclosure: (a) LTR-REA-02-23, Pressure Vessel Neutron Exposure Evaluations, Point Beach Units 1 and 2; S. L. Anderson, Radiation Engineering and Analysis; February 2002

cc: (w/o enclosure)
Project Manager, Point Beach Nuclear Plant, NRR, USNRC
Regional Administrator, Region III, USNRC
NRC Resident Inspector - Point Beach Nuclear Plant
PSCW

ATTACHMENT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING REQUEST FOR EXEMPTIONS TO 10 CFR 50.61, APPENDICES G AND H TO 10 CFR 50, AND APPROVAL OF PTS APPLICATION FOR PBNP UNIT 2 AND PROPOSED HEATUP AND COOLDOWN LIMIT CURVES

POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

The following information is provided in response to the Nuclear Regulatory Commission (NRC) staff's request for additional information (RAI) communicated during telephone conferences with the Nuclear Management Company, LLC (NMC) staff on May 8 and May 21, 2003. The staff's questions are repeated below, followed by the NMC response.

NRC Question 1:

Heatup and Cooldown Curves: Provide estimated Peak Neutron Fluence values at the ID surface and 1/4T for limiting components at EOL for uprated conditions.

NMC Response:

The estimated Peak Neutron Fluence values at the ID surface and 1/4T for limiting components at EOL for uprated conditions is contained in Enclosure (a) and listed individually in Table 2 of WCAP-15976 "PBNP Units 1 & 2 Heatup and Cooldown Limit Curves for Normal Operation.

NRC Question 2:

Nuclear Management Company LLC, licensee for the Point Beach Units 1 and 2, in a letter dated March 3, 2003, requested exemptions to 10 CFR 50.61, Appendices G and H to 10 CFR 50 and approval of PTS for Unit 2 and approval of PT curves for both units. The submittal is based on an ATI report regarding the "Master Curve" fracture toughness application for Unit 2 and WCAP-15976 for the PT curves.

Regarding the values of the fluence used for the Point Beach units as well as the capsules, which were irradiated outside the Point Beach Units, please respond to the following questions:

- What is the axial position of the limiting intermediate to lower shell circumferential weld (SA-1484) and what is the axial average source used for the calculation of the fluence?
- WCAP-15976 states that the fluence values used are based on calculations conforming to the guidance in RG 1.190. The values were transferred from the ATI report, which states the values but does not indicate their origin. Please indicate where these values come from and provide the documents, which substantiate the statement regarding RG 1.190.
- Regarding circumferential weld SA-1484, material/irradiation data from non-Westinghouse plants were used without an integrated surveillance program (ISP). Please state how the provisions of Appendix H for sharing irradiation data are satisfied? (Is this the subject of the Appendix H exemption?)
- Describe the assumptions used in your fluence calculations regarding the removal of the Hafnium rods and the projected power uprate.
- Will future loadings maintain low leakage configurations?

NMC Response:

- The axial position of the limiting intermediate to lower shell circumferential weld (SA-1484) is 15.06 inches below the centerline of the core. The axial average source used for the calculation of the fluence for the limiting intermediate to lower shell circumferential weld (SA-1484) is contained in the following table.

Average Relative Axial Power Distributions
Point Beach Unit 2

Distance From Core Bottom (ft)	Relative Axial Power Distribution – F(z)				
			Cycles 16-25		
	Cycles 1-5	Cycles 6-15	No-Hafnium	Hafnium	Cycles 26+
0.0	0.531	0.602	0.415	0.380	0.602
0.6	0.750	0.781	0.686	0.760	0.781
1.2	0.970	0.961	0.956	1.139	0.961
2.4	1.092	1.059	1.067	1.263	1.059
3.6	1.121	1.086	1.085	0.899	1.086
4.8	1.129	1.097	1.104	0.784	1.097
6.0	1.126	1.101	1.117	0.844	1.101
7.2	1.114	1.096	1.128	1.240	1.096
8.4	1.087	1.083	1.114	1.276	1.083
9.6	1.039	1.048	1.081	1.271	1.048
10.8	0.863	0.928	0.944	1.118	0.928
11.4	0.663	0.737	0.671	0.765	0.737
12.0	0.464	0.546	0.398	0.411	0.546

Notes:

1 - Axial distributions are presented on a relative basis such that the average over the core height is 1.0.

2 - Cycles 1 through 5 operated with non-low leakage fuel management (new fuel assemblies located on the periphery).

3 - Cycles 6 through 15 operated with normal low leakage fuel management (burned fuel placed on the periphery).

4 - Cycles 16 through 25 operated with low leakage fuel management plus part length hafnium power suppression rods located in the twelve peripheral assemblies located on the core flats. Relative axial distributions are tabulated for assemblies with and without the hafnium power suppression rods. A multi-channel synthesis was used in the fluence calculation to account for the varying axial power distributions.

5 - Cycles 26+ represent projection into the future. The assumption used in these projections was that the hafnium power suppression rods were removed and the fuel management reverted back to the designs characteristic of Cycles 6-15.

6 - The circumferential weld location (15.06 inches below core midplane) corresponds to an axial elevation 4.75 ft above the bottom of the active fuel.

- The fluence values used in the analyses are provided in Enclosure (a) and are based on calculations conforming to the guidance in RG 1.190.

- All known material data of the SA-1484 material is included in the B&W Owners Group Master Integrated Reactor Vessel Program (MIRVP). NMC is a member of and participant in this integrated surveillance program (ISP) and shares in the distribution of all material data. The NRC review and approval of the B&W Owners Group MIRVP is documented in a letter from David B. Matthews (NRC) to J. H. Taylor (Framatome ANP), "Babcock & Wilcox Owners Group (B&WOG) Reactor Vessel Working Group Report BAW-1543A", Revision 4, Supplement 2, "Supplement to the Master Integrated Reactor Vessel Surveillance Program" (TAC No. M98089)," July 11, 1997.

- The fluence analyses included scenarios for the removal of Hafnium rods and the projected power uprate following the conclusion of Unit 1 cycle 27 and Unit 2 Cycle 25. The fluence values resulting from these scenarios are contained in the tables contained in Enclosure (a).

- Future fuel loadings are anticipated to maintain low leakage configurations.

NRC Question 3:

Please confirm that fluence calculations performed on the B&W Owner's Group capsules L1 & A3 were performed in accordance with the NRC approved B&W report BAW-2241-P-A. This is of importance because data from capsules L1 & A3 were used in the formation of the Master Curve analyses.

NMC Response:

The fluence analyses performed during the L1 & A3 capsule work were done in accordance with the NRC approved B&W report BAW-2242-P-A. These analyses are documented in the L1 & A3 capsule reports BAW-2400 "Analysis of the B&W Owners Group Capsule L1" and BAW-2412 "Analysis of the B&W Owners Group Capsule A3."

We have reviewed the analyses documented in reports BAW-2400 and BAW-2412 and have determined that they were appropriately performed.

NRC Question 4:

In ATI-021-030-2003-1 on page 3-1, it is indicated that data was imported from (among others) BAW-2254 and BAW-2313. These reports were issued in 1995 and 1999, i.e., before the B&W methodology was approved. How do you justify using that data?

NMC Response:

The analyses in reports BAW-2254 and BAW-2313 were issued before the B&W methodology was approved. However, this methodology was subsequently approved by NRC as being acceptable. We have reviewed BAW-2254 and BAW-2313 to ensure that the methodology employed was in accordance with the methodology as later approved by NRC. This was confirmed to be the case and we have therefore determined that the data is acceptable.

ENCLOSURE

to

NRC 2003-0051
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING REQUEST FOR EXEMPTIONS TO 10 CFR 50.61, APPENDICES G AND H TO 10 CFR 50, AND APPROVAL OF PTS APPLICATION FOR PBNP UNIT 2 AND PROPOSED HEATUP AND COOLDOWN LIMIT CURVES

POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

LTR-REA-02-23
Pressure Vessel Neutron Exposure Evaluations
Point Beach Units 1 and 2

S. L. Anderson
Radiation Engineering and Analysis
February 2002

Pressure Vessel Neutron Exposure Evaluations
Point Beach Units 1 and 2

S. L.. Anderson
Radiation Engineering and Analysis

February 2002

WESTINGHOUSE ELECTRIC COMPANY LLC
P.O. Box 355
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1.0 Background

In the assessment of the state of embrittlement of light water reactor (LWR) pressure vessels, an accurate evaluation of the neutron exposure of each of the materials comprising the beltline region of the vessel is required. In Appendix G to 10 CFR 50[1], the beltline region is defined as *"the region of the reactor vessel shell material (including welds, heat affected zones, and plates or forgings) that directly surrounds the effective height of the reactor core and adjacent regions of the reactor vessel that are predicted to experience sufficient neutron radiation damage to be considered in the selection of the most limiting material with regard to radiation damage"*. In Appendix H to 10 CFR 50[1], the threshold fast neutron fluence (E > 1.0 MeV) to be used to determine if a specific material is to be included in the beltline region is further defined as 1.0E+17 n/cm^2. Therefore, in order to encompass all areas of the reactor vessel anticipated to accrue a a fast neutron exposure greater than 1.0E+17 n/cm^2, plant specific exposure assessments must include evaluations not only at locations of maximum exposure at the inner diameter of the vessel, but, also as a function of axial, azimuthal, and radial location throughout the vessel wall. Regulatory Guide 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence"[2] describes state-of-the-art calculation and measurement procedures that are acceptable to the NRC staff for determining pressure vessel fluence applicable to these beltline locations.

This report describes neutron fluence assessments performed for the Point Beach Units 1 and 2 pressure vessel beltline regions based on the guidance specified in Regulatory Guide 1.190. In these assessments, fast neutron exposures expressed in terms of fast neutron fluence (E > 1.0 MeV) were established for each of the materials comprising the beltline region of the respective pressure vessels.

Exposures of the materials were determined on a plant and fuel cycle specific basis for the first 27 operating cycles at Point Beach Unit 1 and the first 25 operating cycles at Point Beach Unit 2. At the conclusion of fuel cycle 27 (on or about September 2002) Point Beach Unit 1 is anticipated to have accrued approximately 24.3 effective full power years (efpy) of operation. Likewise at the conclusion of fuel cycle 25 (on or about April 2002) Point Beach Unit 2 is expected to have accrued approximately 23.6 efpy.

Following completion of the plant specific exposure assessments encompassing the fuel cycles designed to date, projections of the future neutron exposure of the pressure vessel beltline materials extending to 54 efpy of operation were performed for both units. In performing the fluence projections for future operation, several scenarios were assumed in order to provide a matrix of material exposures based on a series of fuel management and power uprate options.

The fuel management strategies employed during the operating lifetime of both Point Beach Unit 1 and Unit 2 can be conveniently subdivided into three general categories as follows:

Fuel Management Approach	Unit 1	Unit 2
Out-In fuel management strategy with fresh fuel assemblies located on the core periphery.	Cycles 1-7	Cycles 1-5
Conventional low leakage fuel management strategy with burned fuel located on the core periphery.	Cycles 8-16	Cycles 6-15
Conventional low leakage fuel management strategy supplemented with the inclusion of part length hafnium power suppression rods located in the twelve peripheral fuel assemblies spanning the core cardinal axes.	Cycles 17-27	Cycles 16-25

Additionally, an uprate from the current operating core power of 1518.5 MWt to a new core power of 1678.0 MWt is planned for the near future. The following fluence projection scenarios were considered based on the various fuel management strategies and power uprate options:

Case	Fuel Management Approach	Core Power (MWt)
1	Low Leakage With Hafnium Rods Without Uprate	1518.5 for full life
2	Low Leakage Without Hafnium Rods Without Uprate	1518.5 for full life
3	Low Leakage With Hafnium Rods With Uprate	1518.5 to 1678.0
4	Low Leakage Without Hafnium Rods With Uprate	1518.5 to 1678.0

Based on these four operating scenarios, neutron exposure projections applicable to each of the beltline materials were developed for both Point Beach Units 1 and 2. In performing the fluence projections for each of these scenarios the power upratings were assumed to occur at the onset of cycle 28 and cycle 25 for Units 1 and 2, respectively. Results of these plant specific calculations are provided in Section 2.0 of this report.

In addition to the plant specific neutron exposure calculations, dosimetry sets from three (3) in-vessel and twenty (20) ex-vessel sensor sets irradiated at Unit 1 and four (4) in-vessel and twenty (20) ex-vessel sensor sets irradiated at Unit 2 were also re-analyzed using dosimetry evaluation methodologies that follow the guidance provided in Regulatory Guide 1.190. The results of these dosimetry re-evaluations were then used to validate the calculational models that were applied in the plant specific neutron transport analyses of the Point Beach Units. The dosimetry evaluation methodology and comparisons of plant specific calculations with measurement results are provided in Section 3.0 of this report.

2.0 Neutron Transport Calculations

2.1 Method of Analysis

In performing the fast neutron exposure evaluations for the Point Beach Units 1 and 2 reactors, plant specific forward transport calculations were carried out using the three-dimensional flux synthesis technique described in Section 1.3.4 of Regulatory Guide 1.190. For the fuel cycles using either out-in loading patterns or traditional low leakage loading patterns, the following single channel synthesis equation was employed:

$$\varphi(r,\theta,z) = \varphi(r,\theta) * \frac{\varphi(r,z)}{\varphi(r)}$$

where $\phi(r,\theta,z)$ is the synthesized three-dimensional neutron flux distribution, $\phi(r,\theta)$ is the transport solution in r,θ geometry, $\phi(r,z)$ is the two-dimensional solution for a cylindrical reactor model using the actual axial core power distribution, and $\phi(r)$ is the one-dimensional solution for a cylindrical reactor model using the same source per unit height as that used in the r,θ two-dimensional calculation.

For the fuel cycles employing part length hafnium power suppression rods in peripheral fuel assemblies, the axial power distributions in those assemblies differ significantly from the axial power distribution characteristic of the remainder of the reactor core. Therefore, for these fuel cycles the following multichannel synthesis equation was used in the transport calculations:

$$\varphi(r,\theta,z) = \varphi_A(r,\theta) * \frac{\varphi_A(r,z)}{\varphi_A(r)} + \varphi_B(r,\theta) * \frac{\varphi_B(r,z)}{\varphi_B(r)}$$

where the subscript "A" refers to the region of the reactor core that does not include hafnium power suppression rods and the subscript "B" refers to the region of the core comprised of the peripheral assemblies located on the cardinal axes that contain the part length absorber rods.

For the Point Beach Units 1 and 2 analyses, all of the transport calculations were carried out using the DORT two-dimensional discrete ordinates code Version 3.1[3] and the BUGLE-96 cross-section library[4]. The BUGLE-96 library provides a 67 group coupled neutron-gamma ray cross-section data set produced specifically for light water reactor application. In these analyses, anisotropic scattering was treated with a P_5 legendre expansion and the angular discretization was modeled with an S_{16} order of angular quadrature.

A plan view of the r,θ model of the Point Beach Units 1 and 2 reactor geometry at the core midplane is shown in Figure 2.1-1. Since the reactor exhibits octant symmetry only a 0° to 45° sector is depicted. In addition to the core, reactor internals, pressure vessel and primary biological shield, the model also included explicit representations of the

surveillance capsules, the pressure vessel cladding, and the insulation located external to the pressure vessel.

From a neutronic standpoint, the inclusion of the surveillance capsules and associated support structure in the analytical model is significant. Since the presence of the capsules and structure has a marked impact on the magnitude of the neutron flux as well as on the relative neutron and gamma ray spectra at dosimetry locations within the capsules, a meaningful evaluation of the radiation environment internal to the capsules can be made only when these perturbation effects are properly accounted for in the analysis.

In contrast to the relatively massive stainless steel and carbon steel structures associated with the internal surveillance capsules, the thin walled aluminum capsules used for the measurements in the reactor cavity were designed to minimize perturbations in the neutron flux and, thus, to provide free field data at the measurement locations. Therefore, explicit descriptions of these small capsules in the transport models was not required.

In developing the r,θ analytical model of the reactor geometry shown in Figure 2.1-1, nominal design dimensions were employed for the various structural components. Likewise, water temperatures and, hence, coolant density in the reactor core and downcomer regions of the reactor were taken to be representative of full power operating conditions. The reactor core itself was treated as a homogeneous mixture of fuel, cladding, water, and miscellaneous core structures such as fuel assembly grids, guide tubes, etc. The r,θ geometric mesh description of the reactor model shown in Figure 2.1-1 consisted of 148 radial by 105 azimuthal intervals. Mesh sizes were chosen to assure that proper convergence of the inner iterations was achieved on a pointwise basis. The pointwise inner iteration flux convergence criterion utilized in the r,θ calculations was set at a value of 0.001.

A section view of the r,z model of the Point Beach Units 1 and 2 reactors is shown in Figure 2.1-2. The model extended radially from the centerline of the reactor core out to a location interior to the primary biological shield and over an axial span from an elevation 5 inches below the active fuel to 17 inches above the active fuel. The axial extent of the model was chosen to permit the determination of the maximum exposure of vessel materials expected to experience a fast neutron fluence greater than 1.0e+17 n/cm^2 (E > 1.0 MeV) over the service life of the respective units.

As in the case of the r,θ model, nominal design dimensions and full power coolant densities were employed in the calculations. In this case, the homogenous core region was treated as an equivalent cylinder with a volume equal to that of the active core zone. The stainless steel former plates located between the core baffle and core barrel regions were also explicitly included in the model. The r,z geometric mesh description of the reactor model shown in Figure 2.1-2 consisted of 127 radial by 155 axial intervals. Mesh sizes were chosen to assure that proper convergence of the inner iterations was achieved on a pointwise basis. The pointwise inner iteration flux convergence criterion utilized in the r,z calculations was also set at a value of 0.001.

The one-dimensional radial model used in the synthesis procedure consisted of the same 127 radial mesh intervals included in the r,z model. Thus, radial synthesis factors could be determined on a meshwise basis throughout the entire geometry.

The core power distributions used in the plant specific transport analysis for the Point Beach Units 1 and 2 reactors were taken from the appropriate fuel cycle design reports for the respective units (References 5 through 31 for Unit 1 and 32 through 56 for Unit 2). The data extracted from the design reports included fuel assembly specific initial enrichments, beginning of cycle burnups and end of cycle burnups. Appropriate axial distributions were also extracted from the respective design reports.

In constructing the core source distributions from the fuel assembly specific enrichment and burnup data, the energy distribution of the source was based on an appropriate fission split for uranium and plutonium isotopes; and from that fission split, composite values of energy release per fission, neutron yield per fission, and fission spectrum were determined.

Figure 2.1-1

Point beach Units 1 and 2 r,θ Reactor Geometry

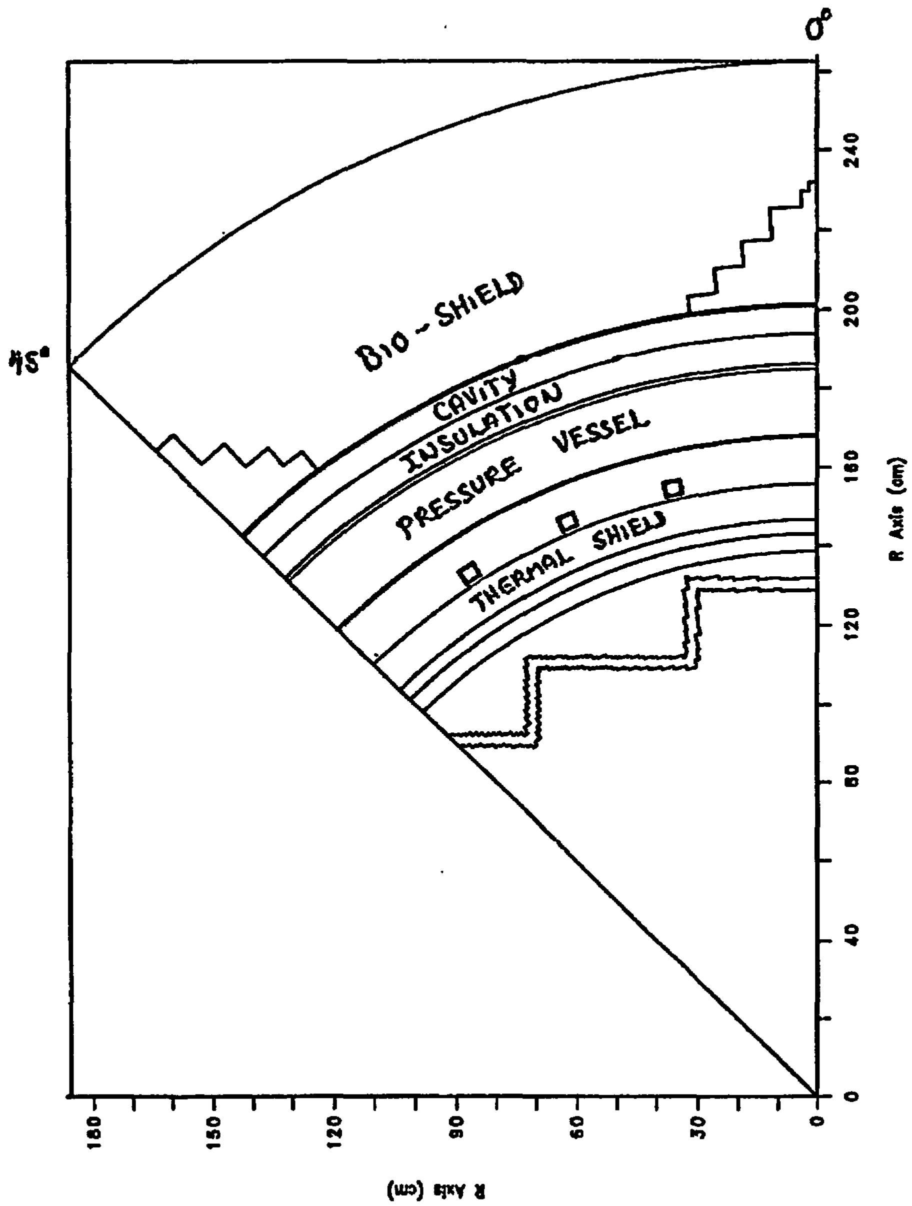
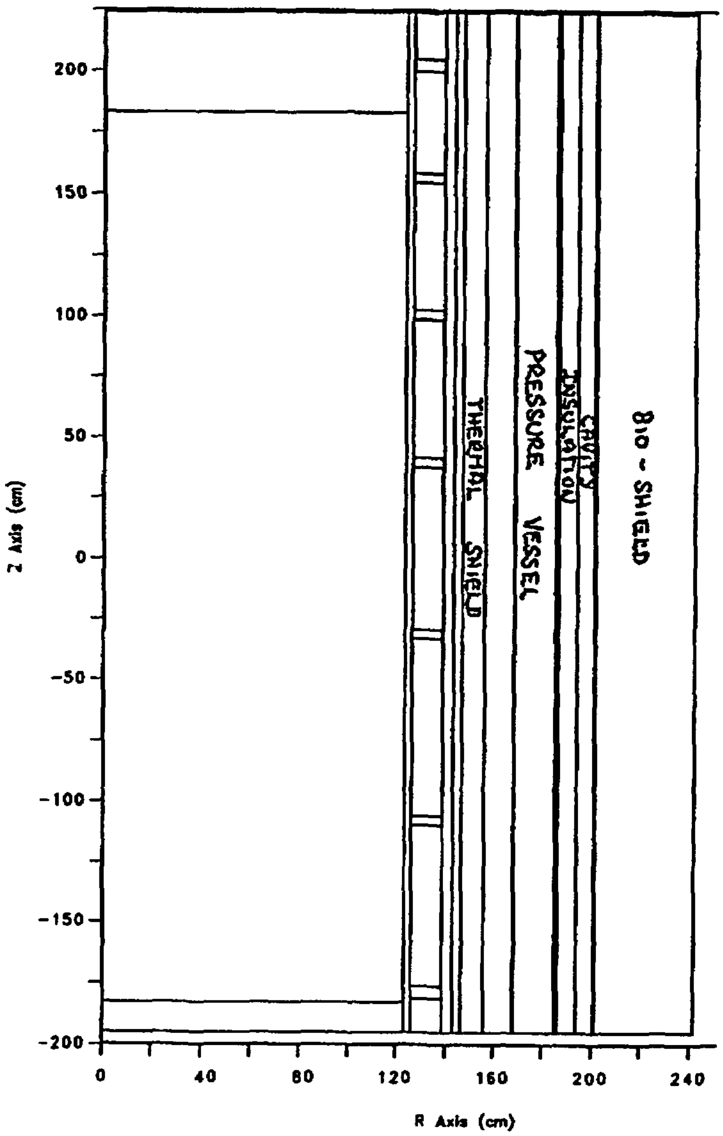


Figure 2.1-2

Point beach Units 1 and 2 r,z Reactor Geometry



2.2 Calculated Neutron Exposure of Point Beach Unit 1 Beltline Materials

A schematic of the beltline region of the Point Beach Unit 1 reactor pressure vessel is shown in Figure 2.2-1. In the case of the Unit 1 pressure vessel, the beltline region is constructed of two (2) shell plates, two (2) longitudinal welds (one in the intermediate shell plate and one in the lower shell plate), two (2) circumferential welds (one joining the intermediate and lower shell plates and one joining the intermediate shell plate to the upper shell forging), and the upper shell forging itself. Each of these seven materials must be considered in the overall embrittlement assessments of the pressure vessel. Pressure vessel materials not included in this compilation are not anticipated to experience a fast neutron (E > 1.0 MeV) exposure in excess of 1.0E+17 n/cm^2 over the service life of the unit and, therefore, are not included in the definition of the beltline region.

The plant and fuel cycle specific calculated fast neutron (E > 1.0 MeV) fluence experienced by the materials comprising the beltline region of the Point Beach Unit 1 reactor are presented in Tables 2.2-1 through 2.2-6 for plant operation through the conclusion of the 27th fuel cycle. The data listed in Tables 2.2-1 through 2.2-6 provide a summary of the calculated fast neutron fluence (E > 1.0 MeV) for all Point Beach Unit 1 fuel cycles designed to date.

In Tables 2.2-1 through 2.2-6, cycle specific maximum neutron exposures at the pressure vessel clad/base metal interface are given at azimuthal angles of 0°, 15°, 30°, and 45° relative to the core cardinal axes. The data provided in Tables 2.2-1 through 2.2-6 were taken at the axial location of the maximum exposure experienced by each material based on the results of the three-dimensional synthesized neutron fluence evaluations.

As noted in Section 1.0 of this report, three general fuel management strategies have been employed during the course of the first 27 fuel cycles of operation at Point Beach Unit 1. These three approaches are summarized as follows:

Cycles	Fuel Management Approach
1-7	Out-In fuel management strategy with fresh fuel assemblies located on the core periphery.
8-16	Conventional low leakage fuel management strategy with burned fuel located on the core periphery.
17-27	Conventional low leakage fuel management strategy supplemented with the inclusion of part length hafnium power suppression rods located in the twelve peripheral fuel assemblies spanning the core cardinal axes.

For Point Beach Unit 1, the hafnium power suppression rods were 72 inches in length and were positioned in the bottom half of the active core region. Thus, the maximum flux reduction impact of the power suppression rods was experienced by the lower shell plate in the 0°-20° azimuthal span as well as by the lower shell longitudinal weld located on the 15° azimuth. Other materials comprising the beltline region of the Point Beach Unit 1 pressure vessel were impacted to a much lesser degree by the presence of the part length absorber rods.

Projections of calculated fast neutron fluence to be accrued beyond the end of cycle 27 were based on the four potential scenarios described in Section 1.0 of this report. The assumed core power level and core power distributions used in these projections are summarized as follows:

Case 1	Core Power Distribution	Core Power (MWt)
1	Average of Cycles 17-27	1518.5
2	Average of Cycles 8-16	1518.5
3	Average of Cycles 17-27	1678.0
4	Average of Cycles 8-16	1678.0

For operation with hafnium power suppression rods, the core power distribution averaged over the eleven fuel cycles that have contained the suppression rods was assumed to be representative of future fuel cycle designs. For operation without the hafnium suppression rods, a power distribution averaged over the nine fuel cycles employing conventional low leakage (Cycles 8-16) was assumed to be representative of future operation.

Results of the fast neutron (E > 1.0 MeV) fluence projections for the Point Beach Unit 1 beltline materials are provided in Tables 2.2-7 through 2.2-18. In Tables 2.2-7 through 2.2-12, data are provided both with and without the presence of hafnium power suppression rods assuming continued operation at a core power level of 1518.5 MWt. In Tables 2.2-13 through 2.2-18, fluence projections are given both with and without the presence of hafnium suppression rods and assuming a core power uprate to 1678.0 MWt at the onset of cycle 28.

Figure 2.2-1

Locations of Pressure Vessel Beltline Materials
Point Beach Unit 1

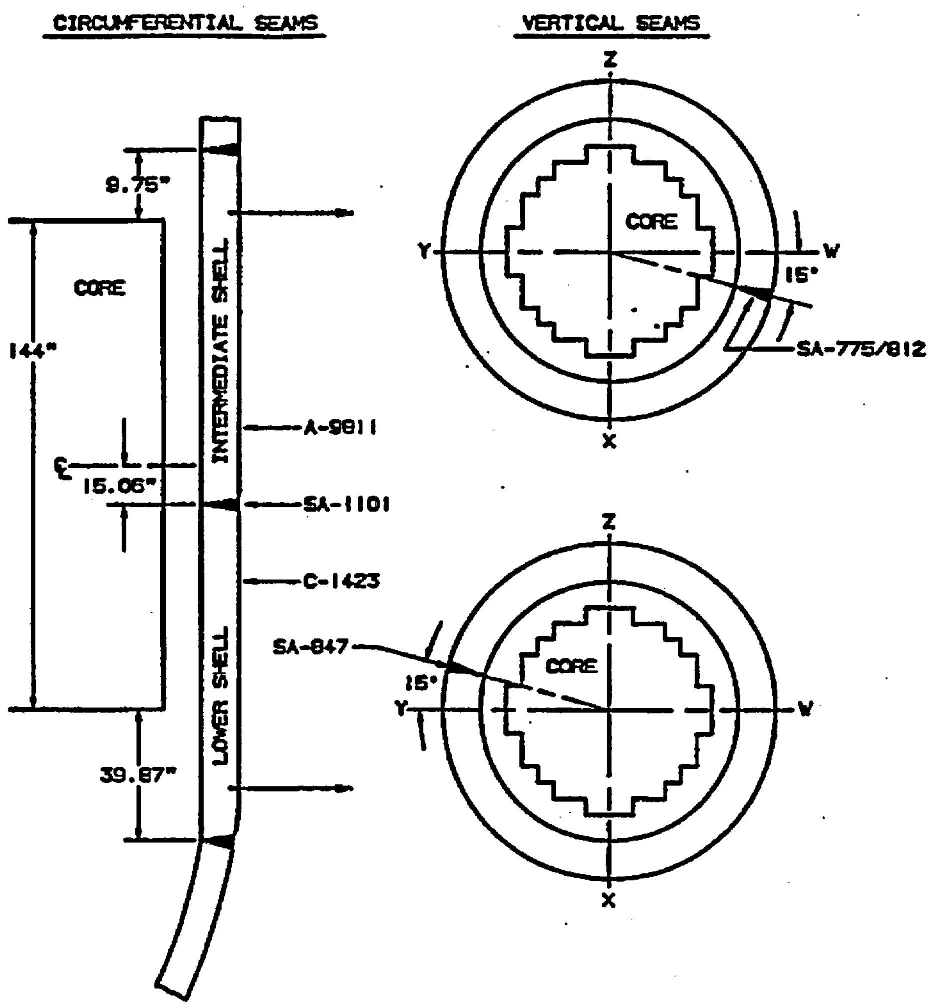


Table 2.2-1

Intermediate Shell to Lower Shell Circumferential Weld (SA-1101)
Neutron Fluence (E > 1.0 MeV)
Point Beach Unit 1

Fuel Cycle	Cycle Time [efps]	Cumulative Time [efps]	Neutron Fluence [n/cm^2]			
			0 Deg.	15 deg.	30 Deg.	45 Deg.
1	4.69E+07	4.69E+07	2.00E+18	1.20E+18	8.07E+17	6.98E+17
2	2.89E+07	7.58E+07	3.11E+18	1.88E+18	1.27E+18	1.10E+18
3	3.82E+07	1.14E+08	4.64E+18	2.82E+18	1.92E+18	1.65E+18
4	2.20E+07	1.36E+08	5.62E+18	3.41E+18	2.34E+18	2.01E+18
5	2.48E+07	1.61E+08	6.68E+18	4.07E+18	2.81E+18	2.42E+18
6	2.57E+07	1.87E+08	7.71E+18	4.71E+18	3.29E+18	2.84E+18
7	2.75E+07	2.14E+08	8.83E+18	5.39E+18	3.77E+18	3.24E+18
8	2.03E+07	2.34E+08	9.52E+18	5.80E+18	4.08E+18	3.53E+18
9	1.88E+07	2.53E+08	1.01E+19	6.15E+18	4.34E+18	3.78E+18
10	2.04E+07	2.74E+08	1.06E+19	6.51E+18	4.63E+18	4.06E+18
11	1.94E+07	2.93E+08	1.12E+19	6.84E+18	4.86E+18	4.25E+18
12	3.04E+07	3.23E+08	1.20E+19	7.41E+18	5.28E+18	4.61E+18
13	2.49E+07	3.48E+08	1.27E+19	7.89E+18	5.65E+18	4.91E+18
14	2.66E+07	3.75E+08	1.34E+19	8.39E+18	6.03E+18	5.23E+18
15	2.65E+07	4.01E+08	1.41E+19	8.87E+18	6.39E+18	5.52E+18
16	2.69E+07	4.28E+08	1.48E+19	9.39E+18	6.78E+18	5.83E+18
17	2.61E+07	4.54E+08	1.53E+19	9.75E+18	7.10E+18	6.13E+18
18	2.62E+07	4.81E+08	1.58E+19	1.01E+19	7.39E+18	6.40E+18
19	2.71E+07	5.08E+08	1.63E+19	1.05E+19	7.72E+18	6.70E+18
20	2.50E+07	5.33E+08	1.68E+19	1.08E+19	8.03E+18	6.97E+18
21	2.82E+07	5.61E+08	1.73E+19	1.12E+19	8.38E+18	7.31E+18
22	2.68E+07	5.88E+08	1.78E+19	1.16E+19	8.72E+18	7.62E+18
23	2.73E+07	6.15E+08	1.83E+19	1.19E+19	9.04E+18	7.93E+18
24	3.10E+07	6.46E+08	1.88E+19	1.23E+19	9.40E+18	8.26E+18
25	3.81E+07	6.84E+08	1.96E+19	1.28E+19	9.90E+18	8.70E+18
26	3.96E+07	7.24E+08	2.02E+19	1.33E+19	1.04E+19	9.13E+18
27	4.47E+07	7.68E+08	2.11E+19	1.40E+19	1.09E+19	9.64E+18

Table 2.2-2

Lower Shell Plate (C-1423)
Neutron Fluence (E > 1.0 MeV)
Point Beach Unit 1

Fuel Cycle	Cycle Time [efps]	Cumulative Time [efps]	Neutron Fluence [n/cm²]			
			0 Deg.	15 deg.	30 Deg.	45 Deg.
1	4.69E+07	4.69E+07	2.07E+18	1.24E+18	8.36E+17	7.23E+17
2	2.89E+07	7.58E+07	3.21E+18	1.94E+18	1.32E+18	1.13E+18
3	3.82E+07	1.14E+08	4.78E+18	2.90E+18	1.98E+18	1.70E+18
4	2.20E+07	1.36E+08	5.80E+18	3.52E+18	2.42E+18	2.08E+18
5	2.48E+07	1.61E+08	6.90E+18	4.21E+18	2.91E+18	2.50E+18
6	2.57E+07	1.87E+08	7.97E+18	4.87E+18	3.41E+18	2.94E+18
7	2.75E+07	2.14E+08	9.14E+18	5.57E+18	3.90E+18	3.36E+18
8	2.03E+07	2.34E+08	9.86E+18	6.01E+18	4.22E+18	3.66E+18
9	1.88E+07	2.53E+08	1.05E+19	6.37E+18	4.51E+18	3.92E+18
10	2.04E+07	2.74E+08	1.10E+19	6.75E+18	4.81E+18	4.22E+18
11	1.94E+07	2.93E+08	1.16E+19	7.10E+18	5.05E+18	4.42E+18
12	3.04E+07	3.23E+08	1.25E+19	7.69E+18	5.50E+18	4.80E+18
13	2.49E+07	3.48E+08	1.32E+19	8.19E+18	5.87E+18	5.11E+18
14	2.66E+07	3.75E+08	1.39E+19	8.70E+18	6.27E+18	5.43E+18
15	2.65E+07	4.01E+08	1.46E+19	9.21E+18	6.65E+18	5.74E+18
16	2.69E+07	4.28E+08	1.54E+19	9.73E+18	7.05E+18	6.06E+18
17	2.61E+07	4.54E+08	1.59E+19	1.01E+19	7.37E+18	6.37E+18
18	2.62E+07	4.81E+08	1.63E+19	1.04E+19	7.68E+18	6.64E+18
19	2.71E+07	5.08E+08	1.68E+19	1.08E+19	8.02E+18	6.96E+18
20	2.50E+07	5.33E+08	1.73E+19	1.12E+19	8.34E+18	7.24E+18
21	2.82E+07	5.61E+08	1.78E+19	1.15E+19	8.70E+18	7.58E+18
22	2.68E+07	5.88E+08	1.83E+19	1.19E+19	9.04E+18	7.91E+18
23	2.73E+07	6.15E+08	1.88E+19	1.23E+19	9.38E+18	8.23E+18
24	3.10E+07	6.46E+08	1.93E+19	1.27E+19	9.75E+18	8.57E+18
25	3.81E+07	6.84E+08	2.00E+19	1.32E+19	1.03E+19	9.03E+18
26	3.96E+07	7.24E+08	2.07E+19	1.37E+19	1.07E+19	9.47E+18
27	4.47E+07	7.68E+08	2.15E+19	1.43E+19	1.13E+19	1.00E+19

Table 2.2-3

Intermediate Shell Plate (A-9811)
Neutron Fluence (E > 1.0 MeV)
Point Beach Unit 1

Fuel Cycle	Cycle Time [efps]	Cumulative Time [efps]	Neutron Fluence [n/cm^2]			
			0 Deg.	15 deg.	30 Deg.	45 Deg.
1	4.69E+07	4.69E+07	2.01E+18	1.21E+18	8.48E+17	7.33E+17
2	2.89E+07	7.58E+07	3.19E+18	1.93E+18	1.34E+18	1.16E+18
3	3.82E+07	1.14E+08	4.64E+18	2.82E+18	2.03E+18	1.74E+18
4	2.20E+07	1.36E+08	5.63E+18	3.42E+18	2.47E+18	2.12E+18
5	2.48E+07	1.61E+08	6.69E+18	4.07E+18	2.95E+18	2.54E+18
6	2.57E+07	1.87E+08	7.72E+18	4.72E+18	3.45E+18	2.98E+18
7	2.75E+07	2.14E+08	8.87E+18	5.41E+18	3.95E+18	3.40E+18
8	2.03E+07	2.34E+08	9.56E+18	5.83E+18	4.27E+18	3.70E+18
9	1.88E+07	2.53E+08	1.01E+19	6.18E+18	4.55E+18	3.96E+18
10	2.04E+07	2.74E+08	1.06E+19	6.50E+18	4.83E+18	4.23E+18
11	1.94E+07	2.93E+08	1.12E+19	6.85E+18	5.08E+18	4.44E+18
12	3.04E+07	3.23E+08	1.20E+19	7.40E+18	5.51E+18	4.81E+18
13	2.49E+07	3.48E+08	1.27E+19	7.90E+18	5.89E+18	5.12E+18
14	2.66E+07	3.75E+08	1.35E+19	8.42E+18	6.30E+18	5.45E+18
15	2.65E+07	4.01E+08	1.42E+19	8.93E+18	6.68E+18	5.77E+18
16	2.69E+07	4.28E+08	1.49E+19	9.46E+18	7.09E+18	6.09E+18
17	2.61E+07	4.54E+08	1.57E+19	9.94E+18	7.44E+18	6.42E+18
18	2.62E+07	4.81E+08	1.64E+19	1.04E+19	7.75E+18	6.70E+18
19	2.71E+07	5.08E+08	1.71E+19	1.09E+19	8.11E+18	7.02E+18
20	2.50E+07	5.33E+08	1.79E+19	1.14E+19	8.44E+18	7.31E+18
21	2.82E+07	5.61E+08	1.86E+19	1.18E+19	8.82E+18	7.67E+18
22	2.68E+07	5.88E+08	1.94E+19	1.23E+19	9.17E+18	8.00E+18
23	2.73E+07	6.15E+08	2.01E+19	1.28E+19	9.52E+18	8.33E+18
24	3.10E+07	6.46E+08	2.09E+19	1.33E+19	9.91E+18	8.69E+18
25	3.81E+07	6.84E+08	2.20E+19	1.40E+19	1.04E+19	9.16E+18
26	3.96E+07	7.24E+08	2.30E+19	1.47E+19	1.09E+19	9.61E+18
27	4.47E+07	7.68E+08	2.43E+19	1.55E+19	1.16E+19	1.02E+19

Table 2.2-4

Intermediate Shell (SA-775/812) and Lower Shell (SA-847) Longitudinal Welds
Neutron Fluence (E > 1.0 MeV)
Point Beach Unit 1

Fuel Cycle	Cycle Time [efps]	Cumulative Time [efps]	Neutron Fluence [n/cm^2]	
			Intermediate Shell	Lower Shell
1	4.69E+07	4.69E+07	1.21E+18	1.24E+18
2	2.89E+07	7.58E+07	1.93E+18	1.94E+18
3	3.82E+07	1.14E+08	2.82E+18	2.90E+18
4	2.20E+07	1.36E+08	3.42E+18	3.52E+18
5	2.48E+07	1.61E+08	4.07E+18	4.21E+18
6	2.57E+07	1.87E+08	4.72E+18	4.87E+18
7	2.75E+07	2.14E+08	5.41E+18	5.57E+18
8	2.03E+07	2.34E+08	5.83E+18	6.01E+18
9	1.88E+07	2.53E+08	6.18E+18	6.37E+18
10	2.04E+07	2.74E+08	6.50E+18	6.75E+18
11	1.94E+07	2.93E+08	6.85E+18	7.10E+18
12	3.04E+07	3.23E+08	7.40E+18	7.69E+18
13	2.49E+07	3.48E+08	7.90E+18	8.19E+18
14	2.66E+07	3.75E+08	8.42E+18	8.70E+18
15	2.65E+07	4.01E+08	8.93E+18	9.21E+18
16	2.69E+07	4.28E+08	9.46E+18	9.73E+18
17	2.61E+07	4.54E+08	9.94E+18	1.01E+19
18	2.62E+07	4.81E+08	1.04E+19	1.04E+19
19	2.71E+07	5.08E+08	1.09E+19	1.08E+19
20	2.50E+07	5.33E+08	1.14E+19	1.12E+19
21	2.82E+07	5.61E+08	1.18E+19	1.15E+19
22	2.68E+07	5.88E+08	1.23E+19	1.19E+19
23	2.73E+07	6.15E+08	1.28E+19	1.23E+19
24	3.10E+07	6.46E+08	1.33E+19	1.27E+19
25	3.81E+07	6.84E+08	1.40E+19	1.32E+19
26	3.96E+07	7.24E+08	1.47E+19	1.37E+19
27	4.47E+07	7.68E+08	1.55E+19	1.43E+19

Table 2.2-5

Intermediate Shell to Upper Shell Circumferential Weld (SA-1426)
Neutron Fluence (E > 1.0 MeV)
Point Beach Unit 1

Fuel Cycle	Cycle Time [efps]	Cumulative Time [efps]	Neutron Fluence [n/cm^2]			
			0 Deg.	15 deg.	30 Deg.	45 Deg.
1	4.69E+07	4.69E+07	1.15E+17	6.93E+16	4.66E+16	4.03E+16
2	2.89E+07	7.58E+07	2.46E+17	1.49E+17	1.01E+17	8.72E+16
3	3.82E+07	1.14E+08	3.45E+17	2.10E+17	1.44E+17	1.23E+17
4	2.20E+07	1.36E+08	4.09E+17	2.49E+17	1.71E+17	1.47E+17
5	2.48E+07	1.61E+08	4.95E+17	3.02E+17	2.09E+17	1.80E+17
6	2.57E+07	1.87E+08	5.71E+17	3.49E+17	2.44E+17	2.10E+17
7	2.75E+07	2.14E+08	6.56E+17	4.01E+17	2.80E+17	2.41E+17
8	2.03E+07	2.34E+08	7.12E+17	4.35E+17	3.06E+17	2.64E+17
9	1.88E+07	2.53E+08	7.66E+17	4.68E+17	3.31E+17	2.89E+17
10	2.04E+07	2.74E+08	8.06E+17	4.95E+17	3.53E+17	3.09E+17
11	1.94E+07	2.93E+08	8.55E+17	5.24E+17	3.73E+17	3.26E+17
12	3.04E+07	3.23E+08	9.15E+17	5.65E+17	4.04E+17	3.53E+17
13	2.49E+07	3.48E+08	9.77E+17	6.08E+17	4.36E+17	3.80E+17
14	2.66E+07	3.75E+08	1.04E+18	6.51E+17	4.70E+17	4.07E+17
15	2.65E+07	4.01E+08	1.10E+18	6.95E+17	5.02E+17	4.33E+17
16	2.69E+07	4.28E+08	1.16E+18	7.39E+17	5.35E+17	4.60E+17
17	2.61E+07	4.54E+08	1.20E+18	7.72E+17	5.68E+17	4.91E+17
18	2.62E+07	4.81E+08	1.24E+18	8.04E+17	6.00E+17	5.21E+17
19	2.71E+07	5.08E+08	1.28E+18	8.35E+17	6.32E+17	5.50E+17
20	2.50E+07	5.33E+08	1.32E+18	8.65E+17	6.60E+17	5.74E+17
21	2.82E+07	5.61E+08	1.36E+18	8.94E+17	6.89E+17	6.02E+17
22	2.68E+07	5.88E+08	1.40E+18	9.21E+17	7.15E+17	6.27E+17
23	2.73E+07	6.15E+08	1.43E+18	9.48E+17	7.40E+17	6.51E+17
24	3.10E+07	6.46E+08	1.47E+18	9.80E+17	7.72E+17	6.81E+17
25	3.81E+07	6.84E+08	1.53E+18	1.02E+18	8.15E+17	7.19E+17
26	3.96E+07	7.24E+08	1.58E+18	1.06E+18	8.55E+17	7.56E+17
27	4.47E+07	7.68E+08	1.64E+18	1.11E+18	9.01E+17	7.98E+17

Table 2.2-6

Upper Shell Forging
Neutron Fluence (E > 1.0 MeV)
Point Beach Unit 1

Fuel Cycle	Cycle Time [efps]	Cumulative Time [efps]	Neutron Fluence [n/cm²]			
			0 Deg.	15 deg.	30 Deg.	45 Deg.
1	4.69E+07	4.69E+07	1.15E+17	6.93E+16	4.66E+16	4.03E+16
2	2.89E+07	7.58E+07	2.46E+17	1.49E+17	1.01E+17	8.72E+16
3	3.82E+07	1.14E+08	3.45E+17	2.10E+17	1.44E+17	1.23E+17
4	2.20E+07	1.36E+08	4.09E+17	2.49E+17	1.71E+17	1.47E+17
5	2.48E+07	1.61E+08	4.95E+17	3.02E+17	2.09E+17	1.80E+17
6	2.57E+07	1.87E+08	5.71E+17	3.49E+17	2.44E+17	2.10E+17
7	2.75E+07	2.14E+08	6.56E+17	4.01E+17	2.80E+17	2.41E+17
8	2.03E+07	2.34E+08	7.12E+17	4.35E+17	3.06E+17	2.64E+17
9	1.88E+07	2.53E+08	7.66E+17	4.68E+17	3.31E+17	2.89E+17
10	2.04E+07	2.74E+08	8.06E+17	4.95E+17	3.53E+17	3.09E+17
11	1.94E+07	2.93E+08	8.55E+17	5.24E+17	3.73E+17	3.26E+17
12	3.04E+07	3.23E+08	9.15E+17	5.65E+17	4.04E+17	3.53E+17
13	2.49E+07	3.48E+08	9.77E+17	6.08E+17	4.36E+17	3.80E+17
14	2.66E+07	3.75E+08	1.04E+18	6.51E+17	4.70E+17	4.07E+17
15	2.65E+07	4.01E+08	1.10E+18	6.95E+17	5.02E+17	4.33E+17
16	2.69E+07	4.28E+08	1.16E+18	7.39E+17	5.35E+17	4.60E+17
17	2.61E+07	4.54E+08	1.20E+18	7.72E+17	5.68E+17	4.91E+17
18	2.62E+07	4.81E+08	1.24E+18	8.04E+17	6.00E+17	5.21E+17
19	2.71E+07	5.08E+08	1.28E+18	8.35E+17	6.32E+17	5.50E+17
20	2.50E+07	5.33E+08	1.32E+18	8.65E+17	6.60E+17	5.74E+17
21	2.82E+07	5.61E+08	1.36E+18	8.94E+17	6.89E+17	6.02E+17
22	2.68E+07	5.88E+08	1.40E+18	9.21E+17	7.15E+17	6.27E+17
23	2.73E+07	6.15E+08	1.43E+18	9.48E+17	7.40E+17	6.51E+17
24	3.10E+07	6.46E+08	1.47E+18	9.80E+17	7.72E+17	6.81E+17
25	3.81E+07	6.84E+08	1.53E+18	1.02E+18	8.15E+17	7.19E+17
26	3.96E+07	7.24E+08	1.58E+18	1.06E+18	8.55E+17	7.56E+17
27	4.47E+07	7.68E+08	1.64E+18	1.11E+18	9.01E+17	7.98E+17

Table 2.2-7

Intermediate Shell to Lower Shell Circumferential Weld (SA-1101)
Calculated Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.11E+19	1.40E+19	1.09E+19	9.64E+18
26.0	2.21E+19	1.47E+19	1.16E+19	1.02E+19
28.0	2.32E+19	1.55E+19	1.23E+19	1.09E+19
30.0	2.44E+19	1.64E+19	1.31E+19	1.16E+19
32.0	2.56E+19	1.72E+19	1.39E+19	1.23E+19
34.0	2.67E+19	1.81E+19	1.46E+19	1.31E+19
36.0	2.79E+19	1.89E+19	1.54E+19	1.38E+19
38.0	2.90E+19	1.98E+19	1.62E+19	1.45E+19
40.0	3.02E+19	2.06E+19	1.70E+19	1.52E+19
42.0	3.14E+19	2.15E+19	1.77E+19	1.59E+19
44.0	3.25E+19	2.23E+19	1.85E+19	1.66E+19
46.0	3.37E+19	2.32E+19	1.93E+19	1.73E+19
48.0	3.49E+19	2.40E+19	2.00E+19	1.80E+19
50.0	3.60E+19	2.49E+19	2.08E+19	1.87E+19
52.0	3.72E+19	2.57E+19	2.16E+19	1.94E+19
54.0	3.84E+19	2.66E+19	2.23E+19	2.01E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.11E+19	1.40E+19	1.09E+19	9.64E+18
26.0	2.26E+19	1.49E+19	1.17E+19	1.03E+19
28.0	2.43E+19	1.61E+19	1.26E+19	1.10E+19
30.0	2.61E+19	1.73E+19	1.34E+19	1.18E+19
32.0	2.79E+19	1.85E+19	1.43E+19	1.26E+19
34.0	2.96E+19	1.97E+19	1.52E+19	1.33E+19
36.0	3.14E+19	2.08E+19	1.61E+19	1.41E+19
38.0	3.32E+19	2.20E+19	1.70E+19	1.48E+19
40.0	3.49E+19	2.32E+19	1.79E+19	1.56E+19
42.0	3.67E+19	2.44E+19	1.88E+19	1.64E+19
44.0	3.85E+19	2.56E+19	1.97E+19	1.71E+19
46.0	4.02E+19	2.67E+19	2.05E+19	1.79E+19
48.0	4.20E+19	2.79E+19	2.14E+19	1.87E+19
50.0	4.38E+19	2.91E+19	2.23E+19	1.94E+19
52.0	4.55E+19	3.03E+19	2.32E+19	2.02E+19
54.0	4.73E+19	3.14E+19	2.41E+19	2.09E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 2.2-8

Lower Shell Plate (C-1423)
Calculated Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.15E+19	1.43E+19	1.13E+19	1.00E+19
26.0	2.25E+19	1.50E+19	1.20E+19	1.06E+19
28.0	2.36E+19	1.59E+19	1.28E+19	1.13E+19
30.0	2.47E+19	1.67E+19	1.36E+19	1.21E+19
32.0	2.59E+19	1.76E+19	1.44E+19	1.28E+19
34.0	2.70E+19	1.84E+19	1.52E+19	1.35E+19
36.0	2.81E+19	1.93E+19	1.60E+19	1.43E+19
38.0	2.93E+19	2.01E+19	1.68E+19	1.50E+19
40.0	3.04E+19	2.10E+19	1.76E+19	1.57E+19
42.0	3.16E+19	2.18E+19	1.83E+19	1.65E+19
44.0	3.27E+19	2.27E+19	1.91E+19	1.72E+19
46.0	3.38E+19	2.35E+19	1.99E+19	1.79E+19
48.0	3.50E+19	2.44E+19	2.07E+19	1.87E+19
50.0	3.61E+19	2.52E+19	2.15E+19	1.94E+19
52.0	3.72E+19	2.61E+19	2.23E+19	2.01E+19
54.0	3.84E+19	2.69E+19	2.31E+19	2.08E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.15E+19	1.43E+19	1.13E+19	1.00E+19
26.0	2.30E+19	1.53E+19	1.21E+19	1.07E+19
28.0	2.49E+19	1.65E+19	1.30E+19	1.15E+19
30.0	2.67E+19	1.78E+19	1.39E+19	1.22E+19
32.0	2.85E+19	1.90E+19	1.49E+19	1.30E+19
34.0	3.04E+19	2.02E+19	1.58E+19	1.38E+19
36.0	3.22E+19	2.15E+19	1.67E+19	1.46E+19
38.0	3.41E+19	2.27E+19	1.77E+19	1.54E+19
40.0	3.59E+19	2.39E+19	1.86E+19	1.62E+19
42.0	3.77E+19	2.51E+19	1.95E+19	1.70E+19
44.0	3.96E+19	2.64E+19	2.04E+19	1.78E+19
46.0	4.14E+19	2.76E+19	2.14E+19	1.86E+19
48.0	4.33E+19	2.88E+19	2.23E+19	1.94E+19
50.0	4.51E+19	3.00E+19	2.32E+19	2.02E+19
52.0	4.69E+19	3.13E+19	2.41E+19	2.10E+19
54.0	4.88E+19	3.25E+19	2.51E+19	2.18E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 2.2-9

Intermediate Shell Plate (A-9811)
Calculated Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.43E+19	1.55E+19	1.16E+19	1.02E+19
26.0	2.57E+19	1.64E+19	1.22E+19	1.08E+19
28.0	2.75E+19	1.75E+19	1.31E+19	1.15E+19
30.0	2.92E+19	1.87E+19	1.39E+19	1.23E+19
32.0	3.09E+19	1.98E+19	1.47E+19	1.30E+19
34.0	3.27E+19	2.09E+19	1.55E+19	1.38E+19
36.0	3.44E+19	2.20E+19	1.64E+19	1.45E+19
38.0	3.61E+19	2.32E+19	1.72E+19	1.53E+19
40.0	3.79E+19	2.43E+19	1.80E+19	1.60E+19
42.0	3.96E+19	2.54E+19	1.89E+19	1.68E+19
44.0	4.14E+19	2.65E+19	1.97E+19	1.76E+19
46.0	4.31E+19	2.76E+19	2.05E+19	1.83E+19
48.0	4.48E+19	2.88E+19	2.13E+19	1.91E+19
50.0	4.66E+19	2.99E+19	2.22E+19	1.98E+19
52.0	4.83E+19	3.10E+19	2.30E+19	2.06E+19
54.0	5.00E+19	3.21E+19	2.38E+19	2.13E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.43E+19	1.55E+19	1.16E+19	1.02E+19
26.0	2.58E+19	1.65E+19	1.23E+19	1.08E+19
28.0	2.76E+19	1.77E+19	1.32E+19	1.16E+19
30.0	2.93E+19	1.89E+19	1.42E+19	1.24E+19
32.0	3.11E+19	2.01E+19	1.51E+19	1.32E+19
34.0	3.29E+19	2.13E+19	1.60E+19	1.40E+19
36.0	3.47E+19	2.24E+19	1.69E+19	1.48E+19
38.0	3.65E+19	2.36E+19	1.79E+19	1.56E+19
40.0	3.83E+19	2.48E+19	1.88E+19	1.64E+19
42.0	4.00E+19	2.60E+19	1.97E+19	1.72E+19
44.0	4.18E+19	2.72E+19	2.06E+19	1.80E+19
46.0	4.36E+19	2.84E+19	2.16E+19	1.88E+19
48.0	4.54E+19	2.96E+19	2.25E+19	1.95E+19
50.0	4.72E+19	3.08E+19	2.34E+19	2.03E+19
52.0	4.90E+19	3.20E+19	2.43E+19	2.11E+19
54.0	5.08E+19	3.32E+19	2.53E+19	2.19E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 2.2-10

Intermediate Shell (SA775/812) and Lower Shell (SA-847) Longitudinal Welds
Calculated Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]	
	Inter. Shell	Lower Shell
24.3	1.55E+19	1.43E+19
26.0	1.64E+19	1.50E+19
28.0	1.75E+19	1.59E+19
30.0	1.87E+19	1.67E+19
32.0	1.98E+19	1.76E+19
34.0	2.09E+19	1.84E+19
36.0	2.20E+19	1.93E+19
38.0	2.32E+19	2.01E+19
40.0	2.43E+19	2.10E+19
42.0	2.54E+19	2.18E+19
44.0	2.65E+19	2.27E+19
46.0	2.76E+19	2.35E+19
48.0	2.88E+19	2.44E+19
50.0	2.99E+19	2.52E+19
52.0	3.10E+19	2.61E+19
54.0	3.21E+19	2.69E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]	
	Inter. Shell	Lower Shell
24.3	1.55E+19	1.43E+19
26.0	1.65E+19	1.53E+19
28.0	1.77E+19	1.65E+19
30.0	1.89E+19	1.78E+19
32.0	2.01E+19	1.90E+19
34.0	2.13E+19	2.02E+19
36.0	2.24E+19	2.15E+19
38.0	2.36E+19	2.27E+19
40.0	2.48E+19	2.39E+19
42.0	2.60E+19	2.51E+19
44.0	2.72E+19	2.64E+19
46.0	2.84E+19	2.76E+19
48.0	2.96E+19	2.88E+19
50.0	3.08E+19	3.00E+19
52.0	3.20E+19	3.13E+19
54.0	3.32E+19	3.25E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 2.2-11

Intermediate Shell to Upper Shell Circumferential Weld (SA-1426)
Calculated Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.64E+18	1.11E+18	9.01E+17	7.98E+17
26.0	1.72E+18	1.17E+18	9.59E+17	8.50E+17
28.0	1.82E+18	1.24E+18	1.03E+18	9.14E+17
30.0	1.91E+18	1.32E+18	1.10E+18	9.78E+17
32.0	2.01E+18	1.39E+18	1.17E+18	1.04E+18
34.0	2.10E+18	1.46E+18	1.24E+18	1.11E+18
36.0	2.20E+18	1.54E+18	1.31E+18	1.17E+18
38.0	2.29E+18	1.61E+18	1.38E+18	1.23E+18
40.0	2.39E+18	1.68E+18	1.45E+18	1.30E+18
42.0	2.48E+18	1.76E+18	1.52E+18	1.36E+18
44.0	2.58E+18	1.83E+18	1.59E+18	1.42E+18
46.0	2.67E+18	1.90E+18	1.66E+18	1.49E+18
48.0	2.77E+18	1.98E+18	1.73E+18	1.55E+18
50.0	2.86E+18	2.05E+18	1.80E+18	1.62E+18
52.0	2.96E+18	2.12E+18	1.87E+18	1.68E+18
54.0	3.06E+18	2.20E+18	1.94E+18	1.74E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.64E+18	1.11E+18	9.01E+17	7.98E+17
26.0	1.77E+18	1.20E+18	9.65E+17	8.52E+17
28.0	1.93E+18	1.30E+18	1.04E+18	9.19E+17
30.0	2.09E+18	1.40E+18	1.12E+18	9.85E+17
32.0	2.25E+18	1.51E+18	1.19E+18	1.05E+18
34.0	2.41E+18	1.61E+18	1.27E+18	1.12E+18
36.0	2.57E+18	1.71E+18	1.35E+18	1.18E+18
38.0	2.73E+18	1.81E+18	1.43E+18	1.25E+18
40.0	2.88E+18	1.92E+18	1.50E+18	1.32E+18
42.0	3.04E+18	2.02E+18	1.58E+18	1.38E+18
44.0	3.20E+18	2.12E+18	1.66E+18	1.45E+18
46.0	3.36E+18	2.23E+18	1.73E+18	1.52E+18
48.0	3.52E+18	2.33E+18	1.81E+18	1.58E+18
50.0	3.68E+18	2.43E+18	1.89E+18	1.65E+18
52.0	3.84E+18	2.54E+18	1.96E+18	1.72E+18
54.0	4.00E+18	2.64E+18	2.04E+18	1.78E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 2.2-12

Upper Shell Forging
Calculated Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.64E+18	1.11E+18	9.01E+17	7.98E+17
26.0	1.72E+18	1.17E+18	9.59E+17	8.50E+17
28.0	1.82E+18	1.24E+18	1.03E+18	9.14E+17
30.0	1.91E+18	1.32E+18	1.10E+18	9.78E+17
32.0	2.01E+18	1.39E+18	1.17E+18	1.04E+18
34.0	2.10E+18	1.46E+18	1.24E+18	1.11E+18
36.0	2.20E+18	1.54E+18	1.31E+18	1.17E+18
38.0	2.29E+18	1.61E+18	1.38E+18	1.23E+18
40.0	2.39E+18	1.68E+18	1.45E+18	1.30E+18
42.0	2.48E+18	1.76E+18	1.52E+18	1.36E+18
44.0	2.58E+18	1.83E+18	1.59E+18	1.42E+18
46.0	2.67E+18	1.90E+18	1.66E+18	1.49E+18
48.0	2.77E+18	1.98E+18	1.73E+18	1.55E+18
50.0	2.86E+18	2.05E+18	1.80E+18	1.62E+18
52.0	2.96E+18	2.12E+18	1.87E+18	1.68E+18
54.0	3.06E+18	2.20E+18	1.94E+18	1.74E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.64E+18	1.11E+18	9.01E+17	7.98E+17
26.0	1.77E+18	1.20E+18	9.65E+17	8.52E+17
28.0	1.93E+18	1.30E+18	1.04E+18	9.19E+17
30.0	2.09E+18	1.40E+18	1.12E+18	9.85E+17
32.0	2.25E+18	1.51E+18	1.19E+18	1.05E+18
34.0	2.41E+18	1.61E+18	1.27E+18	1.12E+18
36.0	2.57E+18	1.71E+18	1.35E+18	1.18E+18
38.0	2.73E+18	1.81E+18	1.43E+18	1.25E+18
40.0	2.88E+18	1.92E+18	1.50E+18	1.32E+18
42.0	3.04E+18	2.02E+18	1.58E+18	1.38E+18
44.0	3.20E+18	2.12E+18	1.66E+18	1.45E+18
46.0	3.36E+18	2.23E+18	1.73E+18	1.52E+18
48.0	3.52E+18	2.33E+18	1.81E+18	1.58E+18
50.0	3.68E+18	2.43E+18	1.89E+18	1.65E+18
52.0	3.84E+18	2.54E+18	1.96E+18	1.72E+18
54.0	4.00E+18	2.64E+18	2.04E+18	1.78E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 2.2-13

Intermediate Shell to Lower Shell Circumferential Weld (SA-1101)
Calculated Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.11E+19	1.40E+19	1.09E+19	9.64E+18
26.0	2.22E+19	1.47E+19	1.16E+19	1.03E+19
28.0	2.34E+19	1.57E+19	1.25E+19	1.11E+19
30.0	2.47E+19	1.66E+19	1.33E+19	1.18E+19
32.0	2.60E+19	1.76E+19	1.42E+19	1.26E+19
34.0	2.73E+19	1.85E+19	1.50E+19	1.34E+19
36.0	2.86E+19	1.94E+19	1.59E+19	1.42E+19
38.0	2.99E+19	2.04E+19	1.67E+19	1.50E+19
40.0	3.12E+19	2.13E+19	1.76E+19	1.58E+19
42.0	3.24E+19	2.23E+19	1.84E+19	1.65E+19
44.0	3.37E+19	2.32E+19	1.93E+19	1.73E+19
46.0	3.50E+19	2.41E+19	2.01E+19	1.81E+19
48.0	3.63E+19	2.51E+19	2.10E+19	1.89E+19
50.0	3.76E+19	2.60E+19	2.18E+19	1.97E+19
52.0	3.89E+19	2.70E+19	2.27E+19	2.04E+19
54.0	4.02E+19	2.79E+19	2.35E+19	2.12E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.11E+19	1.40E+19	1.09E+19	9.64E+18
26.0	2.27E+19	1.50E+19	1.17E+19	1.03E+19
28.0	2.47E+19	1.63E+19	1.27E+19	1.12E+19
30.0	2.66E+19	1.77E+19	1.37E+19	1.20E+19
32.0	2.86E+19	1.90E+19	1.47E+19	1.29E+19
34.0	3.05E+19	2.03E+19	1.57E+19	1.37E+19
36.0	3.25E+19	2.16E+19	1.66E+19	1.46E+19
38.0	3.44E+19	2.29E+19	1.76E+19	1.54E+19
40.0	3.64E+19	2.42E+19	1.86E+19	1.62E+19
42.0	3.83E+19	2.55E+19	1.96E+19	1.71E+19
44.0	4.03E+19	2.68E+19	2.06E+19	1.79E+19
46.0	4.22E+19	2.81E+19	2.16E+19	1.88E+19
48.0	4.42E+19	2.94E+19	2.25E+19	1.96E+19
50.0	4.61E+19	3.07E+19	2.35E+19	2.05E+19
52.0	4.81E+19	3.20E+19	2.45E+19	2.13E+19
54.0	5.01E+19	3.33E+19	2.55E+19	2.21E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 2.2-14

Lower Shell Plate (C-1423)
Calculated Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.15E+19	1.43E+19	1.13E+19	1.00E+19
26.0	2.25E+19	1.51E+19	1.21E+19	1.07E+19
28.0	2.38E+19	1.60E+19	1.29E+19	1.15E+19
30.0	2.51E+19	1.70E+19	1.38E+19	1.23E+19
32.0	2.63E+19	1.79E+19	1.47E+19	1.31E+19
34.0	2.76E+19	1.88E+19	1.56E+19	1.39E+19
36.0	2.88E+19	1.98E+19	1.65E+19	1.47E+19
38.0	3.01E+19	2.07E+19	1.73E+19	1.55E+19
40.0	3.13E+19	2.17E+19	1.82E+19	1.63E+19
42.0	3.26E+19	2.26E+19	1.91E+19	1.71E+19
44.0	3.39E+19	2.35E+19	2.00E+19	1.79E+19
46.0	3.51E+19	2.45E+19	2.08E+19	1.88E+19
48.0	3.64E+19	2.54E+19	2.17E+19	1.96E+19
50.0	3.76E+19	2.63E+19	2.26E+19	2.04E+19
52.0	3.89E+19	2.73E+19	2.35E+19	2.12E+19
54.0	4.01E+19	2.82E+19	2.44E+19	2.20E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.15E+19	1.43E+19	1.13E+19	1.00E+19
26.0	2.30E+19	1.53E+19	1.21E+19	1.07E+19
28.0	2.49E+19	1.65E+19	1.30E+19	1.15E+19
30.0	2.67E+19	1.78E+19	1.39E+19	1.22E+19
32.0	2.85E+19	1.90E+19	1.49E+19	1.30E+19
34.0	3.04E+19	2.02E+19	1.58E+19	1.38E+19
36.0	3.22E+19	2.15E+19	1.67E+19	1.46E+19
38.0	3.41E+19	2.27E+19	1.77E+19	1.54E+19
40.0	3.59E+19	2.39E+19	1.86E+19	1.62E+19
42.0	3.77E+19	2.51E+19	1.95E+19	1.70E+19
44.0	3.96E+19	2.64E+19	2.04E+19	1.78E+19
46.0	4.14E+19	2.76E+19	2.14E+19	1.86E+19
48.0	4.33E+19	2.88E+19	2.23E+19	1.94E+19
50.0	4.51E+19	3.00E+19	2.32E+19	2.02E+19
52.0	4.69E+19	3.13E+19	2.41E+19	2.10E+19
54.0	4.88E+19	3.25E+19	2.51E+19	2.18E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 2.2-15

Intermediate Shell Plate (A-9811)
Calculated Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.43E+19	1.55E+19	1.16E+19	1.02E+19
26.0	2.59E+19	1.65E+19	1.23E+19	1.08E+19
28.0	2.78E+19	1.78E+19	1.32E+19	1.17E+19
30.0	2.97E+19	1.90E+19	1.41E+19	1.25E+19
32.0	3.16E+19	2.02E+19	1.50E+19	1.33E+19
34.0	3.36E+19	2.15E+19	1.60E+19	1.42E+19
36.0	3.55E+19	2.27E+19	1.69E+19	1.50E+19
38.0	3.74E+19	2.40E+19	1.78E+19	1.58E+19
40.0	3.93E+19	2.52E+19	1.87E+19	1.67E+19
42.0	4.12E+19	2.64E+19	1.96E+19	1.75E+19
44.0	4.32E+19	2.77E+19	2.05E+19	1.83E+19
46.0	4.51E+19	2.89E+19	2.15E+19	1.92E+19
48.0	4.70E+19	3.02E+19	2.24E+19	2.00E+19
50.0	4.89E+19	3.14E+19	2.33E+19	2.08E+19
52.0	5.08E+19	3.26E+19	2.42E+19	2.17E+19
54.0	5.27E+19	3.39E+19	2.51E+19	2.25E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.43E+19	1.55E+19	1.16E+19	1.02E+19
26.0	2.59E+19	1.66E+19	1.24E+19	1.09E+19
28.0	2.79E+19	1.79E+19	1.34E+19	1.18E+19
30.0	2.99E+19	1.92E+19	1.44E+19	1.26E+19
32.0	3.18E+19	2.05E+19	1.55E+19	1.35E+19
34.0	3.38E+19	2.19E+19	1.65E+19	1.44E+19
36.0	3.58E+19	2.32E+19	1.75E+19	1.53E+19
38.0	3.78E+19	2.45E+19	1.85E+19	1.61E+19
40.0	3.97E+19	2.58E+19	1.96E+19	1.70E+19
42.0	4.17E+19	2.71E+19	2.06E+19	1.79E+19
44.0	4.37E+19	2.84E+19	2.16E+19	1.88E+19
46.0	4.56E+19	2.98E+19	2.26E+19	1.97E+19
48.0	4.76E+19	3.11E+19	2.36E+19	2.05E+19
50.0	4.96E+19	3.24E+19	2.47E+19	2.14E+19
52.0	5.16E+19	3.37E+19	2.57E+19	2.23E+19
54.0	5.35E+19	3.50E+19	2.67E+19	2.32E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 2.2-16

Intermediate Shell (SA775/812) and Lower Shell (SA-847) Longitudinal Welds
Calculated Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]	
	Inter. Shell	Lower Shell
24.3	1.55E+19	1.43E+19
26.0	1.65E+19	1.51E+19
28.0	1.78E+19	1.60E+19
30.0	1.90E+19	1.70E+19
32.0	2.02E+19	1.79E+19
34.0	2.15E+19	1.88E+19
36.0	2.27E+19	1.98E+19
38.0	2.40E+19	2.07E+19
40.0	2.52E+19	2.17E+19
42.0	2.64E+19	2.26E+19
44.0	2.77E+19	2.35E+19
46.0	2.89E+19	2.45E+19
48.0	3.02E+19	2.54E+19
50.0	3.14E+19	2.63E+19
52.0	3.26E+19	2.73E+19
54.0	3.39E+19	2.82E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]	
	Inter. Shell	Lower Shell
24.3	1.55E+19	1.43E+19
26.0	1.66E+19	1.54E+19
28.0	1.79E+19	1.68E+19
30.0	1.92E+19	1.81E+19
32.0	2.05E+19	1.95E+19
34.0	2.19E+19	2.08E+19
36.0	2.32E+19	2.22E+19
38.0	2.45E+19	2.36E+19
40.0	2.58E+19	2.49E+19
42.0	2.71E+19	2.63E+19
44.0	2.84E+19	2.76E+19
46.0	2.98E+19	2.90E+19
48.0	3.11E+19	3.03E+19
50.0	3.24E+19	3.17E+19
52.0	3.37E+19	3.30E+19
54.0	3.50E+19	3.44E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 2.2-17

Intermediate Shell to Upper Shell Circumferential Weld (SA-1426)
Calculated Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.64E+18	1.11E+18	9.01E+17	7.98E+17
26.0	1.73E+18	1.18E+18	9.65E+17	8.56E+17
28.0	1.83E+18	1.26E+18	1.04E+18	9.26E+17
30.0	1.94E+18	1.34E+18	1.12E+18	9.97E+17
32.0	2.05E+18	1.42E+18	1.20E+18	1.07E+18
34.0	2.15E+18	1.50E+18	1.27E+18	1.14E+18
36.0	2.26E+18	1.58E+18	1.35E+18	1.21E+18
38.0	2.36E+18	1.66E+18	1.43E+18	1.28E+18
40.0	2.47E+18	1.75E+18	1.51E+18	1.35E+18
42.0	2.57E+18	1.83E+18	1.58E+18	1.42E+18
44.0	2.68E+18	1.91E+18	1.66E+18	1.49E+18
46.0	2.78E+18	1.99E+18	1.74E+18	1.56E+18
48.0	2.89E+18	2.07E+18	1.81E+18	1.63E+18
50.0	2.99E+18	2.15E+18	1.89E+18	1.70E+18
52.0	3.10E+18	2.23E+18	1.97E+18	1.77E+18
54.0	3.20E+18	2.31E+18	2.05E+18	1.84E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.64E+18	1.11E+18	9.01E+17	7.98E+17
26.0	1.79E+18	1.21E+18	9.71E+17	8.58E+17
28.0	1.96E+18	1.32E+18	1.06E+18	9.32E+17
30.0	2.14E+18	1.43E+18	1.14E+18	1.01E+18
32.0	2.31E+18	1.55E+18	1.23E+18	1.08E+18
34.0	2.49E+18	1.66E+18	1.31E+18	1.15E+18
36.0	2.66E+18	1.77E+18	1.40E+18	1.23E+18
38.0	2.84E+18	1.89E+18	1.48E+18	1.30E+18
40.0	3.02E+18	2.00E+18	1.57E+18	1.37E+18
42.0	3.19E+18	2.12E+18	1.65E+18	1.45E+18
44.0	3.37E+18	2.23E+18	1.73E+18	1.52E+18
46.0	3.54E+18	2.34E+18	1.82E+18	1.59E+18
48.0	3.72E+18	2.46E+18	1.90E+18	1.67E+18
50.0	3.89E+18	2.57E+18	1.99E+18	1.74E+18
52.0	4.07E+18	2.68E+18	2.07E+18	1.81E+18
54.0	4.24E+18	2.80E+18	2.16E+18	1.89E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 2.2-18

Upper Shell Forging
Calculated Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.64E+18	1.11E+18	9.01E+17	7.98E+17
26.0	1.73E+18	1.18E+18	9.65E+17	8.56E+17
28.0	1.83E+18	1.26E+18	1.04E+18	9.26E+17
30.0	1.94E+18	1.34E+18	1.12E+18	9.97E+17
32.0	2.05E+18	1.42E+18	1.20E+18	1.07E+18
34.0	2.15E+18	1.50E+18	1.27E+18	1.14E+18
36.0	2.26E+18	1.58E+18	1.35E+18	1.21E+18
38.0	2.36E+18	1.66E+18	1.43E+18	1.28E+18
40.0	2.47E+18	1.75E+18	1.51E+18	1.35E+18
42.0	2.57E+18	1.83E+18	1.58E+18	1.42E+18
44.0	2.68E+18	1.91E+18	1.66E+18	1.49E+18
46.0	2.78E+18	1.99E+18	1.74E+18	1.56E+18
48.0	2.89E+18	2.07E+18	1.81E+18	1.63E+18
50.0	2.99E+18	2.15E+18	1.89E+18	1.70E+18
52.0	3.10E+18	2.23E+18	1.97E+18	1.77E+18
54.0	3.20E+18	2.31E+18	2.05E+18	1.84E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.64E+18	1.11E+18	9.01E+17	7.98E+17
26.0	1.79E+18	1.21E+18	9.71E+17	8.58E+17
28.0	1.96E+18	1.32E+18	1.06E+18	9.32E+17
30.0	2.14E+18	1.43E+18	1.14E+18	1.01E+18
32.0	2.31E+18	1.55E+18	1.23E+18	1.08E+18
34.0	2.49E+18	1.66E+18	1.31E+18	1.15E+18
36.0	2.66E+18	1.77E+18	1.40E+18	1.23E+18
38.0	2.84E+18	1.89E+18	1.48E+18	1.30E+18
40.0	3.02E+18	2.00E+18	1.57E+18	1.37E+18
42.0	3.19E+18	2.12E+18	1.65E+18	1.45E+18
44.0	3.37E+18	2.23E+18	1.73E+18	1.52E+18
46.0	3.54E+18	2.34E+18	1.82E+18	1.59E+18
48.0	3.72E+18	2.46E+18	1.90E+18	1.67E+18
50.0	3.89E+18	2.57E+18	1.99E+18	1.74E+18
52.0	4.07E+18	2.68E+18	2.07E+18	1.81E+18
54.0	4.24E+18	2.80E+18	2.16E+18	1.89E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

2.3 Calculated Neutron Exposure of Point Beach Unit 2 Beltline Materials

A schematic of the beltline region of the Point Beach Unit 2 reactor pressure vessel is shown in Figure 2.3-1. In the case of the Unit 2 pressure vessel, the beltline region is constructed of two (2) ring forgings, two (2) circumferential welds (one joining the intermediate and lower shell forgings and one joining the intermediate shell forging to the upper shell forging), and the upper shell forging itself. Each of these five materials must be considered in the overall embrittlement assessments of the pressure vessel. Pressure vessel materials not included in this compilation are not anticipated to experience a fast neutron (E > 1.0 MeV) exposure in excess of 1.0E+17 n/cm^2 over the service life of the unit and, therefore, are not included in the definition of the beltline region.

The plant and fuel cycle specific calculated fast neutron (E > 1.0 MeV) fluence experienced by the materials comprising the beltline region of the Point Beach Unit 2 reactor are presented in Tables 2.3-1 through 2.3-5 for plant operation through the conclusion of the 25th fuel cycle. The data listed in Tables 2.3-1 through 2.3-5 provide a summary of the calculated fast neutron fluence (E > 1.0 MeV) for all Point Beach Unit 2 fuel cycles designed to date.

In Tables 2.3-1 through 2.3-5, cycle specific maximum neutron exposures at the pressure vessel clad/base metal interface are given at azimuthal angles of 0°, 15°, 30°, and 45° relative to the core cardinal axes. The data provided in Tables 2.3-1 through 2.3-5 were taken at the axial location of the maximum exposure experienced by each material based on the results of the three-dimensional synthesized neutron fluence evaluations.

As noted in Section 1.0 of this report, three general fuel management strategies have been employed during the course of the first 25 fuel cycles of operation at Point Beach Unit 2. These three approaches are summarized as follows:

Cycles	Fuel Management Approach
1-5	Out-In fuel management strategy with fresh fuel assemblies located on the core periphery.
6-15	Conventional low leakage fuel management strategy with burned fuel located on the core periphery.
16-25	Conventional low leakage fuel management strategy supplemented with the inclusion of part length hafnium power suppression rods located in the twelve peripheral fuel assemblies spanning the core cardinal axes.

For Point Beach Unit 2, the hafnium power suppression rods were 36 inches in length and were positioned axially such that the center of the suppression rods corresponded to the elevation of the intermediate shell to lower shell circumferential weld. Thus, the

maximum flux reduction impact of the power suppression rods was experienced by the lower shell circumferential weld in the 0°-20° azimuthal. Other materials comprising the beltline region of the Point Beach Unit 2 pressure vessel were impacted to a much lesser degree by the presence of the part length absorber rods.

Projections of calculated fast neutron fluence to be accrued beyond the end of cycle 25 were based on the four potential scenarios described in Section 1.0 of this report. The assumed core power level and core power distributions used in these projections are summarized as follows:

Case 1	Core Power Distribution	Core Power (MWt)
1	Average of Cycles 16-25	1518.5
2	Average of Cycles 6-16	1518.5
3	Average of Cycles 16-25	1678.0
4	Average of Cycles 6-16	1678.0

For operation with hafnium power suppression rods, the core power distribution averaged over the ten fuel cycles that have contained the suppression rods was assumed to be representative of future fuel cycle designs. For operation without the hafnium suppression rods, a power distribution averaged over the ten fuel cycles employing conventional low leakage (Cycles 6-15) was assumed to be representative of future operation.

Results of the fast neutron (E > 1.0 MeV) fluence projections for the Point Beach Unit 2 beltline materials are provided in Tables 2.3-6 through 2.3-15. In Tables 2.3-6 through 2.3-10, data are provided both with and without the presence of hafnium power suppression rods assuming continued operation at a core power level of 1518.5 MWt. In Tables 2.3-11 through 2.3-15, fluence projections are given both with and without the presence of hafnium suppression rods and assuming a core power uprate to 1678.0 MWt at the onset of cycle 26.

Figure 2.3-1

Locations of Pressure Vessel Beltline Materials
Point Beach Unit 2

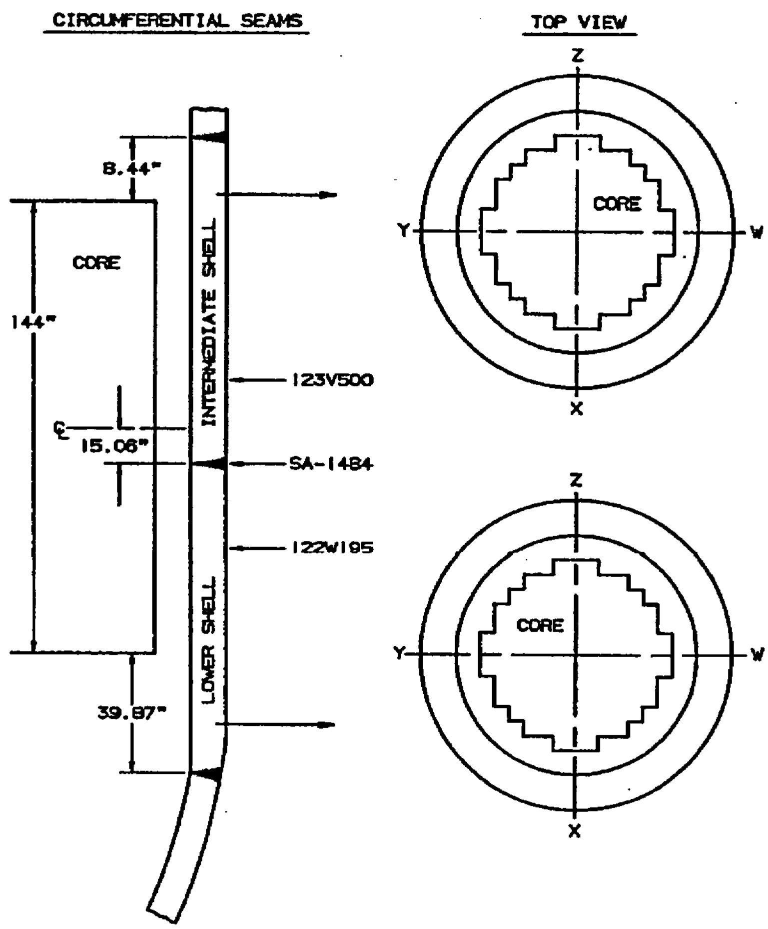


Table 2.3-1

Intermediate Shell to Lower Shell Circumferential Weld (SA-1484)
Neutron Fluence (E > 1.0 MeV)
Point Beach Unit 2

Fuel Cycle	Cycle Time [efps]	Cumulative Time [efps]	Neutron Fluence [n/cm^2]			
			0 Deg.	15 deg.	30 Deg.	45 Deg.
1	4.80E+07	4.80E+07	2.10E+18	1.27E+18	8.55E+17	7.38E+17
2	3.31E+07	8.12E+07	3.55E+18	2.14E+18	1.48E+18	1.28E+18
3	2.75E+07	1.09E+08	4.73E+18	2.84E+18	1.98E+18	1.73E+18
4	2.74E+07	1.36E+08	5.81E+18	3.49E+18	2.45E+18	2.13E+18
5	2.79E+07	1.64E+08	6.92E+18	4.19E+18	2.93E+18	2.52E+18
6	2.73E+07	1.91E+08	7.75E+18	4.75E+18	3.42E+18	2.92E+18
7	2.82E+07	2.19E+08	8.69E+18	5.32E+18	3.85E+18	3.33E+18
8	2.70E+07	2.47E+08	9.63E+18	5.87E+18	4.24E+18	3.70E+18
9	2.50E+07	2.71E+08	1.05E+19	6.39E+18	4.61E+18	4.05E+18
10	3.77E+07	3.09E+08	1.17E+19	7.12E+18	5.17E+18	4.57E+18
11	2.68E+07	3.36E+08	1.24E+19	7.61E+18	5.57E+18	4.91E+18
12	2.52E+07	3.61E+08	1.31E+19	8.09E+18	5.92E+18	5.20E+18
13	2.55E+07	3.87E+08	1.37E+19	8.54E+18	6.27E+18	5.48E+18
14	2.72E+07	4.14E+08	1.44E+19	9.04E+18	6.66E+18	5.84E+18
15	2.54E+07	4.39E+08	1.51E+19	9.49E+18	7.00E+18	6.11E+18
16	2.70E+07	4.66E+08	1.56E+19	9.84E+18	7.30E+18	6.38E+18
17	2.65E+07	4.93E+08	1.61E+19	1.02E+19	7.61E+18	6.67E+18
18	2.67E+07	5.20E+08	1.66E+19	1.06E+19	7.93E+18	6.97E+18
19	2.62E+07	5.46E+08	1.70E+19	1.09E+19	8.24E+18	7.25E+18
20	2.79E+07	5.74E+08	1.76E+19	1.13E+19	8.59E+18	7.58E+18
21	2.84E+07	6.02E+08	1.81E+19	1.17E+19	8.92E+18	7.89E+18
22	2.36E+07	6.26E+08	1.85E+19	1.20E+19	9.25E+18	8.24E+18
23	2.89E+07	6.55E+08	1.90E+19	1.23E+19	9.58E+18	8.56E+18
24	4.94E+07	7.04E+08	1.99E+19	1.30E+19	1.02E+19	9.09E+18
25	4.19E+07	7.46E+08	2.06E+19	1.35E+19	1.07E+19	9.62E+18

Table 2.3-2

Lower Shell Forging (122W195)
Neutron Fluence (E > 1.0 MeV)
Point Beach Unit 2

Fuel Cycle	Cycle Time [efps]	Cumulative Time [efps]	Neutron Fluence [n/cm^2]			
			0 Deg.	15 deg.	30 Deg.	45 Deg.
1	4.80E+07	4.80E+07	2.15E+18	1.30E+18	8.85E+17	7.65E+17
2	3.31E+07	8.12E+07	3.65E+18	2.21E+18	1.53E+18	1.33E+18
3	2.75E+07	1.09E+08	4.87E+18	2.94E+18	2.06E+18	1.80E+18
4	2.74E+07	1.36E+08	5.99E+18	3.62E+18	2.54E+18	2.22E+18
5	2.79E+07	1.64E+08	7.15E+18	4.35E+18	3.05E+18	2.62E+18
6	2.73E+07	1.91E+08	8.01E+18	4.93E+18	3.56E+18	3.04E+18
7	2.82E+07	2.19E+08	8.97E+18	5.51E+18	4.00E+18	3.46E+18
8	2.70E+07	2.47E+08	9.95E+18	6.09E+18	4.42E+18	3.85E+18
9	2.50E+07	2.71E+08	1.09E+19	6.63E+18	4.80E+18	4.21E+18
10	3.77E+07	3.09E+08	1.21E+19	7.38E+18	5.38E+18	4.76E+18
11	2.68E+07	3.36E+08	1.28E+19	7.90E+18	5.80E+18	5.11E+18
12	2.52E+07	3.61E+08	1.35E+19	8.39E+18	6.17E+18	5.41E+18
13	2.55E+07	3.87E+08	1.42E+19	8.85E+18	6.52E+18	5.70E+18
14	2.72E+07	4.14E+08	1.49E+19	9.36E+18	6.92E+18	6.07E+18
15	2.54E+07	4.39E+08	1.55E+19	9.82E+18	7.28E+18	6.35E+18
16	2.70E+07	4.66E+08	1.61E+19	1.02E+19	7.59E+18	6.63E+18
17	2.65E+07	4.93E+08	1.67E+19	1.06E+19	7.91E+18	6.94E+18
18	2.67E+07	5.20E+08	1.73E+19	1.10E+19	8.25E+18	7.24E+18
19	2.62E+07	5.46E+08	1.78E+19	1.14E+19	8.57E+18	7.54E+18
20	2.79E+07	5.74E+08	1.84E+19	1.18E+19	8.93E+18	7.88E+18
21	2.84E+07	6.02E+08	1.90E+19	1.22E+19	9.27E+18	8.20E+18
22	2.36E+07	6.26E+08	1.95E+19	1.25E+19	9.61E+18	8.56E+18
23	2.89E+07	6.55E+08	2.01E+19	1.29E+19	9.95E+18	8.89E+18
24	4.94E+07	7.04E+08	2.11E+19	1.37E+19	1.06E+19	9.45E+18
25	4.19E+07	7.46E+08	2.19E+19	1.43E+19	1.11E+19	9.99E+18

Table 2.3-3

Intermediate Shell Plate (123V500)
Neutron Fluence (E > 1.0 MeV)
Point Beach Unit 2

Fuel Cycle	Cycle Time [efps]	Cumulative Time [efps]	Neutron Fluence [n/cm^2]			
			0 Deg.	15 deg.	30 Deg.	45 Deg.
1	4.80E+07	4.80E+07	2.11E+18	1.27E+18	8.98E+17	7.75E+17
2	3.31E+07	8.12E+07	3.53E+18	2.13E+18	1.54E+18	1.34E+18
3	2.75E+07	1.09E+08	4.67E+18	2.81E+18	2.06E+18	1.79E+18
4	2.74E+07	1.36E+08	5.77E+18	3.48E+18	2.55E+18	2.22E+18
5	2.79E+07	1.64E+08	6.92E+18	4.19E+18	3.06E+18	2.63E+18
6	2.73E+07	1.91E+08	7.76E+18	4.76E+18	3.57E+18	3.05E+18
7	2.82E+07	2.19E+08	8.72E+18	5.34E+18	4.02E+18	3.47E+18
8	2.70E+07	2.47E+08	9.67E+18	5.90E+18	4.43E+18	3.86E+18
9	2.50E+07	2.71E+08	1.06E+19	6.43E+18	4.82E+18	4.23E+18
10	3.77E+07	3.09E+08	1.18E+19	7.15E+18	5.40E+18	4.77E+18
11	2.68E+07	3.36E+08	1.25E+19	7.65E+18	5.82E+18	5.13E+18
12	2.52E+07	3.61E+08	1.32E+19	8.15E+18	6.19E+18	5.43E+18
13	2.55E+07	3.87E+08	1.38E+19	8.61E+18	6.55E+18	5.73E+18
14	2.72E+07	4.14E+08	1.46E+19	9.13E+18	6.97E+18	6.11E+18
15	2.54E+07	4.39E+08	1.52E+19	9.60E+18	7.33E+18	6.40E+18
16	2.70E+07	4.66E+08	1.59E+19	1.01E+19	7.65E+18	6.69E+18
17	2.65E+07	4.93E+08	1.66E+19	1.05E+19	7.99E+18	6.99E+18
18	2.67E+07	5.20E+08	1.73E+19	1.10E+19	8.33E+18	7.31E+18
19	2.62E+07	5.46E+08	1.80E+19	1.14E+19	8.66E+18	7.62E+18
20	2.79E+07	5.74E+08	1.87E+19	1.19E+19	9.03E+18	7.96E+18
21	2.84E+07	6.02E+08	1.94E+19	1.23E+19	9.38E+18	8.30E+18
22	2.36E+07	6.26E+08	2.00E+19	1.27E+19	9.74E+18	8.67E+18
23	2.89E+07	6.55E+08	2.07E+19	1.32E+19	1.01E+19	9.01E+18
24	4.94E+07	7.04E+08	2.19E+19	1.40E+19	1.07E+19	9.58E+18
25	4.19E+07	7.46E+08	2.29E+19	1.47E+19	1.13E+19	1.01E+19

Table 2.3-4

Intermediate Shell to Upper Shell Circumferential Weld (21935)
Neutron Fluence (E > 1.0 MeV)
Point Beach Unit 2

Fuel Cycle	Cycle Time [efps]	Cumulative Time [efps]	Neutron Fluence [n/cm^2]			
			0 Deg.	15 deg.	30 Deg.	45 Deg.
1	4.80E+07	4.80E+07	1.58E+17	9.49E+16	6.40E+16	5.53E+16
2	3.31E+07	8.12E+07	2.97E+17	1.79E+17	1.24E+17	1.08E+17
3	2.75E+07	1.09E+08	4.06E+17	2.44E+17	1.70E+17	1.49E+17
4	2.74E+07	1.36E+08	5.29E+17	3.19E+17	2.24E+17	1.95E+17
5	2.79E+07	1.64E+08	6.49E+17	3.93E+17	2.76E+17	2.37E+17
6	2.73E+07	1.91E+08	7.39E+17	4.54E+17	3.29E+17	2.81E+17
7	2.82E+07	2.19E+08	8.40E+17	5.15E+17	3.75E+17	3.24E+17
8	2.70E+07	2.47E+08	9.38E+17	5.73E+17	4.16E+17	3.63E+17
9	2.50E+07	2.71E+08	1.03E+18	6.28E+17	4.55E+17	4.00E+17
10	3.77E+07	3.09E+08	1.15E+18	6.99E+17	5.11E+17	4.51E+17
11	2.68E+07	3.36E+08	1.22E+18	7.54E+17	5.55E+17	4.89E+17
12	2.52E+07	3.61E+08	1.31E+18	8.10E+17	5.96E+17	5.23E+17
13	2.55E+07	3.87E+08	1.38E+18	8.62E+17	6.35E+17	5.55E+17
14	2.72E+07	4.14E+08	1.46E+18	9.17E+17	6.79E+17	5.95E+17
15	2.54E+07	4.39E+08	1.54E+18	9.76E+17	7.24E+17	6.31E+17
16	2.70E+07	4.66E+08	1.61E+18	1.02E+18	7.66E+17	6.69E+17
17	2.65E+07	4.93E+08	1.67E+18	1.07E+18	8.05E+17	7.05E+17
18	2.67E+07	5.20E+08	1.72E+18	1.11E+18	8.41E+17	7.38E+17
19	2.62E+07	5.46E+08	1.78E+18	1.15E+18	8.70E+17	7.65E+17
20	2.79E+07	5.74E+08	1.84E+18	1.18E+18	9.00E+17	7.93E+17
21	2.84E+07	6.02E+08	1.89E+18	1.22E+18	9.27E+17	8.18E+17
22	2.36E+07	6.26E+08	1.93E+18	1.25E+18	9.54E+17	8.47E+17
23	2.89E+07	6.55E+08	1.99E+18	1.29E+18	9.83E+17	8.74E+17
24	4.94E+07	7.04E+08	2.09E+18	1.36E+18	1.05E+18	9.32E+17
25	4.19E+07	7.46E+08	2.18E+18	1.42E+18	1.10E+18	9.86E+17

Table 2.3-5

Upper Shell Forging
Neutron Fluence (E > 1.0 MeV)
Point Beach Unit 2

Fuel Cycle	Cycle Time [efps]	Cumulative Time [efps]	Neutron Fluence [n/cm^2]			
			0 Deg.	15 deg.	30 Deg.	45 Deg.
1	4.80E+07	4.80E+07	1.58E+17	9.49E+16	6.40E+16	5.53E+16
2	3.31E+07	8.12E+07	2.97E+17	1.79E+17	1.24E+17	1.08E+17
3	2.75E+07	1.09E+08	4.06E+17	2.44E+17	1.70E+17	1.49E+17
4	2.74E+07	1.36E+08	5.29E+17	3.19E+17	2.24E+17	1.95E+17
5	2.79E+07	1.64E+08	6.49E+17	3.93E+17	2.76E+17	2.37E+17
6	2.73E+07	1.91E+08	7.39E+17	4.54E+17	3.29E+17	2.81E+17
7	2.82E+07	2.19E+08	8.40E+17	5.15E+17	3.75E+17	3.24E+17
8	2.70E+07	2.47E+08	9.38E+17	5.73E+17	4.16E+17	3.63E+17
9	2.50E+07	2.71E+08	1.03E+18	6.28E+17	4.55E+17	4.00E+17
10	3.77E+07	3.09E+08	1.15E+18	6.99E+17	5.11E+17	4.51E+17
11	2.68E+07	3.36E+08	1.22E+18	7.54E+17	5.55E+17	4.89E+17
12	2.52E+07	3.61E+08	1.31E+18	8.10E+17	5.96E+17	5.23E+17
13	2.55E+07	3.87E+08	1.38E+18	8.62E+17	6.35E+17	5.55E+17
14	2.72E+07	4.14E+08	1.46E+18	9.17E+17	6.79E+17	5.95E+17
15	2.54E+07	4.39E+08	1.54E+18	9.76E+17	7.24E+17	6.31E+17
16	2.70E+07	4.66E+08	1.61E+18	1.02E+18	7.66E+17	6.69E+17
17	2.65E+07	4.93E+08	1.67E+18	1.07E+18	8.05E+17	7.05E+17
18	2.67E+07	5.20E+08	1.72E+18	1.11E+18	8.41E+17	7.38E+17
19	2.62E+07	5.46E+08	1.78E+18	1.15E+18	8.70E+17	7.65E+17
20	2.79E+07	5.74E+08	1.84E+18	1.18E+18	9.00E+17	7.93E+17
21	2.84E+07	6.02E+08	1.89E+18	1.22E+18	9.27E+17	8.18E+17
22	2.36E+07	6.26E+08	1.93E+18	1.25E+18	9.54E+17	8.47E+17
23	2.89E+07	6.55E+08	1.99E+18	1.29E+18	9.83E+17	8.74E+17
24	4.94E+07	7.04E+08	2.09E+18	1.36E+18	1.05E+18	9.32E+17
25	4.19E+07	7.46E+08	2.18E+18	1.42E+18	1.10E+18	9.86E+17

Table 2.3-6

Intermediate Shell to Lower Shell Circumferential Weld (SA-1484)
Calculated Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.06E+19	1.35E+19	1.07E+19	9.62E+18
26.0	2.20E+19	1.45E+19	1.16E+19	1.05E+19
28.0	2.31E+19	1.53E+19	1.24E+19	1.12E+19
30.0	2.43E+19	1.62E+19	1.31E+19	1.19E+19
32.0	2.54E+19	1.70E+19	1.39E+19	1.26E+19
34.0	2.66E+19	1.78E+19	1.47E+19	1.34E+19
36.0	2.77E+19	1.87E+19	1.54E+19	1.41E+19
38.0	2.88E+19	1.95E+19	1.62E+19	1.48E+19
40.0	3.00E+19	2.03E+19	1.70E+19	1.55E+19
42.0	3.11E+19	2.11E+19	1.77E+19	1.63E+19
44.0	3.23E+19	2.20E+19	1.85E+19	1.70E+19
46.0	3.34E+19	2.28E+19	1.93E+19	1.77E+19
48.0	3.46E+19	2.36E+19	2.00E+19	1.84E+19
50.0	3.57E+19	2.45E+19	2.08E+19	1.91E+19
52.0	3.69E+19	2.53E+19	2.15E+19	1.99E+19
54.0	3.80E+19	2.61E+19	2.23E+19	2.06E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.06E+19	1.35E+19	1.07E+19	9.62E+18
26.0	2.28E+19	1.50E+19	1.18E+19	1.06E+19
28.0	2.47E+19	1.62E+19	1.27E+19	1.14E+19
30.0	2.66E+19	1.74E+19	1.37E+19	1.22E+19
32.0	2.84E+19	1.86E+19	1.46E+19	1.31E+19
34.0	3.03E+19	1.98E+19	1.55E+19	1.39E+19
36.0	3.22E+19	2.10E+19	1.65E+19	1.47E+19
38.0	3.40E+19	2.22E+19	1.74E+19	1.55E+19
40.0	3.59E+19	2.34E+19	1.83E+19	1.64E+19
42.0	3.77E+19	2.47E+19	1.93E+19	1.72E+19
44.0	3.96E+19	2.59E+19	2.02E+19	1.80E+19
46.0	4.15E+19	2.71E+19	2.11E+19	1.88E+19
48.0	4.33E+19	2.83E+19	2.21E+19	1.96E+19
50.0	4.52E+19	2.95E+19	2.30E+19	2.05E+19
52.0	4.71E+19	3.07E+19	2.39E+19	2.13E+19
54.0	4.89E+19	3.19E+19	2.49E+19	2.21E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 2.3-7

Lower Shell Forging (122W195)
Calculated Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.19E+19	1.43E+19	1.11E+19	9.99E+18
26.0	2.35E+19	1.53E+19	1.21E+19	1.09E+19
28.0	2.48E+19	1.62E+19	1.29E+19	1.16E+19
30.0	2.61E+19	1.72E+19	1.37E+19	1.24E+19
32.0	2.75E+19	1.81E+19	1.44E+19	1.31E+19
34.0	2.88E+19	1.90E+19	1.52E+19	1.39E+19
36.0	3.01E+19	1.99E+19	1.60E+19	1.46E+19
38.0	3.14E+19	2.08E+19	1.68E+19	1.54E+19
40.0	3.27E+19	2.17E+19	1.76E+19	1.61E+19
42.0	3.40E+19	2.26E+19	1.84E+19	1.69E+19
44.0	3.54E+19	2.35E+19	1.92E+19	1.76E+19
46.0	3.67E+19	2.44E+19	2.00E+19	1.84E+19
48.0	3.80E+19	2.54E+19	2.08E+19	1.91E+19
50.0	3.93E+19	2.63E+19	2.16E+19	1.99E+19
52.0	4.06E+19	2.72E+19	2.24E+19	2.06E+19
54.0	4.19E+19	2.81E+19	2.32E+19	2.14E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.19E+19	1.43E+19	1.11E+19	9.99E+18
26.0	2.42E+19	1.57E+19	1.23E+19	1.10E+19
28.0	2.61E+19	1.70E+19	1.32E+19	1.19E+19
30.0	2.81E+19	1.82E+19	1.42E+19	1.27E+19
32.0	3.00E+19	1.95E+19	1.52E+19	1.36E+19
34.0	3.19E+19	2.08E+19	1.61E+19	1.44E+19
36.0	3.38E+19	2.20E+19	1.71E+19	1.53E+19
38.0	3.58E+19	2.33E+19	1.81E+19	1.61E+19
40.0	3.77E+19	2.45E+19	1.91E+19	1.70E+19
42.0	3.96E+19	2.58E+19	2.00E+19	1.78E+19
44.0	4.15E+19	2.70E+19	2.10E+19	1.87E+19
46.0	4.34E+19	2.83E+19	2.20E+19	1.96E+19
48.0	4.54E+19	2.95E+19	2.29E+19	2.04E+19
50.0	4.73E+19	3.08E+19	2.39E+19	2.13E+19
52.0	4.92E+19	3.21E+19	2.49E+19	2.21E+19
54.0	5.11E+19	3.33E+19	2.58E+19	2.30E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 2.3-8

Intermediate Shell Forging (123V500)
Calculated Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.29E+19	1.47E+19	1.13E+19	1.01E+19
26.0	2.48E+19	1.59E+19	1.23E+19	1.10E+19
28.0	2.64E+19	1.69E+19	1.31E+19	1.18E+19
30.0	2.80E+19	1.80E+19	1.39E+19	1.26E+19
32.0	2.96E+19	1.90E+19	1.47E+19	1.33E+19
34.0	3.11E+19	2.01E+19	1.55E+19	1.41E+19
36.0	3.27E+19	2.11E+19	1.63E+19	1.49E+19
38.0	3.43E+19	2.21E+19	1.71E+19	1.56E+19
40.0	3.59E+19	2.32E+19	1.80E+19	1.64E+19
42.0	3.75E+19	2.42E+19	1.88E+19	1.72E+19
44.0	3.91E+19	2.53E+19	1.96E+19	1.80E+19
46.0	4.07E+19	2.63E+19	2.04E+19	1.87E+19
48.0	4.22E+19	2.73E+19	2.12E+19	1.95E+19
50.0	4.38E+19	2.84E+19	2.20E+19	2.03E+19
52.0	4.54E+19	2.94E+19	2.29E+19	2.10E+19
54.0	4.70E+19	3.05E+19	2.37E+19	2.18E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.29E+19	1.47E+19	1.13E+19	1.01E+19
26.0	2.52E+19	1.61E+19	1.24E+19	1.12E+19
28.0	2.71E+19	1.74E+19	1.34E+19	1.20E+19
30.0	2.90E+19	1.86E+19	1.44E+19	1.29E+19
32.0	3.09E+19	1.99E+19	1.54E+19	1.37E+19
34.0	3.28E+19	2.11E+19	1.64E+19	1.46E+19
36.0	3.47E+19	2.23E+19	1.73E+19	1.55E+19
38.0	3.66E+19	2.36E+19	1.83E+19	1.63E+19
40.0	3.85E+19	2.48E+19	1.93E+19	1.72E+19
42.0	4.04E+19	2.61E+19	2.03E+19	1.81E+19
44.0	4.23E+19	2.73E+19	2.13E+19	1.89E+19
46.0	4.42E+19	2.85E+19	2.22E+19	1.98E+19
48.0	4.61E+19	2.98E+19	2.32E+19	2.07E+19
50.0	4.81E+19	3.10E+19	2.42E+19	2.15E+19
52.0	5.00E+19	3.23E+19	2.52E+19	2.24E+19
54.0	5.19E+19	3.35E+19	2.62E+19	2.32E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 2.3-9

Intermediate Shell to Upper Shell Circumferential Weld (21935)
Calculated Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.18E+18	1.42E+18	1.10E+18	9.86E+17
26.0	2.33E+18	1.53E+18	1.20E+18	1.07E+18
28.0	2.47E+18	1.62E+18	1.27E+18	1.15E+18
30.0	2.60E+18	1.71E+18	1.35E+18	1.22E+18
32.0	2.73E+18	1.80E+18	1.43E+18	1.29E+18
34.0	2.86E+18	1.89E+18	1.51E+18	1.36E+18
36.0	2.99E+18	1.98E+18	1.59E+18	1.44E+18
38.0	3.12E+18	2.07E+18	1.66E+18	1.51E+18
40.0	3.25E+18	2.16E+18	1.74E+18	1.58E+18
42.0	3.39E+18	2.26E+18	1.82E+18	1.66E+18
44.0	3.52E+18	2.35E+18	1.90E+18	1.73E+18
46.0	3.65E+18	2.44E+18	1.98E+18	1.80E+18
48.0	3.78E+18	2.53E+18	2.05E+18	1.88E+18
50.0	3.91E+18	2.62E+18	2.13E+18	1.95E+18
52.0	4.04E+18	2.71E+18	2.21E+18	2.02E+18
54.0	4.17E+18	2.80E+18	2.29E+18	2.10E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.18E+18	1.42E+18	1.10E+18	9.86E+17
26.0	2.42E+18	1.58E+18	1.22E+18	1.09E+18
28.0	2.63E+18	1.71E+18	1.33E+18	1.18E+18
30.0	2.83E+18	1.84E+18	1.43E+18	1.27E+18
32.0	3.03E+18	1.98E+18	1.53E+18	1.36E+18
34.0	3.24E+18	2.11E+18	1.64E+18	1.45E+18
36.0	3.44E+18	2.25E+18	1.74E+18	1.54E+18
38.0	3.65E+18	2.38E+18	1.84E+18	1.63E+18
40.0	3.85E+18	2.51E+18	1.94E+18	1.72E+18
42.0	4.06E+18	2.65E+18	2.05E+18	1.82E+18
44.0	4.26E+18	2.78E+18	2.15E+18	1.91E+18
46.0	4.47E+18	2.91E+18	2.25E+18	2.00E+18
48.0	4.67E+18	3.05E+18	2.35E+18	2.09E+18
50.0	4.88E+18	3.18E+18	2.46E+18	2.18E+18
52.0	5.08E+18	3.32E+18	2.56E+18	2.27E+18
54.0	5.28E+18	3.45E+18	2.66E+18	2.36E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 2.3-10

Upper Shell Forging
Calculated Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	**15 deg.**	**30 Deg.**	**45 Deg.**
23.6	2.18E+18	1.42E+18	1.10E+18	9.86E+17
26.0	2.33E+18	1.53E+18	1.20E+18	1.07E+18
28.0	2.47E+18	1.62E+18	1.27E+18	1.15E+18
30.0	2.60E+18	1.71E+18	1.35E+18	1.22E+18
32.0	2.73E+18	1.80E+18	1.43E+18	1.29E+18
34.0	2.86E+18	1.89E+18	1.51E+18	1.36E+18
36.0	2.99E+18	1.98E+18	1.59E+18	1.44E+18
38.0	3.12E+18	2.07E+18	1.66E+18	1.51E+18
40.0	3.25E+18	2.16E+18	1.74E+18	1.58E+18
42.0	3.39E+18	2.26E+18	1.82E+18	1.66E+18
44.0	3.52E+18	2.35E+18	1.90E+18	1.73E+18
46.0	3.65E+18	2.44E+18	1.98E+18	1.80E+18
48.0	3.78E+18	2.53E+18	2.05E+18	1.88E+18
50.0	3.91E+18	2.62E+18	2.13E+18	1.95E+18
52.0	4.04E+18	2.71E+18	2.21E+18	2.02E+18
54.0	4.17E+18	2.80E+18	2.29E+18	2.10E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	**15 deg.**	**30 Deg.**	**45 Deg.**
23.6	2.18E+18	1.42E+18	1.10E+18	9.86E+17
26.0	2.42E+18	1.58E+18	1.22E+18	1.09E+18
28.0	2.63E+18	1.71E+18	1.33E+18	1.18E+18
30.0	2.83E+18	1.84E+18	1.43E+18	1.27E+18
32.0	3.03E+18	1.98E+18	1.53E+18	1.36E+18
34.0	3.24E+18	2.11E+18	1.64E+18	1.45E+18
36.0	3.44E+18	2.25E+18	1.74E+18	1.54E+18
38.0	3.65E+18	2.38E+18	1.84E+18	1.63E+18
40.0	3.85E+18	2.51E+18	1.94E+18	1.72E+18
42.0	4.06E+18	2.65E+18	2.05E+18	1.82E+18
44.0	4.26E+18	2.78E+18	2.15E+18	1.91E+18
46.0	4.47E+18	2.91E+18	2.25E+18	2.00E+18
48.0	4.67E+18	3.05E+18	2.35E+18	2.09E+18
50.0	4.88E+18	3.18E+18	2.46E+18	2.18E+18
52.0	5.08E+18	3.32E+18	2.56E+18	2.27E+18
54.0	5.28E+18	3.45E+18	2.66E+18	2.36E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 2.3-11

Intermediate Shell to Lower Shell Circumferential Weld (SA-1484)
Calculated Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.06E+19	1.35E+19	1.07E+19	9.62E+18
26.0	2.21E+19	1.46E+19	1.17E+19	1.06E+19
28.0	2.34E+19	1.55E+19	1.26E+19	1.14E+19
30.0	2.46E+19	1.64E+19	1.34E+19	1.22E+19
32.0	2.59E+19	1.74E+19	1.42E+19	1.30E+19
34.0	2.72E+19	1.83E+19	1.51E+19	1.38E+19
36.0	2.84E+19	1.92E+19	1.59E+19	1.46E+19
38.0	2.97E+19	2.01E+19	1.68E+19	1.54E+19
40.0	3.10E+19	2.10E+19	1.76E+19	1.62E+19
42.0	3.22E+19	2.19E+19	1.85E+19	1.70E+19
44.0	3.35E+19	2.29E+19	1.93E+19	1.77E+19
46.0	3.48E+19	2.38E+19	2.02E+19	1.85E+19
48.0	3.60E+19	2.47E+19	2.10E+19	1.93E+19
50.0	3.73E+19	2.56E+19	2.18E+19	2.01E+19
52.0	3.86E+19	2.65E+19	2.27E+19	2.09E+19
54.0	3.98E+19	2.75E+19	2.35E+19	2.17E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.06E+19	1.35E+19	1.07E+19	9.62E+18
26.0	2.31E+19	1.51E+19	1.19E+19	1.07E+19
28.0	2.51E+19	1.64E+19	1.30E+19	1.16E+19
30.0	2.72E+19	1.78E+19	1.40E+19	1.25E+19
32.0	2.92E+19	1.91E+19	1.50E+19	1.34E+19
34.0	3.13E+19	2.05E+19	1.61E+19	1.43E+19
36.0	3.34E+19	2.18E+19	1.71E+19	1.52E+19
38.0	3.54E+19	2.32E+19	1.81E+19	1.61E+19
40.0	3.75E+19	2.45E+19	1.91E+19	1.71E+19
42.0	3.95E+19	2.58E+19	2.02E+19	1.80E+19
44.0	4.16E+19	2.72E+19	2.12E+19	1.89E+19
46.0	4.37E+19	2.85E+19	2.22E+19	1.98E+19
48.0	4.57E+19	2.99E+19	2.33E+19	2.07E+19
50.0	4.78E+19	3.12E+19	2.43E+19	2.16E+19
52.0	4.98E+19	3.25E+19	2.53E+19	2.25E+19
54.0	5.19E+19	3.39E+19	2.64E+19	2.34E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 2.3-12

Lower Shell Forging (122W195)
Calculated Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.19E+19	1.43E+19	1.11E+19	9.99E+18
26.0	2.37E+19	1.54E+19	1.22E+19	1.10E+19
28.0	2.51E+19	1.64E+19	1.30E+19	1.18E+19
30.0	2.66E+19	1.75E+19	1.39E+19	1.26E+19
32.0	2.80E+19	1.85E+19	1.48E+19	1.35E+19
34.0	2.95E+19	1.95E+19	1.57E+19	1.43E+19
36.0	3.09E+19	2.05E+19	1.66E+19	1.51E+19
38.0	3.24E+19	2.15E+19	1.74E+19	1.59E+19
40.0	3.39E+19	2.25E+19	1.83E+19	1.68E+19
42.0	3.53E+19	2.35E+19	1.92E+19	1.76E+19
44.0	3.68E+19	2.45E+19	2.01E+19	1.84E+19
46.0	3.82E+19	2.55E+19	2.09E+19	1.92E+19
48.0	3.97E+19	2.65E+19	2.18E+19	2.01E+19
50.0	4.11E+19	2.75E+19	2.27E+19	2.09E+19
52.0	4.26E+19	2.85E+19	2.36E+19	2.17E+19
54.0	4.41E+19	2.95E+19	2.44E+19	2.26E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.19E+19	1.43E+19	1.11E+19	9.99E+18
26.0	2.45E+19	1.59E+19	1.24E+19	1.11E+19
28.0	2.66E+19	1.73E+19	1.35E+19	1.21E+19
30.0	2.87E+19	1.87E+19	1.45E+19	1.30E+19
32.0	3.08E+19	2.01E+19	1.56E+19	1.39E+19
34.0	3.30E+19	2.14E+19	1.67E+19	1.49E+19
36.0	3.51E+19	2.28E+19	1.77E+19	1.58E+19
38.0	3.72E+19	2.42E+19	1.88E+19	1.68E+19
40.0	3.93E+19	2.56E+19	1.99E+19	1.77E+19
42.0	4.15E+19	2.70E+19	2.10E+19	1.87E+19
44.0	4.36E+19	2.84E+19	2.20E+19	1.96E+19
46.0	4.57E+19	2.98E+19	2.31E+19	2.06E+19
48.0	4.78E+19	3.12E+19	2.42E+19	2.15E+19
50.0	5.00E+19	3.25E+19	2.52E+19	2.24E+19
52.0	5.21E+19	3.39E+19	2.63E+19	2.34E+19
54.0	5.42E+19	3.53E+19	2.74E+19	2.43E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 2.3-13

Intermediate Shell Forging (123V500)
Calculated Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.29E+19	1.47E+19	1.13E+19	1.01E+19
26.0	2.50E+19	1.60E+19	1.24E+19	1.11E+19
28.0	2.68E+19	1.72E+19	1.33E+19	1.20E+19
30.0	2.85E+19	1.83E+19	1.42E+19	1.28E+19
32.0	3.03E+19	1.95E+19	1.51E+19	1.37E+19
34.0	3.20E+19	2.06E+19	1.60E+19	1.45E+19
36.0	3.38E+19	2.18E+19	1.69E+19	1.54E+19
38.0	3.55E+19	2.29E+19	1.78E+19	1.62E+19
40.0	3.73E+19	2.41E+19	1.87E+19	1.71E+19
42.0	3.90E+19	2.52E+19	1.96E+19	1.79E+19
44.0	4.08E+19	2.64E+19	2.05E+19	1.88E+19
46.0	4.25E+19	2.75E+19	2.14E+19	1.96E+19
48.0	4.43E+19	2.87E+19	2.23E+19	2.05E+19
50.0	4.60E+19	2.98E+19	2.32E+19	2.13E+19
52.0	4.78E+19	3.10E+19	2.41E+19	2.22E+19
54.0	4.95E+19	3.21E+19	2.50E+19	2.30E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.29E+19	1.47E+19	1.13E+19	1.01E+19
26.0	2.54E+19	1.63E+19	1.26E+19	1.13E+19
28.0	2.75E+19	1.77E+19	1.37E+19	1.22E+19
30.0	2.96E+19	1.90E+19	1.47E+19	1.32E+19
32.0	3.17E+19	2.04E+19	1.58E+19	1.41E+19
34.0	3.38E+19	2.18E+19	1.69E+19	1.51E+19
36.0	3.60E+19	2.31E+19	1.80E+19	1.60E+19
38.0	3.81E+19	2.45E+19	1.91E+19	1.70E+19
40.0	4.02E+19	2.59E+19	2.01E+19	1.79E+19
42.0	4.23E+19	2.73E+19	2.12E+19	1.89E+19
44.0	4.44E+19	2.86E+19	2.23E+19	1.99E+19
46.0	4.65E+19	3.00E+19	2.34E+19	2.08E+19
48.0	4.86E+19	3.14E+19	2.45E+19	2.18E+19
50.0	5.07E+19	3.27E+19	2.56E+19	2.27E+19
52.0	5.28E+19	3.41E+19	2.66E+19	2.37E+19
54.0	5.49E+19	3.55E+19	2.77E+19	2.46E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 2.3-14

Intermediate Shell to Upper Shell Circumferential Weld (21935)
Calculated Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.18E+18	1.42E+18	1.10E+18	9.86E+17
26.0	2.35E+18	1.54E+18	1.21E+18	1.08E+18
28.0	2.50E+18	1.64E+18	1.29E+18	1.16E+18
30.0	2.64E+18	1.74E+18	1.38E+18	1.24E+18
32.0	2.79E+18	1.84E+18	1.46E+18	1.32E+18
34.0	2.93E+18	1.94E+18	1.55E+18	1.40E+18
36.0	3.08E+18	2.04E+18	1.64E+18	1.49E+18
38.0	3.22E+18	2.14E+18	1.72E+18	1.57E+18
40.0	3.37E+18	2.24E+18	1.81E+18	1.65E+18
42.0	3.51E+18	2.34E+18	1.90E+18	1.73E+18
44.0	3.66E+18	2.44E+18	1.98E+18	1.81E+18
46.0	3.80E+18	2.55E+18	2.07E+18	1.89E+18
48.0	3.95E+18	2.65E+18	2.15E+18	1.97E+18
50.0	4.09E+18	2.75E+18	2.24E+18	2.05E+18
52.0	4.24E+18	2.85E+18	2.33E+18	2.13E+18
54.0	4.38E+18	2.95E+18	2.41E+18	2.21E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.18E+18	1.42E+18	1.10E+18	9.86E+17
26.0	2.45E+18	1.59E+18	1.24E+18	1.10E+18
28.0	2.67E+18	1.74E+18	1.35E+18	1.20E+18
30.0	2.90E+18	1.89E+18	1.46E+18	1.30E+18
32.0	3.12E+18	2.04E+18	1.58E+18	1.40E+18
34.0	3.35E+18	2.18E+18	1.69E+18	1.50E+18
36.0	3.58E+18	2.33E+18	1.80E+18	1.60E+18
38.0	3.80E+18	2.48E+18	1.92E+18	1.70E+18
40.0	4.03E+18	2.63E+18	2.03E+18	1.80E+18
42.0	4.25E+18	2.78E+18	2.15E+18	1.90E+18
44.0	4.48E+18	2.92E+18	2.26E+18	2.00E+18
46.0	4.71E+18	3.07E+18	2.37E+18	2.10E+18
48.0	4.93E+18	3.22E+18	2.49E+18	2.20E+18
50.0	5.16E+18	3.37E+18	2.60E+18	2.30E+18
52.0	5.39E+18	3.51E+18	2.71E+18	2.40E+18
54.0	5.61E+18	3.66E+18	2.83E+18	2.50E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 2.3-15

Upper Shell Forging
Calculated Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.18E+18	1.42E+18	1.10E+18	9.86E+17
26.0	2.35E+18	1.54E+18	1.21E+18	1.08E+18
28.0	2.50E+18	1.64E+18	1.29E+18	1.16E+18
30.0	2.64E+18	1.74E+18	1.38E+18	1.24E+18
32.0	2.79E+18	1.84E+18	1.46E+18	1.32E+18
34.0	2.93E+18	1.94E+18	1.55E+18	1.40E+18
36.0	3.08E+18	2.04E+18	1.64E+18	1.49E+18
38.0	3.22E+18	2.14E+18	1.72E+18	1.57E+18
40.0	3.37E+18	2.24E+18	1.81E+18	1.65E+18
42.0	3.51E+18	2.34E+18	1.90E+18	1.73E+18
44.0	3.66E+18	2.44E+18	1.98E+18	1.81E+18
46.0	3.80E+18	2.55E+18	2.07E+18	1.89E+18
48.0	3.95E+18	2.65E+18	2.15E+18	1.97E+18
50.0	4.09E+18	2.75E+18	2.24E+18	2.05E+18
52.0	4.24E+18	2.85E+18	2.33E+18	2.13E+18
54.0	4.38E+18	2.95E+18	2.41E+18	2.21E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.18E+18	1.42E+18	1.10E+18	9.86E+17
26.0	2.45E+18	1.59E+18	1.24E+18	1.10E+18
28.0	2.67E+18	1.74E+18	1.35E+18	1.20E+18
30.0	2.90E+18	1.89E+18	1.46E+18	1.30E+18
32.0	3.12E+18	2.04E+18	1.58E+18	1.40E+18
34.0	3.35E+18	2.18E+18	1.69E+18	1.50E+18
36.0	3.58E+18	2.33E+18	1.80E+18	1.60E+18
38.0	3.80E+18	2.48E+18	1.92E+18	1.70E+18
40.0	4.03E+18	2.63E+18	2.03E+18	1.80E+18
42.0	4.25E+18	2.78E+18	2.15E+18	1.90E+18
44.0	4.48E+18	2.92E+18	2.26E+18	2.00E+18
46.0	4.71E+18	3.07E+18	2.37E+18	2.10E+18
48.0	4.93E+18	3.22E+18	2.49E+18	2.20E+18
50.0	5.16E+18	3.37E+18	2.60E+18	2.30E+18
52.0	5.39E+18	3.51E+18	2.71E+18	2.40E+18
54.0	5.61E+18	3.66E+18	2.83E+18	2.50E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

3.0 Neutron Dosimetry Evaluations

3.1 Method of Analysis

Evaluations of neutron sensor sets contained in the in-vessel and ex-vessel dosimetry capsules withdrawn to date from the Point Beach Units 1 and 2 reactors were evaluated using the current state of the art least squares methodology.

Least squares adjustment methods provide the capability of combining the measurement data with the neutron transport calculation resulting in a best estimate neutron energy spectrum with associated uncertainties. Best estimates for key exposure parameters such as $\phi(E > 1.0\ MeV)$ along with their uncertainties are then easily obtained from the adjusted spectrum. In general, the least squares methods, as applied to reactor dosimetry evaluations, act to reconcile the measured sensor reaction rate data, dosimetry reaction cross-sections, and the calculated neutron energy spectrum within their respective uncertainties. For example,

$$R_i \pm \delta_{R_i} = \sum_g (\sigma_{ig} \pm \delta_{\sigma_{ig}})(\phi_g \pm \delta_{\phi_g})$$

relates a set of measured reaction rates, R_i, to a single neutron spectrum, ϕ_g, through the multigroup dosimeter reaction cross-section, σ_{ig}, each with an uncertainty δ. The primary objective of the least squares evaluation is to produce unbiased estimates of the neutron exposure parameters at the location of the measurement.

For the least squares evaluation of the Point Beach Units 1 and 2 dosimetry, the FERRET code[57] was employed to combine the results of the plant specific neutron transport calculations and sensor set reaction rate measurements to determine best estimate values of exposure parameters along with associated uncertainties.

The application of the least squares methodology requires the following input:

1 - The calculated neutron energy spectrum and associated uncertainties at the measurement location.

2 - The measured reaction rates and associated uncertainty for each sensor contained in the multiple foil set.

3 - The energy dependent dosimetry reaction cross-sections and associated uncertainties for each sensor contained in the multiple foil sensor set.

For the current application, the calculated neutron spectrum at each measurement location was obtained from the results of plant specific neutron transport calculations described in Section 2.0 of this report. The spectrum at each sensor set location was input in an absolute sense (rather than as simply a relative spectral shape). Therefore, within the constraints of the assigned uncertainties, the calculated data were treated equally with the measurements. The sensor reaction rates were derived from the measured specific activities of each sensor set and the operating history of the respective reactors. The dosimetry reaction cross-sections were obtained from the SNLRML dosimetry cross-section library[58].

In addition to the magnitude of the calculated neutron spectra, the measured sensor set reaction rates, and the dosimeter set reaction cross-sections, the least squares procedure requires uncertainty estimates for each of these input parameters. The following provides a summary of the uncertainties associated with the least squares evaluation of the Point Beach Units 1 and 2 dosimetry.

Reaction Rate Uncertainties

The overall uncertainty associated with the measured reaction rates includes components due to the basic measurement process, the irradiation history corrections, and the corrections for competing reactions. A high level of accuracy in the reaction rate determinations is assured by utilizing laboratory procedures that conform to the ASTM National Consensus Standards for reaction rate determinations for each sensor type.

After combining all of these uncertainty components, the sensor reaction rates derived from the counting and data evaluation procedures were assigned the following net uncertainties for input to the least squares evaluation:

Reaction	Uncertainty
$Cu^{63}(n,\alpha)Co^{60}$	5%
$Fe^{54}(n,p)Mn^{54}$	5%
$Ni^{58}(n,p)Co^{58}$	5%
$U^{238}(n,f)Cs^{137}$	10%
$Np^{237}(n,f)Cs^{137}$	10%
$Co^{59}(n,\gamma)Co^{60}$	5%

These uncertainties are given at the 1σ level.

Dosimetry Cross-Section Uncertainties

As noted above, the reaction rate cross-sections used in the least squares evaluations were taken from the SNLRML library. This data library provides reaction cross-sections and associated uncertainties, including covariances, for 66 dosimetry sensors in common use. Both cross-sections and uncertainties are provided in a fine multigroup structure for use in least squares adjustment applications. These cross-sections were compiled from the most recent cross-section evaluations and they have been tested with respect to their accuracy and consistency for least squares evaluations. Further, the library has been empirically tested for use in fission spectra determination as well as in the fluence and energy characterization of 14 MeV neutron sources. Detailed discussions of the contents of the SNLRML library along with the evaluation process for each of the sensors is provided in Reference 58.

For sensors included in the Point Beach Units 1 and 2 dosimetry sets, the following uncertainties in the fission spectrum averaged cross-sections are provided in the SNLRML documentation package.

Reaction	Uncertainty
$Cu^{63}(n,\alpha)Co^{60}$	4.08-4.16%
$Fe^{54}(n,p)Mn^{54}$	3.05-3.11%
$Ni^{58}(n,p)Co^{58}$	4.49-4.56%
$U^{238}(n,f)FP$	0.54-0.64%
$Np^{237}(n,f)FP$	10.32-10.97%
$Co^{59}(n,\gamma)Co^{60}$	0.79-3.59%

These tabulated ranges provide an indication of the dosimetry cross-section uncertainties associated with the sensor sets used in LWR irradiations.

Calculated Neutron Spectrum Uncertainties
While the uncertainties associated with the reaction rates were obtained from the measurement procedures and counting benchmarks and the dosimetry cross-section uncertainties were supplied directly with the SNLRML library, the uncertainty matrix for the calculated spectrum was constructed from the following relationship:

$$M_{gg'} = R_n^2 + R_g * R_{g'} * P_{gg'}$$

where R_n specifies an overall fractional normalization uncertainty and the fractional uncertainties $R_{g'}$ and R_g specify additional random groupwise uncertainties that are correlated with a correlation matrix given by:

$$P_{gg'} = [1-\theta]\delta_{gg'} + \theta e^{-H}$$

where

$$H = \frac{(g-g')^2}{2\gamma^2}$$

The first term in the correlation matrix equation specifies purely random uncertainties, while the second term describes the short range correlations over a group range γ (θ specifies the strength of the latter term). The value of δ is 1.0 when g = g' and 0.0 otherwise.

The set of parameters defining the input covariance matrix for the Point Beach Units 1 and calculated spectra was as follows:

Flux Normalization Uncertainty (R_n)	15%
Flux Group Uncertainties (R_g, $R_{g'}$)	
(E > 0.0055 MeV)	15%
(0.68 eV < E < 0.0055 MeV)	29%
(E < 0.68 eV)	52%
Short Range Correlation (θ)	
(E > 0.0055 MeV)	0.9
(0.68 eV < E < 0.0055 MeV)	0.5
(E < 0.68 eV)	0.5

Flux Group Correlation Range (γ)	
(E > 0.0055 MeV)	6
(0.68 eV < E < 0.0055 MeV)	3
(E < 0.68 eV)	2

These uncertainty assignments are consistent with an industry consensus uncertainty of 15-20% (1σ) for the fast neutron portion of the spectrum and provide for a reasonable increase in the uncertainty for neutrons in the intermediate and thermal energy ranges.

3.2 Dosimetry Evaluations for Point Beach Unit 1

During the course of first 27 operating fuel cycles at Point Beach Unit 1, four in-vessel and 20 ex-vessel sensor sets were irradiated at the core midplane elevation and subsequently withdrawn for analysis. A summary of the locations and time of irradiation of each of these multiple foil sensor sets is provided in Table 3.2-1.

In this section, comparisons of the measurement results from each of the sensor set irradiations with corresponding analytical prediction at the measurement locations are presented. These comparisons are provided on two levels. In the first instance calculations of individual sensor reaction rates are compared directly with the measured data from the counting laboratories. This level of comparison is not impacted by the least squares evaluations of the sensor sets. In the second instance, calculated values of neutron exposure rates in terms of ϕ(E > 1.0 MeV) are compared with the best estimate exposure rates obtained from the least squares evaluation.

In Table 3.2-2, comparisons of measured to calculation (M/C) ratios are listed for the threshold sensors contained in in-vessel capsules S, R, and T. Data from capsule V, the first capsule withdrawn from Point Beach Unit 1, was not included in the comparisons, since the original capsule report did not provide sufficient information to upgrade the data evaluation to current methodology and nuclear data. From Table 3.2-2, it is noted that for the individual threshold foils the average M/C ratio ranges from 0.94 to 1.16 with an overall average of 1.03 with an associated standard devistion of 8.1%. In this case, the overall average was based on an equal weighting of each of the sensor types with no adjustments made to account for the spectral coverage of the individual sensors.

In Table 3.2-3 similar comparisons are provided for the twenty sensor sets withdrawn from the core midplane elevation in the reactor cavity. From Table 3.2-3, it is noted that for the individual threshold foils the average M/C ratio ranges from 0.84 to 0.95 with an overall average of 0.88 with an associated standard devistion of 5.6%. As in the case of the in-vessel comparisons, the overall average was based on an equal weighting of each of the sensor types with no adjustments made to account for the spectral coverage of the individual sensors.

In Tables 3.2-4 and 3.2-5, best estimate to calculation (BE/C) ratios for fast neutron flux (E > 1.0 MeV) resulting from the least squares evaluation of each dosimetry set are provided for the in-vessel and ex-vessel irradiations, respectively. For the in-vessel capsules the average BE/C ratio is seen to be 1.02 with an associated uncertainty of 6.7%. The corresponding average BE/C ratio from the ex-vessel irradiations is 0.86 with an uncertainty of 10.6%.

Table 3.2-1

Location and Time of Irradiation for Sensor Sets Withdrawn from Point Beach Unit 1

Capsule ID		Azimuthal Location	Axial Elevation	Cycles of Irradiation
V	In-Vessel	13 Deg.	Core Midplane	1
S	In-Vessel	23 Deg.	Core Midplane	1-3
R	In-Vessel	13 Deg.	Core Midplane	1-5
T	In-Vessel	33 Deg.	Core Midplane	1-11
17-1	Ex-Vessel	0 Deg.	Core Midplane	17
17-2	Ex-Vessel	15 Deg.	Core Midplane	17
17-3	Ex-Vessel	30 Deg.	Core Midplane	17
17-4	Ex-Vessel	45 Deg.	Core Midplane	17
18-1	Ex-Vessel	0 Deg.	Core Midplane	18
18-2	Ex-Vessel	15 Deg.	Core Midplane	18
18-3	Ex-Vessel	30 Deg.	Core Midplane	18
18-4	Ex-Vessel	45 Deg.	Core Midplane	18
19-1	Ex-Vessel	0 Deg.	Core Midplane	19
19-2	Ex-Vessel	15 Deg.	Core Midplane	19
19-3	Ex-Vessel	30 Deg.	Core Midplane	19
19-4	Ex-Vessel	45 Deg.	Core Midplane	19
22-1	Ex-Vessel	0 Deg.	Core Midplane	20-22
22-2	Ex-Vessel	15 Deg.	Core Midplane	20-22
22-3	Ex-Vessel	30 Deg.	Core Midplane	20-22
22-4	Ex-Vessel	45 Deg.	Core Midplane	20-22
24-1	Ex-Vessel	0 Deg.	Core Midplane	23-24
24-2	Ex-Vessel	15 Deg.	Core Midplane	23-24
24-3	Ex-Vessel	30 Deg.	Core Midplane	23-24
24-4	Ex-Vessel	45 Deg.	Core Midplane	23-24

Table 3.2-2

Comparison of Measure and Calculated Threshold Foil Reaction Rates
In-Vessel Capsules – Point Beach Unit 1

Capsule	M/C Ratio				
	$^{63}Cu(n,\alpha)$	$^{54}Fe(n,p)$	$^{58}Ni(n,p)$	$^{238}U(n,f)$	$^{237}Np(n,f)$
V					
S	1.01	0.97	0.86	0.91	1.11
R	1.06	1.04	1.03	1.06	1.15
T	1.08	1.01		1.02	1.24
Average	**1.05**	**1.01**	**0.94**	**1.00**	**1.16**
% std dev	**3.6**	**3.1**	**12.8**	**8.0**	**5.5**

Reaction	Average M/C	% Standard Deviation
$^{63}Cu(n,\alpha)$	1.05	3.6
$^{54}Fe(n,p)$	1.01	3.1
$^{58}Ni(n,p)$	0.94	12.8
$^{238}U(n,f)$	1.00	8.0
$^{237}Np(n,f)$	1.16	5.5
Linear Average	**1.03**	**8.1**

Table 3.2-3

Comparison of Measure and Calculated Threshold Foil Reaction Rates
Ex-Vessel Capsules – Point Beach Unit 1

Capsule	M/C Ratio				
	$^{63}Cu(n,\alpha)$	$^{54}Fe(n,p)$	$^{58}Ni(n,p)$	$^{238}U(n,f)$	$^{237}Np(n,f)$
17-1	0.80	0.75	0.73	0.68	0.87
17-2	0.89	0.80	0.79	0.77	0.88
17-3	0.96	0.87	0.86	0.83	0.99
17-4	0.97	0.88	0.89	0.89	1.07
18-1	0.76	0.73	0.72	0.69	0.79
18-2	0.90	0.84	0.83	0.82	0.91
18-3	1.00	0.92	0.95	0.88	1.14
18-4	1.00	0.94	0.95	0.92	1.10
19-1	0.79	0.73	0.72	0.71	0.89
19-2	0.92	0.84	0.81	0.83	0.94
19-3	1.03	0.92	0.91	1.00	1.04
19-4	1.00	0.93	0.92	0.96	1.22
22-1	0.80	0.74	0.73	0.70	
22-2	0.89	0.79	0.81	0.76	
22-3	0.98	0.93	0.92	0.89	0.83
22-4	1.03	0.93	0.95	0.91	0.91
24-1	0.75	0.71	0.69	0.74	0.67
24-2	0.90	0.84	0.84	0.91	
24-3	0.97	0.95	0.90	1.00	0.96
24-4	1.01	0.94	0.94	1.07	
Average	**0.92**	**0.85**	**0.84**	**0.85**	**0.95**
% std dev	**10.1**	**9.9**	**10.5**	**13.3**	**14.7**

Reaction	Average M/C	% Standard Deviation
$^{63}Cu(n,\alpha)$	0.92	10.1
$^{54}Fe(n,p)$	0.85	9.9
$^{58}Ni(n,p)$	0.84	10.5
$^{238}U(n,f)$	0.85	13.3
$^{237}Np(n,f)$	0.95	14.7
Linear Average	**0.88**	**5.6**

Table 3.2-4

Comparison of Best Estimate and Calculated Neutron Flux (E > 1.0 MeV)
In-Vessel Capsules – Point Beach Unit 1

Capsule	BE/C	% Standard Deviation
V		
S	0.94	7.0
R	1.06	7.0
T	1.06	7.0
Average	**1.02**	**6.7**

Table 3.2-5

Comparison of Best Estimate and Calculated Neutron Flux (E > 1.0 MeV)
Ex-Vessel Capsules – Point Beach Unit 1

Reaction	BE/C	% Standard Deviation
17-1	0.75	7.0
17-2	0.80	7.0
17-3	0.87	7.0
17-4	0.91	7.0
18-1	0.73	7.0
18-2	0.84	7.0
18-3	0.95	7.0
18-4	0.96	7.0
19-1	0.75	7.0
19-2	0.84	7.0
19-3	0.94	7.0
19-4	0.98	7.0
22-1	0.74	7.0
22-2	0.81	7.0
22-3	0.91	7.0
22-4	0.94	7.0
24-1	0.70	7.0
24-2	0.85	7.0
24-3	0.94	7.0
24-4	0.96	7.0
Average	**0.86**	**10.6**

3.3 Dosimetry Evaluations for Point Beach Unit 2

During the course of first 25 operating fuel cycles at Point Beach Unit 2, four in-vessel and 20 ex-vessel sensor sets were irradiated at the core midplane elevation and subsequently withdrawn for analysis. A summary of the locations and time of irradiation of each of these multiple foil sensor sets is provided in Table 3.3-1.

In this section, comparisons of the measurement results from each of the sensor set irradiations with corresponding analytical prediction at the measurement locations are presented. These comparisons are provided on two levels. In the first instance calculations of individual sensor reaction rates are compared directly with the measured data from the counting laboratories. This level of comparison is not impacted by the least squares evaluations of the sensor sets. In the second instance, calculated values of neutron exposure rates in terms of $\phi(E > 1.0 \text{ MeV})$ are compared with the best estimate exposure rates obtained from the least squares evaluation.

In Table 3.3-2, comparisons of measured to calculation (M/C) ratios are listed for the threshold sensors contained in in-vessel capsules V, S, R, and T. From Table 3.2-2, it is noted that for the individual threshold foils the average M/C ratio ranges from 0.97 to 1.09 with an overall average of 1.01 with an associated standard devistion of 2.8%. In this case, the overall average was based on an equal weighting of each of the sensor types with no adjustments made to account for the spectral coverage of the individual sensors.

In Table 3.3-3 similar comparisons are provided for the twenty sensor sets withdrawn from the core midplane elevation in the reactor cavity. From Table 3.3-3, it is noted that for the individual threshold foils the average M/C ratio ranges from 0.89 to 0.99 with an overall average of 0.93 with an associated standard devistion of 4.6%. As in the case of the in-vessel comparisons, the overall average was based on an equal weighting of each of the sensor types with no adjustments made to account for the spectral coverage of the individual sensors.

In Tables 3.3-4 and 3.3-5, best estimate to calculation (BE/C) ratios for fast neutron flux (E > 1.0 MeV) resulting from the least squares evaluation of each dosimetry set are provided for the in-vessel and ex-vessel irradiations, respectively. For the in-vessel capsules the average BE/C ratio is seen to be 1.01 with an associated uncertainty of 0.6%. The corresponding average BE/C ratio from the ex-vessel irradiations is 0.91 with an uncertainty of 3.3%.

Table 3.3-1

Location and Time of Irradiation for Sensor Sets Withdrawn from Point Beach Unit 2

Capsule ID		Azimuthal Location	Axial Elevation	Cycles of Irradiation
V	In-Vessel	13 Deg.	Core Midplane	1
T	In-Vessel	23 Deg.	Core Midplane	1-3
R	In-Vessel	13 Deg.	Core Midplane	1-5
S	In-Vessel	33 Deg.	Core Midplane	1-16
15-1	Ex-Vessel	0 Deg.	Core Midplane	15
15-2	Ex-Vessel	15 Deg.	Core Midplane	15
15-3	Ex-Vessel	30 Deg.	Core Midplane	15
15-4	Ex-Vessel	45 Deg.	Core Midplane	15
16-1	Ex-Vessel	0 Deg.	Core Midplane	16
16-2	Ex-Vessel	15 Deg.	Core Midplane	16
16-3	Ex-Vessel	30 Deg.	Core Midplane	16
16-4	Ex-Vessel	45 Deg.	Core Midplane	16
17-1	Ex-Vessel	0 Deg.	Core Midplane	17
17-2	Ex-Vessel	15 Deg.	Core Midplane	17
17-3	Ex-Vessel	30 Deg.	Core Midplane	17
17-4	Ex-Vessel	45 Deg.	Core Midplane	17
20-1	Ex-Vessel	0 Deg.	Core Midplane	18-20
20-2	Ex-Vessel	15 Deg.	Core Midplane	18-20
20-3	Ex-Vessel	30 Deg.	Core Midplane	18-20
20-4	Ex-Vessel	45 Deg.	Core Midplane	18-20
23-1	Ex-Vessel	0 Deg.	Core Midplane	21-23
23-2	Ex-Vessel	15 Deg.	Core Midplane	21-23
23-3	Ex-Vessel	30 Deg.	Core Midplane	21-23
23-4	Ex-Vessel	45 Deg.	Core Midplane	21-23

Table 3.3-2

Comparison of Measure and Calculated Threshold Foil Reaction Rates
In-Vessel Capsules – Point Beach Unit 2

Capsule	M/C Ratio				
	^{63}Cu(n,α)	^{54}Fe(n,p)	^{58}Ni(n,p)	^{238}U(n,f)	^{237}Np(n,f)
V	0.92	0.92		1.11	1.05
T	0.95	1.00	0.98	0.98	1.11
R	1.01	0.97	1.00	1.03	1.12
S	1.05		0.92	1.09	1.09
Average	**0.98**	**0.97**	**0.97**	**1.05**	**1.09**
% std dev	**6.1**	**4.0**	**4.3**	**5.8**	**2.8**

Reaction	Average M/C	% Standard Deviation
^{63}Cu(n,α)	0.98	6.1
^{54}Fe(n,p)	0.97	4.0
^{58}Ni(n,p)	0.97	4.3
^{238}U(n,f)	1.05	5.8
^{237}Np(n,f)	1.09	2.8
Linear Average	**1.01**	**5.7**

Table 3.3-3

Comparison of Measure and Calculated Threshold Foil Reaction Rates
Ex-Vessel Capsules – Point Beach Unit 2

Capsule	M/C Ratio				
	^{63}Cu(n,α)	^{54}Fe(n,p)	^{58}Ni(n,p)	^{238}U(n,f)	^{237}Np(n,f)
15-1	0.91	0.87	0.88	0.86	0.94
15-2	1.01	0.94	0.95	0.94	1.03
15-3	0.95	0.94	0.91	0.91	1.03
15-4	1.02	0.92	0.95	0.96	1.09
16-1	0.90	0.84	0.85	0.88	0.97
16-2	0.95	0.87	0.89	0.97	0.98
16-3	1.00	0.93	0.93	0.92	1.01
16-4	1.02	0.95	0.96	0.94	1.15
17-1	0.93	0.87	0.87	0.81	0.99
17-2	0.99	0.92	0.91	0.89	0.91
17-3	0.96	0.91	0.91	0.92	0.99
17-4	1.01	0.93	0.93	0.88	0.95
20-1	0.93	0.85	0.87	0.85	0.87
20-2	0.98	0.87	0.88	0.92	0.95
20-3	0.98	0.87	0.89	0.89	0.98
20-4	0.98	0.86	0.89	0.89	0.98
23-1	0.90	0.89	0.89	0.90	
23-2	0.94	0.89	0.90	0.95	
23-3	0.92	0.85	0.84	0.96	0.96
23-4	0.91	0.84	0.85	0.94	1.02
Average	**0.96**	**0.89**	**0.90**	**0.91**	**0.99**
% std dev	**4.3**	**4.1**	**3.8**	**4.5**	**6.5**

Reaction	Average M/C	% Standard Deviation
^{63}Cu(n,α)	0.96	4.3
^{54}Fe(n,p)	0.89	4.1
^{58}Ni(n,p)	0.90	3.8
^{238}U(n,f)	0.91	4.5
^{237}Np(n,f)	0.99	6.5
Linear Average	**0.93**	**4.6**

Table 3.3-4

Comparison of Best Estimate and Calculated Neutron Flux (E > 1.0 MeV)
In-Vessel Capsules – Point Beach Unit 2

Capsule	BE/C	% Standard Deviation
V	1.01	7.0
S	1.02	7.0
R	1.02	7.0
T	1.01	7.0
Average	**1.01**	**0.6**

Table 3.3-5

Comparison of Best Estimate and Calculated Neutron Flux (E > 1.0 MeV)
Ex-Vessel Capsules – Point Beach Unit 2

Reaction	BE/C	% Standard Deviation
15-1	0.88	7.0
15-2	0.95	7.0
15-3	0.94	7.0
15-4	0.96	7.0
16-1	0.87	7.0
16-2	0.92	7.0
16-3	0.94	7.0
16-4	0.98	7.0
17-1	0.87	7.0
17-2	0.90	7.0
17-3	0.93	7.0
17-4	0.91	7.0
20-1	0.87	7.0
20-2	0.92	7.0
20-3	0.92	7.0
20-4	0.92	7.0
23-1	0.89	7.0
23-2	0.91	7.0
23-3	0.89	7.0
23-4	0.90	7.0
Average	**0.91**	**3.3**

Table 3.3-4

Summary of In-Vessel and Ex-Vessel Data Comparions

	In-Vessel Data		Ex-Vessel Data	
	Average M/C	% std dev	Average M/C	% std dev
$^{63}Cu(n,\alpha)$	0.98	6.1	0.96	5.6
$^{54}Fe(n,p)$	0.97	4.0	0.91	7.2
$^{58}Ni(n,p)$	0.97	4.3	0.94	8.6
$^{238}U(n,f)$	1.05	5.8	0.94	8.4
$^{237}Np(n,f)$	1.09	2.8	1.01	8.2
All Reactions	**1.01**	**2.1**	**0.95**	**3.4**

	Combined Data Set	
	Average M/C	% std dev
$^{63}Cu(n,\alpha)$	0.97	4.2
$^{54}Fe(n,p)$	0.94	4.1
$^{58}Ni(n,p)$	0.95	4.8
$^{238}U(n,f)$	1.00	5.0
$^{237}Np(n,f)$	1.05	4.2
All Reactions	**0.98**	**2.0**

4.0 Best Estimate Exposure Evaluations

In this section the measurement results provided in Section 3.0 are combined with the results of the neutron transport calculations described in Section 2.0 to establish best estimates for the neutron exposure of the Point Beach Units 1 and 2 pressure vessel beltline materials. The best estimate exposures were determined from the following equation:

$$\Phi_{BE} = K^{*}\Phi_{C}$$

where: Φ_{BE} = The best estimate neutron exposure for the material of interest.

K = The plant specific best estimate BE/C bias factor derived from the set of in-vessel and ex-vessel measurements available for each reactor.

Φ_{C} = The absolute calculated fast neutron exposure for the material of interest.

In the development of the bias factor (K) for each of the respective reactors, the in-vessel and ex-vessel comparisons were treated as independent data sets and combined linearly to produce an overall value for K.

In the case of Point beach Unit 1 the in-vessel, ex-vessel, and combined BE/C comparisons for neutron flux (E > 1.0 MeV) may be summarized as follows:

	BE/C	% Uncertainty
In-Vessel	1.02	6.7
Ex-Vessel	0.86	10.6
K_1	0.94	6.1

The corresponding data comparisons applicable to Point Beach Unit 2 are as follows:

	BE/C	% Uncertainty
In-Vessel	1.01	0.6
Ex-Vessel	0.91	3.3
K_2	0.96	1.6

Resultant best estimate fluence projections for Point Beach Unit 1 are listed in Tables 4-1 through 4-12 for each of the beltline materials. Projections are provided for fuel management scenarios with and without hafnium power suppression rods and with and without uprated core power. Corresponding fluence projections for Point Beach Unit 2 are given in Tables 4-13 through 4-22.

Table 4-1

Intermediate Shell to Lower Shell Circumferential Weld (SA-1101)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.98E+19	1.31E+19	1.02E+19	9.04E+18
26.0	2.07E+19	1.38E+19	1.09E+19	9.57E+18
28.0	2.18E+19	1.45E+19	1.15E+19	1.02E+19
30.0	2.29E+19	1.54E+19	1.23E+19	1.09E+19
32.0	2.40E+19	1.61E+19	1.30E+19	1.15E+19
34.0	2.50E+19	1.70E+19	1.37E+19	1.23E+19
36.0	2.62E+19	1.77E+19	1.44E+19	1.29E+19
38.0	2.72E+19	1.86E+19	1.52E+19	1.36E+19
40.0	2.83E+19	1.93E+19	1.59E+19	1.43E+19
42.0	2.95E+19	2.02E+19	1.66E+19	1.49E+19
44.0	3.05E+19	2.09E+19	1.74E+19	1.56E+19
46.0	3.16E+19	2.18E+19	1.81E+19	1.62E+19
48.0	3.27E+19	2.25E+19	1.88E+19	1.69E+19
50.0	3.38E+19	2.34E+19	1.95E+19	1.75E+19
52.0	3.49E+19	2.41E+19	2.03E+19	1.82E+19
54.0	3.60E+19	2.50E+19	2.09E+19	1.89E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.98E+19	1.31E+19	1.02E+19	9.04E+18
26.0	2.12E+19	1.40E+19	1.10E+19	9.66E+18
28.0	2.28E+19	1.51E+19	1.18E+19	1.03E+19
30.0	2.45E+19	1.62E+19	1.26E+19	1.11E+19
32.0	2.62E+19	1.74E+19	1.34E+19	1.18E+19
34.0	2.78E+19	1.85E+19	1.43E+19	1.25E+19
36.0	2.95E+19	1.95E+19	1.51E+19	1.32E+19
38.0	3.11E+19	2.06E+19	1.59E+19	1.39E+19
40.0	3.27E+19	2.18E+19	1.68E+19	1.46E+19
42.0	3.44E+19	2.29E+19	1.76E+19	1.54E+19
44.0	3.61E+19	2.40E+19	1.85E+19	1.60E+19
46.0	3.77E+19	2.50E+19	1.92E+19	1.68E+19
48.0	3.94E+19	2.62E+19	2.01E+19	1.75E+19
50.0	4.11E+19	2.73E+19	2.09E+19	1.82E+19
52.0	4.27E+19	2.84E+19	2.18E+19	1.89E+19
54.0	4.44E+19	2.95E+19	2.26E+19	1.96E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 4-2

Lower Shell Plate (C-1423)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.02E+19	1.34E+19	1.06E+19	9.38E+18
26.0	2.11E+19	1.41E+19	1.13E+19	9.94E+18
28.0	2.21E+19	1.49E+19	1.20E+19	1.06E+19
30.0	2.32E+19	1.57E+19	1.28E+19	1.14E+19
32.0	2.43E+19	1.65E+19	1.35E+19	1.20E+19
34.0	2.53E+19	1.73E+19	1.43E+19	1.27E+19
36.0	2.64E+19	1.81E+19	1.50E+19	1.34E+19
38.0	2.75E+19	1.89E+19	1.58E+19	1.41E+19
40.0	2.85E+19	1.97E+19	1.65E+19	1.47E+19
42.0	2.96E+19	2.04E+19	1.72E+19	1.55E+19
44.0	3.07E+19	2.13E+19	1.79E+19	1.61E+19
46.0	3.17E+19	2.20E+19	1.87E+19	1.68E+19
48.0	3.28E+19	2.29E+19	1.94E+19	1.75E+19
50.0	3.39E+19	2.36E+19	2.02E+19	1.82E+19
52.0	3.49E+19	2.45E+19	2.09E+19	1.89E+19
54.0	3.60E+19	2.52E+19	2.17E+19	1.95E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.02E+19	1.34E+19	1.06E+19	9.38E+18
26.0	2.16E+19	1.44E+19	1.14E+19	1.00E+19
28.0	2.34E+19	1.55E+19	1.22E+19	1.08E+19
30.0	2.50E+19	1.67E+19	1.30E+19	1.14E+19
32.0	2.67E+19	1.78E+19	1.40E+19	1.22E+19
34.0	2.85E+19	1.89E+19	1.48E+19	1.29E+19
36.0	3.02E+19	2.02E+19	1.57E+19	1.37E+19
38.0	3.20E+19	2.13E+19	1.66E+19	1.44E+19
40.0	3.37E+19	2.24E+19	1.74E+19	1.52E+19
42.0	3.54E+19	2.35E+19	1.83E+19	1.59E+19
44.0	3.71E+19	2.48E+19	1.91E+19	1.67E+19
46.0	3.88E+19	2.59E+19	2.01E+19	1.74E+19
48.0	4.06E+19	2.70E+19	2.09E+19	1.82E+19
50.0	4.23E+19	2.81E+19	2.18E+19	1.89E+19
52.0	4.40E+19	2.94E+19	2.26E+19	1.97E+19
54.0	4.58E+19	3.05E+19	2.35E+19	2.04E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 4-3

Intermediate Shell Plate (A-9811)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.28E+19	1.45E+19	1.09E+19	9.57E+18
26.0	2.41E+19	1.54E+19	1.14E+19	1.01E+19
28.0	2.58E+19	1.64E+19	1.23E+19	1.08E+19
30.0	2.74E+19	1.75E+19	1.30E+19	1.15E+19
32.0	2.90E+19	1.86E+19	1.38E+19	1.22E+19
34.0	3.07E+19	1.96E+19	1.45E+19	1.29E+19
36.0	3.23E+19	2.06E+19	1.54E+19	1.36E+19
38.0	3.39E+19	2.18E+19	1.61E+19	1.44E+19
40.0	3.56E+19	2.28E+19	1.69E+19	1.50E+19
42.0	3.71E+19	2.38E+19	1.77E+19	1.58E+19
44.0	3.88E+19	2.49E+19	1.85E+19	1.65E+19
46.0	4.04E+19	2.59E+19	1.92E+19	1.72E+19
48.0	4.20E+19	2.70E+19	2.00E+19	1.79E+19
50.0	4.37E+19	2.80E+19	2.08E+19	1.86E+19
52.0	4.53E+19	2.91E+19	2.16E+19	1.93E+19
54.0	4.69E+19	3.01E+19	2.23E+19	2.00E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.28E+19	1.45E+19	1.09E+19	9.57E+18
26.0	2.42E+19	1.55E+19	1.15E+19	1.01E+19
28.0	2.59E+19	1.66E+19	1.24E+19	1.09E+19
30.0	2.75E+19	1.77E+19	1.33E+19	1.16E+19
32.0	2.92E+19	1.89E+19	1.42E+19	1.24E+19
34.0	3.09E+19	2.00E+19	1.50E+19	1.31E+19
36.0	3.26E+19	2.10E+19	1.59E+19	1.39E+19
38.0	3.42E+19	2.21E+19	1.68E+19	1.46E+19
40.0	3.59E+19	2.33E+19	1.76E+19	1.54E+19
42.0	3.75E+19	2.44E+19	1.85E+19	1.61E+19
44.0	3.92E+19	2.55E+19	1.93E+19	1.69E+19
46.0	4.09E+19	2.66E+19	2.03E+19	1.76E+19
48.0	4.26E+19	2.78E+19	2.11E+19	1.83E+19
50.0	4.43E+19	2.89E+19	2.20E+19	1.90E+19
52.0	4.60E+19	3.00E+19	2.28E+19	1.98E+19
54.0	4.77E+19	3.11E+19	2.37E+19	2.05E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 4-4

Intermediate Shell (SA775/812) and Lower Shell (SA-847) Longitudinal Welds
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]	
	Inter. Shell	Lower Shell
24.3	1.45E+19	1.34E+19
26.0	1.54E+19	1.41E+19
28.0	1.64E+19	1.49E+19
30.0	1.75E+19	1.57E+19
32.0	1.86E+19	1.65E+19
34.0	1.96E+19	1.73E+19
36.0	2.06E+19	1.81E+19
38.0	2.18E+19	1.89E+19
40.0	2.28E+19	1.97E+19
42.0	2.38E+19	2.04E+19
44.0	2.49E+19	2.13E+19
46.0	2.59E+19	2.20E+19
48.0	2.70E+19	2.29E+19
50.0	2.80E+19	2.36E+19
52.0	2.91E+19	2.45E+19
54.0	3.01E+19	2.52E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]	
	Inter. Shell	Lower Shell
24.3	1.45E+19	1.34E+19
26.0	1.55E+19	1.44E+19
28.0	1.66E+19	1.55E+19
30.0	1.77E+19	1.67E+19
32.0	1.89E+19	1.78E+19
34.0	2.00E+19	1.89E+19
36.0	2.10E+19	2.02E+19
38.0	2.21E+19	2.13E+19
40.0	2.33E+19	2.24E+19
42.0	2.44E+19	2.35E+19
44.0	2.55E+19	2.48E+19
46.0	2.66E+19	2.59E+19
48.0	2.78E+19	2.70E+19
50.0	2.89E+19	2.81E+19
52.0	3.00E+19	2.94E+19
54.0	3.11E+19	3.05E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 4-5

Intermediate Shell to Upper Shell Circumferential Weld (SA-1426)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.54E+18	1.04E+18	8.45E+17	7.49E+17
26.0	1.61E+18	1.10E+18	9.00E+17	7.97E+17
28.0	1.71E+18	1.16E+18	9.66E+17	8.57E+17
30.0	1.79E+18	1.24E+18	1.03E+18	9.17E+17
32.0	1.89E+18	1.30E+18	1.10E+18	9.76E+17
34.0	1.97E+18	1.37E+18	1.16E+18	1.04E+18
36.0	2.06E+18	1.44E+18	1.23E+18	1.10E+18
38.0	2.15E+18	1.51E+18	1.29E+18	1.15E+18
40.0	2.24E+18	1.58E+18	1.36E+18	1.22E+18
42.0	2.33E+18	1.65E+18	1.43E+18	1.28E+18
44.0	2.42E+18	1.72E+18	1.49E+18	1.33E+18
46.0	2.50E+18	1.78E+18	1.56E+18	1.40E+18
48.0	2.60E+18	1.86E+18	1.62E+18	1.45E+18
50.0	2.68E+18	1.92E+18	1.69E+18	1.52E+18
52.0	2.78E+18	1.99E+18	1.75E+18	1.58E+18
54.0	2.87E+18	2.06E+18	1.82E+18	1.63E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.54E+18	1.04E+18	8.45E+17	7.49E+17
26.0	1.66E+18	1.13E+18	9.05E+17	7.99E+17
28.0	1.81E+18	1.22E+18	9.76E+17	8.62E+17
30.0	1.96E+18	1.31E+18	1.05E+18	9.24E+17
32.0	2.11E+18	1.42E+18	1.12E+18	9.85E+17
34.0	2.26E+18	1.51E+18	1.19E+18	1.05E+18
36.0	2.41E+18	1.60E+18	1.27E+18	1.11E+18
38.0	2.56E+18	1.70E+18	1.34E+18	1.17E+18
40.0	2.70E+18	1.80E+18	1.41E+18	1.24E+18
42.0	2.85E+18	1.89E+18	1.48E+18	1.29E+18
44.0	3.00E+18	1.99E+18	1.56E+18	1.36E+18
46.0	3.15E+18	2.09E+18	1.62E+18	1.43E+18
48.0	3.30E+18	2.19E+18	1.70E+18	1.48E+18
50.0	3.45E+18	2.28E+18	1.77E+18	1.55E+18
52.0	3.60E+18	2.38E+18	1.84E+18	1.61E+18
54.0	3.75E+18	2.48E+18	1.91E+18	1.67E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 4-6

Upper Shell Forging
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.54E+18	1.04E+18	8.45E+17	7.49E+17
26.0	1.61E+18	1.10E+18	9.00E+17	7.97E+17
28.0	1.71E+18	1.16E+18	9.66E+17	8.57E+17
30.0	1.79E+18	1.24E+18	1.03E+18	9.17E+17
32.0	1.89E+18	1.30E+18	1.10E+18	9.76E+17
34.0	1.97E+18	1.37E+18	1.16E+18	1.04E+18
36.0	2.06E+18	1.44E+18	1.23E+18	1.10E+18
38.0	2.15E+18	1.51E+18	1.29E+18	1.15E+18
40.0	2.24E+18	1.58E+18	1.36E+18	1.22E+18
42.0	2.33E+18	1.65E+18	1.43E+18	1.28E+18
44.0	2.42E+18	1.72E+18	1.49E+18	1.33E+18
46.0	2.50E+18	1.78E+18	1.56E+18	1.40E+18
48.0	2.60E+18	1.86E+18	1.62E+18	1.45E+18
50.0	2.68E+18	1.92E+18	1.69E+18	1.52E+18
52.0	2.78E+18	1.99E+18	1.75E+18	1.58E+18
54.0	2.87E+18	2.06E+18	1.82E+18	1.63E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.54E+18	1.04E+18	8.45E+17	7.49E+17
26.0	1.66E+18	1.13E+18	9.05E+17	7.99E+17
28.0	1.81E+18	1.22E+18	9.76E+17	8.62E+17
30.0	1.96E+18	1.31E+18	1.05E+18	9.24E+17
32.0	2.11E+18	1.42E+18	1.12E+18	9.85E+17
34.0	2.26E+18	1.51E+18	1.19E+18	1.05E+18
36.0	2.41E+18	1.60E+18	1.27E+18	1.11E+18
38.0	2.56E+18	1.70E+18	1.34E+18	1.17E+18
40.0	2.70E+18	1.80E+18	1.41E+18	1.24E+18
42.0	2.85E+18	1.89E+18	1.48E+18	1.29E+18
44.0	3.00E+18	1.99E+18	1.56E+18	1.36E+18
46.0	3.15E+18	2.09E+18	1.62E+18	1.43E+18
48.0	3.30E+18	2.19E+18	1.70E+18	1.48E+18
50.0	3.45E+18	2.28E+18	1.77E+18	1.55E+18
52.0	3.60E+18	2.38E+18	1.84E+18	1.61E+18
54.0	3.75E+18	2.48E+18	1.91E+18	1.67E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 4-7

Intermediate Shell to Lower Shell Circumferential Weld (SA-1101)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.98E+19	1.31E+19	1.02E+19	9.04E+18
26.0	2.08E+19	1.38E+19	1.09E+19	9.66E+18
28.0	2.20E+19	1.47E+19	1.17E+19	1.04E+19
30.0	2.32E+19	1.56E+19	1.25E+19	1.11E+19
32.0	2.44E+19	1.65E+19	1.33E+19	1.18E+19
34.0	2.56E+19	1.74E+19	1.41E+19	1.26E+19
36.0	2.68E+19	1.82E+19	1.49E+19	1.33E+19
38.0	2.80E+19	1.91E+19	1.57E+19	1.41E+19
40.0	2.93E+19	2.00E+19	1.65E+19	1.48E+19
42.0	3.04E+19	2.09E+19	1.73E+19	1.55E+19
44.0	3.16E+19	2.18E+19	1.81E+19	1.62E+19
46.0	3.28E+19	2.26E+19	1.89E+19	1.70E+19
48.0	3.41E+19	2.35E+19	1.97E+19	1.77E+19
50.0	3.53E+19	2.44E+19	2.04E+19	1.85E+19
52.0	3.65E+19	2.53E+19	2.13E+19	1.91E+19
54.0	3.77E+19	2.62E+19	2.20E+19	1.99E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.98E+19	1.31E+19	1.02E+19	9.04E+18
26.0	2.13E+19	1.41E+19	1.10E+19	9.66E+18
28.0	2.32E+19	1.53E+19	1.19E+19	1.05E+19
30.0	2.50E+19	1.66E+19	1.29E+19	1.13E+19
32.0	2.68E+19	1.78E+19	1.38E+19	1.21E+19
34.0	2.86E+19	1.90E+19	1.47E+19	1.29E+19
36.0	3.05E+19	2.03E+19	1.56E+19	1.37E+19
38.0	3.23E+19	2.15E+19	1.65E+19	1.44E+19
40.0	3.41E+19	2.27E+19	1.74E+19	1.52E+19
42.0	3.59E+19	2.39E+19	1.84E+19	1.60E+19
44.0	3.78E+19	2.51E+19	1.93E+19	1.68E+19
46.0	3.96E+19	2.64E+19	2.03E+19	1.76E+19
48.0	4.15E+19	2.76E+19	2.11E+19	1.84E+19
50.0	4.32E+19	2.88E+19	2.20E+19	1.92E+19
52.0	4.51E+19	3.00E+19	2.30E+19	2.00E+19
54.0	4.70E+19	3.12E+19	2.39E+19	2.07E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 4-8

Lower Shell Plate (C-1423)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.02E+19	1.34E+19	1.06E+19	9.38E+18
26.0	2.11E+19	1.42E+19	1.14E+19	1.00E+19
28.0	2.23E+19	1.50E+19	1.21E+19	1.08E+19
30.0	2.35E+19	1.59E+19	1.29E+19	1.15E+19
32.0	2.47E+19	1.68E+19	1.38E+19	1.23E+19
34.0	2.59E+19	1.76E+19	1.46E+19	1.30E+19
36.0	2.70E+19	1.86E+19	1.55E+19	1.38E+19
38.0	2.82E+19	1.94E+19	1.62E+19	1.45E+19
40.0	2.94E+19	2.04E+19	1.71E+19	1.53E+19
42.0	3.06E+19	2.12E+19	1.79E+19	1.60E+19
44.0	3.18E+19	2.20E+19	1.88E+19	1.68E+19
46.0	3.29E+19	2.30E+19	1.95E+19	1.76E+19
48.0	3.41E+19	2.38E+19	2.04E+19	1.84E+19
50.0	3.53E+19	2.47E+19	2.12E+19	1.91E+19
52.0	3.65E+19	2.56E+19	2.20E+19	1.99E+19
54.0	3.76E+19	2.65E+19	2.29E+19	2.06E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.02E+19	1.34E+19	1.06E+19	9.38E+18
26.0	2.16E+19	1.44E+19	1.14E+19	1.00E+19
28.0	2.34E+19	1.55E+19	1.22E+19	1.08E+19
30.0	2.50E+19	1.67E+19	1.30E+19	1.14E+19
32.0	2.67E+19	1.78E+19	1.40E+19	1.22E+19
34.0	2.85E+19	1.89E+19	1.48E+19	1.29E+19
36.0	3.02E+19	2.02E+19	1.57E+19	1.37E+19
38.0	3.20E+19	2.13E+19	1.66E+19	1.44E+19
40.0	3.37E+19	2.24E+19	1.74E+19	1.52E+19
42.0	3.54E+19	2.35E+19	1.83E+19	1.59E+19
44.0	3.71E+19	2.48E+19	1.91E+19	1.67E+19
46.0	3.88E+19	2.59E+19	2.01E+19	1.74E+19
48.0	4.06E+19	2.70E+19	2.09E+19	1.82E+19
50.0	4.23E+19	2.81E+19	2.18E+19	1.89E+19
52.0	4.40E+19	2.94E+19	2.26E+19	1.97E+19
54.0	4.58E+19	3.05E+19	2.35E+19	2.04E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 4-9

Intermediate Shell Plate (A-9811)
Best estimate Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.28E+19	1.45E+19	1.09E+19	9.57E+18
26.0	2.43E+19	1.55E+19	1.15E+19	1.01E+19
28.0	2.61E+19	1.67E+19	1.24E+19	1.10E+19
30.0	2.79E+19	1.78E+19	1.32E+19	1.17E+19
32.0	2.96E+19	1.89E+19	1.41E+19	1.25E+19
34.0	3.15E+19	2.02E+19	1.50E+19	1.33E+19
36.0	3.33E+19	2.13E+19	1.59E+19	1.41E+19
38.0	3.51E+19	2.25E+19	1.67E+19	1.48E+19
40.0	3.69E+19	2.36E+19	1.75E+19	1.57E+19
42.0	3.86E+19	2.48E+19	1.84E+19	1.64E+19
44.0	4.05E+19	2.60E+19	1.92E+19	1.72E+19
46.0	4.23E+19	2.71E+19	2.02E+19	1.80E+19
48.0	4.41E+19	2.83E+19	2.10E+19	1.88E+19
50.0	4.59E+19	2.95E+19	2.19E+19	1.95E+19
52.0	4.77E+19	3.06E+19	2.27E+19	2.04E+19
54.0	4.94E+19	3.18E+19	2.35E+19	2.11E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	2.28E+19	1.45E+19	1.09E+19	9.57E+18
26.0	2.43E+19	1.56E+19	1.16E+19	1.02E+19
28.0	2.62E+19	1.68E+19	1.26E+19	1.11E+19
30.0	2.80E+19	1.80E+19	1.35E+19	1.18E+19
32.0	2.98E+19	1.92E+19	1.45E+19	1.27E+19
34.0	3.17E+19	2.05E+19	1.55E+19	1.35E+19
36.0	3.36E+19	2.18E+19	1.64E+19	1.44E+19
38.0	3.55E+19	2.30E+19	1.74E+19	1.51E+19
40.0	3.72E+19	2.42E+19	1.84E+19	1.59E+19
42.0	3.91E+19	2.54E+19	1.93E+19	1.68E+19
44.0	4.10E+19	2.66E+19	2.03E+19	1.76E+19
46.0	4.28E+19	2.80E+19	2.12E+19	1.85E+19
48.0	4.47E+19	2.92E+19	2.21E+19	1.92E+19
50.0	4.65E+19	3.04E+19	2.32E+19	2.01E+19
52.0	4.84E+19	3.16E+19	2.41E+19	2.09E+19
54.0	5.02E+19	3.28E+19	2.50E+19	2.18E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 4-10

Intermediate Shell (SA775/812) and Lower Shell (SA-847) Longitudinal Welds
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]	
	Inter. Shell	Lower Shell
24.3	1.45E+19	1.34E+19
26.0	1.55E+19	1.42E+19
28.0	1.67E+19	1.50E+19
30.0	1.78E+19	1.59E+19
32.0	1.89E+19	1.68E+19
34.0	2.02E+19	1.76E+19
36.0	2.13E+19	1.86E+19
38.0	2.25E+19	1.94E+19
40.0	2.36E+19	2.04E+19
42.0	2.48E+19	2.12E+19
44.0	2.60E+19	2.20E+19
46.0	2.71E+19	2.30E+19
48.0	2.83E+19	2.38E+19
50.0	2.95E+19	2.47E+19
52.0	3.06E+19	2.56E+19
54.0	3.18E+19	2.65E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]	
	Inter. Shell	Lower Shell
24.3	1.45E+19	1.34E+19
26.0	1.56E+19	1.44E+19
28.0	1.68E+19	1.58E+19
30.0	1.80E+19	1.70E+19
32.0	1.92E+19	1.83E+19
34.0	2.05E+19	1.95E+19
36.0	2.18E+19	2.08E+19
38.0	2.30E+19	2.21E+19
40.0	2.42E+19	2.34E+19
42.0	2.54E+19	2.47E+19
44.0	2.66E+19	2.59E+19
46.0	2.80E+19	2.72E+19
48.0	2.92E+19	2.84E+19
50.0	3.04E+19	2.97E+19
52.0	3.16E+19	3.10E+19
54.0	3.28E+19	3.23E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 4-11

Intermediate Shell to Upper Shell Circumferential Weld (SA-1426)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.54E+18	1.04E+18	8.45E+17	7.49E+17
26.0	1.62E+18	1.11E+18	9.05E+17	8.03E+17
28.0	1.72E+18	1.18E+18	9.76E+17	8.69E+17
30.0	1.82E+18	1.26E+18	1.05E+18	9.35E+17
32.0	1.92E+18	1.33E+18	1.13E+18	1.00E+18
34.0	2.02E+18	1.41E+18	1.19E+18	1.07E+18
36.0	2.12E+18	1.48E+18	1.27E+18	1.14E+18
38.0	2.21E+18	1.56E+18	1.34E+18	1.20E+18
40.0	2.32E+18	1.64E+18	1.42E+18	1.27E+18
42.0	2.41E+18	1.72E+18	1.48E+18	1.33E+18
44.0	2.51E+18	1.79E+18	1.56E+18	1.40E+18
46.0	2.61E+18	1.87E+18	1.63E+18	1.46E+18
48.0	2.71E+18	1.94E+18	1.70E+18	1.53E+18
50.0	2.80E+18	2.02E+18	1.77E+18	1.59E+18
52.0	2.91E+18	2.09E+18	1.85E+18	1.66E+18
54.0	3.00E+18	2.17E+18	1.92E+18	1.73E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.54E+18	1.04E+18	8.45E+17	7.49E+17
26.0	1.68E+18	1.14E+18	9.11E+17	8.05E+17
28.0	1.84E+18	1.24E+18	9.94E+17	8.74E+17
30.0	2.01E+18	1.34E+18	1.07E+18	9.47E+17
32.0	2.17E+18	1.45E+18	1.15E+18	1.01E+18
34.0	2.34E+18	1.56E+18	1.23E+18	1.08E+18
36.0	2.50E+18	1.66E+18	1.31E+18	1.15E+18
38.0	2.66E+18	1.77E+18	1.39E+18	1.22E+18
40.0	2.83E+18	1.88E+18	1.47E+18	1.29E+18
42.0	2.99E+18	1.99E+18	1.55E+18	1.36E+18
44.0	3.16E+18	2.09E+18	1.62E+18	1.43E+18
46.0	3.32E+18	2.20E+18	1.71E+18	1.49E+18
48.0	3.49E+18	2.31E+18	1.78E+18	1.57E+18
50.0	3.65E+18	2.41E+18	1.87E+18	1.63E+18
52.0	3.82E+18	2.51E+18	1.94E+18	1.70E+18
54.0	3.98E+18	2.63E+18	2.03E+18	1.77E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 4-12

Upper Shell Forging
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 1

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.54E+18	1.04E+18	8.45E+17	7.49E+17
26.0	1.62E+18	1.11E+18	9.05E+17	8.03E+17
28.0	1.72E+18	1.18E+18	9.76E+17	8.69E+17
30.0	1.82E+18	1.26E+18	1.05E+18	9.35E+17
32.0	1.92E+18	1.33E+18	1.13E+18	1.00E+18
34.0	2.02E+18	1.41E+18	1.19E+18	1.07E+18
36.0	2.12E+18	1.48E+18	1.27E+18	1.14E+18
38.0	2.21E+18	1.56E+18	1.34E+18	1.20E+18
40.0	2.32E+18	1.64E+18	1.42E+18	1.27E+18
42.0	2.41E+18	1.72E+18	1.48E+18	1.33E+18
44.0	2.51E+18	1.79E+18	1.56E+18	1.40E+18
46.0	2.61E+18	1.87E+18	1.63E+18	1.46E+18
48.0	2.71E+18	1.94E+18	1.70E+18	1.53E+18
50.0	2.80E+18	2.02E+18	1.77E+18	1.59E+18
52.0	2.91E+18	2.09E+18	1.85E+18	1.66E+18
54.0	3.00E+18	2.17E+18	1.92E+18	1.73E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
24.3	1.54E+18	1.04E+18	8.45E+17	7.49E+17
26.0	1.68E+18	1.14E+18	9.11E+17	8.05E+17
28.0	1.84E+18	1.24E+18	9.94E+17	8.74E+17
30.0	2.01E+18	1.34E+18	1.07E+18	9.47E+17
32.0	2.17E+18	1.45E+18	1.15E+18	1.01E+18
34.0	2.34E+18	1.56E+18	1.23E+18	1.08E+18
36.0	2.50E+18	1.66E+18	1.31E+18	1.15E+18
38.0	2.66E+18	1.77E+18	1.39E+18	1.22E+18
40.0	2.83E+18	1.88E+18	1.47E+18	1.29E+18
42.0	2.99E+18	1.99E+18	1.55E+18	1.36E+18
44.0	3.16E+18	2.09E+18	1.62E+18	1.43E+18
46.0	3.32E+18	2.20E+18	1.71E+18	1.49E+18
48.0	3.49E+18	2.31E+18	1.78E+18	1.57E+18
50.0	3.65E+18	2.41E+18	1.87E+18	1.63E+18
52.0	3.82E+18	2.51E+18	1.94E+18	1.70E+18
54.0	3.98E+18	2.63E+18	2.03E+18	1.77E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 27 (~ Sept. 2002).

Table 4-13

Intermediate Shell to Lower Shell Circumferential Weld (SA-1484)
Best estimate Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	1.98E+19	1.30E+19	1.03E+19	9.27E+18
26.0	2.12E+19	1.40E+19	1.12E+19	1.01E+19
28.0	2.23E+19	1.47E+19	1.19E+19	1.08E+19
30.0	2.34E+19	1.56E+19	1.26E+19	1.15E+19
32.0	2.45E+19	1.64E+19	1.34E+19	1.21E+19
34.0	2.56E+19	1.71E+19	1.42E+19	1.29E+19
36.0	2.67E+19	1.80E+19	1.48E+19	1.36E+19
38.0	2.77E+19	1.88E+19	1.56E+19	1.43E+19
40.0	2.89E+19	1.96E+19	1.64E+19	1.49E+19
42.0	3.00E+19	2.03E+19	1.71E+19	1.57E+19
44.0	3.11E+19	2.12E+19	1.78E+19	1.64E+19
46.0	3.22E+19	2.20E+19	1.86E+19	1.71E+19
48.0	3.33E+19	2.27E+19	1.93E+19	1.77E+19
50.0	3.44E+19	2.36E+19	2.00E+19	1.84E+19
52.0	3.56E+19	2.44E+19	2.07E+19	1.92E+19
54.0	3.66E+19	2.51E+19	2.15E+19	1.98E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	1.98E+19	1.30E+19	1.03E+19	9.27E+18
26.0	2.20E+19	1.45E+19	1.14E+19	1.02E+19
28.0	2.38E+19	1.56E+19	1.22E+19	1.10E+19
30.0	2.56E+19	1.68E+19	1.32E+19	1.18E+19
32.0	2.74E+19	1.79E+19	1.41E+19	1.26E+19
34.0	2.92E+19	1.91E+19	1.49E+19	1.34E+19
36.0	3.10E+19	2.02E+19	1.59E+19	1.42E+19
38.0	3.28E+19	2.14E+19	1.68E+19	1.49E+19
40.0	3.46E+19	2.25E+19	1.76E+19	1.58E+19
42.0	3.63E+19	2.38E+19	1.86E+19	1.66E+19
44.0	3.82E+19	2.50E+19	1.95E+19	1.73E+19
46.0	4.00E+19	2.61E+19	2.03E+19	1.81E+19
48.0	4.17E+19	2.73E+19	2.13E+19	1.89E+19
50.0	4.35E+19	2.84E+19	2.22E+19	1.98E+19
52.0	4.54E+19	2.96E+19	2.30E+19	2.05E+19
54.0	4.71E+19	3.07E+19	2.40E+19	2.13E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 4-14

Lower Shell Forging (122W195)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.11E+19	1.38E+19	1.07E+19	9.63E+18
26.0	2.26E+19	1.47E+19	1.17E+19	1.05E+19
28.0	2.39E+19	1.56E+19	1.24E+19	1.12E+19
30.0	2.51E+19	1.66E+19	1.32E+19	1.19E+19
32.0	2.65E+19	1.74E+19	1.39E+19	1.26E+19
34.0	2.77E+19	1.83E+19	1.46E+19	1.34E+19
36.0	2.90E+19	1.92E+19	1.54E+19	1.41E+19
38.0	3.03E+19	2.00E+19	1.62E+19	1.48E+19
40.0	3.15E+19	2.09E+19	1.70E+19	1.55E+19
42.0	3.28E+19	2.18E+19	1.77E+19	1.63E+19
44.0	3.41E+19	2.26E+19	1.85E+19	1.70E+19
46.0	3.54E+19	2.35E+19	1.93E+19	1.77E+19
48.0	3.66E+19	2.45E+19	2.00E+19	1.84E+19
50.0	3.79E+19	2.53E+19	2.08E+19	1.92E+19
52.0	3.91E+19	2.62E+19	2.16E+19	1.98E+19
54.0	4.04E+19	2.71E+19	2.24E+19	2.06E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.11E+19	1.38E+19	1.07E+19	9.63E+18
26.0	2.33E+19	1.51E+19	1.19E+19	1.06E+19
28.0	2.51E+19	1.64E+19	1.27E+19	1.15E+19
30.0	2.71E+19	1.75E+19	1.37E+19	1.22E+19
32.0	2.89E+19	1.88E+19	1.46E+19	1.31E+19
34.0	3.07E+19	2.00E+19	1.55E+19	1.39E+19
36.0	3.26E+19	2.12E+19	1.65E+19	1.47E+19
38.0	3.45E+19	2.24E+19	1.74E+19	1.55E+19
40.0	3.63E+19	2.36E+19	1.84E+19	1.64E+19
42.0	3.82E+19	2.49E+19	1.93E+19	1.71E+19
44.0	4.00E+19	2.60E+19	2.02E+19	1.80E+19
46.0	4.18E+19	2.73E+19	2.12E+19	1.89E+19
48.0	4.37E+19	2.84E+19	2.21E+19	1.97E+19
50.0	4.56E+19	2.97E+19	2.30E+19	2.05E+19
52.0	4.74E+19	3.09E+19	2.40E+19	2.13E+19
54.0	4.92E+19	3.21E+19	2.49E+19	2.22E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 4-15

Intermediate Shell Forging (123V500)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.21E+19	1.42E+19	1.09E+19	9.73E+18
26.0	2.39E+19	1.53E+19	1.19E+19	1.06E+19
28.0	2.54E+19	1.63E+19	1.26E+19	1.14E+19
30.0	2.70E+19	1.73E+19	1.34E+19	1.21E+19
32.0	2.85E+19	1.83E+19	1.42E+19	1.28E+19
34.0	3.00E+19	1.94E+19	1.49E+19	1.36E+19
36.0	3.15E+19	2.03E+19	1.57E+19	1.44E+19
38.0	3.30E+19	2.13E+19	1.65E+19	1.50E+19
40.0	3.46E+19	2.24E+19	1.73E+19	1.58E+19
42.0	3.61E+19	2.33E+19	1.81E+19	1.66E+19
44.0	3.77E+19	2.44E+19	1.89E+19	1.73E+19
46.0	3.92E+19	2.53E+19	1.97E+19	1.80E+19
48.0	4.07E+19	2.63E+19	2.04E+19	1.88E+19
50.0	4.22E+19	2.74E+19	2.12E+19	1.96E+19
52.0	4.37E+19	2.83E+19	2.21E+19	2.02E+19
54.0	4.53E+19	2.94E+19	2.28E+19	2.10E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.21E+19	1.42E+19	1.09E+19	9.73E+18
26.0	2.43E+19	1.55E+19	1.19E+19	1.08E+19
28.0	2.61E+19	1.68E+19	1.29E+19	1.16E+19
30.0	2.79E+19	1.79E+19	1.39E+19	1.24E+19
32.0	2.98E+19	1.92E+19	1.48E+19	1.32E+19
34.0	3.16E+19	2.03E+19	1.58E+19	1.41E+19
36.0	3.34E+19	2.15E+19	1.67E+19	1.49E+19
38.0	3.53E+19	2.27E+19	1.76E+19	1.57E+19
40.0	3.71E+19	2.39E+19	1.86E+19	1.66E+19
42.0	3.89E+19	2.51E+19	1.96E+19	1.74E+19
44.0	4.08E+19	2.63E+19	2.05E+19	1.82E+19
46.0	4.26E+19	2.75E+19	2.14E+19	1.91E+19
48.0	4.44E+19	2.87E+19	2.24E+19	1.99E+19
50.0	4.63E+19	2.99E+19	2.33E+19	2.07E+19
52.0	4.82E+19	3.11E+19	2.43E+19	2.16E+19
54.0	5.00E+19	3.23E+19	2.52E+19	2.24E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 4-16

Intermediate Shell to Upper Shell Circumferential Weld (21935)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.10E+18	1.37E+18	1.06E+18	9.50E+17
26.0	2.24E+18	1.47E+18	1.16E+18	1.03E+18
28.0	2.38E+18	1.56E+18	1.22E+18	1.11E+18
30.0	2.51E+18	1.65E+18	1.30E+18	1.18E+18
32.0	2.63E+18	1.73E+18	1.38E+18	1.24E+18
34.0	2.76E+18	1.82E+18	1.45E+18	1.31E+18
36.0	2.88E+18	1.91E+18	1.53E+18	1.39E+18
38.0	3.01E+18	1.99E+18	1.60E+18	1.45E+18
40.0	3.13E+18	2.08E+18	1.68E+18	1.52E+18
42.0	3.27E+18	2.18E+18	1.75E+18	1.60E+18
44.0	3.39E+18	2.26E+18	1.83E+18	1.67E+18
46.0	3.52E+18	2.35E+18	1.91E+18	1.73E+18
48.0	3.64E+18	2.44E+18	1.98E+18	1.81E+18
50.0	3.77E+18	2.52E+18	2.05E+18	1.88E+18
52.0	3.89E+18	2.61E+18	2.13E+18	1.95E+18
54.0	4.02E+18	2.70E+18	2.21E+18	2.02E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.10E+18	1.37E+18	1.06E+18	9.50E+17
26.0	2.33E+18	1.52E+18	1.18E+18	1.05E+18
28.0	2.53E+18	1.65E+18	1.28E+18	1.14E+18
30.0	2.73E+18	1.77E+18	1.38E+18	1.22E+18
32.0	2.92E+18	1.91E+18	1.47E+18	1.31E+18
34.0	3.12E+18	2.03E+18	1.58E+18	1.40E+18
36.0	3.31E+18	2.17E+18	1.68E+18	1.48E+18
38.0	3.52E+18	2.29E+18	1.77E+18	1.57E+18
40.0	3.71E+18	2.42E+18	1.87E+18	1.66E+18
42.0	3.91E+18	2.55E+18	1.98E+18	1.75E+18
44.0	4.10E+18	2.68E+18	2.07E+18	1.84E+18
46.0	4.31E+18	2.80E+18	2.17E+18	1.93E+18
48.0	4.50E+18	2.94E+18	2.26E+18	2.01E+18
50.0	4.70E+18	3.06E+18	2.37E+18	2.10E+18
52.0	4.89E+18	3.20E+18	2.47E+18	2.19E+18
54.0	5.09E+18	3.32E+18	2.56E+18	2.27E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 4-17

Upper Shell Forging
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections Without Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.10E+18	1.37E+18	1.06E+18	9.50E+17
26.0	2.24E+18	1.47E+18	1.16E+18	1.03E+18
28.0	2.38E+18	1.56E+18	1.22E+18	1.11E+18
30.0	2.51E+18	1.65E+18	1.30E+18	1.18E+18
32.0	2.63E+18	1.73E+18	1.38E+18	1.24E+18
34.0	2.76E+18	1.82E+18	1.45E+18	1.31E+18
36.0	2.88E+18	1.91E+18	1.53E+18	1.39E+18
38.0	3.01E+18	1.99E+18	1.60E+18	1.45E+18
40.0	3.13E+18	2.08E+18	1.68E+18	1.52E+18
42.0	3.27E+18	2.18E+18	1.75E+18	1.60E+18
44.0	3.39E+18	2.26E+18	1.83E+18	1.67E+18
46.0	3.52E+18	2.35E+18	1.91E+18	1.73E+18
48.0	3.64E+18	2.44E+18	1.98E+18	1.81E+18
50.0	3.77E+18	2.52E+18	2.05E+18	1.88E+18
52.0	3.89E+18	2.61E+18	2.13E+18	1.95E+18
54.0	4.02E+18	2.70E+18	2.21E+18	2.02E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.10E+18	1.37E+18	1.06E+18	9.50E+17
26.0	2.33E+18	1.52E+18	1.18E+18	1.05E+18
28.0	2.53E+18	1.65E+18	1.28E+18	1.14E+18
30.0	2.73E+18	1.77E+18	1.38E+18	1.22E+18
32.0	2.92E+18	1.91E+18	1.47E+18	1.31E+18
34.0	3.12E+18	2.03E+18	1.58E+18	1.40E+18
36.0	3.31E+18	2.17E+18	1.68E+18	1.48E+18
38.0	3.52E+18	2.29E+18	1.77E+18	1.57E+18
40.0	3.71E+18	2.42E+18	1.87E+18	1.66E+18
42.0	3.91E+18	2.55E+18	1.98E+18	1.75E+18
44.0	4.10E+18	2.68E+18	2.07E+18	1.84E+18
46.0	4.31E+18	2.80E+18	2.17E+18	1.93E+18
48.0	4.50E+18	2.94E+18	2.26E+18	2.01E+18
50.0	4.70E+18	3.06E+18	2.37E+18	2.10E+18
52.0	4.89E+18	3.20E+18	2.47E+18	2.19E+18
54.0	5.09E+18	3.32E+18	2.56E+18	2.27E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 4-18

Intermediate Shell to Lower Shell Circumferential Weld (SA-1484)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	1.98E+19	1.30E+19	1.03E+19	9.27E+18
26.0	2.13E+19	1.41E+19	1.13E+19	1.02E+19
28.0	2.25E+19	1.49E+19	1.21E+19	1.10E+19
30.0	2.37E+19	1.58E+19	1.29E+19	1.18E+19
32.0	2.50E+19	1.68E+19	1.37E+19	1.25E+19
34.0	2.62E+19	1.76E+19	1.45E+19	1.33E+19
36.0	2.74E+19	1.85E+19	1.53E+19	1.41E+19
38.0	2.86E+19	1.94E+19	1.62E+19	1.48E+19
40.0	2.99E+19	2.02E+19	1.70E+19	1.56E+19
42.0	3.10E+19	2.11E+19	1.78E+19	1.64E+19
44.0	3.23E+19	2.21E+19	1.86E+19	1.71E+19
46.0	3.35E+19	2.29E+19	1.95E+19	1.78E+19
48.0	3.47E+19	2.38E+19	2.02E+19	1.86E+19
50.0	3.59E+19	2.47E+19	2.10E+19	1.94E+19
52.0	3.72E+19	2.55E+19	2.19E+19	2.01E+19
54.0	3.83E+19	2.65E+19	2.26E+19	2.09E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	1.98E+19	1.30E+19	1.03E+19	9.27E+18
26.0	2.23E+19	1.45E+19	1.15E+19	1.03E+19
28.0	2.42E+19	1.58E+19	1.25E+19	1.12E+19
30.0	2.62E+19	1.71E+19	1.35E+19	1.20E+19
32.0	2.81E+19	1.84E+19	1.45E+19	1.29E+19
34.0	3.02E+19	1.98E+19	1.55E+19	1.38E+19
36.0	3.22E+19	2.10E+19	1.65E+19	1.46E+19
38.0	3.41E+19	2.24E+19	1.74E+19	1.55E+19
40.0	3.61E+19	2.36E+19	1.84E+19	1.65E+19
42.0	3.81E+19	2.49E+19	1.95E+19	1.73E+19
44.0	4.01E+19	2.62E+19	2.04E+19	1.82E+19
46.0	4.21E+19	2.75E+19	2.14E+19	1.91E+19
48.0	4.40E+19	2.88E+19	2.24E+19	1.99E+19
50.0	4.61E+19	3.01E+19	2.34E+19	2.08E+19
52.0	4.80E+19	3.13E+19	2.44E+19	2.17E+19
54.0	5.00E+19	3.27E+19	2.54E+19	2.25E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 4-19

Lower Shell Forging (122W195)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.11E+19	1.38E+19	1.07E+19	9.63E+18
26.0	2.28E+19	1.48E+19	1.18E+19	1.06E+19
28.0	2.42E+19	1.58E+19	1.25E+19	1.14E+19
30.0	2.56E+19	1.69E+19	1.34E+19	1.21E+19
32.0	2.70E+19	1.78E+19	1.43E+19	1.30E+19
34.0	2.84E+19	1.88E+19	1.51E+19	1.38E+19
36.0	2.98E+19	1.98E+19	1.60E+19	1.45E+19
38.0	3.12E+19	2.07E+19	1.68E+19	1.53E+19
40.0	3.27E+19	2.17E+19	1.76E+19	1.62E+19
42.0	3.40E+19	2.26E+19	1.85E+19	1.70E+19
44.0	3.55E+19	2.36E+19	1.94E+19	1.77E+19
46.0	3.68E+19	2.46E+19	2.01E+19	1.85E+19
48.0	3.83E+19	2.55E+19	2.10E+19	1.94E+19
50.0	3.96E+19	2.65E+19	2.19E+19	2.01E+19
52.0	4.10E+19	2.75E+19	2.27E+19	2.09E+19
54.0	4.25E+19	2.84E+19	2.35E+19	2.18E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.11E+19	1.38E+19	1.07E+19	9.63E+18
26.0	2.36E+19	1.53E+19	1.19E+19	1.07E+19
28.0	2.56E+19	1.67E+19	1.30E+19	1.17E+19
30.0	2.77E+19	1.80E+19	1.40E+19	1.25E+19
32.0	2.97E+19	1.94E+19	1.50E+19	1.34E+19
34.0	3.18E+19	2.06E+19	1.61E+19	1.44E+19
36.0	3.38E+19	2.20E+19	1.71E+19	1.52E+19
38.0	3.58E+19	2.33E+19	1.81E+19	1.62E+19
40.0	3.79E+19	2.47E+19	1.92E+19	1.71E+19
42.0	4.00E+19	2.60E+19	2.02E+19	1.80E+19
44.0	4.20E+19	2.74E+19	2.12E+19	1.89E+19
46.0	4.40E+19	2.87E+19	2.23E+19	1.98E+19
48.0	4.61E+19	3.01E+19	2.33E+19	2.07E+19
50.0	4.82E+19	3.13E+19	2.43E+19	2.16E+19
52.0	5.02E+19	3.27E+19	2.53E+19	2.25E+19
54.0	5.22E+19	3.40E+19	2.64E+19	2.34E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 4-20

Intermediate Shell Forging (123V500)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.21E+19	1.42E+19	1.09E+19	9.73E+18
26.0	2.41E+19	1.54E+19	1.19E+19	1.07E+19
28.0	2.58E+19	1.66E+19	1.28E+19	1.16E+19
30.0	2.75E+19	1.76E+19	1.37E+19	1.23E+19
32.0	2.92E+19	1.88E+19	1.45E+19	1.32E+19
34.0	3.08E+19	1.98E+19	1.54E+19	1.40E+19
36.0	3.26E+19	2.10E+19	1.63E+19	1.48E+19
38.0	3.42E+19	2.21E+19	1.71E+19	1.56E+19
40.0	3.59E+19	2.32E+19	1.80E+19	1.65E+19
42.0	3.76E+19	2.43E+19	1.89E+19	1.72E+19
44.0	3.93E+19	2.54E+19	1.98E+19	1.81E+19
46.0	4.09E+19	2.65E+19	2.06E+19	1.89E+19
48.0	4.27E+19	2.77E+19	2.15E+19	1.98E+19
50.0	4.43E+19	2.87E+19	2.24E+19	2.05E+19
52.0	4.61E+19	2.99E+19	2.32E+19	2.14E+19
54.0	4.77E+19	3.09E+19	2.41E+19	2.22E+19

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.21E+19	1.42E+19	1.09E+19	9.73E+18
26.0	2.45E+19	1.57E+19	1.21E+19	1.09E+19
28.0	2.65E+19	1.71E+19	1.32E+19	1.18E+19
30.0	2.85E+19	1.83E+19	1.42E+19	1.27E+19
32.0	3.05E+19	1.97E+19	1.52E+19	1.36E+19
34.0	3.26E+19	2.10E+19	1.63E+19	1.45E+19
36.0	3.47E+19	2.23E+19	1.73E+19	1.54E+19
38.0	3.67E+19	2.36E+19	1.84E+19	1.64E+19
40.0	3.87E+19	2.50E+19	1.94E+19	1.72E+19
42.0	4.08E+19	2.63E+19	2.04E+19	1.82E+19
44.0	4.28E+19	2.76E+19	2.15E+19	1.92E+19
46.0	4.48E+19	2.89E+19	2.25E+19	2.00E+19
48.0	4.68E+19	3.03E+19	2.36E+19	2.10E+19
50.0	4.88E+19	3.15E+19	2.47E+19	2.19E+19
52.0	5.09E+19	3.29E+19	2.56E+19	2.28E+19
54.0	5.29E+19	3.42E+19	2.67E+19	2.37E+19

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 4-21

Intermediate Shell to Upper Shell Circumferential Weld (21935)
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.10E+18	1.37E+18	1.06E+18	9.50E+17
26.0	2.26E+18	1.48E+18	1.17E+18	1.04E+18
28.0	2.41E+18	1.58E+18	1.24E+18	1.12E+18
30.0	2.54E+18	1.68E+18	1.33E+18	1.19E+18
32.0	2.69E+18	1.77E+18	1.41E+18	1.27E+18
34.0	2.82E+18	1.87E+18	1.49E+18	1.35E+18
36.0	2.97E+18	1.97E+18	1.58E+18	1.44E+18
38.0	3.10E+18	2.06E+18	1.66E+18	1.51E+18
40.0	3.25E+18	2.16E+18	1.74E+18	1.59E+18
42.0	3.38E+18	2.25E+18	1.83E+18	1.67E+18
44.0	3.53E+18	2.35E+18	1.91E+18	1.74E+18
46.0	3.66E+18	2.46E+18	1.99E+18	1.82E+18
48.0	3.81E+18	2.55E+18	2.07E+18	1.90E+18
50.0	3.94E+18	2.65E+18	2.16E+18	1.98E+18
52.0	4.09E+18	2.75E+18	2.24E+18	2.05E+18
54.0	4.22E+18	2.84E+18	2.32E+18	2.13E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm²]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.10E+18	1.37E+18	1.06E+18	9.50E+17
26.0	2.36E+18	1.53E+18	1.19E+18	1.06E+18
28.0	2.57E+18	1.68E+18	1.30E+18	1.16E+18
30.0	2.79E+18	1.82E+18	1.41E+18	1.25E+18
32.0	3.01E+18	1.97E+18	1.52E+18	1.35E+18
34.0	3.23E+18	2.10E+18	1.63E+18	1.45E+18
36.0	3.45E+18	2.24E+18	1.73E+18	1.54E+18
38.0	3.66E+18	2.39E+18	1.85E+18	1.64E+18
40.0	3.88E+18	2.53E+18	1.96E+18	1.73E+18
42.0	4.09E+18	2.68E+18	2.07E+18	1.83E+18
44.0	4.32E+18	2.81E+18	2.18E+18	1.93E+18
46.0	4.54E+18	2.96E+18	2.28E+18	2.02E+18
48.0	4.75E+18	3.10E+18	2.40E+18	2.12E+18
50.0	4.97E+18	3.25E+18	2.51E+18	2.22E+18
52.0	5.19E+18	3.38E+18	2.61E+18	2.31E+18
54.0	5.41E+18	3.53E+18	2.73E+18	2.41E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

Table 4-22

Upper Shell Forging
Best Estimate Neutron Fluence (E > 1.0 MeV) Projections With Uprate
Point Beach Unit 2

With Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.10E+18	1.37E+18	1.06E+18	9.50E+17
26.0	2.26E+18	1.48E+18	1.17E+18	1.04E+18
28.0	2.41E+18	1.58E+18	1.24E+18	1.12E+18
30.0	2.54E+18	1.68E+18	1.33E+18	1.19E+18
32.0	2.69E+18	1.77E+18	1.41E+18	1.27E+18
34.0	2.82E+18	1.87E+18	1.49E+18	1.35E+18
36.0	2.97E+18	1.97E+18	1.58E+18	1.44E+18
38.0	3.10E+18	2.06E+18	1.66E+18	1.51E+18
40.0	3.25E+18	2.16E+18	1.74E+18	1.59E+18
42.0	3.38E+18	2.25E+18	1.83E+18	1.67E+18
44.0	3.53E+18	2.35E+18	1.91E+18	1.74E+18
46.0	3.66E+18	2.46E+18	1.99E+18	1.82E+18
48.0	3.81E+18	2.55E+18	2.07E+18	1.90E+18
50.0	3.94E+18	2.65E+18	2.16E+18	1.98E+18
52.0	4.09E+18	2.75E+18	2.24E+18	2.05E+18
54.0	4.22E+18	2.84E+18	2.32E+18	2.13E+18

Without Hafnium Suppression Rods

Operating Time [efpy]	Neutron Fluence [n/cm^2]			
	0 Deg.	15 deg.	30 Deg.	45 Deg.
23.6	2.10E+18	1.37E+18	1.06E+18	9.50E+17
26.0	2.36E+18	1.53E+18	1.19E+18	1.06E+18
28.0	2.57E+18	1.68E+18	1.30E+18	1.16E+18
30.0	2.79E+18	1.82E+18	1.41E+18	1.25E+18
32.0	3.01E+18	1.97E+18	1.52E+18	1.35E+18
34.0	3.23E+18	2.10E+18	1.63E+18	1.45E+18
36.0	3.45E+18	2.24E+18	1.73E+18	1.54E+18
38.0	3.66E+18	2.39E+18	1.85E+18	1.64E+18
40.0	3.88E+18	2.53E+18	1.96E+18	1.73E+18
42.0	4.09E+18	2.68E+18	2.07E+18	1.83E+18
44.0	4.32E+18	2.81E+18	2.18E+18	1.93E+18
46.0	4.54E+18	2.96E+18	2.28E+18	2.02E+18
48.0	4.75E+18	3.10E+18	2.40E+18	2.12E+18
50.0	4.97E+18	3.25E+18	2.51E+18	2.22E+18
52.0	5.19E+18	3.38E+18	2.61E+18	2.31E+18
54.0	5.41E+18	3.53E+18	2.73E+18	2.41E+18

Note: The first value listed in the "Operating Time" column is the estimated efpy at the end of cycle 25 (~ April 2002).

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