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RESPONSES TO THIRD ROUND EIS
REQUEST FOR ADDITIONAL INFORMATION
DOCKET NO. 72-22 / TAC NO. L22462
PRIVATE FUEL STORAGE FACILITY
PRIVATE FUEL STORAGE L.L.C.

References:
1. NRC Letter, Delligatti to Parkyn, Request for Additional Information for the Environmental Impact Statement, dated October 24, 2000
2. November 6, 2000 teleconference between S&W and the NRC
3. November 7, 2000 teleconference between S&W, PFS, and the NRC/ORNL
4. November 17, 2000 teleconference between S&W, PFS, and the NRC/ORNL
5. PFS Letter, Donnell to U.S. NRC, Responses to Third Round EIS Request for Additional Information, dated November 7, 2000
6. PFS Letter, Donnell to U.S. NRC, Responses to Third Round EIS Request for Additional Information, dated November 15, 2000
7. PFS Letter, Donnell to U.S. NRC, Proprietary Responses to Third Round EIS Request for Additional Information, dated November 15, 2000

Reference 1 submitted the NRC's Third Round Environmental Impact Statement (EIS) Request for Additional Information (RAI). In the Reference 2, 3 and 4 teleconferences, the NRC clarified the information needed to fully address the issues identified in the initial RAI. In Reference 5, Private Fuel Storage L.L.C. (PFS) provided information in response to question nos. 2, 3, 4, and 8 of Reference 1. In Reference 6, PFS provided information responding to question no. 1, and submitted the results of cost-benefit analyses for the Private Fuel Storage Facility (PFSF) developed to respond to question no. 5. Reference 7 submitted the proprietary electronic file of these cost-benefit analyses, which were prepared by Energy Resources International, Inc. (ERI), and the response to question no. 7, which was also proprietary. The cost-benefit analyses submitted in References 6 and 7 were based on the assumption that spent fuel continues to be received at the PFSF subsequent to 20 years of facility operation.

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As discussed in Reference 6, the purpose of this letter is to submit the results of additional cost-benefit analyses for the PFSF that address question no. 5, assuming no spent fuel is received at the PFSF subsequent to 20 years of facility operation (Enclosure 1). In addition to submitting the supplemental cost-benefit analyses in response to question no. 5, this letter also submits the response to question no. 6 of Reference 1 (Enclosure 1), estimating the "break-even" capacity of the PFSF using cost-benefit analyses which likewise assume that no fuel is received at the PFSF subsequent to 20 years of facility operation. As was the case for the PFSF cost-benefit analyses submitted in References 6 and 7, the latest cost-benefit analyses also account for changes to the PFS membership and the date when it is anticipated that the PFSF will become operational (year 2003).

The response to question no. 5 in Enclosure 1 to this letter addresses NRC comments discussed in the Reference 4 teleconference. Specifically, the response considers 1) the possibility that currently shutdown reactors utilize dry storage of spent fuel instead of extended pool storage for the No Action Alternative; and 2) the effects of modifications to fuel pools of some of the operating reactors that may increase the spent fuel inventory of the pools by means of installation of higher density fuel racks, or installation of fuel racks in previously unracked areas of the fuel pools. In those cases where "reracking" significantly increased a pool's storage capacity, the latest cost benefit analyses reflect consequent delays in the date of projected loss of full-core offload capability which impacts the timing of spent fuel shipments from these reactors to the PFSF.

The NRC's comment regarding increased fuel pool capacity for some of the operating reactors from the Reference 4 teleconference also impacts the previous cost-benefit analyses performed to address question no. 5, submitted in References 6 and 7, which assumed spent fuel continues to be received at the PFSF subsequent to 20 years of facility operation. Therefore, Enclosure 1 also includes revisions to the results of the cost-benefit analyses that were previously submitted in Reference 6 to address the NRC's comment by accounting for the increased capacity of certain spent fuel pools.

Enclosure 2 of this letter is a computer diskette which contains electronic files of the updated supplemental loading cost analyses associated with the latest response to question no. 5, as well as question no. 6. The information contained in these enclosed electronic files is non-proprietary. The remainder of the cost-benefit analyses, performed by ERI to address question nos. 5 and 6, is proprietary to ERI. Proprietary electronic files, which contain ERI's cost-benefit analysis developed to address question nos. 5 and 6, are being submitted to the NRC under separate cover.

If you have any questions regarding this submittal, please contact me at 303-741-7009.

Sincerely

John L. Donnell
Project Director
Private Fuel Storage L.L.C.

Enclosures

Copy to (with enclosures):

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ENCLOSURE 1

RESPONSES TO QUESTION Nos. 5 and 6 of the NRC's THIRD ROUND EIS REQUEST FOR ADDITIONAL INFORMATION

ENVIRONMENTAL IMPACT STATEMENT

5. Revise and update the costs and benefits of the proposed PFSF. All previous cases should be revised to reflect:

   a) The current date that the PFSF would become operational.

   b) Any revisions required or implied by changes in PFS membership (e.g. Florida Power, GPU and Illinois Power). At a minimum, this should reflect the alteration in the members-only case and/or the small-throughput case.

   - The previous analyses were based on 2002 as the date the facility would begin to accept spent nuclear fuel. Current information indicates that this date should be revised to 2003.

RESPONSE

This response provides further analysis of question No. 5 to supplement the response submitted in "*Responses to Third Round EIS, Request for Additional Information, Docket NO. 72-22 / TAC NO. L22462,*" November 15, 2000 (11/15/00 Response). This response provides the results of cost-benefit analyses which assume that no fuel is received at the PFSF subsequent to the initial 20 year operating license. The 11/15/00 Response analyzed scenarios in which it was assumed that the PFSF could accept spent fuel over a 40 year term.

In addition, spent fuel pool capacities for all reactors were updated to the extent that pool capacity changes were known by Energy Resources International, Inc. (ERI). Table 1 identifies the pool capacity changes that have been utilized in the analyses contained herein. In some cases, the capacities reported by utilities in November 1998 to the U.S. Nuclear Regulatory Commission (NRC) as posted on the NRC's web site (http://www.nrc.gov/OPA/drycask/sfdata.htm) were different from those previously assumed by ERI. Utilities may have reported "useable" capacity to NRC which can be lower than the "licensed" capacity due to obstructions in the spent fuel pool or due to other items such as control rods being stored in a storage cell. In some cases, the capacities of spent fuel storage pools have been increased through the installation of higher density storage racks or by inserting racks in previously unracked areas of the storage pools. This is referred to as "reracking". To the extent known, capacities for reracking projects in process or the installed capacities for recently completed projects were included. There may be a few additional spent fuel pools that can still be economically reracked to increase spent fuel storage capacity. However, the majority of spent fuel pools have exhausted the ability to add significant in-pool capacity through reracking.

One additional change was made to reflect the fact that Amergen plans to operate the Oyster Creek plant until its license expiration in 2009. The previous analysis assumed that Oyster Creek would close prematurely in 2000. This response also updates the analysis submitted on November 15, 2000 to reflect these changes.

Results of Analyses That Assume No Spent Fuel Received Subsequent to 20 Years of PFSF Operation

The NRC requested that PFS analyze a case in which spent fuel is accepted during the initial 20-year license and that no further spent fuel is accepted after that time. Spent fuel can be shipped from the facility after the initial 20 year license term. While PFS has analyzed this case, as requested, it should be noted that PFS plans to seek renewal of the 20 year license for the proposed facility such that the facility will be able to accept spent fuel over a 40 year period. Previous cost-benefit analyses of the high throughput case, including those in the 11/15/00 Response, have assumed that no spent fuel is received after 20 years of PFSF operation. Therefore, the high throughput case is not reanalyzed in this section.

The parameters for the spent fuel acceptance scenarios analyzed are provided in Table 2. Table 2 also contains a summary of the amount of spent fuel projected to be loaded into dual purpose canisters for at-reactor dry storage and the amounts shipped directly from the spent fuel storage pool. The estimates of spent fuel shipped directly from the storage pools were used to calculate the additional loading costs for shipment offsite.

The results of the at-reactor spent fuel storage cost projection for the cases are summarized in Table 3 in constant 1999 dollars along with the associated costs to operate the PFSF. The Net Benefit (the cost savings associated with PFSF At-Reactor Storage Benefit minus the costs to operate the PFSF) for each case is also presented. NRC required that a discounted cash flow analysis be included assuming a 7.0% real interest rate. In addition, this analysis also examines the results based on a real interest rate of 3.8%. Table 4 provides the costs as net present value 1999 dollars using a 3.8% real discount rate (3.8% NPV). Table 5 provides the costs as net present value 1999 dollars using a 7.0% real discount rate (7.0% NPV). Table 6 presents a summary of the net benefits for all of the 20-year cases presented in this analysis.

Comparison of Results

Case 15: 2003 PFSF, 21,000 MTU Capacity, 2015 Repository
Case 16: 2015 Repository, No Action Alternative

Case 15 assumes that the PFSF operates for a period of 40 years. This assumes that the PFSF begins operation in 2003 and accepts spent fuel at a rate of 1,000 MTU in 2003, 2,000 MTU per year from 2004 through 2012, and at varying rates through 2022. It is assumed that the PFSF ceases fuel receipts in 2022 after operating for the initial 20 year license term. The maximum capacity for the PFSF is 21,000 MTU for this scenario. Case 15 assumes that a total of 51 reactors ship spent nuclear fuel to the PFSF. Total spent nuclear fuel throughput for this case is approximately 27,000 MTU.

Case 15 assumes that spent fuel is shipped to the PFSF based on an "optimized" shipping schedule that takes into account the needs of the reactors that are assumed to store spent fuel at the facility. Case 15 assumes that spent fuel is shipped from the PFSF to a DOE repository beginning in 2015 on an oldest fuel first (OFF) basis. It is assumed that DOE accepts SNF on a system-wide basis at a rate of 1,200 MTU in 2015 and 2016, 2,000 MTU in 2017 and 2018, 2,700 MTU in 2019, and 3,000 MTU thereafter.

Case 16, identical to the updated Case 3, provides a comparative analysis of the reactor storage costs for a 2015 No Action Alternative for the 51 reactors analyzed in Case 15. Case 16 assumes that spent fuel acceptance begins in 2015 at a DOE repository.

The PFSF At-Reactor Storage Benefit for Case 15, presented in Table 3, was calculated to be $4.612 billion. This is the difference between the Total Utility At-Reactor Storage Costs for Case 15 of $4.066 billion and Case 16 of $8.678 billion. PFSF Costs for Case 15 are $1.812 billion for a Net Benefit of $2.80 billion (Constant 1999$). Table 4 presents the results of the 3.8% NPV calculation for Case 15 and Case 16, resulting in Net Benefits of $839.8 million. Table 5 presents the results of the 7% NPV calculation, resulting in Net Benefits of $255.2 million.

Case 17: 2003 PFSF Members Only, 9600 MTU Capacity, 2015 Repository
Case 18: 2015 Repository, No Action Alternative

Case 17 assumes that the PFSF operates for a period of 40 years. This assumes that the PFSF begins operation in 2003 and accepts spent fuel at a rate of 1,000 MTU per year from 2003 through 2009, and at varying rates through 2022 depending upon the availability of spent fuel for shipment from the reactors assumed to utilize the PFSF for this case. Only those reactors that are operated by PFS members were assumed to ship spent fuel to the PFSF in this scenario. The maximum capacity for the PFSF for this member-only scenario was calculated to be approximately 9,600 MTU. Case 17 assumes that a total of 19 reactors ship spent nuclear fuel to the PFSF. Total throughput for the facility is approximately 12,200 MTU.

Case 17 assumes that spent fuel is shipped to the PFSF based on an "optimized" shipping schedule that takes into account the needs of the reactors that are assumed to store spent fuel at the facility. Case 17 assumes that spent fuel is shipped from the PFSF to a DOE repository beginning in 2015 on an OFF basis. It is assumed that DOE accepts SNF on a system-wide basis at a rate of 1,200 MTU in 2015 and 2016, 2,000 MTU in 2017 and 2018, 2,700 MTU in 2019, and 3,000 MTU thereafter.

Case 18, identical to the updated Case 6, provides a comparative analysis of the reactor storage costs for a 2015 No Action Alternative for the 19 reactors analyzed

in Case 17. Case 18 assumes that spent fuel acceptance begins in 2015 at a DOE repository.

The PFSF At-Reactor Storage Benefit for Case 17, presented in Table 3, was calculated to be $1.151 billion. This is the difference between the Total Utility At-Reactor Storage Costs for Case 17 of $1.515 billion and Case 18 of $2.666 billion. PFSF Costs for Case 17 are $1.012 billion for a Net Benefit of $138.7 million (Constant 1999$). Table 4 presents the results of the 3.8% NPV calculation for Case 17 and Case 18, resulting in Net Benefits of ($138) million. Table 5 presents the results of the 7% NPV calculation, resulting in Net Benefits of ($185) million.

Case 19: 2003 PFSF, 19,400 MTU Capacity, 2010 Repository
Case 20: 2010 Repository, No Action Alternative

Case 19 assumes that the PFSF operates for a period of 40 years. This assumes that the PFSF begins operation in 2003 and accepts spent fuel at a rate of 1,000 MTU in 2003, 2,000 MTU from 2004 through 2012, and at varying rates thereafter through 2022 depending upon the availability of spent fuel for shipment from the reactors assumed to utilize the PFSF for this case. The same reactors assumed to ship spent fuel to the PFSF in Case 15 were assumed for Case 19. A maximum capacity for the PFSF was calculated to be 19,400 MTU for this scenario. Case 19 assumes that a total of 51 reactors ship spent nuclear fuel to the PFSF. Total spent nuclear fuel throughput for this case is approximately 27,000 MTU.

Case 19 assumes that spent fuel is shipped to the PFSF based on an "optimized" shipping schedule that takes into account the needs of the reactors that are assumed to store spent fuel at the facility. Case 19 assumes that spent fuel is shipped from the PFSF to a DOE repository beginning in 2010 on an OFF basis. It is assumed that DOE accepts SNF on a system-wide basis at a rate of 1,200 MTU in 2010 and 2011, 2,000 MTU in 2012 and 2013, 2,700 MTU in 2014, and 3,000 MTU thereafter.

Case 20, identical to the updated Case 10, provides a comparative analysis of the reactor storage costs for a 2010 No Action Alternative for the 51 reactors analyzed in Case 19. Case 20 assumes that spent fuel acceptance begins in 2010 at a DOE repository.

The PFSF At-Reactor Storage Benefit for Case 19, presented in Table 3, was calculated to be $3.350 billion. This is the difference between the Total Utility At-Reactor Storage Costs for Case 19 of $3.730 billion and Case 20 of $7.080 billion. PFSF Costs for Case 19 are $1.812 billion for a Net Benefit of $1.538 billion (Constant 1999$). Table 4 presents the results of the 3.8% NPV calculation for Case 19 and Case 20, resulting in Net Benefits of $404.5 million. Table 5 presents the results of the 7% NPV calculation, resulting in Net Benefits of $60 million.

Case 21: 2003 PFSF Members Only, 8,200 MTU Capacity, 2010 Repository
Case 22: 2010 Repository, No Action Alternative

Case 21 assumes that the PFSF operates for a period of 40 years. This assumes that the PFSF begins operation in 2003 and accepts spent fuel at a rate of 1,000 MTU per year from 2003 through 2009, and at varying rates thereafter through 2022 depending upon the availability of spent fuel for shipment from the reactors assumed to utilize the PFSF for this case. Only those reactors that are operated by PFS members were assumed to ship spent fuel to the PFSF in this scenario. The maximum capacity for the PFSF for this member-only scenario was calculated to be approximately 8,200 MTU. Case 21 assumes that a total of 19 reactors ship spent nuclear fuel to the PFSF. Total throughput for the facility is approximately 12,200 MTU.

Case 21 assumes that spent fuel is shipped to the PFSF based on an "optimized" shipping schedule that takes into account the needs of the reactors that are assumed to store spent fuel at the facility. Case 21 assumes that spent fuel is shipped from the PFSF to a DOE repository beginning in 2010 on an OFF basis. It is assumed that DOE accepts SNF on a system-wide basis at a rate of 1,200 MTU in 2010 and 2011, 2,000 MTU in 2012 and 2013, 2,700 MTU in 2014, and 3,000 MTU thereafter.

Case 22, identical to the updated Case 12, provides a comparative analysis of the reactor storage costs for a 2010 No Action Alternative for the 19 reactors analyzed in Case 21. Case 22 assumes that spent fuel acceptance begins in 2010 at a DOE repository.

The PFSF At-Reactor Storage Benefit for Case 21, presented in Table 3, was calculated to be $794.2 million. This is the difference between the Total Utility At-Reactor Storage Costs for Case 21 of $1.290 billion and Case 22 of $2.084 billion. PFSF Costs for Case 21 are $1.012 billion for a Net Benefit of ($218) million (Constant 1999$). Table 4 presents the results of the 3.8% NPV calculation for Case 21 and Case 22, resulting in Net Benefits of ($272) million. Table 5 presents the results of the 7% NPV calculation, resulting in Net Benefits of ($253) million.

It should be noted that the net benefit calculated for the 7% NPV case is actually larger than the net benefit calculated for the 3.8% NPV case. Generally speaking, one would expect the net benefits for the 7% NPV to be lower than those calculated using a 3.8% NPV. Since there are several different cost categories, each will be affected by discounting to different degrees depending upon the timing of the actual cash flows for each cost category. Thus, while each individual cost component is lower in the 7% NPV case than in the 3.8% NPV case, the sum of the cost components results in the 7% NPV being slightly higher than the 3.8% NPV.

Discussion of Results

The assumption that spent fuel receipts at the PFSF would only occur during the initial 20-year license term had no major effect on the operating reactor storage component but did increase the cost associated with shutdown reactor storage. This is due to the fact that some reactors must wait to ship some quantity of spent fuel to the DOE repository instead of being able to ship that spent fuel to the PFSF at an earlier date. Overall, the results of the 20 year analysis continue to demonstrate that there is a need to provide centralized, interim storage of spent fuel.

It should be noted that the 40-year analyses previously submitted to NRC and updated herein conservatively assume that all fuel must cool for a minimum of ten years prior to shipment to the PFSF. In fact, fuel with shorter cooling times can be shipped in current dual purpose systems depending upon the fuel burnup. In addition, many cask designers plan to amend their certificates of compliance to utilize "preferential loading" of spent fuel – that is, loading spent fuel with different cooling times (shorter cooled and longer cooled) in order to maximize cask capacity. This will allow the shipment of shorter cooled fuel in the future. Many cask designers also plan to amend their cask designs in the future to be able to accommodate the shipment of shorter cooled spent fuel. Since this will not be an issue for 15 to 20 years, it is reasonable to assume that the technology needed to ship somewhat shorter cooled fuel will be available. Given these factors, this analysis did assume that some spent fuel that has cooled for less than 10 years may be shipped to the PFSF.

Results of November 15, 2000 Analyses That Assume Spent Fuel Is Received Subsequent to 20 Years of PFSF Operations, with Updated Pool Capacities

The updated pool capacities and the change in operational status of Oyster Creek will have an effect on the results of the analysis submitted to NRC on November 15, 2000 in response to the October 24, 2000, RAI, question 5. Therefore, the updated results of that analysis are also provided in this response so that NRC can make a fair assessment of the 20 Year analysis contained herein and the 40-Year analysis provided previously. The overall results are not changed significantly due to the new assumptions identified.

The changes to the pool capacities and operational status of Oyster Creek resulted in the following changes:

- No real change to the Members Only cases (Case 5, 6, 11, and 12) since there were no major changes to the members only assumptions.
- The Medium throughput cases (Cases 1, 3, 9, and 10) will have lower Operating Reactor Storage costs. The Shutdown Reactor Storage Costs remain the same since there was no change to the operating status of any of the plants assumed in the analysis. Loading costs are higher since a lower amount of spent fuel is required to be placed in dry storage at operating reactors and more spent fuel is

assumed to be shipped directly from the spent fuel storage pool.

- The High throughput cases (Cases 7, 8, 13, and 14) will have lower Operating Reactor Storage costs. There will also be slightly lower Shutdown Reactor Storage costs due to the change in operational status of Oyster Creek. Loading costs will be higher since a lower amount of spent fuel is required to be placed into dry storage at operating reactors and more spent fuel is assumed to be shipped directly from the spent fuel storage pool.

Updated Results

Case 1: 2003 PFSF, 20,000 MTU Capacity, 2015 Repository
Case 3: 2015 Repository, No Action Alternative

The PFSF At-Reactor Storage Benefit for Case 1, presented in Table 8a, was calculated to be $4.949 billion. This is the difference between the Total Utility At-Reactor Storage Costs for Case 1 of $3.729 billion and Case 3 of $8.678 billion. PFSF Costs for Case 1 are $1.863 billion for a Net Benefit of $3.087 billion (Constant 1999$). Table 9a presents the results of the 3.8% NPV calculation for Case 1 and Case 3, resulting in Net Benefits of $897 million. Table 10a presents the results of the 7% NPV calculation, resulting in Net Benefits of $279 million.

Case 5: 2003 PFSF Members Only, 8800 MTU Capacity, 2015 Repository
Case 6: 2015 Repository, No Action Alternative

The PFSF At-Reactor Storage Benefit for Case 5, presented in Table 8a, was calculated to be $1.487 billion. This is the difference between the Total Utility At-Reactor Storage Costs for Case 5 of $1.178 billion and Case 6 of $2.665 billion. PFSF Costs for Case 5 are $1.065 billion for a Net Benefit of $422 million (Constant 1999$). Table 9a presents the results of the 3.8% NPV calculation for Case 5 and Case 6, resulting in Net Benefits of ($64) million. Table 10a presents the results of the 7% NPV calculation, resulting in Net Benefits of ($154.5) million.

Case 7: 2003 PFSF, 38,000 MTU Capacity, 2015 Repository
Case 8: 2015 Repository, No Action Alternative

The PFSF At-Reactor Storage Benefit for Case 7, presented in Table 8a, was calculated to be $8.128 billion. This is the difference between the Total Utility At-Reactor Storage Costs for Case 7 of $9.043 billion and Case 8 of $17.171 billion. PFSF Costs for Case 7 are $2.367 billion for a Net Benefit of $5.761 billion (Constant 1999$). Table 9a presents the results of the 3.8% NPV calculation for Case 7 and Case 8, resulting in Net Benefits of $1.995 billion. Table 10a presents the results of the 7% NPV calculation, resulting in Net Benefits of $921 million.

Case 9: 2003 PFSF, 17,000 MTU Capacity, 2010 Repository
Case 10: 2010 Repository, No Action Alternative

The PFSF At-Reactor Storage Benefit for Case 9, presented in Table 8b, was calculated to be $3.343 billion. This is the difference between the Total Utility At-Reactor Storage Costs for Case 9 of $3.737 billion and Case 10 of $7.080 billion. PFSF Costs for Case 9 are $1.863 billion for a Net Benefit of $1.480 billion (Constant 1999$). Table 9b presents the results of the 3.8% NPV calculation for Case 9 and Case 10, resulting in Net Benefits of $382 million. Table 10b presents the results of the 7% NPV calculation, resulting in Net Benefits of $60 million.

Case 11: 2003 PFSF Members Only, 7,400 MTU Capacity, 2010 Repository
Case 12: 2010 Repository, No Action Alternative

The PFSF At-Reactor Storage Benefit for Case 11, presented in Table 8b, was calculated to be $898 million. This is the difference between the Total Utility At-Reactor Storage Costs for Case 11 of $1.186 billion and Case 12 of $2.084 billion. PFSF Costs for Case 11 are $1.065 billion for a Net Benefit of ($167) million (Constant 1999$). Table 9b presents the results of the 3.8% NPV calculation for Case 11 and Case 12, resulting in Net Benefits of ($253) million. Table 10b presents the results of the 7% NPV calculation, resulting in Net Benefits of ($239) million.

It should be noted that the net benefit calculated for the 7% NPV case is actually larger than the net benefit calculated for the 3.8% NPV case. Generally speaking, one would expect the net benefits for the 7% NPV to be lower than those calculated using a 3.8% NPV. Since there are several different cost categories, each will be affected by discounting to different degrees depending upon the timing of the actual cash flows for each cost category. Thus, while each individual cost component is lower in the 7% NPV case than in the 3.8% NPV case, the sum of the cost components results in the 7% NPV being slightly higher than the 3.8% NPV.

Case 13: 2003 PFSF, 38,000 MTU Capacity, 2010 Repository
Case 14: 2010 Repository, No Action Alternative

The PFSF At-Reactor Storage Benefit for Case 13, presented in Table 8b, was calculated to be $6.829 billion. This is the difference between the Total Utility At-Reactor Storage Costs for Case 13 of $6.756 billion and Case 14 of $13.585 billion. PFSF Costs for Case 13 are $2.366 billion for a Net Benefit of $4.463 billion (Constant 1999$). Table 9b presents the results of the 3.8% NPV calculation for Case 13 and Case 14, resulting in Net Benefits of $1.497 billion. Table 10b presents the results of the 7% NPV calculation, resulting in Net Benefits of $647 million.

Results of Assuming Dry Storage for Specific Shutdown Reactors

The NRC requested that PFS analyze the possibility that eight currently shutdown reactors utilize dry storage instead of extended pool storage for the No Action Alternative (NAA) cases. The reactors NRC requested PFS to examine include: Big Rock Point, Haddam Neck, Humboldt Bay, LaCrosse, Maine Yankee, Rancho Seco, Trojan, and Yankee Rowe. These sites all have a relatively small amount of spent fuel requiring storage and a number of these sites are in the process of implementing dry storage. The analysis performed by PFS includes only seven of these currently shutdown reactors. It does not include the LaCrosse plant since Dairyland Power has no current plans to implement dry storage. It should also be noted that Zion was not included since following the closure of Zion, Exelon announced that it planned to continue pool storage at the Zion plant for the foreseeable future.

It should be noted that the schedule for shutdown plants implementing dry storage has been a long and uncertain process. Sacramento Municipal Utility District submitted a license application for the Rancho Seco Independent Spent Fuel Storage Installation (ISFSI) in October 1991 and did not receive a license until June 2000. Portland General Electric submitted a license application for the Trojan ISFSI in February 1996, received a license in April 1999, and has yet to successfully load fuel into dry storage. Delays such as this will generally result in increasing the costs of implementing dry storage above the generic cost estimates assumed in this analysis. Therefore the analysis that follows should be considered to be conservative in light of the delays experienced by a number of shutdown reactors in implementing at-reactor dry storage.

All seven of the currently shutdown plants evaluated are contained in both the Medium throughput cases and the High throughput cases. Therefore, it was possible to separate out these seven plants for a sensitivity evaluation to examine the effect on total cost if these plants moved spent fuel to dry storage allowing the spent fuel pools to be closed. This would result in long term operation and maintenance costs of $4 million per year per site for dry storage instead of the $8 million per year assumption used for pool storage. In addition to the costs previously assumed for dry storage, an additional $750,000 was added to the upfront costs in order to include the cost of a damaged canister overpack. A number of sites plan to have either an overpack or a transportation cask onsite to be able to handle a damaged dual purpose canister. Since transportation casks generally cost more than $1.5 million, the assumption to use a canister overpack is conservative. The cost was conservatively estimated based on the current cost of dual purpose systems.

Both the 2015 and 2010 NAA Cases were examined. The results of the analyses are provided in Tables 12 and 13, respectively. As presented in Table 12 for the 2015 NAA cases, the cost of wet storage versus dry storage for the seven shutdown plants could provide marginal cost benefits, depending upon the discount

rate assumed. Constant dollar costs are reduced from $1.894 billion for the wet storage scenario to $1.537 billion if dry storage is assumed – a potential savings of $358 million. Using a 3.8% discount rate, the advantage of dry storage is approximately $120 million. Using a 7% discount rate, the advantage of dry storage over wet storage for currently shutdown reactors is only $21 million dollars.

Similar results were calculated for the 2010 NAA cases as presented in Table 13. Constant dollar costs are reduced from $1.615 billion for the wet storage scenario to $1.397 billion for the scenario that assumes post shutdown dry storage. Using a 3.8% discount rate, the advantage of dry storage is approximately $60 million. Using a 7% discount rate, dry storage is more expensive than the wet storage alternative by $10 million.

This analysis shows that there may be marginal cost benefits associated with moving spent fuel from wet storage to dry storage following reactor shutdown for decommissioning at sites with a relatively small amount of spent fuel requiring storage. Sites with a substantial amount of spent fuel requiring storage would have to incur large capital costs to load fuel into dry storage that would likely offset the operating and maintenance cost savings. The economics also will be dependent upon how long spent fuel remains at the shutdown reactor sites – the longer spent fuel must be stored at the site, the more beneficial it may be to move spent fuel to dry storage. Utilities with shutdown reactors that have decided to implement dry storage may not have made this decision solely on the economics associated with dry storage versus wet storage. Instead, other factors such as the projected costs associated with disposal of low level radioactive waste and agreements with local communities may be the driving factors in decisions associated with the immediate dismantlement taking place at many shutdown reactors.

Even when one applies the change in costs associated with using dry storage instead of wet storage at currently shutdown reactors to both the 20-year and 40-year medium and high throughput cases, the overall analyses continue to demonstrate the benefits of the proposed PFSF.

Note that since none of the shutdown reactors analyzed are currently PFS members, these results should not be applied to the small throughput, "Members Only" cases.

Summary

The NRC requested that PFS analyze a case in which it is assumed that spent fuel is accepted during the initial 20-year license and that no further spent fuel is accepted after that time. Spent fuel can be shipped from the facility after the initial 20 year license term. While PFS has analyzed this case, as requested, it should be noted that PFS plans to seek renewal of the 20 year license for the proposed facility such that the facility will be able to accept spent fuel over a 40 year period.

PFS has every reason to believe that it will be able to renew its license for an additional 20 year period. Therefore, the PFSF base case analysis will remain the 40-year cases that were analyzed previously and are updated herein. The 40-year facility provides additional operational flexibility to those plants that use the proposed PFSF.

Both the 20-year and 40-year analyses continue to demonstrate that there is a need to provide centralized, interim storage of spent nuclear fuel for some operating nuclear plants; to allow for the complete dismantlement and decommissioning of other nuclear plants; and to allow for the standardized packaging and staging of spent fuel in a uniform manner prior to its shipment to a federal facility. In addition, the availability of the PFSF, to both member and non-member plants, would provide benefits to those plants which may be unable to increase at-reactor spent fuel storage or where at-reactor storage would not be economically advantageous.

In addition to the at-reactor storage benefits calculated in this analysis, there are other unquantified benefits associated with the operation of the PFSF that should be considered to fully account for the facility benefits. These additional benefits include, but are not limited to:

- Avoidance of the potential effects of premature nuclear plant shutdowns due to insufficient at-reactor spent fuel storage capacity, including the cost of replacement power, replacement generating capacity, and the increase in air emissions associated with the loss of a non-emitting generator.
- Avoidance of delays in the final dismantlement and decommissioning of shutdown plants, which could prohibit the potential reuse of those sites for other purposes.

PFS believes that the calculation of a negative net benefit for any scenario does not imply that the operation of the PFSF would not be beneficial for that scenario. Taking into consideration the additional benefits discussed above, PFS believes that all scenarios analyzed demonstrate that there is a need for the proposed PFSF.

Table 1 Changes in Spent Fuel Pool Capacities from Previous Analyses

Plant Name	Previous Capacity (Assemblies)	New Capacity (Assemblies)	Source of Change:
Browns Ferry 2	3471	3133	Reference 1
Browns Ferry 3	3471	2353	Reference 1
Byron 1	1412	1391	Reference 1
Byron 2	1412	1390	Reference 1
Callaway	1340	2363	Reracked 1999
Calvert Cliffs 1	778	830	Reference 1
Catawba 1	2615	1418	Reference 1
Catawba 2	2615	1418	Reference 1
Comanche Peak 1	1693	556	License Amendment Request, 2/11/99, 50-445
Comanche Peak 2	1687	1470	
Davis Besse	720	1024	FR Volume 65, No. 9, 1/13/00 Docket 50-346
Duane Arnold	2300	2411	Reference 1
Ginna	1015	1369	Reracked 1999
Grand Gulf	3822	4348	Reference 1
Kewaunee	990	1205	Rerack planned 2001, no reference, Nuclear Fuel, 7/12/99
LaSalle 1	4073	3966	Reference 1
LaSalle 2	4073	3966	Reference 1
McGuire 1	1581	1351	Reference 1
McGuire 2	1460	1425	Reference 1
Nine Mile Point 1	2560	4086	Docket 50-220, License Amendment, June 17, 1999
Nine Mile Point 2	2528	4049	Reference 1
Oyster Creek	2600	2990	FR Volume 65, No. 177, 9/12/00, Docket 50-219
Palo Verde 1	1323	1205	FR Volume 65, No. 41, 3/1/00, Docket 50-528, 50-529, 50-530
Palo Verde 2	1323	1205	
Palo Verde 3	1322	1205	
Pilgrim	2875	3404	Installed capacity, rerack, 9/2000
TMI 1	1284	1338	Reference 1
Vermont Yankee	2860	3353	FR Volume 64, No 243, 12/20/99, Docket 50-271
Waterford 3	1070	2398	Reference 1
Watts Bar 1	1294	1386	Rerack 1999, Installation of Sequoyah racks
Wolf Creek	1327	2363	Rerack 1999

References

1. www.nrc.gov/OPA/drycask/sfdata.htm

Table 2 Parameters for Spent Fuel Acceptance Scenarios 20-Year Receipt Cases

Assumptions	Case 15	Case 16	Case 17	Case 18
PFSF Operation Date	2003 PFSF	No PFSF	2003 PFSF	No PFSF
Repository Operation Date	2015	2015	2015	2015
Peak PFSF Capacity (MTU)	21,000	0	9,600	0
Reactors in Comparison	51	51	21	21
MTU In DP Canisters	286	4,229	96	2,318
MTU From Pools	28,826	24,883	13,760	11,538
Total MTU	29,112	29,112	13,856	13,856
Assumptions	**Case 19**	**Case 20**	**Case 21**	**Case 22**
PFSF Operation Date	2003 PFSF	No PFSF	2003 PFSF	No PFSF
Repository Operation Date	2010	2010	2010	2010
Peak PFSF Capacity (MTU)	19,400	0	8,200	0
Reactors in Comparison	51	51	21	21
MTU in DP Canisters	286	2,727	96	1,284
MTU From Pools	28,826	26,385	13,760	12,572
Total MTU	29,112	29,112	13,856	13,856

Table 3 At-Reactor Spent Fuel Storage Cost Summary, 20 Year Receipt Cases, (Millions Constant 1999$)

COMPARISONS OF COSTS FOR PFSF VERSUS 2015 REPOSITORY ONLY SYSTEMS				
Cost Category	**Case 15 vs. Case 16**		**Case 17 vs. Case 18**	
PFSF Operation Date	Case 15 2003 PFSF 21,000 MTU	Case 16 No PFSF	Case 17 2003 PFSF 9,600 MTU	Case 18 No PFSF
Operating Reactor Storage	$ 264.5	$ 950.3	$ 78.2	$ 449.4
Shutdown Reactor Storage	$ 3,407.6	$ 7,419.8	$ 1,288.0	$ 2,108.4
Loading Costs for Shipment Offsite	$ 393.5	$ 307.9	$ 148.5	$ 107.9
Total Utility At-Reactor Storage Cost	$ 4,065.6	$ 8,678.0	$ 1,514.7	$ 2,665.7
PFSF At-Reactor Storage Benefit	$ 4,612.4		$ 1,151.0	
PFS Facility Cost	$ 1,811.9		$ 1,012.3	
Net Benefit	$ 2,800.5		$ 138.7	
COMPARISONS OF COSTS FOR PFSF VERSUS 2010 REPOSITORY ONLY SYSTEMS				
Cost Category	**Case 19 vs. Case 20**		**Case 21 vs. Case 22**	
PFSF Operation Date	Case 19 2003 PFSF 19,400 MTU	Case 20 No PFSF	Case 21 2003 PFSF 8,200 MTU	Case 22 No PFSF
Operating Reactor Storage	$ 264.5	$ 740.6	$ 77.6	$ 307.1
Shutdown Reactor Storage	$3,071.6	$ 6,010.8	$ 1,064.0	$ 1,662.4
Loading Costs for Shipment Offsite	$ 393.5	$ 328.2	$ 148.5	$ 114.8
Total Utility At-Reactor Storage Cost	$ 3,729.6	$ 7,079.6	$ 1,290.1	$ 2,084.3
PFSF At-Reactor Storage Benefit	$ 3,350.0		$ 794.2	
PFS Facility Cost	$ 1,811.9		$ 1,012.3	
Net Benefit	$ 1,538.1		$ (218.1)	

Table 4 At-Reactor Spent Fuel Storage Cost Summary, 20 Year Receipt Cases, (Millions NPV 1999$ - 3.8% Real Interest Rate)

COMPARISONS OF COSTS FOR PFSF VERSUS 2015 REPOSITORY ONLY SYSTEMS				
Cost Category	**Case 15 vs. Case 16**		**Case 17 vs. Case 18**	
PFSF Operation Date	Case 15 2003 PFSF 21,000 MTU	Case 16 No PFSF	Case 17 2003 PFSF 9,600 MTU	Case 18 No PFSF
Operating Reactor Storage	$ 244.6	$ 710.3	$ 71.4	$ 313.2
Shutdown Reactor Storage	$ 1,979.9	$ 3,667.0	$ 561.9	$ 881.0
Loading Costs For Shipment Offsite	$ 280.3	$ 127.0	$ 102.6	$ 40.1
Total Utility At-Reactor Storage Cost	$ 2,504.8	$ 4,504.3	$ 735.9	$ 1,234.3
PFSF At-Reactor Storage Benefit	$ 1,999.5		$ 484.4	
PFS Facility Cost	$ 1,159.7		$ 636.0	
Net Benefit	$ 839.8		$ (137.5)	
COMPARISONS OF COSTS FOR PFSF VERSUS 2010 REPOSITORY ONLY SYSTEMS				
Cost Category	**Case 19 vs. Case 20**		**Case 21 vs. Case 22**	
PFSF Operation Date	Case 19 2003 PFSF 19,400 MTU	Case 20 No PFSF	Case 21 2003 PFSF 8,200 MTU	Case 22 No PFSF
Operating Reactor Storage	$ 244.5	$ 590.4	$ 70.8	$ 234.4
Shutdown Reactor Storage	$ 1,903.2	$ 3,241.4	$ 509.0	$ 762.5
Loading Costs For Shipment Offsite	$ 281.9	$ 162.0	$ 103.4	$ 50.2
Total Utility At-Reactor Storage Cost	$ 2,429.6	$ 3,993.8	$ 683.2	$ 1,047.1
PFSF At-Reactor Storage Benefit	$ 1,564.2		$ 363.9	
PFS Facility Cost	$ 1,159.7		$ 635.9	
Net Benefit	$ 404.5		$ (272.0)	

Table 5 At-Reactor Spent Fuel Storage Cost Summary, 20 Year Receipt Cases, (Millions NPV 1999$ - 7.0% Real Discount Rate)

COMPARISONS OF COSTS FOR PFSF VERSUS 2015 REPOSITORY ONLY SYSTEMS				
Cost Category	**Case 15 vs. Case 19**		**Case 17 vs. Case 18**	
PFSF Operation Date	Case 15 2003 PFSF 21,000 MTU	Case 16 No PFSF	Case 17 2003 PFSF 9,600 MTU	Case 18 No PFSF
Operating Reactor Storage	$ 232.4	$ 579.0	$ 67.4	$ 242.3
Shutdown Reactor Storage	$ 1,470.1	$ 2,376.5	$ 341.3	$ 505.8
Loading Costs for Shipment Offsite	$ 222.4	$ 65.4	$ 80.6	$ 19.0
Total Utility At-Reactor Storage Cost	$ 1,924.9	$ 3,020.9	$ 489.3	$ 767.1
PFSF At-Reactor Storage Benefit	$ 1,096.0		$ 277.8	
PFS Facility Cost	$ 840.8		$ 462.7	
Net Benefit	$ 255.2		$ (184.9)	
COMPARISONS OF COSTS FOR PFSF VERSUS 2010 REPOSITORY ONLY SYSTEMS				
Cost Category	**Case 19 vs. Case 20**		**Case 21 vs. Case 22**	
PFSF Operation Date	Case 19 2003 PFSF 19,400 MTU	Case 20 No PFSF	Case 21 2003 PFSF 8,200 MTU	Case 22 No PFSF
Operating Reactor Storage	$ 232.4	$ 501.9	$ 66.8	$ 192.8
Shutdown Reactor Storage	$ 1,447.6	$ 2,205.2	$ 324.9	$ 462.7
Loading Costs for Shipment Offsite	$ 223.7	$ 97.0	$ 81.4	$ 27.3
Total Utility At-Reactor Storage Cost	$ 1,903.7	$ 2,804.1	$ 473.1	$ 682.0
PFSF At-Reactor Storage Benefit	$ 900.4		$ 209.7	
PFS Facility Cost	$ 840.8		$ 462.7	
Net Benefit	$ 59.6		$ (253.0)	

Table 6 Summary of Net Benefits (Millions of $) 20-Year Receipt Cases

Net Benefits for the 2015 Repository Scenarios		
Net Benefits	**Case 15 vs. Case 16 2003 PFSF 21,000 MTU**	**Case 17 vs. Case 18 2003 PFSF Members Only 9,600 MTU**
Constant 1999$	$2,800	$ 139
NPV 3.8%	$ 840	$ (138)
NPV 7.0%	$ 255	$ (185)

Net Benefits for the 2010 Repository Scenarios		
Net Benefits	**Case 19 vs. Case 20 2003 PFSF 19,400 MTU**	**Case 21 vs. Case 22 2003 PFSF Members Only 8,200 MTU**
Constant 1999$	$ 1,538	$ (218)
NPV 3.8%	$ 404	$ (272)
NPV 7.0%	$ 60	$ (253)

Table 7 Parameters for Spent Fuel Acceptance Scenarios, Updated Pool Capacities

Assumptions	Case 1	Case 3	Case 5	Case 6	Case 7	Case 8
PFSF Operation Date	2003 PFSF	No PFSF	2003 PFSF	No PFSF	2003 PFSF	No PFSF
Repository Operation Date	2015	2015	2015	2015	2015	2015
Peak PFSF Capacity (MTU)	20,000	0	8,800	0	38,000	0
Reactors in Comparison	51	51	21	21	all	All
License Duration (Years)	40		40		40	
Parameters for Calculation of Loading Costs for Shipment Offsite						
MTU In DP Canisters	339	4,229	96	2,318	1,670	17,627
MTU From Pools	28,773	24,883	13,760	11,538	83,532	67,575
Total MTU	29,112	29,112	13,856	13,856	85,202	85,202

Assumptions	Case 9	Case 10	Case 11	Case 12	Case 13	Case 14
PFSF Operation Date	2003 PFSF	No PFSF	2003 PFSF	No PFSF	2003 PFSF	No PFSF
Repository Operation Date	2010	2010	2010	2010	2010	2010
Peak PFSF Capacity (MTU)	17,000	0	7,400	0	38,000	0
Reactors in Comparison	51	51	21	21	All	All
License Duration (Years)	40		40		40	
Parameters for Calculation of Loading Costs for Shipment Offsite						
MTU in DP Canisters	339	2,727	96	1,284	1,895	11,865
MTU From Pools	28,773	26,385	13,760	12,572	83,307	73,337
Total MTU	29,112	29,112	13,856	13,856	85,202	85,202

Table 8a At-Reactor Spent Fuel Storage Cost Summary, Updated Pool Capacities (Millions Constant 1999$)

	Comparisons of Costs for PFSF versus 2015 No Action Alternative Scenarios					
Cost Category	**Case 1 vs. Case 3**		**Case 5 vs. Case 6**		**Case 7 vs. Case 8**	
PFSF Operation Date	Case 1 2003 PFSF 20,000 MTU	Case 3 No PFSF	Case 5 2003 PFSF 8,800 MTU	Case 6 No PFSF	Case 7 2003 PFSF 38,000 MTU	Case 8 No PFSF
Operating Reactor Storage	$ 269.5	$ 950.3	$ 78.2	$ 449.4	$ 791.6	$ 3,060.2
Shutdown Reactor Storage	$ 3,066.0	$ 7,419.8	$ 952.0	$ 2,108.4	$ 7,552.2	$ 13,563.8
Loading Costs for Shipment Offsite	$ 393.3	$ 307.9	$ 148.5	$ 107.9	$ 699.1	$ 547.3
Total Utility At-Reactor Storage Cost	$ 3,728.8	$ 8,678.0	$ 1,178.7	$ 2,665.7	$ 9,042.9	$ 17,171.3
PFSF At-Reactor Storage Benefit	$ 4,949.2		$ 1,487.0		$ 8,128.4	
PFS Facility Cost	$ 1,862.7		$ 1,065.0		$ 2,367.0	
Net Benefit	$ 3,086.5		$ 422.0		$ 5,761.4	

Table 8b At-Reactor Spent Fuel Storage Cost Summary, Updated Pool Capacities (Millions Constant 1999$)

	Comparisons of Costs for PFSF versus 2010 No Action Alternative Scenarios					
Cost Category	**Case 9 vs. Case 10**		**Case 11 vs. Case 12**		**Case 13 vs. Case 14**	
PFSF Operation Date	Case 9 2003 PFSF 17,000 MTU	Case 10 No PFSF	Case 11 2003 PFSF 7,400 MTU	Case 12 No PFSF	Case 13 2003 PFSF 38,000 MTU	Case 14 No PFSF
Operating Reactor Storage	$ 269.5	$ 740.6	$ 77.6	$ 307.1	$ 849.9	$ 2,432.7
Shutdown Reactor Storage	$3,074.0	$ 6,010.8	$ 960.0	$ 1,662.4	$ 5,208.8	$ 10,562.8
Loading Costs for Shipment Offsite	$ 393.3	$ 328.2	$ 148.5	$ 114.8	$ 697.5	$ 589.6
Total Utility At-Reactor Storage Cost	$ 3,736.8	$ 7,079.6	$ 1,186.1	$ 2,084.3	$ 6,756.2	$ 13,585.1
PFSF At-Reactor Storage Benefit	$ 3,342.8		$ 898.2		$ 6,828.9	
PFS Facility Cost	$ 1,862.7		$ 1,065.0		$ 2,366.0	
Net Benefit	$ 1,480.1		$ (166.8)		$ 4,462.9	

Table 9a At-Reactor Spent Fuel Storage Cost Summary, Updated Pool Capacities (Millions NPV 1999$ - 3.8% Real Interest Rate)

	Comparisons of Costs for PFSF versus 2015 No Action Alternative Scenarios					
Cost Category	**Case 1 vs. Case 3**		**Case 5 vs. Case 6**		**Case 7 vs. Case 8**	
PFSF Operation Date	Case 1 2003 PFSF 20,000 MTU	Case 3 No PFSF	Case 5 2003 PFSF 8,800 MTU	Case 6 No PFSF	Case 7 2003 PFSF 38,000 MTU	Case 8 No PFSF
Operating Reactor Storage	$ 248.8	$ 710.3	$ 71.4	$ 313.2	$ 706.8	$ 2,151.9
Shutdown Reactor Storage	$ 1,932.0	$ 3,667.0	$ 490.2	$ 881.0	$ 3,364.8	$ 5,540.8
Loading Costs For Shipment Offsite	$ 277.4	$ 127.0	$ 100.7	$ 40.1	$ 393.5	$ 209.5
Total Utility At-Reactor Storage Cost	$ 2,458.2	$ 4,504.3	$ 662.3	$ 1,234.3	$ 4,465.1	$ 7,902.2
PFSF At-Reactor Storage Benefit	$ 2,046.1		$ 572.0		$ 3,437.1	
PFS Facility Cost	$ 1,148.9		$ 636.0		$ 1,442.0	
Net Benefit	$ 897.2		$ (64.0)		$ 1,995.1	

Table 9b At-Reactor Spent Fuel Storage Cost Summary, Updated Pool Capacities (Millions NPV 1999$ - 3.8% Real Interest Rate)

	Comparisons of Costs for PFSF versus 2010 No Action Alternative Scenarios					
Cost Category	Case 9 vs. Case 10		Case 11 vs. Case 12		Case 13 vs. Case 14	
PFSF Operation Date	Case 9 2003 PFSF 17,000 MTU	Case 10 No PFSF	Case 11 2003 PFSF 7,400 MTU	Case 12 No PFSF	Case 13 2003 PFSF 38,000 MTU	Case 14 No PFSF
Operating Reactor Storage	$ 248.8	$ 590.4	$ 70.8	$ 234.4	$ 758.9	$ 1,817.6
Shutdown Reactor Storage	$ 1,935.0	$ 3,241.4	$ 492.4	$ 762.5	$ 2,729.3	$ 4,763.8
Loading Costs For Shipment Offsite	$ 277.6	$ 162.0	$ 100.7	$ 50.2	$ 421.8	$ 267.3
Total Utility At-Reactor Storage Cost	$ 2,461.4	$ 3,993.8	$ 663.9	$ 1,047.1	$ 3,910.0	$ 6,848.7
PFSF At-Reactor Storage Benefit	$ 1,532.4		$ 383.2		$ 2,938.7	
PFS Facility Cost	$ 1,150.3		$ 636.0		$ 1,442.0	
Net Benefit	$ 382.1		$ (252.8)		$ 1,496.7	

Table 10a At-Reactor Spent Fuel Storage Cost Summary, Updated Pool Capacities (Millions NPV 1999$ - 7.0% Real Discount Rate)

	Comparisons of Costs for PFSF versus 2015 No Action Alternative Scenarios					
Cost Category	**Case 1 vs. Case 3**		**Case 5 vs. Case 6**		**Case 7 vs. Case 8**	
PFSF Operation Date	Case 1 2003 PFSF 20,000 MTU	Case 3 No PFSF	Case 5 2003 PFSF 8,800 MTU	Case 6 No PFSF	Case 7 2003 PFSF 38,000 MTU	Case 8 No PFSF
Operating Reactor Storage	$ 236.2	$ 579.0	$ 67.4	$ 242.3	$ 660.7	$ 1,690.7
Shutdown Reactor Storage	$ 1,465.8	$ 2,376.5	$ 324.1	$ 505.8	$2,064.9	$ 3,131.6
Loading Costs for Shipment Offsite	$ 218.9	$ 65.4	$ 78.1	$ 19.0	$ 273.3	$ 101.8
Total Utility At-Reactor Storage Cost	$ 1,920.9	$ 3,020.9	$ 469.6	$ 767.1	$ 2,998.9	$ 4.924.1
PFSF At-Reactor Storage Benefit	$ 1,100.0		$ 297.5		$ 1,925.2	
PFS Facility Cost	$ 820.6		$ 452.0		$ 1,004.0	
Net Benefit	$ 279.4		$ (154.5)		$ 921.2	

Table 10b At-Reactor Spent Fuel Storage Cost Summary, Updated Pool Capacities (Millions NPV 1999$ - 7.0% Real Discount Rate)

	Comparisons of Costs for PFSF versus 2010 No Action Alternative Scenarios					
Cost Category	**Case 9 vs. Case 10**		**Case 11 vs. Case 12**		**Case 13 vs. Case 14**	
PFSF Operation Date	Case 9 2003 PFSF 17,000 MTU	Case 10 No PFSF	Case 11 2003 PFSF 7,400 MTU	Case 12 No PFSF	Case 13 2003 PFSF 38,000 MTU	Case 14 No PFSF
Operating Reactor Storage	$ 236.2	$ 501.9	$ 66.8	$ 192.8	$ 706.2	$ 1,486.1
Shutdown Reactor Storage	$ 1,467.1	$ 2,205.2	$ 324.9	$ 462.7	$ 1,836.8	$ 2,856.8
Loading Costs for Shipment Offsite	$ 219.1	$ 97.0	$ 78.1	$ 27.3	$ 298.6	$ 150.1
Total Utility At-Reactor Storage Cost	$ 1,922.4	$ 2,804.1	$ 469.8	$ 682.8	$ 2,841.6	$ 4,493.0
PFSF At-Reactor Storage Benefit	$ 881.7		$ 213.0		$ 1,651.4	
PFS Facility Cost	$ 821.9		$ 452.0		$ 1,004.0	
Net Benefit	$ 59.8		$ (239.0)		$ 647.4	

Table 11 Summary of Net Benefits, 40 Year Scenarios, Updated Pool Capacities, (Millions of $)

Net Benefits for the 2015 Repository Scenarios			
Net Benefits	**Case 1 vs. Case 3 2003 PFSF 20,000 MTU**	**Case 5 vs. Case 6 2003 PFSF Members Only 8,800 MTU**	**Case 7 vs. Case 8 2003 PFSF 38,000 MTU**
Constant 1999$	$3,087	$ 422	$ 5,761
NPV 3.8%	$ 897	$ (64)	$ 1,995
NPV 7.0%	$ 279	$ (155)	$ 921
Net Benefits for the 2010 Repository Scenarios			
Net Benefits	**Case 9 vs. Case 10 2003 PFSF 17,000 MTU**	**Case 11 vs. Case 12 2003 PFSF Members Only 7,400 MTU**	**Case 13 vs. Case 14 2003 PFSF 38,000 MTU**
Constant 1999$	$ 1,480	$ (167)	$ 4,463
NPV 3.8%	$ 382	$ (253)	$ 1,497
NPV 7.0%	$ 60	$ (239)	$ 647

TABLE 12 2015 No Action Alternative
Comparison of Cost Associated with Post Shutdown Pool Storage versus Dry Storage for Currently Shutdown Reactors

	MTU	Dry Storage Operating Date	Dry Storage & Loading Costs	Post Shutdown Storage Costs	Total Costs
No Action Alternative – Post Shutdown Wet Storage Costs (Millions $)					
Big Rock Point	66	NA	$ 9.8	$ 240.0	$ 249.8
Haddam Neck	416	NA	$ 19.2	$ 248.0	$ 267.2
Humboldt Bay	29	NA	$ 8.9	$ 320.0	$ 328.9
Maine Yankee	562	NA	$ 2.6	$ 248.0	$ 250.6
Rancho Seco	228	NA	$ 1.1	$ 272.0	$ 273.1
Trojan	359	NA	$ 1.7	$ 256.0	$ 257.7
Yankee Rowe	127	NA	$ 11.5	$ 256.0	$ 267.5
Total (Constant 199$)			$ 54.8	$ 1,840.0	$ 1,894.8
Total (3.8% NPV)			$ 28.6	$ 1,335.0	$ 1,363.6
Total (7.0% NPV)			$ 17.0	$ 1,099.0	$ 1,116.0
No Action Alternative – Post Shutdown Dry Storage Costs (Millions $)					
Big Rock Point	66	2002	$ 25.7	$ 132.0	$ 157.7
Haddam Neck	416	2004	$ 66.2	$ 160.0	$ 226.2
Humboldt Bay	29	2004	$ 21.4	$ 276.0	$ 297.4
Maine Yankee	562	2003	$ 61.9	$ 152.0	$ 213.9
Rancho Seco	228	2002	$ 30.6	$ 192.0	$ 222.6
Trojan	359	2003	$ 42.8	$ 172.0	$ 214.8
Yankee Rowe	127	2002	$ 32.7	$ 172.0	$ 204.7
Total (Constant 199$)			$ 281.3	$ 1,256.0	$ 1,537.3
Total (3.8% NPV)			$ 249.0	$ 994.3	$ 1,243.3
Total (7.0% NPV)			$ 226.0	$ 868.9	$ 1,094.9
DELTA					
Constant 1999$					$ 358
3.8% NPV					$ 120
7.0% NPV					$ 21

TABLE 13 2010 No Action Alternative Comparison of Cost Associated with Post Shutdown Pool Storage versus Dry Storage for Currently Shutdown Reactors

	MTU	Dry Storage Operating Date	Dry Storage Costs	Post Shutdown Storage Costs	Total Costs
No Action Alternative – Post Shutdown Wet Storage Costs (Millions $)					
Big Rock Point	66	NA	$ 9.8	$ 200.0	$ 209.8
Haddam Neck	416	NA	$ 19.2	$ 208.0	$ 227.2
Humboldt Bay	29	NA	$ 8.9	$ 280.0	$ 288.9
Maine Yankee	562	NA	$ 2.6	$ 208.0	$ 210.6
Rancho Seco	228	NA	$ 1.1	$ 232.0	$ 233.1
Trojan	359	NA	$ 1.7	$ 216.0	$ 217.7
Yankee Rowe	127	NA	$ 11.5	$ 216.0	$ 227.5
Total (Constant 199$)			$ 54.8	$ 1,560.0	$ 1,614.8
Total (3.8% NPV)			$ 28.6	$ 1,214.0	$ 1,242.6
Total (7.0% NPV)			$ 17.0	$ 1,036.0	$ 1,053.0
No Action Alternative – Post Shutdown Dry Storage Costs (Millions $)					
Big Rock Point	66	2002	$ 25.7	$ 112.0	$ 137.7
Haddam Neck	416	2004	$ 66.2	$ 140.0	$ 206.2
Humboldt Bay	29	2004	$ 21.4	$ 256.0	$ 277.4
Maine Yankee	562	2003	$ 61.9	$ 132.0	$ 193.9
Rancho Seco	228	2002	$ 30.6	$ 172.0	$ 202.6
Trojan	359	2003	$ 42.8	$ 152.0	$ 194.8
Yankee Rowe	127	2002	$ 32.7	$ 152.0	$ 184.7
Total (Constant 199$)			$ 281.3	$ 1,116.0	$ 1,397.3
Total (3.8% NPV)			$ 249.0	$ 933.5	$ 1,182.5
Total (7.0% NPV)			$ 226.0	$ 837.3	$ 1,063.3
DELTA					
Constant 1999$					$ 218
3.8% NPV					$ 60
7.0% NPV					$ (10)

6. Provide new cost-benefit calculations to address the break-even case, this scenario should include both a 2010 and 2015 opening date for the U.S. Department of Energy permanent repository.
   - This case should include the lowest throughput that would allow PFS to break-even with respect to benefits and costs calculated at a 7% discount rate.
   - The PFS facility costs should be adjusted to reflect the on-pad capacity that would accommodate this break-even throughput. That is, in addition to identifying this break-even throughput, PFS should also identify the capacity of such a facility.

RESPONSE

NRC requested that PFS provide new cost benefit calculations to address "break even" cases assuming that the PFSF begins operation in 2003 for both the 2010 and 2015 Repository scenarios. NRC asked that PFS include the "lowest throughput" that would allow PFS to break even with respect to benefits and costs at a 7% discount rate.

PFS has performed the requested "break even" analysis by examining the at-reactor storage costs for the proposed 2003 PFSF case compared to a comparable No Action Alternative case. This "break even" analysis did not include the other unquantified benefits, discussed in the response to Question 5 of the 102400 RAI, associated with the operation of the PFSF that should be considered to fully account for the facility benefits. Taking these additional benefits into account, the "break even" analyses presented herein would result in the calculation of a positive net benefit and overestimate the facility throughput and capacity needed to result in a net benefit of zero. In other words, the total benefit of the proposed PFSF is not calculated simply by examining at-reactor storage costs.

The "break even" analysis examined two cases – one assuming that the PFSF begins operation in 2003 with a 2015 Repository and the second assuming that the PFSF begins operation in 2003 with a 2010 Repository. However, it should be noted that PFS does not believe that only one "break even" case exists for each of these two scenarios. Rather, a myriad of "break even" cases may exist that depend upon, but may not be limited to:

- The subset of nuclear power plants that are assumed to utilize the PFSF
- The amount of spent fuel from these plants that is shipped to the PFSF (some may be shipped directly to the repository)
- Whether the subset of plants require additional at-reactor spent fuel storage capacity during operation
- The dates that the subset of plants reach the end of their 40-year licenses
- The assumed annual acceptance rates for the PFSF

Thus, it is not practical to find the "lowest throughput" break even case. As requested, PFS has identified two representative "break even" cases. However, it is possible that

there are other "break even" cases that could result in an even lower throughput with a different set of plants assumed.

PFS also does not believe that the constraints imposed by the NRC on the "break even" analysis are realistic. Namely, these are the constraints that the analysis be performed assuming: (1) that the PFSF only receives spent fuel during the initial 20-year license; and (2) that a 7% discount rate be used. As discussed in the response to Question 5 of this submittal, PFS plans to seek renewal of the 20 year license for the proposed facility and has every reason to believe that it will be able to successfully operate the facility for a 40 year period. Regarding the use of a 7% discount rate for performing the present value cash flow analysis, PFS has indicated in previous submittals that it believes that the use of a 3.8% discount rate would more realistically reflect the real cost of money for a project such as the proposed PFSF.

Table 14 provides the results of two possible "break even" cases along with identifying parameters such as the facility throughput and maximum PFSF capacity. These cases assumed that the proposed PFSF would receive fuel only during the initial 20 year license term and that no fuel would be received at the facility subsequent to that time. Spent fuel could be shipped from the facility after the initial 20 year license term.

Case 23, 2003 PFSF, 2015 Repository
Case 24, 2015 Repository

Case 23 assumes that the PFSF operates for a period of 40 years. This case assumes that the PFSF begins operation in 2003 and accepts spent fuel at an annual rate of 1,000 MTU from 2003 to 2010 and at varying rates thereafter through 2022. It is assumed that the PFSF ceases fuel receipts in 2022 after operating for the initial 20 year license term. The maximum capacity for the PFSF is approximately 10,000 MTU for this scenario. Case 23 assumes that a total of 34 reactors ship spent nuclear fuel to the PFSF. Total spent nuclear fuel throughput for this case is approximately 15,500 MTU.

Case 23 assumes that spent fuel is shipped to the PFSF based on an "optimized" shipping schedule that takes into account the needs of the reactors that are assumed to store spent fuel at the facility. Case 23 assumes that spent fuel is shipped from the PFSF to a DOE repository beginning in 2015 on an OFF basis. It is assumed that DOE accepts SNF on a system-wide basis at an annual rate of 1,200 MTU in 2015 and 2016, 2,000 MTU in 2017 and 2018, 2,700 MTU in 2019, and 3,000 MTU thereafter.

Case 24 provides a comparative analysis of the reactor storage costs for a 2015 No Action Alternative for the 34 reactors analyzed in Case 23. Case 24 assumes that spent fuel acceptance begins in 2015 at a DOE repository.

The costs that result from the 7% NPV calculation are presented in Table 14. Net Benefits for the "break even" Case 23 are approximately $49 million (7% NPV).

While the Net Benefits were not calculated to be exactly zero, the result is less than 5% of the total cost for Case 24.

PFS views this scenario as one example of a "break even" case for a proposed 2003 PFSF and a 2015 repository analyzed under the constraints imposed by the NRC. As stated previously, PFS believes that these constraints are not realistic and that the results, therefore, should be viewed in this context.

Case 25, 2003 PFSF, 2010 Repository
Case 26, 2010 Repository

Case 25 assumes that the PFSF operates for a period of 40 years. This case assumes that the PFSF begins operation in 2003 and accepts spent fuel at an annual rate of 1,000 MTU from 2003 to 2018 and at the rate of 500 MTU from 2019 through 2022. It is assumed that the PFSF ceases fuel receipts in 2022 after operating for the initial 20 year license term. The maximum capacity for the PFSF is approximately 8,200 MTU for this scenario. Case 25 assumes that a total of 37 reactors ship spent nuclear fuel to the PFSF. Total spent nuclear fuel throughput for this case is approximately 18,000 MTU.

Case 25 assumes that spent fuel is shipped to the PFSF based on an "optimized" shipping schedule that takes into account the needs of the reactors that are assumed to store spent fuel at the facility. Case 25 assumes that spent fuel is shipped from the PFSF to a DOE repository beginning in 2010 on an OFF basis. It is assumed that DOE accepts SNF on a system-wide basis at an annual rate of 1,200 MTU in 2010 and 2011, 2,000 MTU in 2012 and 2013, 2,700 MTU in 2014, and 3,000 MTU thereafter.

Case 26 provides a comparative analysis of the reactor storage costs for a 2010 No Action Alternative for the 37 reactors analyzed in Case 25. Case 26 assumes that spent fuel acceptance begins in 2010 at a DOE repository.

The costs that result from the 7% NPV calculation are presented in Table 14. Net Benefits for the breakeven Case 25 are approximately $19 million (7% NPV).

PFS views this scenario as one example of a "break even" case for a proposed 2003 PFSF and a 2010 repository analyzed under the constraints imposed by the NRC. As stated previously, PFS believes that these constraints are not realistic and that the results, therefore, should be viewed in this context.

Table 14 At-Reactor Spent Fuel Storage Cost Summary, 20 Year Receipt Cases, "Break Even" Analysis(Millions Constant 1999$)

Comparison of Costs for PFSF Compared to No Action Alternative				
	2015 Repository		2010 Repository	
Cost Category	Case 23 vs. Case 24		Case 25 vs. Case 26	
PFSF Operation Date	Case 23 2003 PFSF "Break Even"	Case 24 No PFSF	Case 25 2003 PFSF "Break Even"	Case 26 No PFSF
PFSF Max Capacity	10,000 MTU		8,200 MTU	
PFSF Throughput	15,500 MTU		18,000 MTU	
Number of Reactors	34	34	37	37
Operating Reactor Storage	$ 140.9	$ 381.3	$ 140.9	$ 325.2
Shutdown Reactor Storage	$ 808.8	$ 1,215.1	$ 853.1	$ 1,329.7
Loading Costs for Shipment Offsite	$ 118.8	$ 37.8	$ 130.2	$ 59.9
Total Utility At-Reactor Storage Cost	$ 1,068.5	$ 1,634.2	$ 1,124.2	$ 1,714.8
PFSF At-Reactor Storage Benefit	$ 565.7		$ 590.6	
PFS Facility Cost	$ 516.7		$ 571.5	
Net Benefit	$ 49		$19.1	

ENCLOSURE 2

COMPUTER DISKETTE WITH NON-PROPRIETARY ELECTRONIC FILES OF THE UPDATED SUPPLEMENTAL LOADING COST ANALYSES ASSOCIATED WITH THE RESPONSE TO EIS RAI #3, QUESTION NOs. 5 and 6