

C.1 SAMGs

§ 50.155(b) *Integrated response capability*. Each applicant or licensee shall develop, implement, and maintain an integrated response capability that includes:

(3) Severe Accident Management Guidelines (SAMGs).

Strategies and guidelines for mitigating the consequences of events that progress to imminent or actual significant damage to fuel in the reactor vessel or spent fuel pool to support actions intended to:

- i. Arrest the progression of fuel damage,
- ii. Maximize the duration for which containment capability is maintained, and,
- iii. Minimize radiological releases.

Assumptions:

(1) Implementation costs would be incurred in 2017 and operations costs would be incurred beginning in 2018.

(2) There are 60 total operating sites that would develop and implement site-specific SAMGs.

(3) Fifty-five of the 60 operating sites would each have one set of SAMGs because each site has one reactor type, one type of NSSS, and one design type. These sites are referred to as "single-SAMGs sites."

(4) Five of the 60 sites would each have two sets of SAMGs because each site has more than one reactor type, type of NSSS, or design type (i.e. Arkansas Nuclear One, Millstone, Nine Mile Point, VC Summer, and Vogtle). These sites are referred to as "dual-SAMGs sites." Of the dual-SAMGs sites, one is a BWR site (i.e., Nine Mile Point). The remaining four sites are PWR sites.

(5) Two sites (i.e., Beaver Valley and Dresden) have units of different vintages and therefore require two sets of SAMGs per site. However, the cost to develop two sets of SAMGs for the different vintages is closer to the costs faced by single-SAMGs sites. Therefore, the analysis accounts for the costs of these two sites as single-SAMGs sites.

(6) Some industry implementation costs have been (or will be) incurred in response to Fukushima, in advance of the proposed rule. The analysis categorizes these costs as "historical." Appendix B discusses these historical costs. Specifically:

- Industry incurred a one-time cost to develop implementation guidance (i.e., NEI 14-01).

- EPRI incurred a one-time cost to develop the SAMG TBR.

- The BWROG incurred a one-time cost to develop a generic SAG.

- The PWROG incurred a one-time cost to develop a generic SAMG. Additional effort would be necessary for the PWROG to develop one generic PWROG SAMG to replace the three existing SAMGs for the Westinghouse, Combustion Engineering, and Babcock and Wilcox reactor designs.

(7) Each of the 21 BWR single-SAMGs sites would incur a one-time cost to develop and implement a set of site-specific SAMGs. The one BWR dual-SAMGs site would incur a one-time cost to develop and implement two sets of site-specific SAMGs. Dual-SAMGs sites would require double the effort of single-SAMGs sites.

(8) Each of the 34 PWR single-SAMGs sites would incur a one-time cost to develop and implement a set of site-specific SAMGs. The four PWR dual-SAMGs sites would incur a one-time cost to develop and implement two sets of site-specific SAMGs. Dual-SAMGs sites would require double the effort of single-SAMGs sites. Additional effort would be necessary for PWR sites (relative to BWR sites) to develop site-specific SAMGs based on the generic SAMG which replaced the three existing SAMGs for the Westinghouse, Combustion Engineering, and Babcock and Wilcox reactor designs.

(9) Each operating site would incur annual costs to maintain the set(s) of site-specific SAMGs by conducting a high-level review to determine whether updates are needed. This review would be added to existing procedure review processes, which would need only slight modifications. As a result, the incremental impact would be small. These procedural reviews would occur on a triennial basis, though these costs have been annualized in the analysis. Costs associated with revisions resulting from these reviews are reflected under Change Control (See Appendix C.8).

(10) The NRC would incur a one-time cost to become familiar with the owners groups' generic SAMGs and develop SAMG oversight materials (e.g., inspection procedures). All sites would adopt the owners group's generic SAMG. As a result, the NRC would not review site-specific SAMGs.

(11) The NRC would incur annual costs to oversee compliance with the SAMGs requirements.

(12) Applicants are required to comply with the proposed rule. Costs incurred by new reactor applicants are estimated separately.

(13) Level of effort estimates are based on the NRC staff's professional judgment.

	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
Develop industry implementation guidance (NEI 14-01)	Executive	\$160/hr		200 hrs	\$ 31,926	\$ 31,926	N/A		
	Manager	\$104/hr		600 hrs	\$ 62,526	\$ 62,526			
	Staff	\$84/hr		0 hrs	\$ -	\$ -			
	Clerical	\$50/hr		0 hrs	\$ -	\$ -			
	Licensing	\$129/hr		200 hrs	\$ 25,742	\$ 25,742			
Develop the SAMG TBR (EPRI)	Executive	\$160/hr		480 hrs	\$ 76,622	\$ 76,622	N/A		
	Manager	\$104/hr		1,000 hrs	\$ 104,210	\$ 104,210			
	Staff	\$84/hr		4,000 hrs	\$ 335,400	\$ 335,400			
	Clerical	\$50/hr		320 hrs	\$ 16,036	\$ 16,036			
	Licensing	\$129/hr		0 hrs	\$ -	\$ -			
Develop generic BWROG SAG	Executive	\$160/hr		1,480 hrs	\$ 236,252	\$ 236,252	N/A		
	Manager	\$104/hr		6,600 hrs	\$ 687,786	\$ 687,786			
	Staff	\$84/hr		3,600 hrs	\$ 301,860	\$ 301,860			
	Clerical	\$50/hr		2,000 hrs	\$ 100,227	\$ 100,227			
	Licensing	\$129/hr		1,200 hrs	\$ 154,452	\$ 154,452			
Develop generic PWROG SAMG	Executive	\$160/hr		1,800 hrs	\$ 287,334	\$ 287,334	N/A		
	Manager	\$104/hr		9,000 hrs	\$ 937,890	\$ 937,890			
	Staff	\$84/hr		4,800 hrs	\$ 402,480	\$ 402,480			
	Clerical	\$50/hr		2,400 hrs	\$ 120,272	\$ 120,272			
	Licensing	\$129/hr		1,600 hrs	\$ 205,936	\$ 205,936			

Appendix C. Detailed Cost Build-up for the Operating License Term

	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
Develop and implement site-specific SAMGs (single-SAMGs BWR sites)	Executive	\$160/hr	21	N/A			40 hrs/site	\$ 6,385	\$ 134,089
	Manager	\$104/hr	21				800 hrs/site	\$ 83,368	\$ 1,750,728
	Staff	\$84/hr	21				800 hrs/site	\$ 67,080	\$ 1,408,680
	Clerical	\$50/hr	21				40 hrs/site	\$ 2,005	\$ 42,095
	Licensing	\$129/hr	21				120 hrs/site	\$ 15,445	\$ 324,349
Develop and implement site-specific SAMGs (dual-SAMGs BWR sites)	Executive	\$160/hr	1	N/A			80 hrs/site	\$ 12,770	\$ 12,770
	Manager	\$104/hr	1				1,600 hrs/site	\$ 166,736	\$ 166,736
	Staff	\$84/hr	1				1,600 hrs/site	\$ 134,160	\$ 134,160
	Clerical	\$50/hr	1				80 hrs/site	\$ 4,009	\$ 4,009
	Licensing	\$129/hr	1				240 hrs/site	\$ 30,890	\$ 30,890
Develop and implement site-specific SAMGs (single-SAMGs PWR sites)	Executive	\$160/hr	34	N/A			40 hrs/site	\$ 6,385	\$ 217,097
	Manager	\$104/hr	34				1,000 hrs/site	\$ 104,210	\$ 3,543,140
	Staff	\$84/hr	34				1,000 hrs/site	\$ 83,850	\$ 2,850,900
	Clerical	\$50/hr	34				40 hrs/site	\$ 2,005	\$ 68,154
	Licensing	\$129/hr	34				120 hrs/site	\$ 15,445	\$ 525,137
Develop and implement site-specific SAMGs (dual-SAMGs PWR sites)	Executive	\$160/hr	4	N/A			80 hrs/site	\$ 12,770	\$ 51,082
	Manager	\$104/hr	4				2,000 hrs/site	\$ 208,420	\$ 833,680
	Staff	\$84/hr	4				2,000 hrs/site	\$ 167,700	\$ 670,800
	Clerical	\$50/hr	4				80 hrs/site	\$ 4,009	\$ 16,036
	Licensing	\$129/hr	4				240 hrs/site	\$ 30,890	\$ 123,562
Total Industry Implementation Cost						\$ 4,086,952			\$ 12,908,095
INDUSTRY OPERATIONS (ANNUAL)									
Maintain site-specific SAMGs (single-SAMGs operating sites)	Executive	\$160/hr	18	N/A			2 hrs/site	\$ 319	\$ 5,747
	Manager	\$104/hr	18				8 hrs/site	\$ 834	\$ 15,006
	Staff	\$84/hr	18				40 hrs/site	\$ 3,354	\$ 60,372
	Clerical	\$50/hr	18				8 hrs/site	\$ 401	\$ 7,216
	Licensing	\$129/hr	18				8 hrs/site	\$ 1,030	\$ 18,534
Maintain site-specific SAMGs (dual-SAMGs operating sites)	Executive	\$160/hr	2	N/A			4 hrs/site	\$ 639	\$ 1,277
	Manager	\$104/hr	2				16 hrs/site	\$ 1,667	\$ 3,335
	Staff	\$84/hr	2				80 hrs/site	\$ 6,708	\$ 13,416
	Clerical	\$50/hr	2				16 hrs/site	\$ 802	\$ 1,604
	Licensing	\$129/hr	2				16 hrs/site	\$ 2,059	\$ 4,119
Total Industry Operations Cost									\$ 130,626
NRC IMPLEMENTATION (ONE-TIME)									
Become familiar with the owners groups' generic SAMGs	NRC Staff	\$124/hr		N/A			400 hrs	\$ 49,600	\$ 49,600
Develop SAMG oversight materials (e.g., inspection procedures)	NRC Staff	\$124/hr		N/A			400 hrs	\$ 49,600	\$ 49,600
Total NRC Implementation Cost									\$ 99,200
NRC OPERATIONS (ANNUAL)									
Oversee site-specific SAMGs	NRC Staff	\$124/hr	60	N/A			4 hrs/site	\$ 496	\$ 29,760
Total NRC Operations Cost									\$ 29,760

C.2 Integration of Emergency Procedures

§ 50.155(b) *Integrated response capability*. Each applicant or licensee shall develop, implement, and maintain an integrated response capability that includes:

(4) Integration of strategies and guidelines in paragraphs (b)(1) - (b)(3) of this section with the Emergency Operating Procedures (EOPs).

Assumptions:

- (1) One-time implementation costs would be incurred in 2017.
- (2) Each of the 60 operating sites would incur a one-time cost to review and confirm that emergency procedures are adequately integrated. The incremental cost to review and confirm does not vary for single-SAMGs and dual-SAMGs sites. Costs associated with revisions resulting from these reviews are reflected under Change Control (See Appendix C.8).
- (3) Costs associated with the NRC's inspections of the integration of emergency procedures are reflected under Drills and Exercises (See Appendix C.7).
- (4) Historical costs associated with integrating FSGs with EOPs are reflected in the analysis of Order EA 12-049. (See Appendix B.)
- (5) Level of effort estimates are based on the NRC staff's professional judgment.

	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
Review the FSGs, EDMGs, and SAMGs to confirm integration with EOPs	Executive	\$160/hr	60	N/A			8 hrs/site	\$ 1,277	\$ 76,622
	Manager	\$104/hr	60				40 hrs/site	\$ 4,168	\$ 250,104
	Staff	\$84/hr	60				120 hrs/site	\$ 10,062	\$ 603,720
	Clerical	\$50/hr	60				0 hrs/site	\$ -	\$ -
	Licensing	\$129/hr	60				32 hrs/site	\$ 4,119	\$ 247,123
Total Industry Implementation Cost									\$ 1,177,570
INDUSTRY OPERATIONS (ANNUAL)									
None.									
NRC IMPLEMENTATION (ONE-TIME)									
None.									
NRC OPERATIONS (ANNUAL)									
None.									

C.3 Phase 1 Staffing

Staffing:

§ 50.155(b) *Integrated response capability*. Each applicant or licensee shall develop, implement, and maintain an integrated response capability that includes:

(5) Sufficient staffing to support implementation of the strategies and guidelines in paragraphs (b)(1) - (b)(3) of this section in conjunction with the EOPs to respond to events.

Section VII. Communications and Staffing Requirements for the Mitigation of Beyond-Design-Basis Events

1. Each nuclear power reactor applicant or licensee shall perform a detailed analysis demonstrating that sufficient staff is available to implement the guidance and strategies to respond to a beyond-design-basis external event resulting in impeded access to the nuclear power plant, an extended loss of ac power sources and loss of access to ultimate heat sink, and affecting all units on-site.

a. An applicant for an operating license issued under this part shall perform this analysis at least two years before the issuance of the first operating license for full power (one authorizing operation above 5 percent of rated thermal power).

b. A holder of a combined license issued under 10 CFR part 52 before the Commission has made the finding under § 52.103(g) shall perform this analysis and submit it to the NRC under 10 CFR 52.3 at least two years before the date specified for completion of the last inspections, tests, and analyses in the ITAAC completion schedule required by 10 CFR 52.99(a) for the plant.

c. Each holder of an operating license or combined license for which the Commission has made the finding specified in 10 CFR 52.103(g) as of [INSERT EFFECTIVE DATE] shall perform this analysis and submit it to the NRC under 10 CFR 50.4 no later than [INSERT DATE 365 DAYS AFTER EFFECTIVE DATE].

Assumptions:

(1) All activities related to staffing will be completed before the proposed rule becomes effective in 2017; hence, all of the costs are historical incremental effort due to the Fukushima response. (See Appendix B.)

(2) Each of the 35 multi-unit operating sites and one multi-unit decommissioning site (i.e., San Onofre) incurred a one-time cost to perform the Phase 1 staffing assessment as requested by the Section 50.54(f) letter.

(3) No site added ERO personnel to its minimum staffing in response to the Phase 1 Staffing Assessment. Therefore, industry would not incur any operational costs as a result of the staffing assessments.

(4) Historical costs associated with Phase 2 Staffing Assessments are reflected in the analysis of Order EA-12-049. (See Appendix B.)

(5) The NRC incurred a one-time cost to review sites' staffing plan evaluations and to conduct inspection activities.

(6) The NRC would perform ongoing oversight; however, this incremental effort would be integrated into existing inspection activities. Therefore, the analysis does not estimate incremental costs for the NRC's oversight.

(7) Level of effort estimates are based on the NRC staff's professional judgment.

Cost Inputs				Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
Perform Phase 1 staffing assessment (multi-unit sites)	Executive	\$160/hr	36	8 hrs/site	\$ 1,277	\$ 45,973	N/A		
	Manager	\$104/hr	36	80 hrs/site	\$ 8,337	\$ 300,125			
	Staff	\$84/hr	36	360 hrs/site	\$ 30,186	\$ 1,086,696			
	Clerical	\$50/hr	36	24 hrs/site	\$ 1,203	\$ 43,298			
	Licensing	\$129/hr	36	8 hrs/site	\$ 1,030	\$ 37,068			
Total Industry Implementation Cost						\$ 1,513,161			
INDUSTRY OPERATIONS (ANNUAL)									
None.									
NRC IMPLEMENTATION (ONE-TIME)									
Review sites' staffing plan evaluations	NRC Staff	\$124/hr		1,800 hrs	\$ 223,200	\$ 223,200	N/A		
Conduct inspection activities	NRC Staff	\$124/hr	60	4 hrs/site	\$ 496	\$ 29,760	N/A		
Total NRC Implementation Cost						\$ 252,960			
NRC OPERATIONS (ANNUAL)									
None.									

C.4 Command and Control

Command and Control:

§ 50.155(b) *Integrated response capability*. Each applicant or licensee shall develop, implement, and maintain an integrated response capability that includes:

(6) A supporting organizational structure with defined roles, responsibilities, and authorities for directing and performing the strategies and guidelines in paragraphs b(1) - b(3) of this section.

Assumptions:

(1) Implementation costs related to command and control would be incurred in 2017.

(2) Each of the 60 operating sites would incur a one-time cost to revise their procedures to verify the site's supporting organizational structure, and define roles, responsibilities, and authorities for directing and performing the activities called for in the SAMGs.

(3) The NRC would perform ongoing oversight; however, this incremental effort would be integrated into existing inspection activities. Therefore, the analysis does not estimate incremental costs for the NRC's oversight.

(4) Level of effort estimates are based on the NRC staff's professional judgment.

Cost Inputs				Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
Revise procedures to document command and control	Executive	\$160/hr	60	N/A			2 hrs/site	\$ 319	\$ 19,156
	Manager	\$104/hr	60				8 hrs/site	\$ 834	\$ 50,021
	Staff	\$84/hr	60				16 hrs/site	\$ 1,342	\$ 80,496
	Clerical	\$50/hr	60				2 hrs/site	\$ 100	\$ 6,014
	Licensing	\$129/hr	60				2 hrs/site	\$ 257	\$ 15,445
Total Industry Implementation Cost									\$ 171,131
INDUSTRY OPERATIONS (ANNUAL)									
None.									
NRC IMPLEMENTATION (ONE-TIME)									
None.									
NRC OPERATIONS (ANNUAL)									
None.									

C.5 Spent Fuel Pool Instrumentation

§ 50.155(c) *Equipment*.

(4) The equipment relied on for the mitigation strategies in paragraph (b)(1) of this section must include reliable means to remotely monitor wide-range spent fuel pool levels to support effective prioritization of event mitigation and recovery actions.

Assumptions:

- (1) Industry implementation costs will be incurred prior to the effective date of the proposed rule (i.e., in response to Order EA-12-051). The analysis categorizes these costs as "historical." Appendix B discusses these historical costs.
- (2) According to NRC data, 60 operating sites installed SFP instrumentation. The number of instruments required varies per site. Installation costs would decrease by 20 percent for each of the first four instruments installed. For example, installation of one instrument would cost \$1.8 million based on NRC staff's unit cost estimates. Installation of two instruments would cost \$3.24 million (i.e., the first installation would cost \$1.8 million and the second would cost \$1.44 million, 80 percent of \$1.8 million). Installation of three instruments would cost \$4.32 million (i.e., the third installation would cost \$1.08 million, 60 percent of \$1.8 million).
- (3) Forty sites purchased and installed two instruments, one site purchased and installed three instruments, 17 sites purchased and installed four instruments, and two sites purchased and installed six instruments. These sites would purchase the instruments on a rolling basis from 2014 to 2016. The table shows the total one-time cost that was incurred by the affected sites over the 2-year period.
- (4) Each site purchased one spare instrument. In addition, each RRC will have six spares available. The cost of a spare is 10 percent of the cost of installing a single instrument (\$1.8 million x 10%). Therefore, the cost of 72 spares is shared among the industry. Industry purchased the instruments on a rolling basis from 2014 to 2016. The table shows the total one-time cost that was incurred over the 2-year period.
- (5) Industry incurred a one-time cost to develop industry guidance (i.e., NEI 12-02).
- (6) Sites required to install the instrumentation incurred a one-time cost to prepare and submit its first and second 6-month update to its integrated plan.
- (7) Sites required to install the instrumentation incurred an annual cost to prepare and submit its third through eighth update to its integrated plans. These updates would require half the amount of effort required for the first and second update.
- (8) Sites required to install the instrumentation would incur an annual cost to test the instruments. Testing occurs on a biennial basis. The costs have been annualized to reflect this. The incremental cost to test the instruments does not vary by the number of instruments at a site.
- (9) The NRC incurred a one-time cost to inspect the installation of the SFP instrumentation at each operating site. The NRC would inspect the instruments on a rolling basis from 2014 to 2016. The table shows the total one-time cost that was incurred by the NRC over the 3-year period.
- (10) The NRC incurred one-time costs to review the first and second updates to integrated plans.
- (11) The NRC incurred annual costs to review the third through eighth 6-month updates to integrated plans. These updates would require half the amount of effort required to review the first and second update.
- (12) The NRC would inspect the instruments within the existing Reactor Oversight Program (ROP). Annual costs for inspecting the new equipment would be negligible relative to the costs incurred in the baseline. Therefore, the analysis does not include annual NRC inspection costs.
- (13) Level of effort estimates are based on the NRC staff's professional judgment.

	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Equipment or Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
Purchase and install SFP instrumentation	Two instruments	\$ 3,240,000	40	N/A	\$ 3,240,000	\$ 129,600,000	N/A		
	Three instruments	\$ 4,320,000	1	N/A	\$ 4,320,000	\$ 4,320,000			
	Four Instruments	\$ 5,040,000	17	N/A	\$ 5,040,000	\$ 85,680,000			
	Six instruments	\$ 6,480,000	2	N/A	\$ 6,480,000	\$ 12,960,000			
Purchase spare instruments	73 instruments	\$ 180,000		72	\$ 12,960,000	\$ 12,960,000	N/A		
Develop industry guidance (NEI 12-02)	Executive Manager	\$160/hr		400 hrs	\$ 63,852	\$ 63,852	N/A		
	Staff	\$104/hr		1,200 hrs	\$ 125,052	\$ 125,052			
	Clerical	\$84/hr		0 hrs	\$ -	\$ -			
		\$50/hr		0 hrs	\$ -	\$ -			
	Licensing	\$129/hr		400 hrs	\$ 51,484	\$ 51,484			
Prepare and submit first and second 6-month update to integrated plan	Executive	\$160/hr	60	16 hrs/site	\$ 2,554	\$ 153,245	N/A		
	Manager	\$104/hr	60	160 hrs/site	\$ 16,674	\$ 1,000,416			
	Staff	\$84/hr	60	80 hrs/site	\$ 6,708	\$ 402,480			
	Clerical	\$50/hr	60	4 hrs/site	\$ 200	\$ 12,027			
	Licensing	\$129/hr	60	40 hrs/site	\$ 5,148	\$ 308,904			
Total Industry Implementation Cost					\$ 247,637,460				
INDUSTRY OPERATIONS (ANNUAL)									
Prepare and submit third through eighth 6-month updates to integrated plan	Executive	\$160/hr	60	8 hrs/site	\$ 1,277	\$ 76,622	N/A		
	Manager	\$104/hr	60	80 hrs/site	\$ 8,337	\$ 500,208			
	Staff	\$84/hr	60	40 hrs/site	\$ 3,354	\$ 201,240			
	Clerical	\$50/hr	60	2 hrs/site	\$ 100	\$ 6,014			
	Licensing	\$129/hr	60	20 hrs/site	\$ 2,574	\$ 154,452			
Test SFP instrumentation (operating sites)	Executive	\$160/hr	30	0 hrs/site	\$ -	\$ -	N/A		
	Manager	\$104/hr	30	2 hrs/site	\$ 208	\$ 6,253			
	Staff	\$84/hr	30	16 hrs/site	\$ 1,342	\$ 40,248			
	Clerical	\$50/hr	30	8 hrs/site	\$ 401	\$ 12,027			
	Licensing	\$129/hr	30	0 hrs/site	\$ -	\$ -			
Total Industry Operations Cost					\$ 997,064				

Appendix C. Detailed Cost Build-up for the Operating License Term

	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Equipment or Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
NRC IMPLEMENTATION (ONE-TIME)									
Inspect SFP instrumentation	NRC Staff	\$124/hr	60	8 hrs/site	\$ 992	\$ 59,520	N/A		
Review industry guidance (NEI 12-02)	NRC Staff	\$124/hr		280 hrs	\$ 34,720	\$ 34,720	N/A		
Review first and second 6-month updates to integrated plans	NRC Staff	\$124/hr	60	40 hrs/site	\$ 4,960	\$ 297,600	N/A		
Total NRC Implementation Cost						\$ 391,840			
NRC OPERATIONS (ANNUAL)									
Review the third through eighth 6-month updates to integrated plans	NRC Staff	\$124/hr	60	20 hrs/site	\$ 2,480	\$ 148,800	N/A		
Total NRC Operations Cost						\$ 148,800			

C.6 SAMGs Training

§ 50.155(e) Training requirements.

Each licensee shall provide for the training and qualification of personnel that perform activities in accordance with the strategies and guidelines identified in paragraphs (b)(1) – (b)(3) of this section using the systems approach to training as defined in 10 CFR 55.4 unless otherwise required by NRC regulations.

Assumptions:

- (1) Implementation costs would be incurred in 2017 and operations costs would be incurred beginning in 2018.
- (2) There are 60 operating sites that would be subject to the training requirement.
- (3) Fifty-five of the 60 sites would each have one training program because each site has one reactor type, one type of NSSS, and one design type. These sites are referred to as "single-SAMGs sites." The 55 sites include two sites that license operators on single reactors (i.e., Beaver Valley and Indian Point).
- (4) Five of the 60 sites would each have two training programs because each site has more than one reactor type, type of NSSS, or design type (i.e. Arkansas, Millstone, Nine Mile Point, Virgil C. Summer, and Vogtle). These sites are referred to as "dual-SAMGs sites."
- (5) Two sites (i.e., Beaver Valley and Dresden) have units of different vintages and therefore require two sets of SAMGs per site. However, the cost to develop two sets of SAMGs for the different vintages is closer to the costs faced by single-SAMGs sites. Therefore, the analysis accounts for the costs of these two sites as single-SAMGs sites.
- (6) The average number of UDMs at both single-SAMGs and dual-SAMGs sites is five.
- (7) There are 30 non-licensed operators (NLOs) that would require training at a single-SAMGs site, and 60 NLOs that would require training at a dual-SAMGs site. NLOs would include on-shift non-licensed operators, maintenance workers, and security personnel assigned operational tasks under SAMGs. Licensed operators would be trained in the baseline; therefore, the analysis does not estimate incremental impacts for training licensed operators.
- (8) Each of the 55 single-SAMGs sites and five dual-SAMGs sites would incur a one-time cost to develop new training materials. This task includes updating rule topics that are not addressed by existing training. This task would be contracted to a contractor. The contractor costs for a dual-SAMGs site would be twice as expensive as for a single-SAMGs site.
- (9) Each of the 55 single-SAMGs sites and five dual-SAMGs sites would incur an annual cost for its personnel at the executive level (UDMs) and at the staff level (NLOs) to attend training, as well as support by individuals at the managerial level. Training would target personnel that perform activities in accordance with the strategies and guidelines in the rule language, including EDMGs and SAMGs.
- (10) Training would be conducted on a biennial basis for each site. The costs are annualized to reflect this.
- (11) Each of the 55 single-SAMGs sites and five dual-SAMGs sites would incur an annual cost to document training and update materials on a biennial basis. The costs are annualized to reflect this.
- (12) The NRC would not review training materials. Costs associated with the NRC evaluating the sufficiency of training through observations of sites' drills or exercises are reflected under Drills and Exercises (See Appendix C.7).
- (13) Applicants are required to comply with the proposed rule. Costs incurred by new reactor applicants are estimated separately.
- (14) Level of effort estimates are based on the NRC staff's professional judgment.

Cost Inputs				Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
Develop new training materials (single-SAMGs sites)	Contractor Cost	\$200,000	55	N/A			N/A	\$ 200,000	\$ 11,000,000
Develop new training materials (dual-SAMGs sites)	Contractor Cost	\$400,000	5	N/A			N/A	\$ 400,000	\$ 2,000,000
Total Industry Implementation Cost								\$ 600,000	\$ 13,000,000
INDUSTRY OPERATIONS (ANNUAL)									
Attend training for UDMs and NLOs (single-SAMGs sites)	Executive	\$160/hr	28	N/A			40 hrs/site	\$ 6,385	\$ 178,786
	Manager	\$104/hr	28				16 hrs/site	\$ 1,667	\$ 46,686
	Staff	\$84/hr	28				240 hrs/site	\$ 20,124	\$ 563,472
	Clerical	\$50/hr	28				0 hrs/site	\$ -	\$ -
	Licensing	\$129/hr	28				0 hrs/site	\$ -	\$ -
Attend training for UDMs and NLOs (dual-SAMGs sites)	Executive	\$160/hr	3	N/A			40 hrs/site	\$ 6,385	\$ 19,156
	Manager	\$104/hr	3				32 hrs/site	\$ 3,335	\$ 10,004
	Staff	\$84/hr	3				480 hrs/site	\$ 40,248	\$ 120,744
	Clerical	\$50/hr	3				0 hrs/site	\$ -	\$ -
	Licensing	\$129/hr	3				0 hrs/site	\$ -	\$ -
Document training and update materials (single-SAMGs sites)	Executive	\$160/hr	28	N/A			2 hrs/site	\$ 319	\$ 8,939
	Manager	\$104/hr	28				24 hrs/site	\$ 2,501	\$ 70,029
	Staff	\$84/hr	28				160 hrs/site	\$ 13,416	\$ 375,648
	Clerical	\$50/hr	28				40 hrs/site	\$ 2,005	\$ 56,127
	Licensing	\$129/hr	28				16 hrs/site	\$ 2,059	\$ 57,662
Document training and update materials (dual-SAMGs sites)	Executive	\$160/hr	3	N/A			4 hrs/site	\$ 639	\$ 1,916
	Manager	\$104/hr	3				48 hrs/site	\$ 5,002	\$ 15,006
	Staff	\$84/hr	3				320 hrs/site	\$ 26,832	\$ 80,496
	Clerical	\$50/hr	3				80 hrs/site	\$ 4,009	\$ 12,027.20
	Licensing	\$129/hr	3				32 hrs/site	\$ 4,119	\$ 12,356
Total Industry Operations Cost								\$ 139,045	\$ 1,629,054
NRC IMPLEMENTATION (ONE-TIME)									
None.									
NRC OPERATIONS (ANNUAL)									
None.									

C.7 SAMGs Drills and Exercises

§ 50.155(f) *Drills and Exercises.*

(1) An applicant for an operating license issued under this part shall conduct an initial drill or exercise that demonstrates the capability to transition to and use one or more of the strategies and guidelines in paragraphs (b)(1) - (b)(3) of this section and use the communications equipment required in 10 CFR part 50, appendix E, section VII no more than 12 months before issuance of an operating license for the unit described in the license application.

(2) A holder of a combined license issued under 10 CFR part 52 before the Commission has made the finding under § 52.103(g), shall conduct an initial drill or exercise that demonstrates the capability to transition to and use one or more of the strategies and guidelines in paragraphs (b)(1) - (b)(3) of this section and use the communications equipment required in 10 CFR part 50, appendix E, section VII no more than 12 months before the date specified for completion of the last inspections, tests, and analyses in the ITAAC completion schedule required by 10 CFR 52.99(a) for the unit described in the combined license.

(3) Once the Commission issues an operating license to an entity described in paragraph (f)(1) of this section or makes the finding under § 52.103(g) for an entity described in paragraph (f)(2) of this section, the licensee shall conduct subsequent drills, exercises, or both that collectively demonstrate a capability to use at least one of the strategies and guidelines in each of paragraphs (b)(1) - (b)(3) of this section in succeeding 8-year intervals. The drills and exercises performed to demonstrate this capability must include transitions from other procedures and guidelines as applicable, and the use of communications equipment required in 10 CFR part 50, appendix E, section VII. Each licensee shall not exceed eight years between any consecutive drills or exercises.

(4) A holder of an operating license issued under this part or a combined license under 10 CFR part 52 for which the Commission has made the finding specified in 10 CFR 52.103(g) as of [INSERT EFFECTIVE DATE], shall conduct an initial drill or exercise that demonstrates the capability to transition to and use one or more of the strategies and guidelines in paragraphs (b)(1) - (b)(3) of this section and use communications equipment required in 10 CFR part 50, appendix E, section VII by [INSERT DATE 4 YEARS AFTER EFFECTIVE DATE]. Following this initial drill or exercise, the licensee shall conduct subsequent drills, exercises, or both that collectively demonstrate a capability to use at least one of the strategies and guidelines in each of paragraphs (b)(1) - (b)(3) of this section in succeeding 8-year intervals. The drills and exercises performed to demonstrate this capability must include transitions from other procedures and guidelines as applicable, and the use of communications equipment required in 10 CFR part 50, appendix E, section VII. Each licensee shall not exceed eight years between any consecutive drills or exercises.

Assumptions:

- (1) Implementation costs would be incurred in 2017 and operations costs would be incurred beginning in 2017.
- (2) There are 60 operating sites that would be subject to the drills or exercises.
- (3) Fifty-five of the 60 operating sites would each have one set of SAMGs because each site has one reactor type, one type of NSSS, and one design type. These sites are referred to as "single-SAMGs sites."
- (4) Five of the 60 operating sites would each have two sets of SAMGs because each site has more than one reactor type, type of NSSS, or design type (i.e., Arkansas, Millstone, Nine Mile Point, Virgil C. Summer, and Vogtle). These sites are referred to as "dual-SAMGs sites."
- (5) Two sites (i.e., Beaver Valley and Dresden) have units of different vintages and therefore require two sets of SAMGs per site. However, the cost to develop two sets of SAMGs for the different vintages is closer to the costs faced by single-SAMGs sites. Therefore, the analysis accounts for the costs of these two sites as single-SAMGs sites.
- (6) The analysis estimates the incremental costs of drills or exercises for SAMGs. Drills or exercises for EDMGs are included in the baseline as they are already required. Drills or exercises for FSGs are included in the cost analysis for EA-12-049. (See Appendix B.)
- (7) One UDM would participate in drills at single-SAMGs and dual-SAMGs sites. Five UDMs would participate in exercises at single-SAMGs and dual-SAMGs sites.
- (8) The average number of NLOs participating in drills at a single-SAMGs site is 10. For a dual-SAMGs site, the average number of NLOs is 20. The average number of NLOs participating in exercises at a single-SAMGs site is 40. For a dual-SAMG site, the average number of NLOs participating in exercises is 80. NLOs would include onshift NLOs, maintenance workers, and security personnel assigned operational tasks under SAMGs.
- (9) Each of the 60 operating sites would incur one-time costs to develop new drill or exercise scenarios for SAMGs. These sites would incorporate the new scenarios into their existing EP drill and exercise program.
- (10) The level of effort estimates for dual-SAMGs sites are double the level of effort estimates for single-SAMGs sites.
- (11) Each of the 60 operating sites would incur one-time costs to conduct initial drills rather than exercises within four years of the effective date of the rule. The table shows the total cost the affected sites would incur over the 4-year period.
- (12) Each of the two sites with new reactor licensees would incur one-time costs conduct initial drills. As a conservatism, the COL holders would choose to conduct initial SAMGs drills (as opposed to EDMG or FSGs drills or exercises).
- (13) Industry would voluntarily conduct demonstrations of RRC capabilities which would involve transporting FLEX equipment from each RRC to selected sites. The estimated cost of Order EA-12-049 does not include these RRC demonstration costs.
- (14) Although the proposed rule would require sites to perform a drill or exercise in succeeding 8-year intervals, per year, one single-SAMGs site and one dual-SAMGs site would conduct and document the results of a SAMGs exercise (which is more costly than a drill). All other sites would choose to perform drills instead of exercises. On an annual basis, this means approximately six single-SAMGs sites and one dual-SAMGs site would conduct and document the results of SAMGs drills.
- (15) SAFER would participate in one drill per year. SAFER participation would include a SCC Lead, a SCC L&T Coordinator, a SCC SA Coordinator and two RRC Leads.
- (16) The NRC would incur a one-time cost to review new drill or exercise scenarios.
- (17) The NRC would incur a one-time cost to observe initial drills. The NRC would observe initial drills for combined license holders in 2018. Additionally, the NRC would observe initial drills for operating license holders on a rolling basis from 2018 to 2021. The table shows the total cost the NRC would incur over the 4-year period.
- (18) The NRC would incur annual costs to observe drills or exercises.
- (19) There is no incremental impact on State and Local offsite response organizations or for drill or exercise preparation or post-drill or exercise reviews and summaries because drills or exercises would occur concurrently to other EP drills or exercises in the baseline. As a result, the proposed rule would not add any additional costs above what is incurred in the baseline.
- (20) Level of effort estimates are based on the NRC staff's professional judgment.

Appendix C. Detailed Cost Build-up for the Operating License Term

	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
Develop new drill and exercise scenarios (single-SAMGs sites)	Executive	\$160/hr	55	N/A			20 hrs/site	\$ 3,193	\$ 175,593
	Manager	\$104/hr	55				80 hrs/site	\$ 8,337	\$ 458,524
	Staff	\$84/hr	55				80 hrs/site	\$ 6,708	\$ 368,940
	Clerical	\$50/hr	55				20 hrs/site	\$ 1,002	\$ 55,125
	Licensing	\$129/hr	55				20 hrs/site	\$ 2,574	\$ 141,581
Develop new drill and exercise scenarios (dual-SAMGs sites)	Executive	\$160/hr	5	N/A			40 hrs/site	\$ 6,385	\$ 31,926
	Manager	\$104/hr	5				160 hrs/site	\$ 16,674	\$ 83,368
	Staff	\$84/hr	5				160 hrs/site	\$ 13,416	\$ 67,080
	Clerical	\$50/hr	5				40 hrs/site	\$ 2,005	\$ 10,023
	Licensing	\$129/hr	5				40 hrs/site	\$ 5,148	\$ 25,742
Conduct initial drills (operating license holders)	Executive	\$160/hr	60	N/A			4 hrs/site	\$ 639	\$ 38,311
	Manager	\$104/hr	60				0 hrs/site	\$ -	\$ -
	Staff	\$84/hr	60				40 hrs/site	\$ 3,354	\$ 201,240
	Clerical	\$50/hr	60				16 hrs/site	\$ 802	\$ 48,109
	Licensing	\$129/hr	60				24 hrs/site	\$ 3,089	\$ 185,342
Conduct initial drills (COL holders)	Executive	\$160/hr	2	N/A			4 hrs/site	\$ 639	\$ 1,277
	Manager	\$104/hr	2				0 hrs/site	\$ -	\$ -
	Staff	\$84/hr	2				40 hrs/site	\$ 3,354	\$ 6,708
	Clerical	\$50/hr	2				16 hrs/site	\$ 802	\$ 1,604
	Licensing	\$129/hr	2				24 hrs/site	\$ 3,089	\$ 6,178
Total Industry Implementation Cost									\$ 1,906,670
INDUSTRY OPERATIONS (ANNUAL)									
Conduct drills and document performance (single-SAMGs sites)	Executive	\$160/hr	6	N/A			4 hrs/site	\$ 639	\$ 3,831
	Manager	\$104/hr	6				0 hrs/site	\$ -	\$ -
	Staff	\$84/hr	6				40 hrs/site	\$ 3,354	\$ 20,124
	Clerical	\$50/hr	6				16 hrs/site	\$ 802	\$ 4,811
	Licensing	\$129/hr	6				24 hrs/site	\$ 3,089	\$ 18,534
Conduct drills and document performance (dual-SAMGs sites)	Executive	\$160/hr	1	N/A			4 hrs/site	\$ 639	\$ 639
	Manager	\$104/hr	1				0 hrs/site	\$ -	\$ -
	Staff	\$84/hr	1				80 hrs/site	\$ 6,708	\$ 6,708
	Clerical	\$50/hr	1				32 hrs/site	\$ 1,604	\$ 1,604
	Licensing	\$129/hr	1				40 hrs/site	\$ 5,148	\$ 5,148
Conduct an exercise and document performance (single-SAMGs sites)	Executive	\$160/hr	1	N/A			50 hrs/site	\$ 7,982	\$ 7,982
	Manager	\$104/hr	1				20 hrs/site	\$ 2,084	\$ 2,084
	Staff	\$84/hr	1				400 hrs/site	\$ 33,540	\$ 33,540
	Clerical	\$50/hr	1				16 hrs/site	\$ 802	\$ 802
	Licensing	\$129/hr	1				24 hrs/site	\$ 3,089	\$ 3,089
Conduct an exercise and document performance (dual-SAMGs sites)	Executive	\$160/hr	1	N/A			50 hrs/site	\$ 7,982	\$ 7,982
	Manager	\$104/hr	1				40 hrs/site	\$ 4,168	\$ 4,168
	Staff	\$84/hr	1				800 hrs/site	\$ 67,080	\$ 67,080
	Clerical	\$50/hr	1				32 hrs/site	\$ 1,604	\$ 1,604
	Licensing	\$129/hr	1				40 hrs/site	\$ 5,148	\$ 5,148
Participate in drills (SAFER)	Executive	\$160/hr		N/A			0 hrs	\$ -	\$ -
	Manager	\$104/hr					24 hrs	\$ 2,501	\$ 2,501
	Staff	\$84/hr					16 hrs	\$ 1,342	\$ 1,342
	Clerical	\$50/hr					8 hrs	\$ 401	\$ 401
	Licensing	\$129/hr					0 hrs	\$ -	\$ -
Total Industry Operations Cost									\$ 199,121
NRC IMPLEMENTATION (ONE-TIME)									
Review new scenarios	NRC Staff	\$124/hr	60	N/A			8 hrs/site	\$ 992	\$ 59,520
Observe initial drills (operating licenses)	NRC Staff	\$124/hr	60	N/A			8 hrs/site	\$ 992	\$ 59,520
Observe initial drills (COL holders)	NRC Staff	\$124/hr	2	N/A			8 hrs/site	\$ 992	\$ 1,984
Total NRC Implementation Cost									\$ 121,024
NRC OPERATIONS (ANNUAL)									
Observe drills or exercises	NRC Staff	\$124/hr	9	N/A			8 hrs/site	\$ 992	\$ 8,928
Total NRC Operations Cost									\$ 8,928

C.8 SAMGs Change Control**§ 50.155(g) Change Control.**

- (1) A licensee may make changes in the implementation of the requirements in this section and 10 CFR Part 50, appendix E, section VII without NRC approval, *provided* that before implementing each such change, the licensee performs an evaluation demonstrating that the provisions of this section and 10 CFR part 50, appendix E, section VII continue to be met.
- (2) Documentation of all changes, including the evaluation required by paragraph (g)(1) of this section, shall be maintained until the requirements of this section and section VII of Appendix E to 10 CFR Part 50 no longer apply.
- (3) Changes in the implementation of requirements in this chapter subject to change control processes other than paragraph (g) of this section and resulting from changes in the implementation of the requirements in this section and 10 CFR part 50, appendix E, section VII must be processed via their respective change control processes.

Assumptions:

- (1) Implementation costs would be incurred in 2017 and operations costs would be incurred beginning in 2018.
- (2) There are 60 total operating sites that would develop and implement site-specific SAMGs.
- (3) Fifty-five of the 60 operating sites would each have one set of SAMGs because each site has one reactor type, one type of NSSS, and one design type. These sites are referred to as "single-SAMGs sites."
- (4) Five of the 60 operating sites would each have two sets of SAMGs because each site has more than one reactor type, type of NSSS, or design type (i.e., Arkansas, Millstone, Nine Mile Point, VC Summer, and Vogtle). These sites are referred to as "dual-SAMGs sites." Of the dual-SAMGs sites, one is a BWR site (i.e., Nine Mile Point). The remaining four sites are PWR sites.
- (5) Two sites (i.e., Beaver Valley and Dresden) have units of different vintages and therefore require two sets of SAMGs per site. However, the cost to develop two SAMGs for the different vintages is closer to the costs faced by single-SAMGs sites. Therefore, the analysis accounts for the costs of the these two sites as single-SAMGs sites.
- (6) Major updates to the generic and site-specific SAMGs are performed on a triennial basis. The analysis annualizes costs to account for the 3-year periodicity.
- (7) Each BWR and PWR site would incur a one-time cost to revise a change control policy and procedures.
- (8) BWROG and PWROG would incur annual costs to update its generic SAG and SAMG, respectively, based on operating experience.
- (9) Each of the 21 BWR single-SAMG sites would incur annual costs to update its set of site-specific SAMGs based on changes made to the BWROG generic SAG. One BWR dual-SAMG site would incur annual costs to update its two sets of site-specific SAMGs based on changes made to the BWROG generic SAG. Dual-SAMGs sites would require double the effort of single-SAMGs sites.
- (10) Each of the 34 PWR single-SAMGs sites would incur annual costs to update its site-specific SAMGs based on changes made to the generic PWROG SAMG. Each of the four PWR dual-SAMGs sites would incur annual costs to update its two site-specific SAMGs based on changes made to the generic PWROG SAMG. Dual-SAMGs would require double the effort of single-SAMGs sites. This includes additional effort by the PWR sites due to the multiple vendors (i.e., the Westinghouse, Combustion Engineering, and Babcock and Wilcox reactor designs).
- (11) The NRC would incur a one-time cost to revise existing inspection procedures.
- (12) The NRC would incur annual costs to oversee the SAMGs change control process for both single- and dual-SAMGs sites.
- (13) Applicants are required to comply with the proposed rule. Costs incurred by new reactor applicants are estimated separately.
- (14) Changes made to the SAMG TBR, generic SAMGs, or site-specific SAMGs would not trigger the NRC's review and approval.
- (15) Level of effort estimates are based on the NRC staff's professional judgment.

Required Activity	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
Develop change control policy and procedures (operating sites)	Executive	\$160/hr	60	N/A			8 hrs/site	\$ 1,277	\$ 76,622
	Manager	\$104/hr	60				40 hrs/site	\$ 4,168	\$ 250,104
	Staff	\$84/hr	60				80 hrs/site	\$ 6,708	\$ 402,480
	Clerical	\$50/hr	60				8 hrs/site	\$ 401	\$ 24,054
	Licensing	\$129/hr	60				16 hrs/site	\$ 2,059	\$ 123,562
Total Industry Implementation Cost								\$ 14,614	\$ 876,822
INDUSTRY OPERATIONS (ANNUAL)									
Update generic BWROG SAG	Executive	\$160/hr		N/A			5 hrs	\$ 851	\$ 851
	Manager	\$104/hr					8 hrs	\$ 834	\$ 834
	Staff	\$84/hr					27 hrs	\$ 2,236	\$ 2,236
	Clerical	\$50/hr					8 hrs	\$ 401	\$ 401
	Licensing	\$129/hr					3 hrs	\$ 343	\$ 343
Update generic PWROG SAMG	Executive	\$160/hr		N/A			5 hrs	\$ 851	\$ 851
	Manager	\$104/hr					8 hrs	\$ 834	\$ 834
	Staff	\$84/hr					27 hrs	\$ 2,236	\$ 2,236
	Clerical	\$50/hr					8 hrs	\$ 401	\$ 401
	Licensing	\$129/hr					5 hrs	\$ 686	\$ 686
Update site-specific SAMGs (single-SAMGs BWR sites)	Executive	\$160/hr	21	N/A			8 hrs/site	\$ 1,277	\$ 26,818
	Manager	\$104/hr	21				11 hrs/site	\$ 1,112	\$ 23,343
	Staff	\$84/hr	21				40 hrs/site	\$ 3,354	\$ 70,434
	Clerical	\$50/hr	21				8 hrs/site	\$ 401	\$ 8,419
	Licensing	\$129/hr	21				3 hrs/site	\$ 343	\$ 7,208
Update site-specific SAMGs (dual-SAMGs BWR sites)	Executive	\$160/hr	1	N/A			16 hrs/site	\$ 2,554	\$ 2,554
	Manager	\$104/hr	1				21 hrs/site	\$ 2,223	\$ 2,223
	Staff	\$84/hr	1				80 hrs/site	\$ 6,708	\$ 6,708
	Clerical	\$50/hr	1				16 hrs/site	\$ 802	\$ 802
	Licensing	\$129/hr	1				5 hrs/site	\$ 686	\$ 686

Appendix C. Detailed Cost Build-up for the Operating License Term

	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
Update site-specific SAMGs (single-SAMGs PWR sites)	Executive	\$160/hr	34	N/A			11 hrs/site	\$ 1,703	\$ 57,892
	Manager	\$104/hr	34				13 hrs/site	\$ 1,389	\$ 47,242
	Staff	\$84/hr	34				53 hrs/site	\$ 4,472	\$ 152,048
	Clerical	\$50/hr	34				11 hrs/site	\$ 535	\$ 18,174
	Licensing	\$129/hr	34				3 hrs/site	\$ 343	\$ 11,670
Update site-specific SAMGs (dual-SAMGs PWR sites)	Executive	\$160/hr	4	N/A			21 hrs/site	\$ 3,405	\$ 13,622
	Manager	\$104/hr	4				27 hrs/site	\$ 2,779	\$ 11,116
	Staff	\$84/hr	4				107 hrs/site	\$ 8,944	\$ 35,776
	Clerical	\$50/hr	4				21 hrs/site	\$ 1,069	\$ 4,276
	Licensing	\$129/hr	4				5 hrs/site	\$ 686	\$ 2,746
Total Industry Operations Cost									\$ 513,431
NRC IMPLEMENTATION (ONE-TIME)									
Revise existing inspection procedures	NRC Staff	\$124/hr		N/A			100 hrs	\$ 12,400	\$ 12,400
Total NRC Implementation Cost									\$ 12,400
NRC OPERATIONS (ANNUAL)									
Oversee SAMGs change control process for single-SAMGs sites	NRC Staff	\$124/hr	55	N/A			16 hrs/site	\$ 1,984	\$ 109,120
Oversee SAMGs change control process for dual-SAMGs sites	NRC Staff	\$124/hr	5	N/A			32 hrs/site	\$ 3,968	\$ 19,840
Total NRC Operations Cost									\$ 128,960

C.9 Multi-Source Dose Assessment

10 CFR Part 50, Appendix E
Section IV:

B. Assessment Actions

1. The means to be used for determining the magnitude of, and for continually assessing the impact of, the release of radioactive materials, including from all reactor core and spent fuel pool sources, shall be described, including emergency action levels that are to be used as criteria for determining the need for notification and participation of local and State agencies, the Commission, and other Federal agencies, and the emergency action levels that are to be used for determining when and what type of protective measures should be considered within and outside the site boundary to protect health and safety. The emergency action levels shall be based on in-plant conditions and instrumentation in addition to onsite and offsite monitoring. By June 20, 2012 for nuclear power reactor licensees, these action levels must include hostile action that may adversely affect the nuclear power plant. The initial emergency action levels shall be discussed and agreed on by the applicant or licensee and state and local governmental authorities, and approved by the NRC. Thereafter, emergency action levels shall be reviewed with the State and local governmental authorities on an annual basis.

E. Emergency Facilities and Equipment

Adequate provisions shall be made and described for emergency facilities and equipment, including:

2. Equipment for determining the magnitude of and for continuously assessing the impact of the release of radioactive materials, including from all reactor core and spent fuel pool sources, to the environment.

Assumptions:

- (1) These industry implementation costs will be incurred prior to the effective date of the proposed rule. The analysis categorizes these costs as "historical." Appendix B discusses these historical costs.
- (2) Fifty-six operating sites and four decommissioning sites with fuel remaining in the SFP (i.e., Crystal River, Kewaunee, Oyster Creek, and Vermont Yankee) implemented multi-source dose assessment capabilities. The remaining decommissioning site with fuel remaining in the SFP (i.e., San Onofre) would not implement multi-source dose assessment capabilities. Four sites have already implemented multi-source dose assessment capabilities voluntarily (i.e., Duane Arnold, Fermi, Fort Calhoun, and Seabrook). Therefore, the analysis does not estimate the incremental costs for these four sites.
- (3) Each of the 56 operating sites and four decommissioning sites with multiple SFPs incurred a one-time cost to review and revise procedures to reflect software updates.
- (4) Twenty-six operating sites and two decommissioning sites with multiple SFPs (i.e., Crystal River and Oyster Creek) used the RASCAL URI software which was developed to interface with the NRC's RASCAL software. These sites incurred a one-time cost to customize the computer software for its site-specific needs. There is no cost for the receipt of the software code.
- (5) Thirty operating sites and two decommissioning sites with multiple SFPs (i.e., Kewaunee and Vermont Yankee) developed software independently. These sites incurred a one-time cost to update their existing software.
- (6) Each of the affected sites incurred a one-time cost to develop training materials for the ERO team.
- (7) Each of the affected sites incurred a one-time cost to deliver ERO training on how to conduct individual dose assessments for multiple release points.
- (8) Each of the affected sites would incur an annual cost to update its software.
- (9) Annual training and annual inventory checks and functionality training for the new rule requirement would replace existing training and annual inventory checks and functionality training occurring in the baseline. Hence, no incremental costs are estimated for annual training and annual inventory checks and functionality training.
- (10) The NRC incurred a one-time cost to develop computer software, as well as training and a user's guide.
- (11) The NRC would incur annual costs to update the computer software.
- (12) COL applicants would address the implementation of a multi-source dose assessment capability consistent with their licensing, construction, and startup schedules. Costs incurred by new reactor applicants are estimated separately.
- (13) Level of effort and contractor cost estimates are based on the NRC staff's professional judgment.

	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
Review and revise procedures (operating sites)	Executive	\$160/hr	56	8 hrs/site	\$ 1,277	\$ 71,514	N/A		
	Manager	\$104/hr	56	16 hrs/site	\$ 1,667	\$ 93,372			
	Staff	\$84/hr	56	24 hrs/site	\$ 2,012	\$ 112,694			
	Clerical	\$50/hr	56	8 hrs/site	\$ 401	\$ 22,451			
	Licensing	\$129/hr	56	8 hrs/site	\$ 1,030	\$ 57,662			
Review and revise procedures (decommissioning sites)	Executive	\$160/hr	4	8 hrs/site	\$ 1,277	\$ 5,108	N/A		
	Manager	\$104/hr	4	16 hrs/site	\$ 1,667	\$ 6,669			
	Staff	\$84/hr	4	24 hrs/site	\$ 2,012	\$ 8,050			
	Clerical	\$50/hr	4	8 hrs/site	\$ 401	\$ 1,604			
	Licensing	\$129/hr	4	8 hrs/site	\$ 1,030	\$ 4,119			
Develop computer software	Contractor Costs	\$150,000	32	N/A	\$ 150,000	\$ 4,800,000	N/A		
Customize computer software	Contractor Costs	\$70,000	28	N/A	\$ 70,000	\$ 1,960,000	N/A		
Develop training materials for ERO team (operating sites)	Executive	\$160/hr	56	16 hrs/site	\$ 2,554	\$ 143,028	N/A		
	Manager	\$104/hr	56	40 hrs/site	\$ 4,168	\$ 233,430			
	Staff	\$84/hr	56	80 hrs/site	\$ 6,708	\$ 375,648			
	Clerical	\$50/hr	56	80 hrs/site	\$ 4,009	\$ 224,508			
	Licensing	\$129/hr	56	8 hrs/site	\$ 1,030	\$ 57,662			

Appendix C. Detailed Cost Build-up for the Operating License Term

	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
Develop training materials for ERO team (decommissioning sites)	Executive	\$160/hr	4	16 hrs/site	\$ 2,554	\$ 10,216	N/A		
	Manager	\$104/hr	4	40 hrs/site	\$ 4,168	\$ 16,674			
	Staff	\$84/hr	4	80 hrs/site	\$ 6,708	\$ 26,832			
	Clerical	\$50/hr	4	80 hrs/site	\$ 4,009	\$ 16,036			
	Licensing	\$129/hr	4	8 hrs/site	\$ 1,030	\$ 4,119			
Deliver ERO training (operating sites)	Executive	\$160/hr	56	8 hrs/site	\$ 1,277	\$ 71,514	N/A		
	Manager	\$104/hr	56	8 hrs/site	\$ 834	\$ 46,686			
	Staff	\$84/hr	56	40 hrs/site	\$ 3,354	\$ 187,824			
	Clerical	\$50/hr	56	8 hrs/site	\$ 401	\$ 22,451			
	Licensing	\$129/hr	56	0 hrs/site	\$ -	\$ -			
Deliver ERO training (decommissioning sites)	Executive	\$160/hr	4	8 hrs/site	\$ 1,277	\$ 5,108	N/A		
	Manager	\$104/hr	4	8 hrs/site	\$ 834	\$ 3,335			
	Staff	\$84/hr	4	40 hrs/site	\$ 3,354	\$ 13,416			
	Clerical	\$50/hr	4	8 hrs/site	\$ 401	\$ 1,604			
	Licensing	\$129/hr	4	0 hrs/site	\$ -	\$ -			
Total Industry Implementation Cost						\$ 8,603,334			
INDUSTRY OPERATIONS (ANNUAL)									
Update computer software (operating sites)	Executive	\$160/hr	56	0 hrs/site	\$ -	\$ -	N/A		
	Manager	\$104/hr	56	8 hrs/site	\$ 834	\$ 46,686			
	Staff	\$84/hr	56	80 hrs/site	\$ 6,708	\$ 375,648			
	Clerical	\$50/hr	56	32 hrs/site	\$ 1,604	\$ 89,803			
	Licensing	\$129/hr	56	0 hrs/site	\$ -	\$ -			
Update computer software (decommissioning sites)	Executive	\$160/hr	4	0 hrs/site	\$ -	\$ -	N/A		
	Manager	\$104/hr	4	8 hrs/site	\$ 834	\$ 3,335			
	Staff	\$84/hr	4	80 hrs/site	\$ 6,708	\$ 26,832			
	Clerical	\$50/hr	4	32 hrs/site	\$ 1,604	\$ 6,415			
	Licensing	\$129/hr	4	0 hrs/site	\$ -	\$ -			
Total Industry Operations Cost						\$ 548,718			
NRC IMPLEMENTATION (ONE-TIME)									
Develop computer software, training, and user's guide	Contractor Costs	\$150,000		N/A	\$ 150,000	\$ 150,000	N/A		
Total NRC Implementation Cost						\$ 150,000			
NRC OPERATIONS (ANNUAL)									
Update computer software	NRC Staff	\$124/hr		120 hrs	\$ 14,880	\$ 14,880	N/A		
Total NRC Operations Cost						\$ 14,880			
TOTAL									

C.10 Developing and Issuing Final Rule**Assumptions:**

- (1) Implementation costs would be incurred in 2016.
 (2) Industry's cost associated with the development of the final rule are not included in the analysis.
 (3) The NRC would incur a one-time cost to develop and issue the MBDDE final rule.
 (4) Level of effort estimates are based on the NRC staff's professional judgment.

	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
None.									
INDUSTRY OPERATIONS (ANNUAL)									
None.									
NRC IMPLEMENTATION (ONE-TIME)									
Develop and issue MBDDE final rule	NRC Staff	\$124/hr		N/A			7,100 hrs	\$ 880,400	\$ 880,400
Total NRC Implementation Cost									\$ 880,400
NRC OPERATIONS (ANNUAL)									
None.									

D.1 Exemption Analysis**§ 50.155(a) Applicability.**

(3) When the NRC has docketed the certifications described in § 50.82(a)(1) or § 52.110(a) of this chapter, submitted by a licensee subject to the requirements of this section and section VII of appendix E to 10 CFR part 50, then that licensee shall comply with the requirements of § 50.155(b)-(f) associated with maintaining or restoring secondary containment capabilities, if applicable, and spent fuel pool cooling capabilities, but not with § 50.155(c)(4) and section VII of appendix E to 10 CFR part 50, for the unit described in the § 50.82(a)(1) or § 52.110(a) certifications until the spent fuel pool(s) is empty of all irradiated fuel.

(i) Holders of operating licenses or combined licenses for which the NRC has the docketed certifications described in § 50.82(a)(1) or § 52.110(a) of this chapter need not meet the requirements of this section except for paragraph (b)(2) if the licensee performs and retains an analysis demonstrating that the decay heat of the fuel in the spent fuel pool is removed solely by heating and boiling of water within the spent fuel pool and the boil-off period provides sufficient time for the licensee to obtain off-site resources on an ad hoc basis to sustain the spent fuel pool cooling function indefinitely.

Assumptions:

- (1) All activities related to conducting and submitting the exemption analysis (i.e., an analysis demonstrating that the decay heat of the fuel in the spent fuel pool is removed solely by heating and boiling of water within the spent fuel pool and the boil-off period provides sufficient time for the licensee to obtain off-site resources) occur the second year following the end of a site's operating license.
- (2) Five currently decommissioning sites (i.e., Crystal River, Kewaunee, San Onofre, Oyster Creek, and Vermont Yankee) would conduct and submit an exemption analysis prior to the proposed rule's effective date.
- (3) Fifty-eight BWR and PWR sites and two sites with new reactors would conduct and submit an analysis within two years of announcing decommissioning plans.
- (4) The NRC would incur a one-time cost to review and approve the analyses.
- (5) Level of effort and contractor cost estimates are based on the NRC staff's professional judgment.

	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
Conduct and submit the exemption analysis (Current decommissioning sites)	Contractor Cost	\$500,000	5	N/A	\$ 500,000	\$ 2,500,000	N/A		
Conduct and submit the exemption analysis (BWR and PWR decommissioning sites)	Contractor Cost	\$500,000	58	N/A	\$ 500,000	\$ 29,000,000	N/A		
Conduct and submit the exemption analysis (AP1000 decommissioning sites)	Contractor Cost	\$500,000	2	N/A	\$ 500,000	\$ 1,000,000	N/A		
Total Industry Operations Cost				\$ 32,500,000					
INDUSTRY OPERATION (ANNUAL)									
None.									
NRC IMPLEMENTATION (ONE-TIME)									
Review and approve the exemption analyses for current decommissioning sites	NRC Staff	\$124/hr	5	1,000 hrs	\$ 124,000	\$ 620,000	N/A		
Review and approve the exemption analyses for BWR and PWR decommissioning sites	NRC Staff	\$124/hr	58	1,000 hrs	\$ 124,000	\$ 7,192,000	N/A		
Review and approve the exemption analyses for AP1000 decommissioning sites	NRC Staff	\$124/hr	2	1,000 hrs	\$ 124,000	\$ 248,000	N/A		
Total NRC Operations Cost				\$ 8,060,000					
NRC OPERATION (ANNUAL)									
None.									

D.2 SAMGs

§ 50.155(b) *Integrated response capability*. Each applicant or licensee shall develop, implement, and maintain an integrated response capability that includes:

(3) Severe Accident Management Guidelines (SAMGs).

Strategies and guidelines for mitigating the consequences of events that result in significant damage to fuel in the reactor vessel or spent fuel pool to support actions intended to:

- i. Arrest the progression of fuel damage,
- ii. Maximize the duration for which containment capability is maintained, and,
- iii. Minimize radiological releases.

Assumptions:

- (1) On average, 58 operating sites have 24 years remaining on their operating licenses. See Section 3.1 for discussion on how this average was derived. Each of the 58 operating sites would begin incurring costs as a decommissioning site in 2041.
- (2) On average, two new reactor sites have 61 years remaining on their operating licenses. Each of the two sites with new reactors (i.e., Virgil C. Summer and Vogtle) would begin incurring costs as a decommissioning site in 2078.
- (3) Costs would be incurred during the first two years of decommissioning.
- (4) Each affected site would incur annual costs to maintain site-specific SAMGs, which would involve a high-level review to determine if updates are needed. This review would be added to existing procedure review processes, which would need only slight modifications. As a result, the incremental impact would be small. These procedural reviews would occur on a triennial basis, though these costs have been annualized in the analysis. Costs associated with revisions resulting from these reviews are reflected under Change Control (See Appendix D.5).
- (5) Applicants are required to comply with the proposed rule. Costs incurred by new reactor applicants are estimated separately.
- (6) Level of effort estimates are based on the NRC staff's professional judgment.

Cost Inputs				Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
None.									
INDUSTRY OPERATIONS (ANNUAL)									
Maintain site-specific SAMGs (BWR and PWR decommissioning sites)	Executive	\$160/hr	19	N/A			2 hrs/site	\$ 319	\$ 6,066
	Manager	\$104/hr	19				8 hrs/site	\$ 834	\$ 15,840
	Staff	\$84/hr	19				40 hrs/site	\$ 3,354	\$ 63,726
	Clerical	\$50/hr	19				8 hrs/site	\$ 401	\$ 7,617
	Licensing	\$129/hr	19				8 hrs/site	\$ 1,030	\$ 19,564
Maintain site-specific SAMGs (AP1000 decommissioning sites)	Executive	\$160/hr	1	N/A			2 hrs/site	\$ 319	\$ 319
	Manager	\$104/hr	1				8 hrs/site	\$ 834	\$ 834
	Staff	\$84/hr	1				40 hrs/site	\$ 3,354	\$ 3,354
	Clerical	\$50/hr	1				8 hrs/site	\$ 401	\$ 401
	Licensing	\$129/hr	1				8 hrs/site	\$ 1,030	\$ 1,030
Total Industry Operations Cost								\$ 11,875	\$ 118,751
NRC IMPLEMENTATION (ONE-TIME)									
None.									
NRC OPERATIONS (ANNUAL)									
None.									

D.3 Spent Fuel Pool Instrumentation§ 50.155(c) *Equipment*.

(4) The equipment relied on for the mitigation strategies in paragraph (b)(1) of this section must include reliable means to remotely monitor wide-range spent fuel pool levels to support effective prioritization of event mitigation and recovery actions.

Assumptions:

(1) These industry implementation costs will be incurred prior to the effective date of the proposed rule (i.e., in response to Order EA-12-051). The analysis categorizes these costs as "historical." Appendix B discusses these historical costs.

(2) On average, 58 operating sites have 24 years remaining on their operating licenses. Section 3.1 for a discussion of how this average was derived. Each of the 58 operating sites would begin incurring costs as a decommissioning site in 2041.

(3) On average, two new reactor sites have 61 years remaining on their operating licenses. Each of the two sites with new reactors (i.e., Virgil C. Summer and Vogtle) would begin incurring costs as a decommissioning site in 2078.

(4) Costs would be incurred during the first two years of decommissioning.

(5) Sites required to install the instrumentation would incur an annual cost to test the instruments. Testing occurs on a biennial basis. The costs have been annualized to reflect this. The incremental cost to test the instruments does not vary by the number of instruments at a site.

(6) Level of effort estimates are based on the NRC staff's professional judgment.

Cost Inputs				Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Equipment or Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
None.									
INDUSTRY OPERATIONS (ANNUAL)									
Test SFP instrumentation (BWR and PWR decommissioning sites)	Executive	\$160/hr	29	0 hrs/site	\$ -	\$ -	N/A		
	Manager	\$104/hr	29	2 hrs/site	\$ 208	\$ 6,044			
	Staff	\$84/hr	29	16 hrs/site	\$ 1,342	\$ 38,906			
	Clerical	\$50/hr	29	8 hrs/site	\$ 401	\$ 11,626			
	Licensing	\$129/hr	29	0 hrs/site	\$ -	\$ -			
Test SFP instrumentation (AP1000 sites)	Executive	\$160/hr	1	0 hrs/site	\$ -	\$ -	N/A		
	Manager	\$104/hr	1	2 hrs/site	\$ 208	\$ 208			
	Staff	\$84/hr	1	16 hrs/site	\$ 1,342	\$ 1,342			
	Clerical	\$50/hr	1	8 hrs/site	\$ 401	\$ 401			
	Licensing	\$129/hr	1	0 hrs/site	\$ -	\$ -			
Total Industry Operations Cost						\$ 58,528			
NRC IMPLEMENTATION (ONE-TIME)									
None.									
NRC OPERATIONS (ANNUAL)									
None.									

D.4 SAMGs Training**§ 50.155(e) Training requirements**

Each licensee shall provide for the training and qualification of personnel that perform activities in accordance with the strategies and guidelines identified in paragraphs (b)(1) – (b)(3) of this section using the systems approach to training as defined in 10 CFR 55.4 unless otherwise required by NRC regulations.

Assumptions:

- (1) On average, 58 operating sites have 24 years remaining on their operating licenses. See Section 3.1 for a discussion of how this average was derived. Each of the 58 operating sites would begin incurring costs as a decommissioning site in 2041.
- (2) On average, two new reactor sites have 61 years remaining on their operating licenses. Each of the two sites with new reactors (i.e., Virgil C. Summer and Vogtle) would begin incurring costs as a decommissioning site in 2078.
- (3) Costs would be incurred during the first two years of decommissioning.
- (4) Decommissioning sites would be required to comply with the training requirements, but the burden for developing training materials, attending training, and verifying satisfactory completion of training would be less than that incurred by operating sites. Five UDMs and 10 NLOs would require training at a decommissioning site.
- (5) Each affected sites would incur an annual cost for its personnel at the executive level (UDMs) and at the staff level (NLOs) to attend training, as well as support by individuals at the manager level. Training would target personnel that perform activities in accordance with the strategies and guidelines in the rule language, including EDMGs and SAMGs.
- (6) Training would be conducted on a biennial basis for each site. The costs are annualized to reflect this.
- (7) Each affected site would incur an annual cost to document training and update materials.
- (8) Training documentation and updates of training materials would be conducted on a biennial basis for each site. The costs are annualized to reflect this.
- (9) Applicants are required to comply with the proposed rule. Costs incurred by new reactor applicants are estimated separately.
- (10) Level of effort estimates are based on the NRC staff's professional judgment.

	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
None.									
INDUSTRY OPERATIONS (ANNUAL)									
Attend training for UDMs and non-licensed operators (BWR and PWR decommissioning sites)	Executive	\$160/hr	29	N/A			10 hrs/site	\$ 1,596	\$ 46,293
	Manager	\$104/hr	29				8 hrs/site	\$ 834	\$ 24,177
	Staff	\$84/hr	29				20 hrs/site	\$ 1,677	\$ 48,633
	Clerical	\$50/hr	29				0 hrs/site	\$ -	\$ -
	Licensing	\$129/hr	29				0 hrs/site	\$ -	\$ -
Attend training for UDMs and non-licensed operators (AP1000 decommissioning sites)	Executive	\$160/hr	1	N/A			10 hrs/site	\$ 1,596	\$ 1,596
	Manager	\$104/hr	1				8 hrs/site	\$ 834	\$ 834
	Staff	\$84/hr	1				20 hrs/site	\$ 1,677	\$ 1,677
	Clerical	\$50/hr	1				0 hrs/site	\$ -	\$ -
	Licensing	\$129/hr	1				0 hrs/site	\$ -	\$ -
Document training and update materials (BWR and PWR decommissioning sites)	Executive	\$160/hr	29	N/A			2 hrs/site	\$ 319	\$ 9,259
	Manager	\$104/hr	29				5 hrs/site	\$ 500	\$ 14,506
	Staff	\$84/hr	29				32 hrs/site	\$ 2,683	\$ 77,813
	Clerical	\$50/hr	29				8 hrs/site	\$ 401	\$ 11,626
	Licensing	\$129/hr	29				2 hrs/site	\$ 257	\$ 7,465
Document training and update materials (AP1000 decommissioning sites)	Executive	\$160/hr	1	N/A			2 hrs/site	\$ 319	\$ 319
	Manager	\$104/hr	1				5 hrs/site	\$ 500	\$ 500
	Staff	\$84/hr	1				32 hrs/site	\$ 2,683	\$ 2,683
	Clerical	\$50/hr	1				8 hrs/site	\$ 401	\$ 401
	Licensing	\$129/hr	1				2 hrs/site	\$ 257	\$ 257
Total Industry Operations Cost									\$ 248,039
NRC IMPLEMENTATION (ONE-TIME)									
None.									
NRC OPERATIONS (ANNUAL)									
None.									

D.5 SAMGs Change Control**§ 50.155(g) Change Control**

- (1) A licensee may make changes in the implementation of the requirements in this section and 10 CFR Part 50 Appendix E Section VII without NRC approval, *provided* that before implementing each such change, the licensee performs an evaluation demonstrating that the provisions of this section and 10 CFR part 50, Appendix E, Section VII continue to be met.
- (2) Documentation of all changes, including the evaluation required by paragraph (g)(1) of this section, shall be maintained until the requirements of this section and section VII of Appendix E to 10 CFR Part 50 no longer apply.
- (3) Changes in the implementation of requirements in this chapter subject to change control processes other than paragraph (g) of this section and resulting from changes in the implementation of the requirements in this section and 10 CFR part 50 Appendix E section VII must be processed via their respective change control processes.

Assumptions:

- (1) On average, 58 operating sites have 24 years remaining on their operating licenses. See Section 3.1 for a discussion of how this average was derived. Each of the 58 operating sites would begin incurring costs as a decommissioning site in 2041.
- (2) On average, two new reactor sites have 61 years remaining on their operating licenses. Each of the two sites with new reactors (i.e., Virgil C. Summer and Vogtle) would begin incurring costs as a decommissioning site in 2078.
- (3) Costs would be incurred during the first two years of decommissioning.
- (4) Each decommissioning site with fuel remaining in the SFP would incur annual costs to update site-specific SAMGs for the SFP.
- (5) Applicants are required to comply with the proposed rule. Costs incurred by new reactor applicants are estimated separately.
- (6) Level of effort estimates are based on the NRC staff's professional judgment.

Required Activity	Cost Inputs			Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
None.									
INDUSTRY OPERATIONS (ANNUAL)									
Update site-specific SAMGs (BWR and PWR decommissioning sites)	Executive	\$160/hr	58	N/A			5 hrs	\$ 851	\$ 49,379
	Manager	\$104/hr	58				5 hrs	\$ 556	\$ 32,236
	Staff	\$84/hr	58				13 hrs	\$ 1,118	\$ 64,844
	Clerical	\$50/hr	58				3 hrs	\$ 134	\$ 7,751
	Licensing	\$129/hr	58				3 hrs	\$ 343	\$ 19,907
Update site-specific SAMGs (AP1000 decommissioning sites)	Executive	\$160/hr	2	N/A			5 hrs/site	\$ 851	\$ 1,703
	Manager	\$104/hr	2				5 hrs/site	\$ 556	\$ 1,112
	Staff	\$84/hr	2				13 hrs/site	\$ 1,118	\$ 2,236
	Clerical	\$50/hr	2				3 hrs/site	\$ 134	\$ 267
	Licensing	\$129/hr	2				3 hrs/site	\$ 343	\$ 686
Total Industry Operations Cost									\$ 180,121
NRC IMPLEMENTATION (ONE-TIME)									
None.									
NRC OPERATIONS (ANNUAL)									
None.									

D. 6 Multi-Source Dose Assessment

10 CFR Part 50, Appendix E
Section IV:

B. Assessment Actions

1. The means to be used for determining the magnitude of, and for continually assessing the impact of, the release of radioactive materials, including from all reactor core and spent fuel pool sources, shall be described, including emergency action levels that are to be used as criteria for determining the need for notification and participation of local and State agencies, the Commission, and other Federal agencies, and the emergency action levels that are to be used for determining when and what type of protective measures should be considered within and outside the site boundary to protect health and safety. The emergency action levels that are to be used for determining when and what type of protective measures should be considered within and outside the site boundary to protect health and safety. The emergency action levels shall be based on in-plant conditions and instrumentation in addition to onsite and offsite monitoring. By June 20, 2012 for nuclear power reactor licensees, these action levels must include hostile action that may adversely affect the nuclear power plant. The initial emergency action levels shall be discussed and agreed on by the applicant or licensee and state and local governmental authorities, and approved by the NRC. Thereafter, emergency action levels shall be reviewed with the State and local governmental authorities on an annual basis.

E. Emergency Facilities and Equipment

Adequate provisions shall be made and described for emergency facilities and equipment, including:

2. Equipment for determining the magnitude of and for continuously assessing the impact of the release of radioactive materials, including from all reactor core and spent fuel pool sources, to the environment.

Assumptions:

- (1) These industry implementation costs will be incurred prior to the effective date of the proposed rule. The analysis categorizes these costs as "historical." Appendix B discusses these historical costs.
- (2) According to NRC data, 60 operating sites. Four sites have already implemented multi-source dose assessment capabilities voluntarily (i.e., Duane Arnold, Fermi, Fort Calhoun, and Seabrook). Therefore, the analysis does not estimate the incremental costs for these four sites.
- (3) Costs would be incurred for the first two years of decommissioning.
- (4) Each of the affected sites would incur an annual cost to update its software.
- (5) Annual training and annual inventory checks and functionality training for the new rule requirement would replace existing training and annual inventory checks and functionality training occurring in the baseline. Hence, no incremental costs are estimated for annual training and annual inventory checks and functionality training.
- (6) COL applicants would address the implementation of a multi-source dose assessment capability consistent with their licensing, construction, and startup schedules. Costs incurred by new reactor applicants are estimated separately.
- (7) Level of effort estimates are based on the NRC staff's professional judgment.

Cost Inputs				Historical Incremental Effort Due to Fukushima Response			Incremental Effort Due to Proposed Rule		
Required Activity	Labor Category	Unit Cost	Sites Affected	Units	Cost Per Affected Site	Total Cost	Units	Cost Per Affected Site	Total Cost
INDUSTRY IMPLEMENTATION (ONE-TIME)									
None.									
INDUSTRY OPERATIONS (ANNUAL)									
Update computer software (BWR and PWR decommissioning sites)	Executive	\$160/hr	54	0 hrs/site	\$ -	\$ -	N/A		
	Manager	\$104/hr	54	8 hrs/site	\$ 834	\$ 45,019			
	Staff	\$84/hr	54	80 hrs/site	\$ 6,708	\$ 362,232			
	Clerical	\$50/hr	54	32 hrs/site	\$ 1,604	\$ 86,596			
	Licensing	\$129/hr	54	0 hrs/site	\$ -	\$ -			
Update computer software (AP1000 decommissioning sites)	Executive	\$160/hr	2	0 hrs/site	\$ -	\$ -	N/A		
	Manager	\$104/hr	2	8 hrs/site	\$ 834	\$ 1,667			
	Staff	\$84/hr	2	80 hrs/site	\$ 6,708	\$ 13,416			
	Clerical	\$50/hr	2	32 hrs/site	\$ 1,604	\$ 3,207			
	Licensing	\$129/hr	2	0 hrs/site	\$ -	\$ -			
Total Industry Operations Cost					\$ 18,291	\$ 512,137			
NRC IMPLEMENTATION (ONE-TIME)									
None.									
NRC OPERATIONS (ANNUAL)									
None.									

Appendix E. Costs for a BWR 1-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL IMPLEMENTATION COSTS								
Initial Response								
Construct a seismic missile-protected Emergency Water Storage Tank (EWST) to provide a minimum coping time of 16 hours.								
Site Equipment	Emergency water storage tank (EWST)	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	1 unit	14 sites	\$158,000	\$2,212,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	3,600 hours	14 sites	\$186,336	\$2,608,704
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	500 hours	14 sites	\$41,310	\$578,340
Build clean water tank with availability to supply RCIC/HPCI with water of acceptable quality for RCIC/HPCI injection into RPV.								
Site Equipment	Clean water tank	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	1 unit	14 sites	\$158,000	\$2,212,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	3,600 hours	14 sites	\$186,336	\$2,608,704
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	500 hours	14 sites	\$41,310	\$578,340
Install quick-disconnect connection point downstream of the CST isolation valve to allow for a gravity drain between the clean water tank and the RCIC/HPCI suction supply piping.								
Site Equipment	Quick-disconnect connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	1 unit	14 sites	\$75,000	\$1,050,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	40 hours	14 sites	\$2,070	\$28,986
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	200 hours	14 sites	\$16,524	\$231,336
Install cross connect between the RCIC/HPCI suction supply lines.								
Site Equipment	Cross connect	\$200,000 / unit	\$200,000 / unit	\$200,000 / unit	1 unit	14 sites	\$200,000	\$2,800,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	40 hours	14 sites	\$2,070	\$28,986
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	14 sites	\$33,048	\$462,672
Modify HPCS SW to install new cross-tie piping. Modify HPCS SW return line to add a manually-aligned cooling tower bypass line that discharges to the UHS basins. Modify RHR C injection piping to make the connection from the HPCS SW cross-tie piping.								
Site Equipment	Cross-tie piping	\$167,000 / unit	\$167,000 / unit	\$167,000 / unit	1 unit	14 sites	\$167,000	\$2,338,000
Site Equipment	Connection line	\$167,000 / unit	\$167,000 / unit	\$167,000 / unit	1 unit	14 sites	\$167,000	\$2,338,000
Site Equipment	Connection point	\$167,000 / unit	\$167,000 / unit	\$167,000 / unit	1 unit	14 sites	\$167,000	\$2,338,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	200 hours	14 sites	\$10,352	\$144,928
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,000 hours	14 sites	\$82,620	\$1,156,680

Appendix E. Order EA-12-049 Costs - BWR 1-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Onsite Portable Equipment								
Procure portable FLEX equipment (N+1).								
Site Equipment	Air compressor (300 HH Sullair Diesel air compressors)	\$13,000 / unit	\$13,000 / unit	\$13,000 / unit	2 units	14 sites	\$26,000	\$364,000
Site Equipment	Low pressure/ Medium flow pump	\$55,000 / unit	\$55,000 / unit	\$55,000 / unit	2 units	14 sites	\$110,000	\$1,540,000
Site Equipment	Electric fuel oil transfer pumps and associated equipment	\$1,000 / unit	\$1,000 / unit	\$700 / unit	2 units	14 sites	\$1,400	\$19,600
Site Equipment	Deployment vehicles	\$24,000 / unit	\$35,000 / unit	\$30,000 / unit	2 units	14 sites	\$60,000	\$840,000
Site Equipment	Flatbed trailers	\$8,000 / unit	\$18,000 / unit	\$12,000 / unit	2 units	14 sites	\$24,000	\$336,000
Site Equipment	Hose and fittings	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	2 units	14 sites	\$4,000	\$56,000
Site Equipment	Strainers	\$10 / unit	\$20 / unit	\$10 / unit	2 units	14 sites	\$20	\$280
Site Equipment	Monitor nozzles for SFP spray	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	2 units	14 sites	\$2,000	\$28,000
Site Equipment	Portable diesel generator sets (SAMA diesel generators) (480 Vac, 400 kW)	\$75,000 / unit	\$125,000 / unit	\$100,000 / unit	2 units	14 sites	\$200,000	\$2,800,000
Site Equipment	Portable diesel generator (480 Vac, 200 kW)	\$50,000 / unit	\$101,000 / unit	\$77,000 / unit	2 units	14 sites	\$154,000	\$2,156,000
Site Equipment	Portable diesel generator (120 Vac, 15 kW)	\$5,000 / unit	\$10,000 / unit	\$8,000 / unit	2 units	14 sites	\$16,000	\$224,000
Site Equipment	High volume fans	\$300 / unit	\$1,000 / unit	\$500 / unit	2 units	14 sites	\$1,000	\$14,000
Site Equipment	Duct (cooling/heating units)	\$300 / unit	\$300 / unit	\$300 / unit	2 units	14 sites	\$600	\$8,400
Site Equipment	Radiation protection equipment: Survey Instruments	\$1,000 / unit	\$4,000 / unit	\$2,000 / unit	20 units	14 sites	\$40,000	\$560,000
Site Equipment	Radiation protection equipment: Dosimetry	\$100 / unit	\$100 / unit	\$100 / unit	20 units	14 sites	\$2,000	\$28,000
Site Equipment	Debris removal equipment	\$180,000 / unit	\$425,000 / unit	\$288,000 / unit	2 units	14 sites	\$576,000	\$8,064,000
Site Equipment	Nitrogen/air bottles	\$100 / unit	\$200 / unit	\$100 / unit	8 units	14 sites	\$800	\$11,200
Site Equipment	Diesel tank cart	\$3,000 / unit	\$8,000 / unit	\$6,000 / unit	2 units	14 sites	\$12,000	\$168,000
Site Equipment	Communications Gear: Docking Station	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	1 unit	14 sites	\$2,000	\$28,000
Site Equipment	Communications Gear: Mobile phones	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	1 unit	14 sites	\$1,000	\$14,000
Site Equipment	Communications Gear: Emergency kits	\$1,000 / unit	\$3,000 / unit	\$2,000 / unit	5 units	14 sites	\$10,000	\$140,000
Site Equipment	Communications Gear: Fixed mast antennas	\$200 / unit	\$300 / unit	\$200 / unit	2 units	14 sites	\$400	\$5,600
Site Equipment	Communications Gear: Antenna cable	\$100 / unit	\$1,000 / unit	\$600 / unit	2 units	14 sites	\$1,200	\$16,800
Site Equipment	Communications Gear: Rechargeable batteries	\$80 / unit	\$100 / unit	\$100 / unit	15 units	14 sites	\$1,500	\$21,000
Site Equipment	Communications Gear: Four-bay satellite phone battery chargers	\$500 / unit	\$600 / unit	\$600 / unit	8 units	14 sites	\$4,800	\$67,200
Site Equipment	Communications Gear: Single-bay satellite phone battery	\$200 / unit	\$200 / unit	\$200 / unit	8 units	14 sites	\$1,600	\$22,400
Site Equipment	Communications Gear: DC automobile outlet charger cords to charge single- and four-bay battery chargers	\$20 / unit	\$20 / unit	\$20 / unit	8 units	14 sites	\$160	\$2,240
Site Equipment	Communications Gear: Solar panel chargers	\$200 / unit	\$200 / unit	\$200 / unit	4 units	14 sites	\$800	\$11,200
Site Equipment	Commodities: Food	\$5,000 / unit	\$6,000 / unit	\$5,000 / unit	1 unit	14 sites	\$5,000	\$70,000
Site Equipment	Commodities: Water	\$400 / unit	\$400 / unit	\$400 / unit	2 units	14 sites	\$800	\$11,200
Site Equipment	Motor Starters	\$400 / unit	\$400 / unit	\$400 / unit	2 units	14 sites	\$800	\$11,200
Site Equipment	Receptacles	\$50 / unit	\$50 / unit	\$50 / unit	2 units	14 sites	\$100	\$1,400
Site Equipment	Power cables and conduits	\$20 / unit	\$20 / unit	\$20 / unit	500 units	14 sites	\$10,000	\$140,000
Site Equipment	Portable lighting and batteries	\$100 / unit	\$100 / unit	\$100 / unit	20 units	14 sites	\$2,000	\$28,000

Appendix E. Order EA-12-049 Costs - BWR 1-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Install quick-disconnect connection point on Auxiliary Steam Supply line inside the Turbine Building Heater Drain Pump Rooms and an Auxiliary Steam Supply line to RCIC piping interconnection for injection into RPV by FLEX pump.								
Site Equipment	Quick-disconnect connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	1 unit	14 sites	\$75,000	\$1,050,000
Site Equipment	Auxiliary Steam Supply line	\$1,000,000 / unit	\$1,000,000 / unit	\$1,000,000 / unit	1 unit	14 sites	\$1,000,000	\$14,000,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	200 hours	14 sites	\$10,352	\$144,928
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	14 sites	\$33,048	\$462,672
Design and pre-stage modified flange adapter for connection of FLEX pump discharge hose to Integrated Leak Rate Test (ILRT) piping for RPV makeup through RHR B Loop water injection.								
Site Equipment	Modified flange adapter	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	1 unit	14 sites	\$10,000	\$140,000
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	200 units	14 sites	\$16,524	\$231,336
Modify HPCS SW to install connection points on the HPCS SW piping and new building penetrations at the Category I SSW pump house for the diesel-driven FLEX pump discharge hose connections. Modify SSW B pump discharge piping at the UHS basin so that large diesel-driven RRC pumps can be connected to the SSW B system and provide cooling water to RHR B heat exchanger. Modify SSW B return piping to add a line to return hot suppression pool water to RRC supplied heat removal equipment including the capability of manual alignment to bypass the UHS cooling towers.								
Site Equipment	Discharge hose connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	2 units	14 sites	\$150,000	\$2,100,000
Site Equipment	Connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	2 units	14 sites	\$150,000	\$2,100,000
Site Equipment	Piping line	\$500,000 / unit	\$500,000 / unit	\$500,000 / unit	1 unit	14 sites	\$500,000	\$7,000,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	400 hours	14 sites	\$20,704	\$289,856
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	2,000 hours	14 sites	\$165,240	\$2,313,360
Add connection points and cabling at control building wall to connect to Buses C and D (which power battery chargers and critical AC components) to work with FLEX diesel generators. Add connection points and transfer switches locally at battery chargers (welding receptacle type connection point) to allow connection of power cables from FLEX diesel generators.								
Site Equipment	Connection points	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	4 units	14 sites	\$3,000,000	\$42,000,000
Site Equipment	Cabling	\$2,000 / unit	\$6,000 / unit	\$4,000 / unit	4 units	14 sites	\$16,000	\$224,000
Site Equipment	Transfer switches	\$4,000 / unit	\$7,000 / unit	\$6,000 / unit	2 units	14 sites	\$12,000	\$168,000
Site Labor	Labor (Electricians)			\$52 / hour	200 hours	14 sites	\$10,300	\$144,200
Procure and install electrical cabling from near switchgear to connection point on exterior of control building. Procure electrical cabling to connect FLEX diesel generators to connection point on exterior of Control Building.								
Site Equipment	Electric cabling	\$200 / unit	\$600 / unit	\$400 / unit	2 units	14 sites	\$800	\$11,200
Site Labor	Labor (Electricians)			\$52 / hour	16 hours	14 sites	\$824	\$11,536
Modify or refurbish spare breaker on Class 1 E LC 15BA6/16BB6 to make connections from 480 V FLEX diesel generator.								
Site Labor	Labor (Electricians)			\$52 / hour	40 hours	14 sites	\$2,060	\$28,840

Appendix E. Order EA-12-049 Costs - BWR 1-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Install power cables from outside connection point to ADHR power supply.								
Site Equipment	Power connection cables	\$200 / unit	\$200 / unit	\$200 / unit	1 unit	14 sites	\$200	\$2,800
Site Labor	Labor (Electricians)			\$52 / hour	20 hours	14 sites	\$1,030	\$14,420
Modify power supply to battery chargers to install welding type receptacles, termination box, disconnects, and cable for quick connection to battery chargers and battery exhaust fan.								
Site Equipment	Welding type receptacles	\$50 / unit	\$100 / unit	\$50 / unit	2 units	14 sites	\$100	\$1,400
Site Equipment	Termination box	\$400 / unit	\$2,000 / unit	\$900 / unit	1 unit	14 sites	\$900	\$12,600
Site Equipment	Disconnects	\$100 / unit	\$100 / unit	\$100 / unit	2 units	14 sites	\$200	\$2,800
Site Equipment	Cable	\$200 / unit	\$600 / unit	\$400 / unit	2 units	14 sites	\$800	\$11,200
Site Labor	Labor			\$30 / hour	40 hours	14 sites	\$1,200	\$16,800
Modify MCC15B21 (power supply to Division I SPMU valves) by installing a connection point and new permanent cable or conduit to receive backup power from 480 V FLEX diesel generator (refurbish spare breaker if necessary).								
Site Equipment	Connection point	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	1 unit	14 sites	\$750,000	\$10,500,000
Site Equipment	Cable/conduit	\$200 / unit	\$600 / unit	\$400 / unit	1 unit	14 sites	\$400	\$5,600
Site Labor	Labor (Electricians)			\$52 / hour	40 hours	14 sites	\$2,060	\$28,840
Provide cable and raceway (that is seismically supported) from 480 V FLEX diesel generator to battery chargers and battery room exhaust fan.								
Site Equipment	Cable	\$100 / unit	\$100 / unit	\$100 / unit	1,000 units	14 sites	\$100,000	\$1,400,000
Site Equipment	Raceway	\$20 / unit	\$30 / unit	\$20 / unit	1 unit	14 sites	\$20	\$280
Site Labor	Labor (Electricians)			\$52 / hour	24 hours	14 sites	\$1,236	\$17,304
Modify or refurbish spare breaker to MCC 16B31 to provide sufficient capacity to power train B RHR support loads from 480 V FLEX diesel generator.								
Site Labor	Labor (Electricians)			\$52 / hour	40 hours	14 sites	\$2,060	\$28,840
Modify connection of 4160 Vac RRC FLEX DG to the Class1E 16AB 4160 Vac.								
Site Equipment	Connection	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	1 unit	14 sites	\$750,000	\$10,500,000
Site Labor	Labor (Electricians)			\$52 / hour	16 hours	14 sites	\$824	\$11,536
Modify the SFP line by installing 2 connections for 2 separate lines leading to the spent fuel pool area for a SFP FLEX hose connection and a SFP FLEX spray connection.								
Site Equipment	Connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	2 units	14 sites	\$150,000	\$2,100,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	100 hours	14 sites	\$5,176	\$72,464
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	200 hours	14 sites	\$16,524	\$231,336
Install hard pipe with dual isolation valve from valve P41F185A to new SFP FLEX connection.								
Site Equipment	Hard pipe and dual isolation valve	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	1 unit	14 sites	\$10,000	\$140,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	40 hours	14 sites	\$2,070	\$28,986
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	200 hours	14 sites	\$16,524	\$231,336

Appendix E. Order EA-12-049 Costs - BWR 1-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Offsite Portable Equipment								
Licensee's share of RRC costs.								
RRC Equipment	Licensee's share of RRC equipment costs			\$874,000 / unit	1 unit	14 sites	\$874,000	\$12,236,000
RRC Setup	Licensee's share of RRC setup costs			\$283,000 / unit	1 unit	14 sites	\$283,000	\$3,962,000
Procure offsite Phase 3 equipment.								
Site Equipment	Radiation protection equipment: Survey Instruments	\$500 / unit	\$4,000 / unit	\$2,000 / unit	20 units	14 sites	\$40,000	\$560,000
Site Equipment	Radiation protection equipment: Dosimetry	\$100 / unit	\$100 / unit	\$100 / unit	20 units	14 sites	\$2,000	\$28,000
Site Equipment	Commodities: Food	\$5,000 / unit	\$6,000 / unit	\$5,000 / unit	1 unit	14 sites	\$5,000	\$70,000
Site Equipment	Commodities: Water	\$400 / unit	\$400 / unit	\$400 / unit	2 units	14 sites	\$800	\$11,200
Install transfer panel (disconnect switch) in Turbine Building.								
Site Equipment	Transfer panel (disconnect switch)	\$500 / unit	\$500 / unit	\$500 / unit	1 unit	14 sites	\$500	\$7,000
Site Labor	Labor (Electricians)			\$52 / hour	60 hours	14 sites	\$3,090	\$43,260
Supporting Functions								
Change emergency control room lighting to LED bulbs to reduce load on batteries and reduce heat load in MCR.								
Site Equipment	LED bulbs	\$100 / unit	\$100 / unit	\$100 / unit	12 units	14 units	\$1,200	\$16,800
Site Labor	Labor (Electricians)			\$52 / hour	40 hours	14 sites	\$2,060	\$28,840
An analysis will be performed to determine site-specific fuel consumption rates and available supplies.								
Site Labor	Labor			\$84 / hour	120 hours	14 sites	\$10,062	\$140,868
External Event Considerations								
To ensure that the portable equipment can be connected under flooding conditions, a plant modification is required to establish a flood staging area for portable equipment that preserves the capability to connect this equipment with the design-basis flood present.								
Contractor	Flood staging area	\$604,000 / unit	\$604,000 / unit	\$604,000 / unit	1 unit	14 sites	\$604,000	\$8,456,000
Design or build onsite FLEX storage buildings given requirements covered above (protect from storms and high winds).								
Contractor	Storage building	\$1,700,000 / unit	\$3,000,000 / unit	\$2,350,000 / unit	2 units	14 sites	\$4,700,000	\$65,800,000

Appendix E. Order EA-12-049 Costs - BWR 1-Unit Site

ACTIVITY	UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Programmatic Controls							
Develop the Overall Integrated Plan. Perform a site-specific evaluation determining baseline coping capabilities, applicable extreme external hazards, and needed enhancements to mitigate an ELAP/LUHS event such that no fuel damage occurs.							
Site Labor Labor			\$84 / hour	4,000 hours	14 sites	\$335,400	\$4,695,600
Develop strategies (playbook) with RRC.							
Site Labor Labor			\$84 / hour	320 hours	14 sites	\$26,832	\$375,648
Develop and conduct staffing analysis.							
Site Labor Labor			\$84 / hour	480 hours	14 sites	\$40,248	\$563,472
Issue FLEX Support Guidelines containing the procedures to control the FLEX equipment's physical protection, storage, deployment and quality; to read instruments locally; and to re-power hydrogen igniters (in Procedure 05-S-01-STRTEFY, Alternative Strategies). Also incorporate enhanced battery load shedding guidance into station procedures for loss of ac power to extend the availability of dc power.							
Site Labor Labor			\$84 / hour	4,000 hours	14 sites	\$335,400	\$4,695,600
Modify plant procedures to take into account FLEX Support Guidelines. Procedures to be considered include EOP, EDMG, and SAMG strategies.							
Site Labor Labor			\$84 / hour	800 hours	14 sites	\$67,080	\$939,120
Modify existing plant configuration control procedures to ensure that changes to the plant design physical layout, roads, buildings, and miscellaneous structures will not adversely affect the approved FLEX strategies.							
Site Labor Labor			\$84 / hour	400 hours	14 sites	\$33,540	\$469,560
Create maintenance and testing procedures.							
Site Labor Labor			\$84 / hour	1,000 hours	14 sites	\$83,850	\$1,173,900
Develop training programs for operation of FLEX equipment.							
Contractor Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	14 sites	\$250,000	\$3,500,000
Develop training modules for personnel that will be responsible for implementing the FLEX strategies, and ERO personnel will be developed to ensure personnel proficiency in the mitigation of beyond-design-basis external events (BDBEEs).							
Contractor Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	14 sites	\$250,000	\$3,500,000
Develop design requirements and supporting analysis for portable FLEX equipment.							
Site Labor Labor			\$84 / hour	2,000 hours	14 sites	\$167,700	\$2,347,800
An analysis will be performed to determine commodity requirements.							
Site Labor Labor			\$84 / hour	80 hours	14 sites	\$6,708	\$93,912
Involvement with industry group activities.							
Site Labor Labor			\$84 / hour	750 hours	14 sites	\$62,888	\$880,425
Procedure setpoint calculations (Procedure entry, exit, and decision criteria) and other engineering support.							
Site Labor Labor			\$84 / hour	1,000 hours	14 sites	\$83,850	\$1,173,900

Appendix E. Order EA-12-049 Costs - BWR 1-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL OPERATIONS COST								
Programmatic Controls								
6-month status reports on implementation of mitigation strategies.								
Site Labor	Labor			\$84 / hour	100 hours	14 sites	\$8,385	\$117,390
Maintenance and testing.								
Site Labor	Labor			\$84 / hour	400 hours	14 sites	\$33,540	\$469,560
Conduct training (implemented in accordance with the systematic approach to training). The training modules for personnel that will be responsible for implementing the FLEX strategies and ERO personnel will be implemented and maintained per existing training programs. The details, objectives, frequency, and success measures will follow the plant's SAT process.								
Site Labor	Labor			\$84 / hour	1,000 hours	14 sites	\$83,850	\$1,173,900
Change control. Design requirements for FLEX equipment will be documented and controlled by the existing plant modification process.								
Site Labor	Labor			\$84 / hour	160 hours	14 sites	\$13,416	\$187,824
Maintenance of the FLEX Support Guidelines.								
Site Labor	Labor			\$84 / hour	240 hours	14 sites	\$20,124	\$281,736
Licensee's share of RRC ongoing costs (staffing, rent, testing and maintenance).								
RRC Maintenance	Licensee's share of RRC ongoing costs			\$129,000 / unit	1 unit	14 sites	\$129,000	\$1,806,000
Licensee's share of RRC transportation costs (first 3 years).								
RRC Transportation	Licensee's share of RRC transportation costs (first 3 years)			\$184,000 / unit	1 unit	14 sites	\$184,000	\$2,576,000
Licensee's share of RRC transportation costs (after first 3 years).								
RRC Transportation	Licensee's share of RRC transportation costs (after first 3 years)			\$15,000 / unit	1 unit	14 sites	\$15,000	\$210,000

Appendix F. Costs for a BWR 2-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL IMPLEMENTATION COSTS								
Initial Response								
Construct a seismic missile-protected Emergency Water Storage Tank (EWST) to provide a minimum coping time of 16 hours.								
Site Equipment	Emergency water storage tank (EWST)	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	2 units	9 sites	\$316,000	\$2,844,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	7,200 hours	9 sites	\$372,672	\$3,354,048
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,000 hours	9 sites	\$82,620	\$743,580
Build clean water tank with availability to supply RCIC/HPCI with water of acceptable quality for RCIC/HPCI injection into RPV.								
Site Equipment	Clean water tank	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	2 units	9 sites	\$316,000	\$2,844,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	7,200 hours	9 sites	\$372,672	\$3,354,048
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,000 hours	9 sites	\$82,620	\$743,580
Install quick-disconnect connection point downstream of the CST isolation valve to allow for a gravity drain between the clean water tank and the RCIC/HPCI suction supply piping.								
Site Equipment	Quick-disconnect connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	2 units	9 sites	\$150,000	\$1,350,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	80 hours	9 sites	\$4,141	\$37,267
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	9 sites	\$33,048	\$297,432
Install cross connect between the RCIC/HPCI suction supply lines.								
Site Equipment	Cross connect	\$200,000 / unit	\$200,000 / unit	\$200,000 / unit	2 units	9 sites	\$400,000	\$3,600,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	80 hours	9 sites	\$4,141	\$37,267
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	800 hours	9 sites	\$66,096	\$594,864
Modify HPCS SW to install new cross-tie piping. Modify HPCS SW return line to add a manually-aligned cooling tower bypass line that discharges to the UHS basins. Modify RHR C injection piping to make the connection from the HPCS SW cross-tie piping.								
Site Equipment	Cross-tie piping	\$167,000 / unit	\$167,000 / unit	\$167,000 / unit	2 units	9 sites	\$334,000	\$3,006,000
Site Equipment	Connection line	\$167,000 / unit	\$167,000 / unit	\$167,000 / unit	2 units	9 sites	\$334,000	\$3,006,000
Site Equipment	Connection point	\$167,000 / unit	\$167,000 / unit	\$167,000 / unit	2 units	9 sites	\$334,000	\$3,006,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	400 hours	9 sites	\$20,704	\$186,336
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	2,000 hours	9 sites	\$165,240	\$1,487,160

Appendix F. Order EA-12-049 Costs - BWR 2-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Onsite Portable Equipment								
Procure portable FLEX equipment (N+1).								
Site Equipment	Air compressor (300 HH Sullair Diesel air compressors)	\$13,000 / unit	\$13,000 / unit	\$13,000 / unit	3 units	9 sites	\$39,000	\$351,000
Site Equipment	Low pressure/ Medium flow pump	\$55,000 / unit	\$55,000 / unit	\$55,000 / unit	3 units	9 sites	\$165,000	\$1,485,000
Site Equipment	Electric fuel oil transfer pumps and associated equipment	\$1,000 / unit	\$1,000 / unit	\$700 / unit	3 units	9 sites	\$2,100	\$18,900
Site Equipment	Deployment vehicles	\$24,000 / unit	\$35,000 / unit	\$30,000 / unit	3 units	9 sites	\$90,000	\$810,000
Site Equipment	Flatbed trailers	\$8,000 / unit	\$18,000 / unit	\$12,000 / unit	3 units	9 sites	\$36,000	\$324,000
Site Equipment	Hose and fittings	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	3 units	9 sites	\$6,000	\$54,000
Site Equipment	Strainers	\$10 / unit	\$20 / unit	\$10 / unit	3 units	9 sites	\$30	\$270
Site Equipment	Monitor nozzles for SFP spray	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	3 units	9 sites	\$3,000	\$27,000
Site Equipment	Portable diesel generator sets (SAMA diesel generators)	\$75,000 / unit	\$125,000 / unit	\$100,000 / unit	3 units	9 sites	\$300,000	\$2,700,000
Site Equipment	Portable diesel generator (480 Vac, 200 kW)	\$50,000 / unit	\$101,000 / unit	\$77,000 / unit	3 units	9 sites	\$231,000	\$2,079,000
Site Equipment	Portable diesel generator (120 Vac, 15 kW)	\$5,000 / unit	\$10,000 / unit	\$8,000 / unit	3 units	9 sites	\$24,000	\$216,000
Site Equipment	High volume fans	\$300 / unit	\$1,000 / unit	\$500 / unit	3 units	9 sites	\$1,500	\$13,500
Site Equipment	Duct (cooling/heating units)	\$300 / unit	\$300 / unit	\$300 / unit	3 units	9 sites	\$900	\$8,100
Site Equipment	Radiation protection equipment: Survey Instruments	\$1,000 / unit	\$4,000 / unit	\$2,000 / unit	40 units	9 sites	\$80,000	\$720,000
Site Equipment	Radiation protection equipment: Dosimetry	\$100 / unit	\$100 / unit	\$100 / unit	40 units	9 sites	\$4,000	\$36,000
Site Equipment	Debris removal equipment	\$180,000 / unit	\$425,000 / unit	\$288,000 / unit	3 units	9 sites	\$864,000	\$7,776,000
Site Equipment	Nitrogen/air bottles	\$100 / unit	\$200 / unit	\$100 / unit	16 units	9 sites	\$1,600	\$14,400
Site Equipment	Diesel tank cart	\$3,000 / unit	\$8,000 / unit	\$6,000 / unit	3 units	9 sites	\$18,000	\$162,000
Site Equipment	Communications Gear: Docking Station	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	2 units	9 sites	\$4,000	\$36,000
Site Equipment	Communications Gear: Mobile phones	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	2 units	9 sites	\$2,000	\$18,000
Site Equipment	Communications Gear: Emergency kits	\$1,000 / unit	\$3,000 / unit	\$2,000 / unit	10 units	9 sites	\$20,000	\$180,000
Site Equipment	Communications Gear: Fixed mast antennas	\$200 / unit	\$300 / unit	\$200 / unit	4 units	9 sites	\$800	\$7,200
Site Equipment	Communications Gear: Antenna cable	\$100 / unit	\$1,000 / unit	\$600 / unit	4 units	9 sites	\$2,400	\$21,600
Site Equipment	Communications Gear: Rechargeable batteries	\$80 / unit	\$100 / unit	\$100 / unit	30 units	9 sites	\$3,000	\$27,000
Site Equipment	Communications Gear: Four-bay satellite phone battery	\$500 / unit	\$600 / unit	\$600 / unit	16 units	9 sites	\$9,600	\$86,400
Site Equipment	Communications Gear: Single-bay satellite phone battery	\$200 / unit	\$200 / unit	\$200 / unit	16 units	9 sites	\$3,200	\$28,800
Site Equipment	Communications Gear: DC automobile outlet charger cords to charge single- and four-bay battery chargers	\$20 / unit	\$20 / unit	\$20 / unit	16 units	9 sites	\$320	\$2,880
Site Equipment	Communications Gear: Solar panel chargers	\$200 / unit	\$200 / unit	\$200 / unit	8 units	9 sites	\$1,600	\$14,400
Site Equipment	Commodities: Food	\$5,000 / unit	\$6,000 / unit	\$5,000 / unit	2 units	9 sites	\$10,000	\$90,000
Site Equipment	Commodities: Water	\$400 / unit	\$400 / unit	\$400 / unit	4 units	9 sites	\$1,600	\$14,400
Site Equipment	Motor Starters	\$400 / unit	\$400 / unit	\$400 / unit	4 units	9 sites	\$1,600	\$14,400
Site Equipment	Receptacles	\$50 / unit	\$50 / unit	\$50 / unit	4 units	9 sites	\$200	\$1,800
Site Equipment	Power cables and conduits	\$20 / unit	\$20 / unit	\$20 / unit	1,000 units	9 sites	\$20,000	\$180,000
Site Equipment	Portable lighting and batteries	\$100 / unit	\$100 / unit	\$100 / unit	40 units	9 sites	\$4,000	\$36,000
Install quick-disconnect connection point on Auxiliary Steam Supply line inside the Turbine Building Heater Drain Pump Rooms and an Auxiliary Steam Supply line to RCIC piping interconnection for injection into RPV by FLEX pump.								
Site Equipment	Quick-disconnect connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	2 units	9 sites	\$150,000	\$1,350,000
Site Equipment	Auxiliary Steam Supply line	\$1,000,000 / unit	\$1,000,000 / unit	\$1,000,000 / unit	2 units	9 sites	\$2,000,000	\$18,000,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	400 hours	9 sites	\$20,704	\$186,336
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	800 hours	9 sites	\$66,096	\$594,864
Design and pre-stage modified flange adapter for connection of FLEX pump discharge hose to Integrated Leak Rate Test (ILRT) piping for RPV makeup through RHR B Loop water injection.								
Site Equipment	Modified flange adapter	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	2 units	9 sites	\$20,000	\$180,000
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	9 sites	\$33,048	\$297,432

Appendix F. Order EA-12-049 Costs - BWR 2-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Modify HPCS SW to install connection points on the HPCS SW piping and new building penetrations at the Category I SSW pump house for the diesel-driven FLEX pump discharge hose connections. Modify SSW B pump discharge piping at the UHS basin so that large diesel-driven RRC pumps can be connected to the SSW B system and provide cooling water to RHR B heat exchanger. Modify SSW B return piping to add a line to return hot suppression pool water to RRC supplied heat removal equipment including the capability of manual alignment to bypass the UHS cooling towers.								
Site Equipment	Discharge hose connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	4 units	9 sites	\$300,000	\$2,700,000
Site Equipment	Connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	4 units	9 sites	\$300,000	\$2,700,000
Site Equipment	Piping line	\$500,000 / unit	\$500,000 / unit	\$500,000 / unit	2 units	9 sites	\$1,000,000	\$9,000,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	800 hours	9 sites	\$41,408	\$372,672
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	4,000 hours	9 sites	\$330,480	\$2,974,320
Add connection points and cabling at control building wall to connect to Buses C and D (which power battery chargers and critical AC components) to work with FLEX diesel generators. Add connection points and transfer switches locally at battery chargers (welding receptacle type connection point) to allow connection of power cables from FLEX diesel generators.								
Site Equipment	Connection points	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	8 units	9 sites	\$6,000,000	\$54,000,000
Site Equipment	Cabling	\$2,000 / unit	\$6,000 / unit	\$4,000 / unit	8 units	9 sites	\$32,000	\$288,000
Site Equipment	Transfer switches	\$4,000 / unit	\$7,000 / unit	\$6,000 / unit	4 units	9 sites	\$24,000	\$216,000
Site Labor	Labor (Electricians)			\$52 / hour	400 hours	9 sites	\$20,600	\$185,400
Procure and install electrical cabling from near switchgear to connection point on exterior of control building. Procure electrical cabling to connect FLEX diesel generators to connection point on exterior of Control Building.								
Site Equipment	Electric cabling	\$200 / unit	\$600 / unit	\$400 / unit	4 units	9 sites	\$1,600	\$14,400
Site Labor	Labor (Electricians)			\$52 / hour	32 hours	9 sites	\$1,648	\$14,832
Modify or refurbish spare breaker on Class 1 E LC 15BA6/16BB6 to make connections from 480 V FLEX diesel generator.								
Site Labor	Labor (Electricians)			\$52 / hour	80 hours	9 sites	\$4,120	\$37,080
Install power cables from outside connection point to ADHR power supply.								
Site Equipment	Power connection cables	\$200 / unit	\$200 / unit	\$200 / unit	2 units	9 sites	\$400	\$3,600
Site Labor	Labor (Electricians)			\$52 / hour	40 hours	9 sites	\$2,060	\$18,540
Modify power supply to battery chargers to install welding type receptacles, termination box, disconnects, and cable for quick connection to battery chargers and battery exhaust fan.								
Site Equipment	Welding type receptacles	\$50 / unit	\$100 / unit	\$50 / unit	4 units	9 sites	\$200	\$1,800
Site Equipment	Termination box	\$400 / unit	\$2,000 / unit	\$900 / unit	2 units	9 sites	\$1,800	\$16,200
Site Equipment	Disconnects	\$100 / unit	\$100 / unit	\$100 / unit	4 units	9 sites	\$400	\$3,600
Site Equipment	Cable	\$200 / unit	\$600 / unit	\$400 / unit	4 units	9 sites	\$1,600	\$14,400
Site Labor	Labor			\$30 / hour	80 hours	9 sites	\$2,400	\$21,600
Modify MCC15B21 (power supply to Division I SPMU valves) by installing a connection point and new permanent cable or conduit to receive backup power from 480 V FLEX diesel generator (refurbish spare breaker if necessary).								
Site Equipment	Connection point	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	2 units	9 sites	\$1,500,000	\$13,500,000
Site Equipment	Cable/conduit	\$200 / unit	\$600 / unit	\$400 / unit	2 units	9 sites	\$800	\$7,200
Site Labor	Labor (Electricians)			\$52 / hour	80 hours	9 sites	\$4,120	\$37,080
Provide cable and raceway (that is seismically supported) from 480 V FLEX diesel generator to battery chargers and battery room exhaust fan.								
Site Equipment	Cable	\$100 / unit	\$100 / unit	\$100 / unit	2,000 units	9 sites	\$200,000	\$1,800,000
Site Equipment	Raceway	\$20 / unit	\$30 / unit	\$20 / unit	2 units	9 sites	\$40	\$360
Site Labor	Labor (Electricians)			\$52 / hour	48 hours	9 sites	\$2,472	\$22,248

Appendix F. Order EA-12-049 Costs - BWR 2-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Modify or refurbish spare breaker to MCC 16B31 to provide sufficient capacity to power train B RHR support loads from 480 V FLEX diesel generator.								
Site Labor	Labor (Electricians)			\$52 / hour	80 hours	9 sites	\$4,120	\$37,080
Modify connection of 4160 Vac RRC FLEX DG to the Class1E 16AB 4160 Vac.								
Site Equipment	Connection	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	2 units	9 sites	\$1,500,000	\$13,500,000
Site Labor	Labor (Electricians)			\$52 / hour	32 hours	9 sites	\$1,648	\$14,832
Modify the SFP line by installing 2 connections for 2 separate lines leading to the spent fuel pool area for a SFP FLEX hose connection and a SFP FLEX spray connection.								
Site Equipment	Connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	4 units	9 sites	\$300,000	\$2,700,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	200 hours	9 sites	\$10,352	\$93,168
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	9 sites	\$33,048	\$297,432
Install hard pipe with dual isolation valve from valve P41F185A to new SFP FLEX								
Site Equipment	Hard pipe and dual isolation valve	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	2 units	9 sites	\$20,000	\$180,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	80 hours	9 sites	\$4,141	\$37,267
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	9 sites	\$33,048	\$297,432
Offsite Portable Equipment								
Licensee's share of RRC costs.								
RRC Equipment	Licensee's share of RRC equipment costs			\$874,000 / unit	1 unit	9 sites	\$874,000	\$7,866,000
RRC Setup	Licensee's share of RRC setup costs			\$283,000	1 unit	9 sites	\$283,000	\$2,547,000
Procure offsite Phase 3 equipment.								
Site Equipment	Radiation protection equipment: Survey Instruments	\$500 / unit	\$4,000 / unit	\$2,000 / unit	40 units	9 sites	\$80,000	\$720,000
Site Equipment	Radiation protection equipment: Dosimetry	\$100 / unit	\$100 / unit	\$100 / unit	40 units	9 sites	\$4,000	\$36,000
Site Equipment	Commodities: Food	\$5,000 / unit	\$6,000 / unit	\$5,000 / unit	2 units	9 sites	\$10,000	\$90,000
Site Equipment	Commodities: Water	\$400 / unit	\$400 / unit	\$400 / unit	4 units	9 sites	\$1,600	\$14,400
Install transfer panel (disconnect switch) in Turbine Building.								
Site Equipment	Transfer panel (disconnect switch)	\$500 / unit	\$500 / unit	\$500 / unit	2 units	9 sites	\$1,000	\$9,000
Site Labor	Labor (Electricians)			\$52 / hour	120 hours	9 sites	\$6,180	\$55,620
Supporting Functions								
Change emergency control room lighting to LED bulbs to reduce load on batteries and reduce heat load in MCR.								
Site Equipment	LED bulbs	\$100 / unit	\$100 / unit	\$100 / unit	24 units	9 sites	\$2,400	\$21,600
Site Labor	Labor (Electricians)			\$52 / hour	80 hours	9 sites	\$4,120	\$37,080
An analysis will be performed to determine site-specific fuel consumption rates and available supplies.								
Site Labor	Labor			\$84 / hour	240 hours	9 sites	\$20,124	\$181,116

Appendix F. Order EA-12-049 Costs - BWR 2-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
External Event Considerations								
To ensure that the portable equipment can be connected under flooding conditions, a plant modification is required to establish a flood staging area for portable equipment that preserves the capability to connect this equipment with the design-basis flood present.								
Contractor	Flood staging area	\$604,000 / unit	\$604,000 / unit	\$604,000 / unit	2 units	9 sites	\$1,208,000	\$10,872,000
Design or build onsite FLEX storage buildings given requirements covered above (protect from storms and high winds).								
Contractor	Storage building	\$1,700,000 / unit	\$3,000,000 / unit	\$2,350,000 / unit	3 units	9 sites	\$7,050,000	\$63,450,000
Programmatic Controls								
Develop the Overall Integrated Plan. Perform a site-specific evaluation determining baseline coping capabilities, applicable extreme external hazards, and needed enhancements to mitigate an ELAP/LUHS event such that no fuel damage occurs.								
Site Labor	Labor			\$84	5,000 hours	9 sites	\$419,250	\$3,773,250
Develop strategies (playbook) with RCC.								
Site Labor	Labor			\$84	400 hours	9 sites	\$33,540	\$301,860
Develop and conduct staffing analysis.								
Site Labor	Labor			\$84	480 hours	9 sites	\$40,248	\$362,232
Issue FLEX Support Guidelines containing the procedures to control the FLEX equipment's physical protection, storage, deployment and quality; to read instruments locally; and to re-power hydrogen igniters (in Procedure 05-S-01-STRTEFY, Alternative Strategies). Also incorporate enhanced battery load shedding guidance into station procedures for loss of ac power to extend the availability of dc power.								
Site Labor	Labor			\$84 / hour	6,000 hours	9 sites	\$503,100	\$4,527,900
Modify plant procedures to take into account FLEX Support Guidelines. Procedures to be considered include EOP, EDMG, and SAMG strategies.								
Site Labor	Labor			\$84 / hour	1,200 hours	9 sites	\$100,620	\$905,580
Modify existing plant configuration control procedures to ensure that changes to the plant design physical layout, roads, buildings, and miscellaneous structures will not adversely affect the approved FLEX strategies.								
Site Labor	Labor			\$84 / hour	400 hours	9 sites	\$33,540	\$301,860
Create maintenance and testing procedures.								
Site Labor	Labor			\$84 / hour	1,200 hours	9 sites	\$100,620	\$905,580
Develop training programs for operation of FLEX equipment.								
Contractor	Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	9 sites	\$250,000	\$2,250,000
Develop training modules for personnel that will be responsible for implementing the FLEX strategies, and ERO personnel will be developed to ensure personnel proficiency in the mitigation of beyond-design-basis external events (BDBEEs).								
Contractor	Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	9 sites	\$300,000	\$2,700,000
Develop design requirements and supporting analysis for portable FLEX equipment.								
Site Labor	Labor			\$84 / hour	2,400 hours	9 sites	\$201,240	\$1,811,160
An analysis will be performed to determine commodity requirements.								
Site Labor	Labor			\$84 / hour	80 hours	9 sites	\$6,708	\$60,372
Involvement with industry group activities.								
Site Labor	Labor			\$84 / hour	788 hours	9 sites	\$66,032	\$594,287
Procedure setpoint calculations (Procedure entry, exit, and decision criteria) and other engineering support.								
Site Labor	Labor			\$84 / hour	1,250 hours	9 sites	\$104,813	\$943,313

Appendix F. Order EA-12-049 Costs - BWR 2-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL OPERATIONS COST								
Programmatic Controls								
6-month status reports on implementation of mitigation strategies.								
Site Labor	Labor			\$84 / hour	150 hours	9 sites	\$12,578	\$113,198
Maintenance and testing.								
Site Labor	Labor			\$84 / hour	400 hours	9 sites	\$33,540	\$301,860
Conduct training (implemented in accordance with the systematic approach to training). The training modules for personnel that will be responsible for implementing the FLEX strategies and ERO personnel will be implemented and maintained per existing training programs. The details, objectives, frequency, and success measures will follow the plant's SAT process.								
Site Labor	Labor			\$84 / hour	1,750 hours	9 sites	\$146,738	\$1,320,638
Change control. Design requirements for FLEX equipment will be documented and controlled by the existing plant modification process.								
Site Labor	Labor			\$84 / hour	240 hours	9 sites	\$20,124	\$181,116
Maintenance of the FLEX Support Guidelines.								
Site Labor	Labor			\$84 / hour	312 hours	9 sites	\$26,161	\$235,451
Licensee's share of RRC ongoing costs (staffing, rent, testing and maintenance).								
RRC Maintenance	Licensee's share of RRC ongoing costs			\$129,000 / unit	1 unit	9 sites	\$129,000	\$1,161,000
Licensee's share of RRC transportation costs (first 3 years).								
RRC Transportation	Licensee's share of RRC transportation costs (first 3 years)			\$184,000 / unit	1 unit	9 sites	\$184,000	\$1,656,000
Licensee's share of RRC transportation costs (after first 3 years).								
RRC Transportation	Licensee's share of RRC transportation costs (after first 3 years)			\$15,000 / unit	1 unit	9 sites	\$15,000	\$135,000

Appendix G. Costs for a BWR 3-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL IMPLEMENTATION COSTS								
Initial Response								
Construct a seismic missile-protected Emergency Water Storage Tank (EWST) to provide a minimum coping time of 16 hours.								
Site Equipment	Emergency water storage tank (EWST)	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	3 units	1 site	\$474,000	\$474,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	10,800 hours	1 site	\$559,008	\$559,008
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,500 hours	1 site	\$123,930	\$123,930
Build clean water tank with availability to supply RCIC/HPCI with water of acceptable quality for RCIC/HPCI injection into RPV.								
Site Equipment	Clean water tank	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	3 units	1 site	\$474,000	\$474,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	10,800 hours	1 site	\$559,008	\$559,008
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,500 hours	1 site	\$123,930	\$123,930
Install quick-disconnect connection point downstream of the CST isolation valve to allow for a gravity drain between the clean water tank and the RCIC/HPCI suction supply piping.								
Site Equipment	Quick-disconnect connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	3 units	1 site	\$225,000	\$225,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	120 hours	1 site	\$6,211	\$6,211
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	600 hours	1 site	\$49,572	\$49,572
Install cross connect between the RCIC/HPCI suction supply lines.								
Site Equipment	Cross connect	\$200,000 / unit	\$200,000 / unit	\$200,000 / unit	3 units	1 site	\$600,000	\$600,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	120 hours	1 site	\$6,211	\$6,211
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,200 hours	1 site	\$99,144	\$99,144
Modify HPCS SW to install new cross-tie piping. Modify HPCS SW return line to add a manually-aligned cooling tower bypass line that discharges to the UHS basins. Modify RHR C injection piping to make the connection from the HPCS SW cross-tie piping.								
Site Equipment	Cross-tie piping	\$167,000 / unit	\$167,000 / unit	\$167,000 / unit	3 units	1 site	\$501,000	\$501,000
Site Equipment	Connection line	\$167,000 / unit	\$167,000 / unit	\$167,000 / unit	3 units	1 site	\$501,000	\$501,000
Site Equipment	Connection point	\$167,000 / unit	\$167,000 / unit	\$167,000 / unit	3 units	1 site	\$501,000	\$501,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	600 hours	1 site	\$31,056	\$31,056
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	3,000 hours	1 site	\$247,860	\$247,860

Appendix G. Order EA-12-049 Costs - BWR 3-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Onsite Portable Equipment								
Procure portable FLEX equipment (N+1).								
Site Equipment	Air compressor (300 HH Sullair Diesel air compressors)	\$13,000 / unit	\$13,000 / unit	\$13,000 / unit	4 units	1 site	\$52,000	\$52,000
Site Equipment	Low pressure/ Medium flow pump	\$55,000 / unit	\$55,000 / unit	\$55,000 / unit	4 units	1 site	\$220,000	\$220,000
Site Equipment	Electric fuel oil transfer pumps and associated equipment	\$1,000 / unit	\$1,000 / unit	\$700 / unit	4 units	1 site	\$2,800	\$2,800
Site Equipment	Deployment vehicles	\$24,000 / unit	\$35,000 / unit	\$30,000 / unit	4 units	1 site	\$120,000	\$120,000
Site Equipment	Flatbed trailers	\$8,000 / unit	\$18,000 / unit	\$12,000 / unit	4 units	1 site	\$48,000	\$48,000
Site Equipment	Hose and fittings	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	4 units	1 site	\$8,000	\$8,000
Site Equipment	Strainers	\$10 / unit	\$20 / unit	\$10 / unit	4 units	1 site	\$40	\$40
Site Equipment	Monitor nozzles for SFP spray	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	4 units	1 site	\$4,000	\$4,000
Site Equipment	Portable diesel generator sets (SAMA diesel generators)	\$75,000 / unit	\$125,000 / unit	\$100,000 / unit	4 units	1 site	\$400,000	\$400,000
Site Equipment	Portable diesel generator (480 Vac, 200 kW)	\$50,000 / unit	\$101,000 / unit	\$77,000 / unit	4 units	1 site	\$308,000	\$308,000
Site Equipment	Portable diesel generator (120 Vac, 15 kW)	\$5,000 / unit	\$10,000 / unit	\$8,000 / unit	4 units	1 site	\$32,000	\$32,000
Site Equipment	High volume fans	\$300 / unit	\$1,000 / unit	\$500 / unit	4 units	1 site	\$2,000	\$2,000
Site Equipment	Duct (cooling/heating units)	\$300 / unit	\$300 / unit	\$300 / unit	4 units	1 site	\$1,200	\$1,200
Site Equipment	Radiation protection equipment: Survey Instruments	\$1,000 / unit	\$4,000 / unit	\$2,000 / unit	60 units	1 site	\$120,000	\$120,000
Site Equipment	Radiation protection equipment: Dosimetry	\$100 / unit	\$100 / unit	\$100 / unit	60 units	1 site	\$6,000	\$6,000
Site Equipment	Debris removal equipment	\$180,000 / unit	\$425,000 / unit	\$288,000 / unit	4 units	1 site	\$1,152,000	\$1,152,000
Site Equipment	Nitrogen/air bottles	\$100 / unit	\$200 / unit	\$100 / unit	24 units	1 site	\$2,400	\$2,400
Site Equipment	Diesel tank cart	\$3,000 / unit	\$8,000 / unit	\$6,000 / unit	4 units	1 site	\$24,000	\$24,000
Site Equipment	Communications Gear: Docking Station	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	3 units	1 site	\$6,000	\$6,000
Site Equipment	Communications Gear: Mobile phones	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	3 units	1 site	\$3,000	\$3,000
Site Equipment	Communications Gear: Emergency kits	\$1,000 / unit	\$3,000 / unit	\$2,000 / unit	15 units	1 site	\$30,000	\$30,000
Site Equipment	Communications Gear: Fixed mast antennas	\$200 / unit	\$300 / unit	\$200 / unit	6 units	1 site	\$1,200	\$1,200
Site Equipment	Communications Gear: Antenna cable	\$100 / unit	\$1,000 / unit	\$600 / unit	6 units	1 site	\$3,600	\$3,600
Site Equipment	Communications Gear: Rechargeable batteries	\$80 / unit	\$100 / unit	\$100 / unit	45 units	1 site	\$4,500	\$4,500
Site Equipment	Communications Gear: Four-bay satellite phone battery	\$500 / unit	\$600 / unit	\$600 / unit	24 units	1 site	\$14,400	\$14,400
Site Equipment	Communications Gear: Single-bay satellite phone battery	\$200 / unit	\$200 / unit	\$200 / unit	24 units	1 site	\$4,800	\$4,800
Site Equipment	Communications Gear: DC automobile outlet charger	\$20 / unit	\$20 / unit	\$20 / unit	24 units	1 site	\$480	\$480
Site Equipment	Communications Gear: Solar panel chargers	\$200 / unit	\$200 / unit	\$200 / unit	12 units	1 site	\$2,400	\$2,400
Site Equipment	Commodities: Food	\$5,000 / unit	\$6,000 / unit	\$5,000 / unit	3 units	1 site	\$15,000	\$15,000
Site Equipment	Commodities: Water	\$400 / unit	\$400 / unit	\$400 / unit	6 units	1 site	\$2,400	\$2,400
Site Equipment	Motor Starters	\$400 / unit	\$400 / unit	\$400 / unit	6 units	1 site	\$2,400	\$2,400
Site Equipment	Receptacles	\$50 / unit	\$50 / unit	\$50 / unit	6 units	1 site	\$300	\$300
Site Equipment	Power cables and conduits	\$20 / unit	\$20 / unit	\$20 / unit	1,500 units	1 site	\$30,000	\$30,000
Site Equipment	Portable lighting and batteries	\$100 / unit	\$100 / unit	\$100 / unit	60 units	1 site	\$6,000	\$6,000
Install quick-disconnect connection point on Auxiliary Steam Supply line inside the Turbine Building Heater Drain Pump Rooms and an Auxiliary Steam Supply line to RCIC piping interconnection for injection into RPV by FLEX pump.								
Site Equipment	Quick-disconnect connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	3 units	1 site	\$225,000	\$225,000
Site Equipment	Auxiliary Steam Supply line	\$1,000,000 / unit	\$1,000,000 / unit	\$1,000,000 / unit	3 units	1 site	\$3,000,000	\$3,000,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	400 hours	1 site	\$20,704	\$20,704
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	800 hours	1 site	\$66,096	\$66,096
Design and pre-stage modified flange adapter for connection of FLEX pump discharge hose to Integrated Leak Rate Test (ILRT) piping for RPV makeup through RHR B Loop water injection.								
Site Equipment	Modified flange adapter	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	3 units	1 site	\$30,000	\$30,000
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	600 hours	1 site	\$49,572	\$49,572

Appendix G. Order EA-12-049 Costs - BWR 3-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Modify HPCS SW to install connection points on the HPCS SW piping and new building penetrations at the Category I SSW pump house for the diesel-driven FLEX pump discharge hose connections. Modify SSW B pump discharge piping at the UHS basin so that large diesel-driven RRC pumps can be connected to the SSW B system and provide cooling water to RHR B heat exchanger. Modify SSW B return piping to add a line to return hot suppression pool water to RRC supplied heat removal equipment including the capability of manual alignment to bypass the UHS cooling towers.								
Site Equipment	Discharge hose connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	6 units	1 site	\$450,000	\$450,000
Site Equipment	Connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	6 units	1 site	\$450,000	\$450,000
Site Equipment	Piping line	\$500,000 / unit	\$500,000 / unit	\$500,000 / unit	3 units	1 site	\$1,500,000	\$1,500,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	1,200 hours	1 site	\$62,112	\$62,112
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	6,000 hours	1 site	\$495,720	\$495,720
Add connection points and cabling at control building wall to connect to Buses C and D (which power battery chargers and critical AC components) to work with FLEX diesel generators. Add connection points and transfer switches locally at battery chargers (welding receptacle type connection point) to allow connection of power cables from FLEX diesel generators.								
Site Equipment	Connection points	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	12 units	1 site	\$9,000,000	\$9,000,000
Site Equipment	Cabling	\$2,000 / unit	\$6,000 / unit	\$4,000 / unit	12 units	1 site	\$48,000	\$48,000
Site Equipment	Transfer switches	\$4,000 / unit	\$7,000 / unit	\$6,000 / unit	6 units	1 site	\$36,000	\$36,000
Site Labor	Labor (Electricians)			\$52 / hour	600 hours	1 site	\$30,900	\$30,900
Procure and install electrical cabling from near switchgear to connection point on exterior of control building. Procure electrical cabling to connect FLEX diesel generators to connection point on exterior of Control Building.								
Site Equipment	Electric cabling	\$200 / unit	\$600 / unit	\$400 / unit	6 units	1 site	\$2,400	\$2,400
Site Labor	Labor (Electricians)			\$52 / hour	48 hours	1 site	\$2,472	\$2,472
Modify or refurbish spare breaker on Class 1 E LC 15BA6/16BB6 to make connections from 480 V FLEX diesel generator.								
Site Labor	Labor (Electricians)			\$52 / hour	120 hours	1 site	\$6,180	\$6,180
Install power cables from outside connection point to ADHR power supply.								
Site Equipment	Power connection cables	\$200 / unit	\$200 / unit	\$200 / unit	3 units	1 site	\$600	\$600
Site Labor	Labor (Electricians)			\$52 / hour	60 hours	1 site	\$3,090	\$3,090
Modify power supply to battery chargers to install welding type receptacles, termination box, disconnects, and cable for quick connection to battery chargers and battery exhaust fan.								
Site Equipment	Welding type receptacles	\$50 / unit	\$100 / unit	\$50 / unit	6 units	1 site	\$300	\$300
Site Equipment	Termination box	\$400 / unit	\$2,000 / unit	\$900 / unit	3 units	1 site	\$2,700	\$2,700
Site Equipment	Disconnects	\$100 / unit	\$100 / unit	\$100 / unit	6 units	1 site	\$600	\$600
Site Equipment	Cable	\$200 / unit	\$600 / unit	\$400 / unit	6 units	1 site	\$2,400	\$2,400
Site Labor	Labor			\$30 / hour	120 hours	1 site	\$3,600	\$3,600
Modify MCC15B21 (power supply to Division I SPMU valves) by installing a connection point and new permanent cable or conduit to receive backup power from 480 V FLEX diesel generator (refurbish spare breaker if necessary).								
Site Equipment	Connection point	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	3 units	1 site	\$2,250,000	\$2,250,000
Site Equipment	Cable/conduit	\$200 / unit	\$600 / unit	\$400 / unit	3 units	1 site	\$1,200	\$1,200
Site Labor	Labor (Electricians)			\$52 / hour	120 hours	1 site	\$6,180	\$6,180

Appendix G. Order EA-12-049 Costs - BWR 3-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Provide cable and raceway (that is seismically supported) from 480 V FLEX diesel generator to battery chargers and battery room exhaust fan.								
Site Equipment	Cable	\$100 / unit	\$100 / unit	\$100 / unit	3,000 units	1 site	\$300,000	\$300,000
Site Equipment	Raceway	\$20 / unit	\$30 / unit	\$20 / unit	3 units	1 site	\$60	\$60
Site Labor	Labor (Electricians)			\$52 / hour	72 hours	1 site	\$3,708	\$3,708
Modify or refurbish spare breaker to MCC 16B31 to provide sufficient capacity to power train B RHR support loads from 480 V FLEX diesel generator.								
Site Labor	Labor (Electricians)			\$52 / hour	120 hours	1 site	\$6,180	\$6,180
Modify connection of 4160 Vac RRC FLEX DG to the Class1E 16AB 4160 Vac.								
Site Equipment	Connection	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	3 units	1 site	\$2,250,000	\$2,250,000
Site Labor	Labor (Electricians)			\$52 / hour	48 hours	1 site	\$2,472	\$2,472
Modify the SFP line by installing 2 connections for 2 separate lines leading to the spent fuel pool area for a SFP FLEX hose connection and a SFP FLEX spray connection.								
Site Equipment	Connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	6 units	1 site	\$450,000	\$450,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	300 hours	1 site	\$15,528	\$15,528
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	600 hours	1 site	\$49,572	\$49,572
Install hard pipe with dual isolation valve from valve P41F185A to new SFP FLEX connection.								
Site Equipment	Hard pipe and dual isolation valve	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	2 units	1 site	\$20,000	\$20,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	120 hours	1 site	\$6,211	\$6,211
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	600 hours	1 site	\$49,572	\$49,572
Offsite Portable Equipment								
Licensee's share of RRC costs.								
RRC Equipment	Licensee's share of RRC equipment costs			\$874,000 / unit	1 unit	1 site	\$874,000	\$874,000
RRC Setup	Licensee's share of RRC setup costs			\$283,000 / unit	1 unit	1 site	\$283,000	\$283,000
Procure offsite Phase 3 equipment.								
Site Equipment	Radiation protection equipment: Survey Instruments	\$500 / unit	\$4,000 / unit	\$2,000 / unit	60 units	1 site	\$120,000	\$120,000
Site Equipment	Radiation protection equipment: Dosimetry	\$100 / unit	\$100 / unit	\$100 / unit	60 units	1 site	\$6,000	\$6,000
Site Equipment	Commodities: Food	\$5,000 / unit	\$6,000 / unit	\$5,000 / unit	3 units	1 site	\$15,000	\$15,000
Site Equipment	Commodities: Water	\$400 / unit	\$400 / unit	\$400 / unit	6 units	1 site	\$2,400	\$2,400
Install transfer panel (disconnect switch) in Turbine Building.								
Site Equipment	Transfer panel (disconnect switch)	\$500 / unit	\$500 / unit	\$500 / unit	3 units	1 site	\$1,500	\$1,500
Site Labor	Labor (Electricians)			\$52 / hour	180 hours	1 site	\$9,270	\$9,270
Supporting Functions								
Change emergency control room lighting to LED bulbs to reduce load on batteries and reduce heat load in MCR.								
Site Equipment	LED bulbs	\$100 / unit	\$100 / unit	\$100 / unit	36 units	1 site	\$3,600	\$3,600
Site Labor	Labor (Electricians)			\$52 / hour	120 hours	1 site	\$6,180	\$6,180
An analysis will be performed to determine site-specific fuel consumption rates and available supplies.								
Site Labor	Labor			\$84 / hour	360 hours	1 site	\$30,186	\$30,186

Appendix G. Order EA-12-049 Costs - BWR 3-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
External Event Considerations								
To ensure that the portable equipment can be connected under flooding conditions, a plant modification is required to establish a flood staging area for portable equipment that preserves the capability to connect this equipment with the design-basis flood present.								
Contractor	Flood staging area	\$604,000 / unit	\$604,000 / unit	\$604,000 / unit	3 units	1 site	\$1,812,000	\$1,812,000
Design or build onsite FLEX storage buildings given requirements covered above (protect from storms and high winds).								
Contractor	Storage building	\$1,700,000 / unit	\$3,000,000 / unit	\$2,350,000 / unit	4 units	1 site	\$9,400,000	\$9,400,000
Programmatic Controls								
Develop the Overall Integrated Plan. Perform a site-specific evaluation determining baseline coping capabilities, applicable extreme external hazards, and needed enhancements to mitigate an ELAP/LUHS event such that no fuel damage occurs.								
Site Labor	Labor			\$84 / hour	6,000 hours	1 site	\$503,100	\$503,100
Develop strategies (playbook) with RRC.								
Site Labor	Labor			\$84 / hour	480 hours	1 site	\$40,248	\$40,248
Develop and conduct staffing analysis.								
Site Labor	Labor			\$84 / hour	480 hours	1 site	\$40,248	\$40,248
Issue FLEX Support Guidelines containing the procedures to control the FLEX equipment's physical protection, storage, deployment and quality; to read instruments locally; and to re-power hydrogen igniters (in Procedure 05-S-01-STRTEFY, Alternative Strategies). Also incorporate enhanced battery load shedding guidance into station procedures for loss of ac power to extend the availability of dc power.								
Site Labor	Labor			\$84 / hour	8,000 hours	1 site	\$670,800	\$670,800
Modify plant procedures to take into account FLEX Support Guidelines.								
Site Labor	Labor			\$84 / hour	1,600 hours	1 site	\$134,160	\$134,160
Modify existing plant configuration control procedures to ensure that changes to the plant design physical layout, roads, buildings, and miscellaneous structures will not adversely affect the approved FLEX strategies.								
Site Labor	Labor			\$84 / hour	400 hours	1 site	\$33,540	\$33,540
Create maintenance and testing procedures.								
Site Labor	Labor			\$84 / hour	1,400 hours	1 site	\$117,390	\$117,390
Develop training programs for operation of FLEX equipment.								
Contractor	Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	1 site	\$250,000	\$250,000
Develop training modules for personnel that will be responsible for implementing the FLEX strategies, and ERO personnel will be developed to ensure personnel proficiency in the mitigation of beyond-design-basis external events (BDBEES).								
Contractor	Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	1 site	\$350,000	\$350,000
Develop design requirements and supporting analysis for portable FLEX equipment.								
Site Labor	Labor			\$84 / hour	2,800 hours	1 site	\$234,780	\$234,780
An analysis will be performed to determine commodity requirements.								
Site Labor	Labor			\$84 / hour	80 hours	1 site	\$6,708	\$6,708
Involvement with industry group activities.								
Site Labor	Labor			\$84 / hour	825 hours	1 site	\$69,176	\$69,176
Procedure setpoint calculations (Procedure entry, exit, and decision criteria) and								
Site Labor	Labor			\$84 / hour	1,500 hours	1 site	\$125,775	\$125,775

Appendix G. Order EA-12-049 Costs - BWR 3-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	NUMBER OF AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL OPERATIONS COST								
Programmatic Controls								
6-month status reports on implementation of mitigation strategies.								
Site Labor	Labor			\$84 / hour	200 hours	1 site	\$16,770	\$16,770
Maintenance and testing.								
Site Labor	Labor			\$84 / hour	400 hours	1 site	\$33,540	\$33,540
Conduct training (implemented in accordance with the systematic approach to training). The training modules for personnel that will be responsible for implementing the FLEX strategies and ERO personnel will be implemented and maintained per existing training programs. The details, objectives, frequency, and success measures will follow the plant's SAT process.								
Site Labor	Labor			\$84 / hour	2,500 hours	1 site	\$209,625	\$209,625
Change control. Design requirements for FLEX equipment will be documented and controlled by the existing plant modification process.								
Site Labor	Labor			\$84 / hour	320 hours	1 site	\$26,832	\$26,832
Maintenance of the FLEX Support Guidelines								
Site Labor	Labor			\$84 / hour	256 hours	1 site	\$21,466	\$21,466
Licensee's share of RRC ongoing costs (staffing, rent, testing and maintenance).								
RRC Maintenance	Licensee's share of RRC ongoing costs			\$129,000 / unit	1 unit	1 site	\$129,000	\$129,000
Licensee's share of RRC transportation costs (first 3 years).								
RRC Transportation	Licensee's share of RRC transportation costs (first 3 years)			\$184,000 / unit	1 unit	1 site	\$184,000	\$184,000
Licensee's share of RRC transportation costs (after first 3 years).								
RRC Transportation	Licensee's share of RRC transportation costs (after first 3 years)			\$15,000 / unit	1 unit	1 site	\$15,000	\$15,000

Appendix H. Costs for a PWR 1-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL IMPLEMENTATION COSTS								
Initial Response								
Harden and protect the dedicated shutdown diesel generator to provide power to Motor Control Center.								
Site Equipment	Building material or prefabricated structures	\$20,000 / unit	\$20,000 / unit	\$20,000 / unit	1 unit	12 sites	\$20,000	\$240,000
Site Labor	Labor			\$84 / hour	400 hours	12 sites	\$33,540	\$402,480
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	12 sites	\$33,048	\$396,576
Install a robust, shielded connection on each RMWST that extends through the RMWST shield building providing two diverse connections for transferring the RMWST inventory to the CST.								
Site Equipment	Connection	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	2 units	12 sites	\$1,500,000	\$18,000,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	100 hours	12 sites	\$5,176	\$62,112
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	500 hours	12 sites	\$41,310	\$495,720
Upgrade non-seismic condensate transfer pump suction nozzle to seismic qualification to increase CST inventory availability time to 40 hours.								
Site Equipment	Seismic condensate transfer pump suction nozzle	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	1 unit	12 sites	\$2,000	\$24,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	100 hours	12 sites	\$5,176	\$62,112
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	200 hours	12 sites	\$16,524	\$198,288
Construct a seismic, missile-protected emergency water storage tank (EWST).								
Site Equipment	Emergency Water Storage Tank (EWST)	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	1 unit	12 sites	\$158,000	\$1,896,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	3,600 hours	12 sites	\$186,336	\$2,236,032
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	500 hours	12 sites	\$41,310	\$495,720
Construct a seismic, missile-protected tank to provide a protected water source for core cooling and heat removal strategies. A diesel-powered feedwater pump will supply the water to the AFW system piping. Flow distribution instrumentation will be required during the ELAP.								
Site Equipment	Tank	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	1 unit	12 sites	\$158,000	\$1,896,000
Site Equipment	Diesel-powered feedwater pump	\$50,000 / unit	\$50,000 / unit	\$50,000 / unit	1 unit	12 sites	\$50,000	\$600,000
Site Equipment	Flow distribution instrumentation	\$30,000 / unit	\$30,000 / unit	\$30,000 / unit	1 unit	12 sites	\$30,000	\$360,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	2,000 hours	12 sites	\$103,520	\$1,242,240
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,000 hours	12 sites	\$82,620	\$991,440
Install clean water receiver tank (CWRT) (high wind/missile protected and contains borated water).								
Site Equipment	Borated Water Storage Tank or Clean Water Receiver Tank	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	1 unit	12 sites	\$158,000	\$1,896,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	3,600 hours	12 sites	\$186,336	\$2,236,032
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	500 hours	12 sites	\$41,310	\$495,720
Modify power controls for SG PORVs from a dc-powered instrument bus to allow for continued operation from the MCR.								
Site Labor	Labor (Control and Valve Installers and Repairers, Except Mechanical Door)			\$52 / hour	120 hours	12 sites	\$6,228	\$74,736
Install permanent nitrogen bottle racks near each SG PORV operating station with hose and regulators to align for control to remain available in the control room.								
Site Equipment	Nitrogen bottle racks	\$5,000 / unit	\$5,000 / unit	\$5,000 / unit	2 units	12 sites	\$10,000	\$120,000
Site Labor	Labor			\$84 / hour	16 hours	12 sites	\$1,342	\$16,099
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	200 hours	12 sites	\$16,524	\$198,288
Install Westinghouse low-leakage RCP seals.								
Site Equipment	Low-leakage RCP seals.	\$58,000 / unit	\$58,000 / unit	\$58,000 / unit	4 units	12 sites	\$232,000	\$2,784,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	80 hours	12 sites	\$4,141	\$49,690
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	12 sites	\$33,048	\$396,576

Appendix H. Order EA-12-049 Costs - PWR One-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Seismically upgrade the Alternate Seal Injection (ASI) system and add an ASI pump discharge path to the CVCS charging header.								
Site Equipment	Seismic piping and a connection to the charging header	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	1 unit	12 sites	\$10,000	\$120,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	80 hours	12 sites	\$4,141	\$49,690
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	200 hours	12 sites	\$16,524	\$198,288
Onsite Portable Equipment								
Procure portable FLEX equipment (N+1).								
Site Equipment	Vehicles	\$24,000 / unit	\$35,000 / unit	\$30,000 / unit	1 unit	12 sites	\$30,000	\$360,000
Site Equipment	480 Vac diesel generators (480 kW)	\$75,000 / unit	\$125,000 / unit	\$100,000 / unit	2 units	12 sites	\$200,000	\$2,400,000
Site Equipment	480 Vac diesel generators (200 kW)	\$50,000 / unit	\$101,000 / unit	\$77,000 / unit	2 units	12 sites	\$154,000	\$1,848,000
Site Equipment	120 Vac diesel generators (15 kW)	\$5,000 / unit	\$10,000 / unit	\$8,000 / unit	2 units	12 sites	\$16,000	\$192,000
Site Equipment	Self-powered CST FLEX pumps	\$6,000 / unit	\$6,000 / unit	\$6,000 / unit	2 units	12 sites	\$12,000	\$144,000
Site Equipment	Self-powered SG FLEX pumps	\$6,000 / unit	\$6,000 / unit	\$6,000 / unit	2 units	12 sites	\$12,000	\$144,000
Site Equipment	Self-powered SFP FLEX pumps (200% capacity)	\$6,000 / unit	\$6,000 / unit	\$6,000 / unit	2 units	12 sites	\$12,000	\$144,000
Site Equipment	Electric motor-driven Mode 1-4 RCS FLEX pumps	\$3,000 / unit	\$3,000 / unit	\$3,000 / unit	2 units	12 sites	\$6,000	\$72,000
Site Equipment	Electric motor-driven Mode 5-6 RCS FLEX pumps	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	2 units	12 sites	\$2,000	\$24,000
Site Equipment	Electric motor-driven diesel fuel FLEX pumps	\$500 / unit	\$1,000 / unit	\$700 / unit	2 units	12 sites	\$1,400	\$16,800
Site Equipment	Flatbed trailers	\$8,000 / unit	\$18,000 / unit	\$12,000 / unit	2 units	12 sites	\$24,000	\$288,000
Site Equipment	Trailers with Fuel Tank	\$3,000 / unit	\$8,000 / unit	\$6,000 / unit	2 units	12 sites	\$12,000	\$144,000
Site Equipment	Portable fuel containers	\$20 / unit	\$60 / unit	\$40 / unit	2 units	12 sites	\$80	\$960
Site Equipment	Monitor spray nozzles for SFP spray	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	2 units	12 sites	\$2,000	\$24,000
Site Equipment	Hose and fittings	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	2 units	12 sites	\$4,000	\$48,000
Site Equipment	Strainers	\$10 / unit	\$20 / unit	\$10 / unit	2 units	12 sites	\$20	\$240
Site Equipment	Communications Gear: Docking Station	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	1 unit	12 sites	\$2,000	\$24,000
Site Equipment	Communications Gear: Mobile phones	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	1 unit	12 sites	\$1,000	\$12,000
Site Equipment	Communications Gear: Emergency kits	\$1,000 / unit	\$3,000 / unit	\$2,000 / unit	5 units	12 sites	\$10,000	\$120,000
Site Equipment	Communications Gear: Fixed mast antennas	\$200 / unit	\$300 / unit	\$200 / unit	2 units	12 sites	\$400	\$4,800
Site Equipment	Communications Gear: Antenna cable	\$100 / unit	\$1,000 / unit	\$600 / unit	2 units	12 sites	\$1,200	\$14,400
Site Equipment	Communications Gear: Rechargeable batteries	\$80 / unit	\$100 / unit	\$100 / unit	15 units	12 sites	\$1,500	\$18,000
Site Equipment	Communications Gear: Four-bay satellite phone battery chargers	\$500 / unit	\$600 / unit	\$600 / unit	8 units	12 sites	\$4,800	\$57,600
Site Equipment	Communications Gear: Single-bay satellite phone battery chargers	\$200 / unit	\$200 / unit	\$200 / unit	8 units	12 sites	\$1,600	\$19,200
Site Equipment	Communications Gear: DC automobile outlet charger cords to charge single- and four-bay battery chargers	\$20 / unit	\$20 / unit	\$20 / unit	8 units	12 sites	\$160	\$1,920
Site Equipment	Communications Gear: Solar panel chargers	\$200 / unit	\$200 / unit	\$200 / unit	4 units	12 sites	\$800	\$9,600
Site Equipment	Portable ventilation fans	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	4 units	12 sites	\$8,000	\$96,000
Site Equipment	Portable air compressors	\$13,000 / unit	\$13,000 / unit	\$13,000 / unit	1 unit	12 sites	\$13,000	\$156,000
Site Equipment	Fuel transfer hoses	\$3,000 / unit	\$4,000 / unit	\$3,000 / unit	2 units	12 sites	\$6,000	\$72,000
Site Equipment	Radiation protection equipment: Survey equipment	\$500 / unit	\$4,000 / unit	\$2,000 / unit	20 units	12 sites	\$40,000	\$480,000
Site Equipment	Radiation protection equipment: Dosimetry	\$100 / unit	\$100 / unit	\$100 / unit	20 units	12 sites	\$2,000	\$24,000
Site Equipment	Commodities: Food	\$5,000 / unit	\$6,000 / unit	\$5,000 / unit	1 unit	12 sites	\$5,000	\$60,000
Site Equipment	Commodities: Water	\$400 / unit	\$400 / unit	\$400 / unit	2 units	12 sites	\$800	\$9,600
Install diverse suction connections and fill connections on each CST. Install seismically-rugged new pipes and equipment used to provide core cooling and heat removal to the SG.								
Site Equipment	Suction connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	4 units	12 sites	\$300,000	\$3,600,000
Site Equipment	Fill connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	4 units	12 sites	\$300,000	\$3,600,000
Site Equipment	Pipes	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	1 unit	12 sites	\$1,000	\$12,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	200 hours	12 sites	\$10,352	\$124,224
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,000 hours	12 sites	\$82,620	\$991,440

Appendix H. Order EA-12-049 Costs - PWR One-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Install connection points downstream of the charging pump discharge header for connecting the Mode 1-4 RCS FLEX pump for reactivity control and RCS inventory control or Mode 5-6 RCS FLEX pump for core cooling and RCS inventory control.								
Site Equipment	Connection points	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	2 units	12 sites	\$150,000	\$1,800,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	80 hours	12 sites	\$4,141	\$49,690
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,000 hours	12 sites	\$82,620	\$991,440
Add branch connections with quick disconnect fittings to the boric acid transfer pump suction header. Install permanent piping from boric acid tank room to CVCS crosstie. Provide a branch from the CVCS drain line to allow a connection point. Modify vent connection downstream from boron injection tanks for portable pump connection. Resize the CVCS crosstie drain line to four inch piping.								
Site Equipment	Branch connections with quick disconnect fittings	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	2 units	12 sites	\$150,000	\$1,800,000
Site Equipment	Piping	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	1 unit	12 sites	\$10,000	\$120,000
Site Equipment	Connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	1 unit	12 sites	\$75,000	\$900,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	200 hours	12 sites	\$10,352	\$124,224
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,000 hours	12 sites	\$82,620	\$991,440
Add FLEX pump discharge connection points to both trains of the ESW system.								
Site Equipment	Connection points	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	2 units	12 sites	\$150,000	\$1,800,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	80 hours	12 sites	\$4,141	\$49,690
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	12 sites	\$33,048	\$396,576
Install a connection point downstream of the EFW Pump.								
Site Equipment	Connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	1 unit	12 sites	\$75,000	\$900,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	40 hours	12 sites	\$2,070	\$24,845
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	12 sites	\$33,048	\$396,576
Modify spare breaker BE 113 (preferred) and BF109 (alternate) for 480V FLEX diesel generator connection. Install new vertical section on switchgear C1 (preferred) and DI (alternate) for 4160V FLEX diesel generator connection.								
Site Labor	Labor (Electricians)			\$52 / hour	40 hours	12 sites	\$2,060	\$24,720
For deployment of the 4160 V FLEX diesel generator, stage the DG North of the diesel generator building. For the preferred connection, it will route a cable via a new penetration through the north wall of the Auxiliary Building. For the alternate connection, the cable will be routed through the main door of the Auxiliary building. The cable will connect to a FLEX connection panel installed in the room. The panel will be permanently wired with Class 1E cable through an existing cable raceway.								
Site Equipment	Cables	\$200 / unit	\$600 / unit	\$400 / unit	3 units	12 sites	\$1,200	\$14,400
Site Equipment	Connection panel	\$100,000 / unit	\$100,000 / unit	\$100,000 / unit	1 unit	12 sites	\$100,000	\$1,200,000
Site Equipment	Class 1E cable	\$100 / unit	\$100 / unit	\$100 / unit	1000 units	12 sites	\$100,000	\$1,200,000
Site Equipment	Medium voltage (MV) cable connectors	\$80 / unit	\$80 / unit	\$80 / unit	15 units	12 sites	\$1,200	\$14,400
Site Labor	Labor (Electricians)			\$52 / hour	160 hours	12 sites	\$8,240	\$98,880
Install supply and return connections of the Train A containment cooler service water piping outside containment to supply supplemental cooling to the containment fan coolers.								
Site Equipment	Connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	2 units	12 sites	\$150,000	\$1,800,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	100 hours	12 sites	\$5,176	\$62,112
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	12 sites	\$33,048	\$396,576
Route a new header directly to the Spent Fuel Pool just above the normal water level. The header will be routed outside via a penetration through the Fuel Handling Area west wall and will terminate in a blind flange or Storz quick connection. A manual isolation valve will be located just inside the Fuel Handling Area train bay door.								
Site Equipment	Header (pipe)	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	1 unit	12 sites	\$10,000	\$120,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	100 hours	12 sites	\$5,176	\$62,112
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	200 hours	12 sites	\$16,524	\$198,288

Appendix H. Order EA-12-049 Costs - PWR One-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
SFP spray will be required. A permanent modification to install spray nozzles in the Fuel Handling Building will be made. These nozzles will be mounted on the walls approximately 20 ft above the deck, and pointed at the pool. A hard pipe line will be routed from the nozzles to the installed header for the preferred SFP makeup strategy and will utilize the same connection point located outside the Auxiliary Building. In order to keep the functions separate, the SFP Spray line will connect upstream of the isolation valve on the SFP makeup header and will also have a manual isolation valve. Flow rate requirements will be much greater for SFP spray than for makeup. For this reason, suction will be taken from the Intake Canal for this strategy.								
Site Equipment	Hard pipe line	\$50,000 / unit	\$50,000 / unit	\$50,000 / unit	1 unit	12 sites	\$50,000	\$600,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	100 hours	12 sites	\$5,176	\$62,112
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	500 hours	12 sites	\$41,310	\$495,720
Offsite Portable Equipment								
Licensee's share of RRC costs.								
RRC Equipment	Licensee's share of RRC equipment costs			\$874,000 / unit	1 unit	12 sites	\$874,000	\$10,488,000
RRC Setup	Licensee's share of RRC setup costs			\$283,000 / unit	1 unit	12 sites	\$283,000	\$3,396,000
Procure offsite Phase 3 equipment.								
Site Equipment	Radiation protection equipment: Survey equipment	\$500 / unit	\$4,000 / unit	\$2,000 / unit	20 units	12 sites	\$40,000	\$480,000
Site Equipment	Radiation protection equipment: Dosimetry	\$100 / unit	\$100 / unit	\$100 / unit	20 units	12 sites	\$2,000	\$24,000
Site Equipment	Commodities: Food	\$5,000 / unit	\$6,000 / unit	\$5,000 / unit	1 unit	12 sites	\$5,000	\$60,000
Site Equipment	Commodities: Water	\$400 / unit	\$400 / unit	\$400 / unit	2 units	12 sites	\$800	\$9,600
Modify 4,160 Vac bus T11A/D to allow connection of external 4,160 Vac portable diesel generator.								
Site Equipment	Connection point	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	1 unit	12 sites	\$750,000	\$9,000,000
Site Labor	Labor (Electricians)			\$52 / hour	100 hours	12 sites	\$5,150	\$61,800
Supporting Functions								
Upgrade the installed Self-Contained DC Emergency Lighting units with LED lamps.								
Site Equipment	LED lamps	\$100 / unit	\$100 / unit	\$100 / unit	12 units	12 sites	\$1,200	\$14,400
Site Labor	Labor (Electricians)			\$52 / hour	40 hours	12 sites	\$2,060	\$24,720
A connection will be made to a drain line located on the supply line to the EDG from the associated EDG day tank.								
Site Equipment	Connection	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	1 unit	12 sites	\$750,000	\$9,000,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	40 hours	12 sites	\$2,070	\$24,845
Add connection points at Diesel fuel Oil Storage Tanks 4-inch flanges downstream of valves to support transfer of inventory for use in FLEX equipment.								
Site Equipment	Connection points	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	2 units	12 sites	\$1,500,000	\$18,000,000
Site Labor	Labor			\$52 / hour	100 hours	12 sites	\$5,176	\$62,112
External Event Considerations								
Preparation for staging FLEX equipment can involve identifying staging areas, leveling staging areas, building a structure to temporarily hold equipment, fitting in FLEX equipment into the plant as a prestaged item.								
Contractor	Staging area	\$604,000 / unit	\$604,000 / unit	\$604,000 / unit	1 unit	12 sites	\$604,000	\$7,248,000
Two FLEX storage locations will be provided for the storage of the related FLEX equipment. The FLEX equipment will be protected in accordance with NEI 12-06, Section 5.3.1.								
Contractor	Storage building	\$1,700,000 / unit	\$3,000,000 / unit	\$2,350,000 / unit	2 units	12 sites	\$4,700,000	\$56,400,000

Appendix H. Order EA-12-049 Costs - PWR One-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Programmatic Controls								
Develop the Overall Integrated Plan. Perform a site-specific evaluation determining baseline coping capabilities, applicable extreme external hazards, and needed enhancements to mitigate an ELAP/LUHS event such that no fuel damage occurs.								
Site Labor	Labor			\$84 / hour	4,000 hours	12 sites	\$335,400	\$4,024,800
Develop strategies (playbook) with RRC.								
Site Labor	Labor			\$84 / hour	320 hours	12 sites	\$26,832	\$321,984
Develop/conduct a staffing analysis.								
Site Labor	Labor			\$84 / hour	480 hours	12 sites	\$40,248	\$482,976
Develop and implement FLEX Support Guidelines. Develop procedures to read instruments locally. Procedures on re-powering hydrogen igniters in Procedure 05-S-01-STRTEFY, Alternative Strategies. Enhanced battery load shedding guidance will be incorporated into station procedures for loss of ac power to extend the wavailability of dc power.								
Site Labor	Labor			\$84 / hour	4,000 hours	12 sites	\$335,400	\$4,024,800
Modify plant procedures to take into account FLEX Support Guidelines. Procedures to be considered include EOP, EDMG, and SAMG strategies.								
Site Labor	Labor			\$84 / hour	800 hours	12 sites	\$67,080	\$804,960
Modify existing plant configuration control procedures to ensure that changes to the plant design physical layout, roads, buildings, and miscellaneous structures will not adversely affect the approved FLEX strategies.								
Site Labor	Labor			\$84 / hour	400 hours	12 sites	\$33,540	\$402,480
Create maintenance and testing procedures.								
Site Labor	Labor			\$84 / hour	1,000 hours	12 sites	\$83,850	\$1,006,200
Develop training programs for operation of FLEX equipment.								
Contractor	Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	12 sites	\$250,000	\$3,000,000
Develop training modules for personnel that will be responsible for implementing the FLEX strategies, and ERO personnel will be developed to ensure personnel proficiency in the mitigation of beyond-design-basis external events (BDBEEs).								
Contractor	Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	12 sites	\$250,000	\$3,000,000
Develop design requirements and supporting analysis for portable FLEX equipment.								
Site Labor	Labor			\$84 / hour	2,000 hours	12 sites	\$167,700	\$2,012,400
An analysis will be performed to determine commodity requirements.								
Site Labor	Labor			\$84 / hour	80 hours	12 sites	\$6,708	\$80,496
Involvement with industry group activities.								
Site Labor	Labor			\$84 / hour	750 hours	12 sites	\$62,888	\$754,650
Procedure setpoint calculations (Procedure entry, exit, and decision criteria) and other engineering support.								
Site Labor	Labor			\$84 / hour	1,000 hours	12 sites	\$83,850	\$1,006,200

Appendix H. Order EA-12-049 Costs - PWR One-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL OPERATIONS COSTS								
Programmatic Controls								
Provide 6-month status reports on implementation of mitigation strategies.								
Site Labor	Labor			\$84 / hour	100 hours	12 sites	\$8,385	\$100,620
Maintenance and testing.								
Site Labor	Labor			\$84 / hour	400 hours	12 sites	\$33,540	\$402,480
Training will be performed in 2014, and will be implemented in accordance with the Systematic Approach to Training. The training modules for personnel that will be responsible for implementing the FLEX strategies, and ERO personnel will be implemented and maintained per existing training programs. The details, objectives, frequency, and success measures will follow the plant's SAT process.								
Site Labor	Labor			\$84 / hour	1,000 hours	12 sites	\$83,850	\$1,006,200
Change control.								
Site Labor	Labor			\$84 / hour	160 hours	12 sites	\$13,416	\$160,992
Maintenance of the FLEX Support Guidelines.								
Site Labor	Labor			\$84 / hour	240 hours	12 sites	\$20,124	\$241,488
Licensee's share of RRC ongoing costs (staffing, rent, testing and maintenance).								
RRC Maintenance	Licensee's share of RRC ongoing costs			\$129,000 / unit	1 unit	12 sites	\$129,000	\$1,548,000
Licensee's share of RRC transportation costs (first 3 years).								
RRC Transportation	Licensee's share of RRC transportation costs (first 3 years)			\$184,000 / unit	1 unit	12 sites	\$184,000	\$2,208,000
Licensee's share of RRC transportation costs (after first 3 years).								
RRC Transportation	Licensee's share of RRC transportation costs (after first 3 years)			\$15,000 / unit	1 unit	12 sites	\$15,000	\$180,000

Appendix I. Costs for a PWR 2-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL IMPLEMENTATION COSTS								
Initial Response								
Harden and protect the dedicated shutdown diesel generator to provide power to Motor Control Center.								
Site Equipment	Building material or prefabricated structures	\$20,000 / unit	\$20,000 / unit	\$20,000 / unit	2 units	24 sites	\$40,000	\$960,000
Site Labor	Labor			\$84 / hour	800 hours	24 sites	\$67,080	\$1,609,920
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	800 hours	24 sites	\$66,096	\$1,586,304
Install a robust, shielded connection on each RMWST that extends through the RMWST shield building providing two diverse connections for transferring the RMWST inventory to the CST.								
Site Equipment	Connection	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	4 units	24 sites	\$3,000,000	\$72,000,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	200 hours	24 sites	\$10,352	\$248,448
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,000 hours	24 sites	\$82,620	\$1,982,880
Upgrade non-seismic condensate transfer pump suction nozzle to seismic qualification to increase CST inventory availability time to 40 hours.								
Site Equipment	Seismic condensate transfer pump suction nozzle	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	2 units	24 sites	\$4,000	\$96,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	200 hours	24 sites	\$10,352	\$248,448
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	24 sites	\$33,048	\$793,152
Construct a seismic, missile-protected emergency water storage tank (EWST).								
Site Equipment	Emergency Water Storage Tank (EWST)	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	2 units	24 sites	\$316,000	\$7,584,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	7,200 hours	24 sites	\$372,672	\$8,944,128
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,000 hours	24 sites	\$82,620	\$1,982,880
Construct a seismic, missile-protected tank to provide a protected water source for core cooling and heat removal strategies. A diesel-powered feedwater pump will supply the water to the AFW system piping. Flow distribution instrumentation will be required during the ELAP.								
Site Equipment	Tank	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	2 units	24 sites	\$316,000	\$7,584,000
Site Equipment	Diesel-powered feedwater pump	\$50,000 / unit	\$50,000 / unit	\$50,000 / unit	2 units	24 sites	\$100,000	\$2,400,000
Site Equipment	Flow distribution instrumentation	\$30,000 / unit	\$30,000 / unit	\$30,000 / unit	2 units	24 sites	\$60,000	\$1,440,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	4,000 hours	24 sites	\$207,040	\$4,968,960
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	2,000 hours	24 sites	\$165,240	\$3,965,760
Install clean water receiver tank (CWRT) (high wind/missile protected and contains borated water).								
Site Equipment	Tank	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	2 units	24 sites	\$316,000	\$7,584,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	7,200 hours	24 sites	\$372,672	\$8,944,128
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,000 hours	24 sites	\$82,620	\$1,982,880
Modify power controls for SG PORVs from a dc-powered instrument bus to allow for continued operation from the MCR.								
Site Labor	Mechanical Door)			\$52 / hour	240 hours	24 sites	\$12,456	\$298,944
Install permanent nitrogen bottle racks near each SG PORV operating station with hose and regulators to align for control to remain available in the control room.								
Site Equipment	Nitrogen bottle racks	\$5,000 / unit	\$5,000 / unit	\$5,000 / unit	4 units	24 sites	\$20,000	\$480,000
Site Labor	Labor			\$84 / hour	32 hours	24 sites	\$2,683	\$64,397
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	24 sites	\$33,048	\$793,152
Install Westinghouse low-leakage RCP seals.								
Site Equipment	Low-leakage RCP seals.	\$58,000 / unit	\$58,000 / unit	\$58,000 / unit	8 units	24 sites	\$464,000	\$11,136,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	160 hours	24 sites	\$8,282	\$198,758
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	800 hours	24 sites	\$66,096	\$1,586,304

Appendix I. Order EA-12-049 Costs - PWR 2-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Seismically upgrade the Alternate Seal Injection (ASI) system and add an ASI pump discharge path to the CVCS charging header.								
Site Equipment	Seismic piping and a connection to the charging header	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	2 units	24 sites	\$20,000	\$480,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	160 hours	24 sites	\$8,282	\$198,758
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	24 sites	\$33,048	\$793,152
Onsite Portable Equipment								
Procure portable FLEX equipment (N+1).								
Site Equipment	Vehicles	\$24,000 / unit	\$35,000 / unit	\$30,000 / unit	2 units	24 sites	\$60,000	\$1,440,000
Site Equipment	480 Vac diesel generators (480 kW)	\$75,000 / unit	\$125,000 / unit	\$100,000 / unit	3 units	24 sites	\$300,000	\$7,200,000
Site Equipment	480 Vac diesel generators (200 kW)	\$50,000 / unit	\$101,000 / unit	\$77,000 / unit	3 units	24 sites	\$231,000	\$5,544,000
Site Equipment	120 Vac diesel generators (15 kW)	\$5,000 / unit	\$10,000 / unit	\$8,000 / unit	3 units	24 sites	\$24,000	\$576,000
Site Equipment	Self-powered CST FLEX pumps	\$6,000 / unit	\$6,000 / unit	\$6,000 / unit	3 units	24 sites	\$18,000	\$432,000
Site Equipment	Self-powered SG FLEX pumps	\$6,000 / unit	\$6,000 / unit	\$6,000 / unit	3 units	24 sites	\$18,000	\$432,000
Site Equipment	Self-powered SFP FLEX pumps (200% capacity)	\$6,000 / unit	\$6,000 / unit	\$6,000 / unit	3 units	24 sites	\$18,000	\$432,000
Site Equipment	Electric motor-driven Mode 1-4 RCS FLEX pumps	\$3,000 / unit	\$3,000 / unit	\$3,000 / unit	3 units	24 sites	\$9,000	\$216,000
Site Equipment	Electric motor-driven Mode 5-6 RCS FLEX pumps	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	3 units	24 sites	\$3,000	\$72,000
Site Equipment	Electric motor-driven diesel fuel FLEX pumps	\$500 / unit	\$1,000 / unit	\$700 / unit	3 units	24 sites	\$2,100	\$50,400
Site Equipment	Flatbed trailers	\$8,000 / unit	\$18,000 / unit	\$12,000 / unit	3 units	24 sites	\$36,000	\$864,000
Site Equipment	Trailers with Fuel Tank	\$3,000 / unit	\$8,000 / unit	\$6,000 / unit	3 units	24 sites	\$18,000	\$432,000
Site Equipment	Portable fuel containers	\$20 / unit	\$60 / unit	\$40 / unit	3 units	24 sites	\$120	\$2,880
Site Equipment	Monitor spray nozzles for SFP spray	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	3 units	24 sites	\$3,000	\$72,000
Site Equipment	Hose and fittings	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	3 units	24 sites	\$6,000	\$144,000
Site Equipment	Strainers	\$10 / unit	\$20 / unit	\$10 / unit	3 units	24 sites	\$30	\$720
Site Equipment	Communications Gear: Docking Station	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	2 units	24 sites	\$4,000	\$96,000
Site Equipment	Communications Gear: Mobile phones	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	2 units	24 sites	\$2,000	\$48,000
Site Equipment	Communications Gear: Emergency kits	\$1,000 / unit	\$3,000 / unit	\$2,000 / unit	10 units	24 sites	\$20,000	\$480,000
Site Equipment	Communications Gear: Fixed mast antennas	\$200 / unit	\$300 / unit	\$200 / unit	4 units	24 sites	\$800	\$19,200
Site Equipment	Communications Gear: Antenna cable	\$100 / unit	\$1,000 / unit	\$600 / unit	4 units	24 sites	\$2,400	\$57,600
Site Equipment	Communications Gear: Rechargeable batteries	\$80 / unit	\$100 / unit	\$100 / unit	30 units	24 sites	\$3,000	\$72,000
Site Equipment	Communications Gear: Four-bay satellite phone battery chargers	\$500 / unit	\$600 / unit	\$600 / unit	16 units	24 sites	\$9,600	\$230,400
Site Equipment	Communications Gear: Single-bay satellite phone battery chargers	\$200 / unit	\$200 / unit	\$200 / unit	16 units	24 sites	\$3,200	\$76,800
Site Equipment	Communications Gear: DC automobile outlet charger cords to charge single- and four-bay battery chargers	\$20 / unit	\$20 / unit	\$20 / unit	16 units	24 sites	\$320	\$7,680
Site Equipment	Communications Gear: Solar panel chargers	\$200 / unit	\$200 / unit	\$200 / unit	8 units	24 sites	\$1,600	\$38,400
Site Equipment	Portable ventilation fans	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	8 units	24 sites	\$16,000	\$384,000
Site Equipment	Portable air compressors	\$13,000 / unit	\$13,000 / unit	\$13,000 / unit	2 units	24 sites	\$26,000	\$624,000
Site Equipment	Fuel transfer hoses	\$3,000 / unit	\$4,000 / unit	\$3,000 / unit	3 units	24 sites	\$9,000	\$216,000
Site Equipment	Radiation protection equipment: Survey equipment	\$500 / unit	\$4,000 / unit	\$2,000 / unit	40 units	24 sites	\$80,000	\$1,920,000
Site Equipment	Radiation protection equipment: Dosimetry	\$100 / unit	\$100 / unit	\$100 / unit	40 units	24 sites	\$4,000	\$96,000
Site Equipment	Commodities: Food	\$5,000 / unit	\$6,000 / unit	\$5,000 / unit	2 units	24 sites	\$10,000	\$240,000
Site Equipment	Commodities: Water	\$400 / unit	\$400 / unit	\$400 / unit	4 units	24 sites	\$1,600	\$38,400
Install diverse suction connections and fill connections on each CST. Install seismically-rugged new pipes and equipment used to provide core cooling and heat removal to the SG.								
Site Equipment	Suction connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	8 units	24 sites	\$600,000	\$14,400,000
Site Equipment	Fill connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	8 units	24 sites	\$600,000	\$14,400,000
Site Equipment	Pipes	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	2 units	24 sites	\$2,000	\$48,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	400 hours	24 sites	\$20,704	\$496,896
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	2,000 hours	24 sites	\$165,240	\$3,965,760
Install connection points downstream of the charging pump discharge header for connecting the Mode 1-4 RCS FLEX pump for reactivity control and RCS inventory control or Mode 5-6 RCS FLEX pump for core cooling and RCS inventory control.								

Appendix I. Order EA-12-049 Costs - PWR 2-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Site Equipment	Connection points	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	4 units	24 sites	\$300,000	\$7,200,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	160 hours	24 sites	\$8,282	\$198,758
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	2,000 hours	24 sites	\$165,240	\$3,965,760
Add branch connections with quick disconnect fittings to the boric acid transfer pump suction header. Install permanent piping from boric acid tank room to CVCS crosstie. Provide a branch from the CVCS drain line to allow a connection point. Modify vent connection downstream from boron injection tanks for portable pump connection. Resize the CVCS crosstie drain line to four inch piping.								
Site Equipment	Branch connections with quick disconnect fittings	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	4 units	24 sites	\$300,000	\$7,200,000
Site Equipment	Piping	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	2 units	24 sites	\$20,000	\$480,000
Site Equipment	Connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	2 units	24 sites	\$150,000	\$3,600,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	400 hours	24 sites	\$20,704	\$496,896
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	2,000 hours	24 sites	\$165,240	\$3,965,760
Add FLEX pump discharge connection points to both trains of the ESW system.								
Site Equipment	Connection points	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	4 units	24 sites	\$300,000	\$7,200,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	160 hours	24 sites	\$8,282	\$198,758
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	800 hours	24 sites	\$66,096	\$1,586,304
Install a connection point downstream of the EFW Pump.								
Site Equipment	Connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	2 units	24 sites	\$150,000	\$3,600,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	80 hours	24 sites	\$4,141	\$99,379
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	800 hours	24 sites	\$66,096	\$1,586,304
Modify spare breaker BE 113 (preferred) and BF109 (alternate) for 480V FLEX diesel generator connection. Install new vertical section on switchgear C1 (preferred) and DI (alternate) for 4160V FLEX diesel generator connection.								
Site Labor	Labor (Electricians)			\$52 / hour	80 hours	24 sites	\$4,120	\$98,880
For deployment of the 4160 V FLEX diesel generator, stage the DG North of the diesel generator building. For the preferred connection, it will route a cable via a new penetration through the north wall of the Auxiliary Building. For the alternate connection, the cable will be routed through the main door of the Auxiliary building. The cable will connect to a FLEX connection panel installed in the room. The panel will be permanently wired with Class 1E cable through an existing cable raceway.								
Site Equipment	Cables	\$200 / unit	\$600 / unit	\$400 / unit	6 units	24 sites	\$2,400	\$57,600
Site Equipment	Connection panel	\$100,000 / unit	\$100,000 / unit	\$100,000 / unit	2 units	24 sites	\$200,000	\$4,800,000
Site Equipment	Class 1E cable	\$100 / unit	\$100 / unit	\$100 / unit	2,000 units	24 sites	\$200,000	\$4,800,000
Site Equipment	Medium voltage (MV) cable connectors	\$80 / unit	\$80 / unit	\$80 / unit	30 units	24 sites	\$2,400	\$57,600
Site Labor	Labor (Electricians)			\$52 / hour	320 hours	24 sites	\$16,480	\$395,520
Install supply and return connections of the Train A containment cooler service water piping outside containment to supply supplemental cooling to the containment fan coolers.								
Site Equipment	Connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	4 units	24 sites	\$300,000	\$7,200,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	200 hours	24 sites	\$10,352	\$248,448
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	800 hours	24 sites	\$66,096	\$1,586,304
Route a new header directly to the Spent Fuel Pool just above the normal water level. The header will be routed outside via a penetration through the Fuel Handling Area west wall and will terminate in a blind flange or Storz quick connection. A manual isolation valve will be located just inside the Fuel Handling Area train bay door.								
Site Equipment	Header (pipe)	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	2 units	24 sites	\$20,000	\$480,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	200 hours	24 sites	\$10,352	\$248,448
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	400 hours	24 sites	\$33,048	\$793,152

Appendix I. Order EA-12-049 Costs - PWR 2-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
SFP spray will be required. A permanent modification to install spray nozzles in the Fuel Handling Building will be made. These nozzles will be mounted on the walls approximately 20 ft above the deck, and pointed at the pool. A hard pipe line will be routed from the nozzles to the installed header for the preferred SFP makeup strategy and will utilize the same connection point located outside the Auxiliary Building. In order to keep the functions separate, the SFP Spray line will connect upstream of the isolation valve on the SFP makeup header and will also have a manual isolation valve. Flow rate requirements will be much greater for SFP spray than for makeup. For this reason, suction will be taken from the Intake Canal for this strategy.								
Site Equipment	Hard pipe line	\$50,000 / unit	\$50,000 / unit	\$50,000 / unit	2 units	24 sites	\$100,000	\$2,400,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	200 hours	24 sites	\$10,352	\$248,448
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,000 hours	24 sites	\$82,620	\$1,982,880
Offsite Portable Equipment								
Licensee's share of RRC costs.								
RRC Equipment	Licensee's share of RRC equipment costs			\$874,000 / unit	1 unit	24 sites	\$874,000	\$20,976,000
RRC Setup	Licensee's share of RRC setup costs			\$283,000 / unit	1 unit	24 sites	\$283,000	\$6,792,000
Procure offsite Phase 3 equipment.								
Site Equipment	Radiation protection equipment: Survey equipment	\$500 / unit	\$4,000 / unit	\$2,000 / unit	40 units	24 sites	\$80,000	\$1,920,000
Site Equipment	Radiation protection equipment: Dosimetry	\$100 / unit	\$100 / unit	\$100 / unit	40 units	24 sites	\$4,000	\$96,000
Site Equipment	Commodities: Food	\$5,000 / unit	\$6,000 / unit	\$5,000 / unit	2 units	24 sites	\$10,000	\$240,000
Site Equipment	Commodities: Water	\$400 / unit	\$400 / unit	\$400 / unit	4 units	24 sites	\$1,600	\$38,400
Modify 4,160 Vac bus T11A/D to allow connection of external 4,160 Vac portable diesel generator.								
Site Equipment	Connection point	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	2 units	24 sites	\$1,500,000	\$36,000,000
Site Labor	Labor (Electricians)			\$52 / hour	200 hours	24 sites	\$10,300	\$247,200
Supporting Functions								
Upgrade the installed Self-Contained DC Emergency Lighting units with LED lamps.								
Site Equipment	LED lamps	\$100 / unit	\$100 / unit	\$100 / unit	24 units	24 sites	\$2,400	\$57,600
Site Labor	Labor (Electricians)			\$52 / hour	80 hours	24 sites	\$4,120	\$98,880
A connection will be made to a drain line located on the supply line to the EDG from the associated EDG day tank.								
Site Equipment	Connection	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	2 units	24 sites	\$1,500,000	\$36,000,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	80 hours	24 sites	\$4,141	\$99,379
Add connection points at Diesel fuel Oil Storage Tanks 4-inch flanges downstream of valves to support transfer of inventory for use in FLEX equipment.								
Site Equipment	Connection points	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	4 units	24 sites	\$3,000,000	\$72,000,000
Site Labor	Labor			\$52 / hour	200 hours	24 sites	\$10,352	\$248,448
External Event Considerations								
Preparation for staging FLEX equipment can involve identifying staging areas, leveling staging areas, building a structure to temporarily hold equipment, fitting in FLEX equipment into the plant as a prestaged item.								
Contractor	Staging area	\$604,000 / unit	\$604,000 / unit	\$604,000 / unit	2 units	24 sites	\$1,208,000	\$28,992,000
Two FLEX storage locations will be provided for the storage of the related FLEX equipment. The FLEX equipment will be protected in accordance with NEI 12-06, Section 5.3.1.								
Contractor	Storage building	\$1,700,000 / unit	\$3,000,000 / unit	\$2,350,000 / unit	3 units	24 sites	\$7,050,000	\$169,200,000

Appendix I. Order EA-12-049 Costs - PWR 2-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Programmatic Controls								
Develop the Overall Integrated Plan. Perform a site-specific evaluation determining baseline coping capabilities, applicable extreme external hazards, and needed enhancements to mitigate an ELAP/LUHS event such that no fuel damage occurs.								
Site Labor	Labor			\$84 / hour	5,000 hours	24 sites	\$419,250	\$10,062,000
Develop strategies (playbook) with RRC.								
Site Labor	Labor			\$84 / hour	400 hours	24 sites	\$33,540	\$804,960
Develop/conduct a staffing analysis.								
Site Labor	Labor			\$84 / hour	480 hours	24 sites	\$40,248	\$965,952
Develop and implement FLEX Support Guidelines. Develop procedures to read instruments locally. Procedures on re-powering hydrogen igniters in Procedure 05-S-01-STRTEFY, Alternative Strategies. Enhanced battery load shedding guidance will be incorporated into station procedures for loss of ac power to extend the wavailability of dc power.								
Site Labor	Labor			\$84 / hour	6,000 hours	24 sites	\$503,100	\$12,074,400
Modify plant procedures to take into account FLEX Support Guidelines. Procedures to be considered include EOP, EDMG, and SAMG strategies.								
Site Labor	Labor			\$84 / hour	1,200 hours	24 sites	\$100,620	\$2,414,880
Modify existing plant configuration control procedures to ensure that changes to the plant design physical layout, roads, buildings, and miscellaneous structures will not adversely affect the approved FLEX strategies.								
Site Labor	Labor			\$84 / hour	400 hours	24 sites	\$33,540	\$804,960
Create maintenance and testing procedures.								
Site Labor	Labor			\$84 / hour	1,200 hours	24 sites	\$100,620	\$2,414,880
Develop training programs for operation of FLEX equipment.								
Contractor	Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	24 sites	\$250,000	\$6,000,000
Develop training modules for personnel that will be responsible for implementing the FLEX strategies, and ERO personnel will be developed to ensure personnel proficiency in the mitigation of beyond-design-basis external events (BDBEEs).								
Contractor	Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	24 sites	\$312,500	\$7,500,000
Develop design requirements and supporting analysis for portable FLEX equipment.								
Site Labor	Labor			\$84 / hour	2,400 hours	24 sites	\$201,240	\$4,829,760
An analysis will be performed to determine commodity requirements.								
Site Labor	Labor			\$84 / hour	80 hours	24 sites	\$6,708	\$160,992
Involvement with industry group activities.								
Site Labor	Labor			\$84 / hour	788 hours	24 sites	\$66,032	\$1,584,765
Procedure setpoint calculations (Procedure entry, exit, and decision criteria) and other engineering support.								
Site Labor	Labor			\$84 / hour	1,000 hours	24 sites	\$83,850	\$2,012,400

Appendix I. Order EA-12-049 Costs - PWR 2-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL OPERATIONS COSTS								
Programmatic Controls								
Provide 6-month status reports on implementation of mitigation strategies.								
Site Labor	Labor			\$84 / hour	150 hours	24 sites	\$12,578	\$301,860
Maintenance and testing.								
Site Labor	Labor			\$84 / hour	400 hours	24 sites	\$33,540	\$804,960
Training will be performed in 2014, and will be implemented in accordance with the Systematic Approach to Training. The training modules for personnel that will be responsible for implementing the FLEX strategies, and ERO personnel will be implemented and maintained per existing training programs. The details, objectives, frequency, and success measures will follow the plant's SAT process.								
Site Labor	Labor			\$84 / hour	1,750 hours	24 sites	\$146,738	\$3,521,700
Change control.								
Site Labor	Labor			\$84 / hour	240 hours	24 sites	\$20,124	\$482,976
Maintenance of the FLEX Support Guidelines.								
Contractor				\$84 / hour	312 hours	24 sites	\$26,161	\$627,869
Licensee's share of RRC ongoing costs (staffing, rent, testing and maintenance).								
RRC Maintenance	Licensee's share of RRC ongoing costs			\$129,000 / unit	1 unit	24 sites	\$129,000	\$3,096,000
Licensee's share of RRC transportation costs (first 3 years).								
RRC Transportation	Licensee's share of RRC transportation costs (first 3 years)			\$184,000 / unit	1 unit	24 sites	\$184,000	\$4,416,000
Licensee's share of RRC transportation costs (after first 3 years).								
RRC Transportation	Licensee's share of RRC transportation costs (after first 3 years)			\$15,000 / unit	1 unit	24 sites	\$15,000	\$360,000

Appendix J. Costs for a PWR 3-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL IMPLEMENTATION COSTS								
Initial Response								
Harden and protect the dedicated shutdown diesel generator to provide power to Motor Control Center.								
Site Equipment	Building material or prefabricated structures	\$20,000 / unit	\$20,000 / unit	\$20,000 / unit	3 units	2 sites	\$60,000	\$120,000
Site Labor	Labor			\$84 / hour	1,200 hours	2 sites	\$100,620	\$201,240
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,200 hours	2 sites	\$99,144	\$198,288
Install a robust, shielded connection on each RMWST that extends through the RMWST shield building providing two diverse connections for transferring the RMWST inventory to the CST.								
Site Equipment	Connection	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	6 units	2 sites	\$4,500,000	\$9,000,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	300 hours	2 sites	\$15,528	\$31,056
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,500 hours	2 sites	\$123,930	\$247,860
Upgrade non-seismic condensate transfer pump suction nozzle to seismic qualification to increase CST inventory availability time to 40 hours.								
Site Equipment	Seismic condensate transfer pump suction nozzle	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	3 units	2 sites	\$6,000	\$12,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	300 hours	2 sites	\$15,528	\$31,056
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	600 hours	2 sites	\$49,572	\$99,144
Construct a seismic, missile-protected emergency water storage tank (EWST).								
Site Equipment	Emergency Water Storage Tank (EWST)	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	3 units	2 sites	\$474,000	\$948,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	10,800 hours	2 sites	\$559,008	\$1,118,016
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,500 hours	2 sites	\$123,930	\$247,860
Construct a seismic, missile-protected tank to provide a protected water source for core cooling and heat removal strategies. A diesel-powered feedwater pump will supply the water to the AFW system piping. Flow distribution instrumentation will be required during the ELAP.								
Site Equipment	Tank	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	3 units	2 sites	\$474,000	\$948,000
Site Equipment	Diesel-powered feedwater pump	\$50,000 / unit	\$50,000 / unit	\$50,000 / unit	3 units	2 sites	\$150,000	\$300,000
Site Equipment	Flow distribution instrumentation	\$30,000 / unit	\$30,000 / unit	\$30,000 / unit	3 units	2 sites	\$90,000	\$180,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	6,000 hours	2 sites	\$310,560	\$621,120
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	3,000 hours	2 sites	\$247,860	\$495,720
Install clean water receiver tank (CWRT) (high wind/missile protected and contains borated water).								
Site Equipment	Tank	\$130,000 / unit	\$186,000 / unit	\$158,000 / unit	3 units	2 sites	\$474,000	\$948,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	10,800 hours	2 sites	\$559,008	\$1,118,016
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,500 hours	2 sites	\$123,930	\$247,860
Modify power controls for SG PORVs from a dc-powered instrument bus to allow for continued operation from the MCR.								
Site Labor	Mechanical Door			\$52 / hour	360 hours	2 sites	\$18,684	\$37,368
Install permanent nitrogen bottle racks near each SG PORV operating station with hose and regulators to align for control to remain available in the control room.								
Site Equipment	Nitrogen bottle racks	\$5,000 / unit	\$5,000 / unit	\$5,000 / unit	6 units	2 sites	\$30,000	\$60,000
Site Labor	Labor			\$84 / hour	48 hours	2 sites	\$4,025	\$8,050
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	600 hours	2 sites	\$49,572	\$99,144
Install Westinghouse low-leakage RCP seals.								
Site Equipment	Low-leakage RCP seals.	\$58,000 / unit	\$58,000 / unit	\$58,000 / unit	12 units	2 sites	\$696,000	\$1,392,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	240 hours	2 sites	\$12,422	\$24,845
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,200 hours	2 sites	\$99,144	\$198,288

Appendix J. Order EA-12-049 Costs - PWR 3-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Seismically upgrade the Alternate Seal Injection (ASI) system and add an ASI pump discharge path to the CVCS charging header.								
Site Equipment	Seismic piping and a connection to the charging header	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	3 units	2 sites	\$30,000	\$60,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	240 hours	2 sites	\$12,422	\$24,845
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	600 hours	2 sites	\$49,572	\$99,144
Onsite Portable Equipment								
Procure portable FLEX equipment (N+1).								
Site Equipment	Vehicles	\$24,000 / unit	\$35,000 / unit	\$30,000 / unit	3 units	2 sites	\$90,000	\$180,000
Site Equipment	480 Vac diesel generators (480 kW)	\$75,000 / unit	\$125,000 / unit	\$100,000 / unit	4 units	2 sites	\$400,000	\$800,000
Site Equipment	480 Vac diesel generators (200 kW)	\$50,000 / unit	\$101,000 / unit	\$77,000 / unit	4 units	2 sites	\$308,000	\$616,000
Site Equipment	120 Vac diesel generators (15 kW)	\$5,000 / unit	\$10,000 / unit	\$8,000 / unit	4 units	2 sites	\$32,000	\$64,000
Site Equipment	Self-powered CST FLEX pumps	\$6,000 / unit	\$6,000 / unit	\$6,000 / unit	4 units	2 sites	\$24,000	\$48,000
Site Equipment	Self-powered SG FLEX pumps	\$6,000 / unit	\$6,000 / unit	\$6,000 / unit	4 units	2 sites	\$24,000	\$48,000
Site Equipment	Self-powered SFP FLEX pumps (200% capacity)	\$6,000 / unit	\$6,000 / unit	\$6,000 / unit	4 units	2 sites	\$24,000	\$48,000
Site Equipment	Electric motor-driven Mode 1-4 RCS FLEX pumps	\$3,000 / unit	\$3,000 / unit	\$3,000 / unit	4 units	2 sites	\$12,000	\$24,000
Site Equipment	Electric motor-driven Mode 5-6 RCS FLEX pumps	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	4 units	2 sites	\$4,000	\$8,000
Site Equipment	Electric motor-driven diesel fuel FLEX pumps	\$500 / unit	\$1,000 / unit	\$700 / unit	4 units	2 sites	\$2,800	\$5,600
Site Equipment	Flatbed trailers	\$8,000 / unit	\$18,000 / unit	\$12,000 / unit	4 units	2 sites	\$48,000	\$96,000
Site Equipment	Trailers with Fuel Tank	\$3,000 / unit	\$8,000 / unit	\$6,000 / unit	4 units	2 sites	\$24,000	\$48,000
Site Equipment	Portable fuel containers	\$20 / unit	\$60 / unit	\$40 / unit	4 units	2 sites	\$160	\$320
Site Equipment	Monitor spray nozzles for SFP spray	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	3 units	2 sites	\$3,000	\$6,000
Site Equipment	Hose and fittings	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	3 units	2 sites	\$6,000	\$12,000
Site Equipment	Strainers	\$10 / unit	\$20 / unit	\$10 / unit	3 units	2 sites	\$30	\$60
Site Equipment	Communications Gear: Docking Station	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	3 units	2 sites	\$6,000	\$12,000
Site Equipment	Communications Gear: Mobile phones	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	3 units	2 sites	\$3,000	\$6,000
Site Equipment	Communications Gear: Emergency kits	\$1,000 / unit	\$3,000 / unit	\$2,000 / unit	15 units	2 sites	\$30,000	\$60,000
Site Equipment	Communications Gear: Fixed mast antennas	\$200 / unit	\$300 / unit	\$200 / unit	6 units	2 sites	\$1,200	\$2,400
Site Equipment	Communications Gear: Antenna cable	\$100 / unit	\$1,000 / unit	\$600 / unit	6 units	2 sites	\$3,600	\$7,200
Site Equipment	Communications Gear: Rechargeable batteries	\$80 / unit	\$100 / unit	\$100 / unit	45 units	2 sites	\$4,500	\$9,000
Site Equipment	Communications Gear: Four-bay satellite phone battery chargers	\$500 / unit	\$600 / unit	\$600 / unit	24 units	2 sites	\$14,400	\$28,800
Site Equipment	Communications Gear: Single-bay satellite phone battery chargers	\$200 / unit	\$200 / unit	\$200 / unit	24 units	2 sites	\$4,800	\$9,600
Site Equipment	Communications Gear: DC automobile outlet charger cords to charge single- and four-bay battery chargers	\$20 / unit	\$20 / unit	\$20 / unit	24 units	2 sites	\$480	\$960
Site Equipment	Communications Gear: Solar panel chargers	\$200 / unit	\$200 / unit	\$200 / unit	12 units	2 sites	\$2,400	\$4,800
Site Equipment	Portable ventilation fans	\$2,000 / unit	\$2,000 / unit	\$2,000 / unit	12 units	2 sites	\$24,000	\$48,000
Site Equipment	Portable air compressors	\$13,000 / unit	\$13,000 / unit	\$13,000 / unit	3 units	2 sites	\$39,000	\$78,000
Site Equipment	Fuel transfer hoses	\$3,000 / unit	\$4,000 / unit	\$3,000 / unit	3 units	2 sites	\$9,000	\$18,000
Site Equipment	Radiation protection equipment: Survey equipment	\$500 / unit	\$4,000 / unit	\$2,000 / unit	60 units	2 sites	\$120,000	\$240,000
Site Equipment	Radiation protection equipment: Dosimetry	\$100 / unit	\$100 / unit	\$100 / unit	60 units	2 sites	\$6,000	\$12,000
Site Equipment	Commodities: Food	\$5,000 / unit	\$6,000 / unit	\$5,000 / unit	3 units	2 sites	\$15,000	\$30,000
Site Equipment	Commodities: Water	\$400 / unit	\$400 / unit	\$400 / unit	6 units	2 sites	\$2,400	\$4,800
Install diverse suction connections and fill connections on each CST. Install seismically-rugged new pipes and equipment used to provide core cooling and heat removal to the SG.								
Site Equipment	Suction connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	12 units	2 sites	\$900,000	\$1,800,000
Site Equipment	Fill connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	12 units	2 sites	\$900,000	\$1,800,000
Site Equipment	Pipes	\$1,000 / unit	\$1,000 / unit	\$1,000 / unit	3 units	2 sites	\$3,000	\$6,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	600 hours	2 sites	\$31,056	\$62,112
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	3,000 hours	2 sites	\$247,860	\$495,720

Appendix J. Order EA-12-049 Costs - PWR 3-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Install connection points downstream of the charging pump discharge header for connecting the Mode 1-4 RCS FLEX pump for reactivity control and RCS inventory control or Mode 5-6 RCS FLEX pump for core cooling and RCS inventory control.								
Site Equipment	Connection points	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	6 units	2 sites	\$450,000	\$900,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	240 hours	2 sites	\$12,422	\$24,845
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	3,000 hours	2 sites	\$247,860	\$495,720
Add branch connections with quick disconnect fittings to the boric acid transfer pump suction header. Install permanent piping from boric acid tank room to CVCS crosstie. Provide a branch from the CVCS drain line to allow a connection point. Modify vent connection downstream from boron injection tanks for portable pump connection. Resize the CVCS crosstie drain line to four inch piping.								
Site Equipment	Branch connections with quick disconnect fittings	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	6 units	2 sites	\$450,000	\$900,000
Site Equipment	Piping	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	3 units	2 sites	\$30,000	\$60,000
Site Equipment	Connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	3 units	2 sites	\$225,000	\$450,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	600 hours	2 sites	\$31,056	\$62,112
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	3,000 hours	2 sites	\$247,860	\$495,720
Add FLEX pump discharge connection points to both trains of the ESW system.								
Site Equipment	Connection points	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	6 units	2 sites	\$450,000	\$900,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	240 hours	2 sites	\$12,422	\$24,845
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,200 hours	2 sites	\$99,144	\$198,288
Install a connection point downstream of the EFW Pump.								
Site Equipment	Connection point	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	3 units	2 sites	\$225,000	\$450,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	120 hours	2 sites	\$6,211	\$12,422
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,200 hours	2 sites	\$99,144	\$198,288
Modify spare breaker BE 113 (preferred) and BF109 (alternate) for 480V FLEX diesel generator connection. Install new vertical section on switchgear C1 (preferred) and DI (alternate) for 4160V FLEX diesel generator connection.								
Site Labor	Labor (Electricians)			\$52 / hour	120 hours	2 sites	\$6,180	\$12,360
For deployment of the 4160 V FLEX diesel generator, stage the DG North of the diesel generator building. For the preferred connection, it will route a cable via a new penetration through the north wall of the Auxiliary Building. For the alternate connection, the cable will be routed through the main door of the Auxiliary building. The cable will connect to a FLEX connection panel installed in the room. The panel will be permanently wired with Class 1E cable through an existing cable raceway.								
Site Equipment	Cables	\$200 / unit	\$600 / unit	\$400 / unit	9 units	2 sites	\$3,600	\$7,200
Site Equipment	Connection panel	\$100,000 / unit	\$100,000 / unit	\$100,000 / unit	3 units	2 sites	\$300,000	\$600,000
Site Equipment	Class 1E cable	\$100 / unit	\$100 / unit	\$100 / unit	3,000 units	2 sites	\$300,000	\$600,000
Site Equipment	Medium voltage (MV) cable connectors	\$80 / unit	\$80 / unit	\$80 / unit	45 units	2 sites	\$3,600	\$7,200
Site Labor	Labor (Electricians)			\$52 / hour	480 hours	2 sites	\$24,720	\$49,440
Install supply and return connections of the Train A containment cooler service water piping outside containment to supply supplemental cooling to the containment fan coolers.								
Site Equipment	Connections	\$75,000 / unit	\$75,000 / unit	\$75,000 / unit	6 units	2 sites	\$450,000	\$900,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	300 hours	2 sites	\$15,528	\$31,056
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,200 hours	2 sites	\$99,144	\$198,288

Appendix J. Order EA-12-049 Costs - PWR 3-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Route a new header directly to the Spent Fuel Pool just above the normal water level. The header will be routed outside via a penetration through the Fuel Handling Area west wall and will terminate in a blind flange or Storz quick connection. A manual isolation valve will be located just inside the Fuel Handling Area train bay door.								
Site Equipment	Header (pipe)	\$10,000 / unit	\$10,000 / unit	\$10,000 / unit	3 units	2 sites	\$30,000	\$60,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	300 hours	2 sites	\$15,528	\$31,056
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	600 hours	2 sites	\$49,572	\$99,144
SFP spray will be required. A permanent modification to install spray nozzles in the Fuel Handling Building will be made. These nozzles will be mounted on the walls approximately 20 ft above the deck, and pointed at the pool. A hard pipe line will be routed from the nozzles to the installed header for the preferred SFP makeup strategy and will utilize the same connection point located outside the Auxiliary Building. In order to keep the functions separate, the SFP Spray line will connect upstream of the isolation valve on the SFP makeup header and will also have a manual isolation valve. Flow rate requirements will be much greater for SFP spray than for makeup. For this reason, suction will be taken from the Intake Canal for this strategy.								
Site Equipment	Hard pipe line	\$50,000 / unit	\$50,000 / unit	\$50,000 / unit	3 units	2 sites	\$150,000	\$300,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	300 hours	2 sites	\$15,528	\$31,056
Site Labor	Engineering and design (Mechanical Engineer)			\$83 / hour	1,500 hours	2 sites	\$123,930	\$247,860
Offsite Portable Equipment								
Licensee's share of RRC costs.								
RRC Equipment	Licensee's share of RRC equipment costs			\$874,000 / unit	1 unit	2 sites	\$874,000	\$1,748,000
RRC Setup	Licensee's share of RRC setup costs			\$283,000 / unit	1 unit	2 sites	\$283,000	\$566,000
Procure offsite Phase 3 equipment.								
Site Equipment	Radiation protection equipment: Survey equipment	\$500 / unit	\$4,000 / unit	\$2,000 / unit	60 units	2 sites	\$120,000	\$240,000
Site Equipment	Radiation protection equipment: Dosimetry	\$100 / unit	\$100 / unit	\$100 / unit	60 units	2 sites	\$6,000	\$12,000
Site Equipment	Commodities: Food	\$5,000 / unit	\$6,000 / unit	\$5,000 / unit	3 units	2 sites	\$15,000	\$30,000
Site Equipment	Commodities: Water	\$400 / unit	\$400 / unit	\$400 / unit	6 units	2 sites	\$2,400	\$4,800
Modify 4,160 Vac bus T11A/D to allow connection of external 4,160 Vac portable diesel generator.								
Site Equipment	Connection point	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	3 units	2 sites	\$2,250,000	\$4,500,000
Site Labor	Labor (Electricians)			\$52 / hour	300 hours	2 sites	\$15,450	\$30,900
Supporting Functions								
Upgrade the installed Self-Contained DC Emergency Lighting units with LED lamps.								
Site Equipment	LED lamps	\$100 / unit	\$100 / unit	\$100 / unit	36 units	2 sites	\$3,600	\$7,200
Site Labor	Labor (Electricians)			\$52 / hour	120 hours	2 sites	\$6,180	\$12,360
A connection will be made to a drain line located on the supply line to the EDG from the associated EDG day tank.								
Site Equipment	Connection	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	3 units	2 sites	\$2,250,000	\$4,500,000
Site Labor	Labor (Plumbers, Pipefitters, and Steamfitters)			\$52 / hour	120 hours	2 sites	\$6,211	\$12,422
Add connection points at Diesel fuel Oil Storage Tanks 4-inch flanges downstream of valves to support transfer of inventory for use in FLEX equipment.								
Site Equipment	Connection points	\$750,000 / unit	\$750,000 / unit	\$750,000 / unit	6 units	2 sites	\$4,500,000	\$9,000,000
Site Labor	Labor			\$52 / hour	300 hours	2 sites	\$15,528	\$31,056

Appendix J. Order EA-12-049 Costs - PWR 3-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
External Event Considerations								
Preparation for staging FLEX equipment can involve identifying staging areas, leveling staging areas, building a structure to temporarily hold equipment, fitting in FLEX equipment into the plant as a prestaged item.								
Contractor	Staging area	\$604,000 / unit	\$3,000,000 / unit	\$604,000 / unit	3 units	2 sites	\$1,812,000	\$3,624,000
Two FLEX storage locations will be provided for the storage of the related FLEX equipment. The FLEX equipment will be protected in accordance with NEI 12-06, Section 5.3.1.								
Contractor	Storage building	\$1,700,000 / unit	\$3,000,000 / unit	\$2,350,000 / unit	4 units	2 sites	\$9,400,000	\$18,800,000
Programmatic Controls								
Develop the Overall Integrated Plan. Perform a site-specific evaluation determining baseline coping capabilities, applicable extreme external hazards, and needed enhancements to mitigate an ELAP/LUHS event such that no fuel damage occurs.								
Site Labor	Labor			\$84 / hour	6,000 hours	2 sites	\$503,100	\$1,006,200
Develop strategies (playbook) with RRC.								
Site Labor	Labor			\$84 / hour	480 hours	2 sites	\$40,248	\$80,496
Develop/conduct a staffing analysis.								
Site Labor	Labor			\$84 / hour	480 hours	2 sites	\$40,248	\$80,496
Develop and implement FLEX Support Guidelines. Develop procedures to read instruments locally. Procedures on re-powering hydrogen igniters in Procedure 05-S-01-STRTEFY, Alternative Strategies. Enhanced battery load shedding guidance will be incorporated into station procedures for loss of ac power to extend the wavailability of dc power.								
Site Labor	Labor			\$84 / hour	8,000 hours	2 sites	\$670,800	\$1,341,600
Modify plant procedures to take into account FLEX Support Guidelines. Procedures to be considered include EOP, EDMG, and SAMG strategies.								
Site Labor	Labor			\$84 / hour	1,600 hours	2 sites	\$134,160	\$268,320
Modify existing plant configuration control procedures to ensure that changes to the plant design physical layout, roads, buildings, and miscellaneous structures will not adversely affect the approved FLEX strategies.								
Site Labor	Labor			\$84 / hour	400 hours	2 sites	\$33,540	\$67,080
Create maintenance and testing procedures.								
Site Labor	Labor			\$84 / hour	1,400 hours	2 sites	\$117,390	\$234,780
Develop training programs for operation of FLEX equipment.								
Contractor	Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	2 sites	\$250,000	\$500,000
Develop training modules for personnel that will be responsible for implementing the FLEX strategies, and ERO personnel will be developed to ensure personnel proficiency in the mitigation of beyond-design-basis external events (BDBEEs).								
Contractor	Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	2 units	2 sites	\$375,000	\$750,000
Develop design requirements and supporting analysis for portable FLEX equipment.								
Site Labor	Labor			\$84 / hour	2,800 hours	2 sites	\$234,780	\$469,560
An analysis will be performed to determine commodity requirements.								
Site Labor	Labor			\$84 / hour	80 hours	2 sites	\$6,708	\$13,416
Involvement with industry group activities.								
Site Labor	Labor			\$84 / hour	825 hours	2 sites	\$69,176	\$138,353
Procedure setpoint calculations (Procedure entry, exit, and decision criteria) and other engineering support.								
Site Labor	Labor			\$84 / hour	1,000 hours	2 sites	\$83,850	\$167,700

Appendix J. Order EA-12-049 Costs - PWR 3-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL OPERATIONS COSTS								
Programmatic Controls								
Provide 6-month status reports on implementation of mitigation strategies.								
Site Labor	Labor			\$84 / hour	200 hours	2 sites	\$16,770	\$33,540
Maintenance and testing.								
Site Labor	Labor			\$84 / hour	400 hours	2 sites	\$33,540	\$67,080
Training will be performed in 2014, and will be implemented in accordance with the Systematic Approach to Training. The training modules for personnel that will be responsible for implementing the FLEX strategies, and ERO personnel will be implemented and maintained per existing training programs. The details, objectives, frequency, and success measures will follow the plant's SAT process.								
Site Labor	Labor			\$84 / hour	2,500 hours	2 sites	\$209,625	\$419,250
Change control.								
Site Labor	Labor			\$84 / hour	320 hours	2 sites	\$26,832	\$53,664
Maintenance of the FLEX Support Guidelines.								
Site Labor	Labor			\$84 / hour	384 hours	2 sites	\$32,198	\$64,397
Licensee's share of RRC ongoing costs (staffing, rent, testing and maintenance).								
RRC Maintenance	Licensee's share of RRC ongoing costs			\$129,000 / unit	1 unit	2 sites	\$129,000	\$258,000
Licensee's share of RRC transportation costs (first 3 years).								
RRC Transportation	Licensee's share of RRC transportation costs (first 3 years)			\$184,000 / unit	1 unit	2 sites	\$184,000	\$368,000
Licensee's share of RRC transportation costs (after first 3 years).								
RRC Transportation	Licensee's share of RRC transportation costs (after first 3 years)			\$15,000 / unit	1 unit	2 sites	\$15,000	\$30,000

Appendix K. Costs for a AP1000 2-Unit Site

ACTIVITY	UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL IMPLEMENTATION COSTS							
Initial Response							
None							
	\$0	\$0	\$0		2 sites	\$0	\$0
Onsite Portable Equipment							
None							
	\$0	\$0	\$0		2 sites	\$0	\$0
Offsite Portable Equipment							
None							
			\$0		2 sites	\$0	\$0
Supporting Functions							
None							
	\$0	\$0	\$0		2 sites	\$0	\$0
External Event Considerations							
None							
	\$0	\$0	\$0		2 sites	\$0	\$0

Appendix K. Order EA-12-049 Costs - AP1000 Two-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
Programmatic Controls								
Develop the Overall Integrated Plan. Perform a site-specific evaluation determining baseline coping capabilities, applicable extreme external hazards, and needed enhancements to mitigate an ELAP/LUHS event such that no fuel damage occurs.								
Site Labor	Labor			\$80 / hour	5,000 hours	2 sites	\$400,000	\$800,000
Develop strategies (playbook) with RRC.								
Site Labor	Labor			\$84 / hour	400 hours	2 sites	\$33,540	\$67,080
Develop/conduct a staffing analysis.								
Site Labor	Labor			\$84 / hour	480 hours	2 sites	\$40,248	\$80,496
Develop and implement FLEX Support Guidelines. Develop procedures to read instruments locally. Procedures on re-powering hydrogen igniters in Procedure 05-S-01-STRTEFY, Alternative Strategies. Enhanced battery load shedding guidance will be incorporated into station procedures for loss of ac power to extend the wavailability of dc power.								
Site Labor	Labor			\$84 / hour	6,000 hours	2 sites	\$503,100	\$1,006,200
Modify plant procedures to take into account FLEX Support Guidelines. Procedures to be considered include EOP, EDMG, and SAMG strategies.								
Site Labor	Labor			\$84 / hour	1,200 hours	2 sites	\$100,620	\$201,240
Modify existing plant configuration control procedures to ensure that changes to the plant design physical layout, roads, buildings, and miscellaneous structures will not adversely affect the approved FLEX strategies.								
Site Labor	Labor			\$84 / hour	800 hours	2 sites	\$67,080	\$134,160
Create maintenance procedures.								
Site Labor	Labor			\$84 / hour	1,200 hours	2 sites	\$100,620	\$201,240
Develop training programs for operation of FLEX equipment.								
Contractor	Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	2 sites	\$250,000	\$500,000
Develop training modules for personnel that will be responsible for implementing the FLEX strategies, and ERO personnel will be developed to ensure personnel proficiency in the mitigation of beyond-design-basis external events (BDBEEs).								
Contractor	Training Development	\$250,000 / unit	\$250,000 / unit	\$250,000 / unit	1 unit	2 sites	\$300,000	\$600,000
Develop design requirements and supporting analysis for portable FLEX equipment.								
Site Labor	Labor			\$84 / hour	2,400 hours	2 sites	\$201,240	\$402,480
An analysis will be performed to determine commodity requirements.								
Site Labor	Labor			\$84 / hour	80 hours	2 sites	\$6,708	\$13,416
Involvement with industry group activities								
Site Labor	Labor			\$84 / hour	788 hours	12 sites	\$66,032	\$792,383
Procedure setpoint calculations (Procedure entry, exit, and decision criteria) and other engineering support.								
Site Labor	Labor			\$84 / hour	1,250 hours	12 sites	\$104,813	\$1,257,750

Appendix K. Order EA-12-049 Costs - AP1000 Two-Unit Site

ACTIVITY		UNIT COST (min)	UNIT COST (max)	UNIT COST (best estimate)	QUANTITY/ HOURS	AFFECTED ENTITIES	COST PER AFFECTED SITE	TOTAL COST
INCREMENTAL OPERATIONS COSTS								
Programmatic Controls								
Provide 6-month status reports on implementation of mitigation strategies.								
Site Labor	Labor			\$84 / hour	150 hours	2 sites	\$12,578	\$25,155
Maintenance and testing.								
Site Labor	Labor			\$84 / hour	400 hours	2 sites	\$33,540	\$67,080
Training will primarily consist of the typical objective-based procedure training that operators receive on these procedures and guidelines accompanied by simulator scenario training that integrate these hypothetical events. The training for the FLEX aspects of the AP1000 design will build upon the training that is already required for the post 72-hour operational requirements.								
Training material for classroom presentation and simulator scenarios need to be developed in accordance with the systems approach to training as delineated in 10 CFR 55.4.								
Site Labor	Labor			\$84 / hour	1,750 hours	2 sites	\$146,738	\$293,475
Change control.								
Site Labor	Labor			\$84 / hour	300 hours	2 sites	\$25,155	\$50,310
Maintenance of the FLEX Support Guidelines.								
Site Labor	Labor			\$84 / hour	312 hours	2 sites	\$26,161	\$52,322

Appendix L. NRC Costs

Activity	Annual Labor Rate	Estimated FTE (Annualized)	Total Costs
NRC IMPLEMENTATION (ONE-TIME)			
Licensing activities.	\$176,000/FTE	3.0 FTE	\$528,000
Subtotal		3.0 FTE	\$528,000
NRC OPERATIONS (ANNUAL)			
Inspection activities.	\$176,000/FTE	3.0 FTE	\$528,000
Subtotal		3.0 FTE	\$528,000
Total NRC Cost			\$1,056,000

Appendix M. Equipment and Supplies Unit Cost References

	Equipment and Supplies	Source	Website	Unit Cost	Notes	Comments	Date Accessed
1	Air Compressor	All Cost	http://www.allcostdata.info/search.html?b2dbsSearch=diesel+air+compressors	\$1,406	a	100 cfm, 35 hp	10/3/2013
				\$2,089	a	175 cfm, 65 hp	
				\$6,763	a	600 cfm, 200 hp	
		Atlas Copco	http://www.atlascopco.us/usus/products/Product.aspx?id=2750262&productgroupid=3511437	\$13,200		185 cfm	10/7/2013
		RS Means: Building Construction Data, 2005		\$895	a, b, c	diesel engine, rotary screw. 250 cfm	10/24/2013
				\$1,145	a, b, c	diesel engine, rotary screw. 365 cfm	
				\$1,372	a, b, c	diesel engine, rotary screw. 450 cfm	
				\$2,266	a, b, c	diesel engine, rotary screw. 600 cfm	
				\$2,386	a, b, c	diesel engine, rotary screw. 750 cfm	
		All Cost	http://www.allcostdata.info/search.html?b2dbsSearch=diesel+air+compressors	\$1,406	a	100 cfm, 35 hp	10/3/2013
				\$2,089	a	175 cfm, 65 hp	
				\$6,763	a	600 cfm, 200 hp	
		Atlas Copco	http://www.atlascopco.us/usus/products/Product.aspx?id=2750262&productgroupid=3511437	\$13,200		185 cfm	10/7/2013
		RS Means: Building Construction Data, 2005		\$347	a, b, c	60 cfm	10/24/2013
				\$447	a, b, c	160 cfm	
2	Air Compressor Piping	Northern Tool & Equipment	http://www.northerntool.com/shop/tools/product_200366544_200366544?cm_ven=natural&cm_cat=netconcepts&cm_pla=Google&cm_ite=	\$50		0.5", 100' roll	10/29/2013
			http://www.northerntool.com/shop/tools/product_200484021_200484021?cm_ven=natural&cm_cat=netconcepts&cm_pla=Google&cm_ite=	\$140		0.75". 100' roll of HDPE/Aluminum core tubing	10/29/2013
3	Auxiliary Steam Supply Line	NRC estimate		\$1,000,000			2/23/2014
4	Boron Mixing System	NRC estimate		\$20,000			2/23/2014
5	Building Material or Prefabricated Structures	Independent expert		\$20,000			3/24/2014
6	Cable Connector	Independent expert		\$75			3/22/2014
7	Cable Sets	Independent expert		\$2,000			3/22/2014
				\$6,000			
		Northern Tool & Equipment	http://www2.northerntool.com/generators/generator-accessories/generator-cordsets-plugs-3.htm	\$200		Reliance Generator Power Cord, 50 A, 10'	10/11/2013
				\$600		CEP All-Weather Power Cord, 50 A, 10'	
8	Connection Line	Independent expert		\$166,667			3/24/2014
		NRC estimate		\$100,000			2/23/2014
9	Connection Panel	NRC estimate		\$100,000			2/23/2014
10	Cross-Tie Piping	Independent expert		\$166,667			3/24/2014
		NUREG/CR-2800, "Guidelines for Nuclear Power Plant Safety Issue Prioritization Information Development," U.S. Nuclear Regulatory Commission		\$405,859			2/18/2014

Appendix M. Order EA-12-049 - Equipment and Supplies Unit Cost References

	Equipment and Supplies	Source	Website	Unit Cost	Notes	Comments	Date Accessed
11	Deployable, Mobile, Rechargeable Communications Kit Supporting Satellite and Radio Communications.	Satwest	http://www.satwest.com/Iridium_Emergency_Phone_Kit_Solar_Charger_p/ekit-9595ae.htm	\$2,619		Iridium 9555 Emergency Kit, Ac & DC charger, solar charger, auxilliary antenna, antenna adaptor, pelican case	1/15/2014
		Satphonestore	http://www.satphonestore.com/iridium-9555-packages/iridium-9505a-emergency-package.html	\$1,895		Iridium 9555, pelican case, 2 batteries, ac travel charger, dc charger, magnet mount antenna, antenna adapter, solar charger	1/15/2014
		Northern Axxess Satellite Communications	http://www.northernaxcess.com/satellite-communication-products/satellite-phones/iridium-satellite-phones/iridium-9555-satellite-phone-adventure-package-pelican-case-solar-panel/	\$1,349		Iridium 9555, AC/DC chargers, auxiliary antenna adapter, portable auxiliary antenna, pelican case, solar panel	1/15/2014
		Satellite Phone Depot	http://www.satellite-phone-depot.com/dk050-iridium-9555-satellite-phone-docking-0509555.html	\$1,799		Iridium 9555 Phone Docking Station	1/15/2014
		Global Satellite	https://www.globalsatellite.us/products/iridium-9555	\$1,356		Iridium 9555, 143 mm x 55mm x 30mm, 266 g,	12/2/2013
		XSAT	http://www.xsatshop.com/iridium-satellite-phones.html	\$1,149		Iridium 9555, 143 mm x 55 mm x 30 mm, 266 g,	12/2/2013
		Satphonestore	http://www.satphonestore.com/application-browsing/satellite-phones/satellite-phone-accessories/accessories-antennas/iridium-maastmount-antenna.html	\$250		Iridium fixed mast antenna	1/15/2014
		Mackay	http://www.mackaysatellite.com/iridium-accessory-9505-9505a-9555-9575-fixed-mast-antenna-at1621142.html	\$225		Iridium fixed mast antenna	1/15/2014
		Satcom Store	http://satcomstore.com/9555-handheld-phone-rechargeable-li-ion-battery-bat20801	\$80		Iridium 9555 rechargeable battery	1/15/2014
		TR Telecom	http://www.trtelecom.com.au/iridium-9555-rechargeable-battery	\$119		Iridium 9555 rechargeable battery	1/15/2014
		GMPCS Personal Communications	http://www.gmpcs-us.com/Accessory/9555-Rechargeable-Li-ion-Battery.htm	\$92		Iridium 9555 rechargeable battery	1/15/2014
		Bluecosmo Satellite Communications	http://www.bluecosmo.com/satellite-accessories/batteries-chargers/satstation-iridium-9555-bat20801-four-bay-battery-charger	\$500		Iridium 9555 Four-Bay Battery Charger	1/15/2014
		SatTrans	http://www.sattransusa.com/irid-chrg-ss4-9555.html	\$565		Iridium 9555 Four-Bay Battery Charger	1/15/2014
		Northern Axxess Satellite Communications	http://www.northernaxcess.com/satellite-communication-products/satellite-accessories/external-battery-chargers/satstation-four-bay-battery-charger-for-iridium-9575-extreme-9555-9505a-9505-9500-satellite-phones/	\$575		Iridium 9555 Four-Bay Battery Charger	1/15/2014
		GMPCS Personal Communications	http://www.gmpcs-us.com/Accessory/Four-Bay-Set-For-9555-Charger.htm	\$575		Iridium 9555 Four-Bay Battery Charger	1/15/2014
		Satcom Store	http://satcomstore.com/iridium-9555-four-bay-charger	\$565		Iridium 9555 Four-Bay Battery Charger	1/15/2014
		Satphonestore	http://www.satphonestore.com/satstation-iridumbatterycharger-single-bay-bat20801.html	\$155		Iridium 9555 Single-Bay Battery Charger	1/15/2014
		Satcom Store	http://satcomstore.com/iridium-9555-single-bay-charger	\$155		Iridium 9555 Single-Bay Battery Charger	1/15/2014
		Roadpost Satcom	http://www.roadpost.com/Nomad-135-Solar-Panel-P769C333.aspx?UserID=128797385&SessionID=7a4cvNHT9bCJ8GWX4vV2	\$229		Solar Powered battery charger compatible Iridium 9555	1/15/2014
		SatTrans	http://www.sattransusa.com/ir95ac.html	\$199		Solar Powered battery charger compatible Iridium 9556	1/15/2014

Appendix M. Order EA-12-049 - Equipment and Supplies Unit Cost References

	Equipment and Supplies	Source	Website	Unit Cost	Notes	Comments	Date Accessed
		MJ Sales, Inc.	http://www.mjsales.net/itemsearch.asp?FamilyID=852	\$20		DC Cigarette iridium battery charger cord for single and four bay iridium chargers	1/15/2014
		M-Cramer Satellitenservices	http://www.m-cramer-shop.de/index.php?manufacturers_id=55&sort=6a&f	\$1,095	d	40 m antenna cable for active antennas (converted from eurozone - euro)	2/19/2014
		Satphone	http://store.satphone.co.uk/Catalog/Fleet-Phone/IsatDOCK-Cable-Kit-ACTIVE-40m	\$678	d	IsatDOCK 40m active antenna cable kit (converted from UK - pound sterling)	2/19/2014
		MJ Sales, Inc.	https://www.mjsales.net/items.asp?FamilyID=1036&this_Cat1ID=281&Cat2ID=98	\$123		40 m (131 ft) main antenna coax cable for AD-511 Iridium Active Antenna	2/19/2014
12	Diesel Fuel Tank (Portable)	Equipmentland	http://www.equipmentland.com/product_images/vendor_images/transcube/TransCube-Fuel-Tanks-EQL.pdf	\$4,768		264 gallons	5/21/2014
		Generator Joe	http://www.generatorjoe.net/product.asp?0=674&1=693&3=3760	\$5,949		265 gallons	5/21/2014
13	Diesel Fuel Transfer Pump	Grainger	http://www.grainger.com/product/GPI-Fuel-Transfer-Fuel-Pump-WP35695/_/N-hu2Z1z0nj1o?_=1386863567018&s_pp=false	\$744		25 gpm, 12 Vdc	12/12/2013
				\$879		25 gpm, 12 Vdc	12/12/2013
			http://www.grainger.com/product/FILL-RITE-Fuel-Transfer-Pump-24UY34?s_pp=false	\$975		25 gpm, 12 Vdc	12/12/2013
		Northern Tool & Equipment	http://www.northerntool.com/shop/tools/product_200434941_200434941	\$530		25 gpm, 12 V	12/12/2013
			http://www.northerntool.com/shop/tools/product_200434942_200434942	\$600		25 gpm, 12 V	12/12/2013
		Proflow Dynamics	http://store.proflowdynamics.com/modules/store/DC-Transfer-Pumps_C223.cfm	\$566		Bi-Pump (PIUSI), 22.5 gpm, available in 12 V and 24 V	10/11/2013
		Dultmeier Sales	http://www.dultmeier.com/products/0.851.867.5390/9783	\$3,764		60 gpm, 6.5 HP	5/21/2014
		Pumpbiz	http://www.pumpbiz.com/shopping_product_list.asp?pcid=5467	\$4,886		56 gpm, 29.87 psi	5/21/2014
				\$7,935		56 gpm	
				\$8,302		56 gpm, 29.87 psi	

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	Equipment and Supplies	Source	Website	Unit Cost	Notes	Comments	Date Accessed
14	Diesel Generator	Baldor	http://www.baldor.com/products/generators/pt.asp	\$3,582		DG3E	10/8/2013
				\$4,995		DG6E	
		Northern Tool & Equipment	http://www.northerntool.com/shop/tools/product_200360138_200360138	\$1,200			10/8/2013
		Independent expert		\$5,000			3/22/2014
				\$10,000			
		Wayfair	http://www.wayfair.com/Winco-Power-Systems-15-Kw-Single-Phase-120-240-V-Natural-Gas-and-Propane-Double-Fuel-Standby-Generator-PSS15B4W-WNC1085.html	\$5,886		15 kW single phase 120/240 V	5/19/2014
		Baldor	http://www.baldor.com/support/Literature/Load.ashx/CA2400?LitNumber=CA2400	\$21,038		TG25LT-1K	10/8/2016
		Aurora Generators Inc	http://www.auroragenerators.com/generators/portable-diesel-generators#!/-/product/category=2991958&id=13028031	\$1,199		Portable Diesel Generator	10/14/2013
		Baldor	http://www.baldor.com/products/generators/pt.asp	\$4,995		Industrial Portable Generator, Catalogue # DG6E	10/14/2013
		Sears	http://www.sears.com/all-power-america-6500w-diesel-generator-w-electric/p-07107337000P?prdNo=1&blockType=G1	\$1,365		All Power America 6500 W Diesel Generator	10/14/2013
		Baldor	http://www.baldor.com/products/generators/ts.asp	\$24,288		TS25S	10/7/2013
				\$29,073		TS35S	
				\$33,612		TS45S	
				\$255,613		TS500S	
		RS Means: Building Construction Cost Data, 2005		\$33,995	c	(Vac not specified), Cost reflects national average material prices for January of 2005 and include delivery to the job site. No sales taxes are included.	10/23/2013
		Depco Power Systems	http://www.depco.com/101-250kw-generator-sets/	\$101,438		6090HFG95, 277/480 V, 190 kW	5/19/2014
				\$99,500		G3406TA, 227/480 V, 190 kW	
		Generator Joe	http://www.generatorjoe.net/price.asp?30=75001+and+100000	\$86,252		250 DF2-3, 227/480 V, 250 kW, no enclosure	5/19/2014
		Hardy Diesel Generators	http://www.hardydiesel.com/diesel-generators-120-250-kw.html	\$51,956		HDHJD-225, 480 V 225 kW, enclosed	5/19/2014
		Independent expert		\$50,000		480 V, 200 kW	3/22/2014
				\$75,000			
		Independent expert		\$75,000			3/22/2014
				\$125,000			
		EPRI: Costs of Utility Distributed Generators, 1-10MW: Twenty-Four Case Studies	http://www.publicpower.org/files/Deed/FinalReportCostsofUtilityDistributedGenerators.pdf	\$640,632	c		1/13/2014
				\$801,845	c		
		Amazon	http://www.amazon.com/600-KW-Perkins-Diesel-Generator/dp/B009M7EL8E	\$75,650			10/3/2013
		FG Wilson	http://www.fgwilson.com/cda/files/32083017/P750-1(4PP)GB(0213).pdf http://www.fgwilson.com/diesel_generator_sets/350to750kVA			P750-1	10/7/2013
		Generac	http://www.generac.com/Industrial/Diesel/				10/3/2013
		Hardy Diesel Generators	http://www.hardydiesel.com/mitsubishi-generators/mitsubishi-600-kw-diesel-generator.html	\$94,950			10/3/2013

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	Equipment and Supplies	Source	Website	Unit Cost	Notes	Comments	Date Accessed
		Kohler Power Systems	http://www.kohlerpower.com/industrial/detail.htm?sectionNumber=13261&categoryNumber=11961&productnum=21540402				10/3/2013
		RS Means: Facilities Construction Cost Data, 2000		\$135,283	c	Cost reflects national average material prices for January of 2000 and include delivery to the	10/23/2013
		NRC estimate		\$100,000			2/23/2014
		EPRI: Costs of Utility Distributed Generators, 1-10MW: Twenty-Four Case Studies	http://www.publicpower.org/files/Deed/FinalReportCostsofUtilityDistributedGenerators.pdf	\$858,649	c	4.16 kV	1/13/2014
				\$879,413	c	4.16 kV	
				\$886,249	c	4.16 kV	
				\$895,112	c	4.16 kV	
				\$910,305	c	4.16 kV	
				\$969,810	c	4.16 kV	
15	Diesel Generator Fuel Transfer Hose	Dultmeier Sales	http://www.dultmeier.com/products/0.851.867.5390/9784	\$2,584		Model# DUFPU1P, 1" x 38' hose, 32 gpm	10/14/2013
			http://www.dultmeier.com/products/0.851.867.5390/10889	\$2,941		Model# DUFPU1-M1, 1" x 38' hose, 32 gpm	
			http://www.dultmeier.com/products/0.851.867.5390/9783	\$3,700		Model# DUFPU1.5P, 1-1/2" x 38' hose, 60 gpm	
			http://www.dultmeier.com/products/0.851.867.5390/10888	\$4,005		Model# DUFPU1.5-M1, 1-1/2" x 38' hose, 60 gpm	
16	Diesel Generator Switchgear	EPRI: Costs of Utility Distributed Generators, 1-10MW: Twenty-Four Case Studies	http://www.publicpower.org/files/Deed/FinalReportCostsofUtilityDistributedGenerators.pdf	\$12,000			1/13/2014
17	Diesel Generator Switchgear and Transformer	EPRI: Costs of Utility Distributed Generators, 1-10MW: Twenty-Four Case Studies	http://www.publicpower.org/files/Deed/FinalReportCostsofUtilityDistributedGenerators.pdf	\$52,795	c		1/13/2014
				\$70,191	c		
				\$74,273	c		
18	Discharge Hose	Ultimate Industrial Solutions	http://www.ultimateindustrial.com/jason-4328-0500-100-nitrile-fuel-discharge-hose-300-psi-5-x-100-feet/	\$3,354			5/20/2014
19	Disconnect	NRC estimate		\$100			2/23/2014
20	Dosimetry	Arrow-Tech	http://www.dosimeter.com/direct-reading-dosimeters/direct-reading-dosimeter-w138-0-200mr-with-sapphire-window/	\$148		Direct-reading dosimeter	10/4/2013
21	Duct	Global Industrial	http://www.globalindustrial.com/p/hvac/ventilation/flexible-ducts/s-ti-thermaflex-flexible-hvac-duct-14-diameter?infoParam.campaignId=T9A&gclid=CLWIs	\$280		S-TI Thermaflex Flexible Hvac duct - 14' diameter	12/15/2013
		Home Depot	http://www.homedepot.com/p/Master-Flow-14-in-x-25-ft-Insulated-Flexible-Duct-R6-Silver-Jacket-F6IFD14X300/100211848	\$255		4 Master Flow 14" x 25' insulated flexible duct	12/15/2013
		Lowes	http://www.lowes.com/pd_127632-42471-LW1470_4294934297__?productId=3664140&Ntt=flex&pl=1&currentURL=%3FNtt%3Dflex&facetInfo=&state=R	\$252		4 Standex ADP 14" x 25' fiberglass insulated flex duct	12/15/2013
22	Electric FLEX Pump	Wayfair	http://www.wayfair.com/Multiquip-106-GPM-Honda-GX-160-High-Pressure-Pump-QP205SH-MTQ1176.html	\$1,399			12/12/2013

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	Equipment and Supplies	Source	Website	Unit Cost	Notes	Comments	Date Accessed
23	Emergency Water Storage Tank	Independent expert		\$130,480			3/24/2014
				\$186,190			3/24/2014
		NRC Regulatory Guide: Office of Standards Development, Regulatory Guide 1.110: Cost-Benefit Analysis for Radwaste Systems for Light-Water-Cooled Nuclear Power Plants	http://pbadupws.nrc.gov/docs/ML1324/ML13241A052.pdf	\$18,619		10,000 gallon tank (SS, ASME VIII, atmospheric service, 200 degrees Fahrenheit)	2/18/014
		Tanks For Less	http://www.tanksforless.com/p/1164/20000-gallon-austin-fiberglass-water-tank	\$13,048		20,000 gallons fiberglass tank	12/15/2013
24	Facility to Store FLEX Equipment	NRC estimate		\$1,000,000			2/23/2014
25	Female NPT SS hydraulic couplings	Amazon	http://www.amazon.com/Dixon-Hydraulic-Quick-Connect-Fitting-Coupling/dp/B00BG1W52I	\$53		1-1/4" x 1-1/4" NPTF Female, 2,500 psi	5/20/2014
26	Flatbed Trailer	Featherlite Trailers	http://www.fthr.com/products/commercial-and-utility-trailers/flatbed	\$8,000		Model 3110, 8'6" x 22'	10/11/2013
				\$8,800		Model 3310, 8'6" x 24'	
				\$18,000		Model 1585, 8'6" x 30'	
27	FLEX Hose Jumper	Discount Ramps	http://www.discountramps.com/hose-protectors.htm	\$580		7"	10/4/2013
		Handi-Ramp	http://www.handiramp.com/hoseprotector.htm	\$700		6.5"	10/4/2013
		Turtle Plastics	http://www.fire-end.com/TurtlePlastics-HoseBridge-Kits.htm	\$1,746		5", 4", and 3"	10/4/2013
28	Flood Staging Area	NRC estimate		\$1,000,000			2/23/2014
29	Flow Distribution Instrumentation	Independent expert		\$30,000			3/24/2014
30	Food	EverSafe	http://www.eversafemres.com/mre-wholesale-eversafe-mre-pallet-48-cases/	\$4,752		1 pallet (48 cases) of MREs	2/19/2014
		Preparedness.com	http://preparedness.com/sumrpaof48ca.html	\$5,799		1 pallet (48 cases) of MREs	
31	Front Loader	CAT	http://www.cat.com/en_US/products/new/equipment/track-loaders.html	\$180,000		Medium Track Loader Model 953D	10/7/2013
				\$260,000		Large Track Loader Model 963D	
				\$425,000		Large Track Loader Model 973D	
		RS Means: Building Construction Cost Data, 2005		\$373	a, c	Front end loader, 70 C.Y./hr	10/24/2013
32	Fuel Air-Lift Container	NRC estimate		\$1,500			5/21/2014
33	Hard Pipe and Dual Isolation Valves	NRC estimate		\$10,000			2/23/2014
34	Hard Piping	Independent expert		\$10,000			3/24/2014
				\$50,000			
		NRC estimate		\$1,000			2/23/2014
35	High-Capacity Pump	NRC estimate		\$20,000			2/23/2014
36	High-Pressure Hose	Fastenal	http://www.fastenal.com/web/products/details/400380-131280;jsessionid=7BJGT7LfwZZQJv1Fp7pJWDQ0Jd9h8RYGSHp2WYFpzLQnYvvPVpWY1149440359!1560414073?isPunchout=false	\$2,787		1-1/2" Inside diameter, 2500 psi, 50 ft	5/20/2014
		Grainger	http://www.grainger.com/product/EATON-Bulk-Hose-4VTL8	\$986		1", 50 ft., 2500 psi	5/20/2014
		Fastenal	http://www.fastenal.com/web/products/details/400380-131280;jsessionid=7BJGT7LfwZZQJv1Fp7pJWDQ0Jd9h8RYGSHp2WYFpzLQnYvvPVpWY1149440359!1560414073?isPunchout=false	\$5,573		1-1/2" Inside diameter, 2500 psi, 100ft	5/20/2014
37	High-Pressure Pump	NRC estimate		\$20,000			2/23/2014

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	Equipment and Supplies	Source	Website	Unit Cost	Notes	Comments	Date Accessed
38	High Volume Fan	Dultmeier Sales	http://www.dultmeier.com/products/0.656.5568.5571.5574/10865	\$333		portable cooling belt drive fan. 42" blade diameter; 13,000 high cfm; 9,000 low cfm; 1/2	12/15/2013
		Industrial Fans Direct	http://www.industrialfansdirect.com/TE-VI4213-V.html	\$609		42" Blade diameter, 13,00 cfm	12/15/2013
39	Holder, Hydrant Wrench, & Spanner Wrench	Kochek Co.	http://www.kochek.com/products/productList.aspx?u id=381-375-342	\$152			5/20/2014
40	Hose trunks	Resolution of Generic Safety Issues: Issue 107: Main Transformer Failures (Rev. 3) (NUREG-0933, Main Report with Supplements 1-34)	http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0933/sec3/107r3.html	\$500		110 ft	2/24/2014
41	Installation of Connection Point	Independent expert		\$166,667			3/24/2014
42	Installation of Cross Connect	Independent expert		\$200,000			3/24/2014
43	Installation of Permanent Connection Points	NRC estimate		\$750,000			11/14/2013
		Independent expert		\$75,000			3/24/2014
44	Isolation Valve	Wayfair	http://www.wayfair.com/Noritz-Sweat-Tankless-Isolation-Valve-Kit-VOHA1074.html	\$84		500,000 Btu pressure relief, 3.5" x 7.8" and 13" in diameter	10/29/2013
45	Label	Emedco	http://www.emedco.com/circuit-breaker-labels-cl70.html	\$24		Self-adhesive labels. 5'8" x 1.5", package of 70, assorted colors	10/29/2013
		TXBCS	http://www.txbcs.com/cart/index.php?main_page=product_info&cPath=65_68&products_id=185	\$10		Magnetic, 2 panel label set	10/29/2013
46	Large FLEX Pump	All Cost	http://www.allcostdata.info/detail.html/154150800/Fire-pump,-incl-cntrl,-8%22-pump,-diesel,-2500-GPM,-100-PSI,-213	\$94,677			10/4/2013
		Pentair	http://www.aurorapump.com/EngineeredProduct_FirePumpSplitCase_Electric.aspx	\$65,569		Pump model 8-481-17B, 115psi at 2,500 gpm. Includes the pump, engine, and controller. (Does not include fuel tank, batteries, options, etc.)	10/4/2013
				\$118,401		Pump model 8-481-124, 215psi at 2,500 gpm. Includes the pump, engine, and controller. (Does not include fuel tank, batteries, options, etc.)	
47	LED Bulb	Technical Review of Risk-Informed, Performance-Based Methods for Nuclear Power Plant Protection Analyses	http://www.appendixr.com/ARS%20CD%202002/nrc/nureg/1521.pdf	\$100		Used the cost of an emergency light battery as a proxy for the cost of a LED lamp	2/23/2014
48	Lighting Tower	Larson Electronics	http://www.larsonelectronics.com/p-1764-explosion-proof-light-quadpod-mount-24-inch-400-watt-metal-halide-class-1-div-1-cd.aspx	\$2,988		24", 400 W, Class 1 Div 1 C&D, 36,000 lumens	5/19/2014
			http://www.larsonelectronics.com/p-71420-800-watt-telescoping-light-mast-25-3-stage-light-tower-360-rotating-boom-high-mast-lighting.aspx	\$4,536		25', 800 W	5/21/2014
49	Low pressure/Medium flow pump	Independent expert		\$55,000			3/22/2014
		NRC estimate		\$8,000			2/23/2014
50	Modified Flange Adapter	Independent expert		\$10,000			3/24/2014
		NRC estimate		\$4,500			2/23/2014

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	Equipment and Supplies	Source	Website	Unit Cost	Notes	Comments	Date Accessed
51	Monitor Spray Nozzle and Required Hoses	POK	http://www.pokfire.com/nozzles.htm	\$1,203			10/3/2013
52	Motor Starter	Grainger	http://www.grainger.com/category/magnetic-starters-with-thermal-overload/starters-and-contactors/electrical/ecatalog/N-nrt#nav=%2Fcategory%2Fmagnetic-starters-with-thermal-overload%2Fstarters-and-contactors%2Felectrical%2Fecatalog%2FN-nrtZ1yzzeluZ1yzzie%3F_%3D1395941806821	\$446			3/27/2014
53	Mounted NEMA-4X	Grainger	http://www.grainger.com/Grainger/RITTAL-Enclosure-5AAF5?BV_UseBVCookie=No&ItemKey=5AAF5&seoUrl=RITTAL-Enclosure-5AAF5	\$2,184		Rittal Enclosure, Wall Mount, NEMA 4X, SS	10/14/2013
		NEMA Enclosures	http://buy.nemaenclosures.com/wall-mount-type-4x-enclosure-w-back-panel-16-00x16-00x6-53.html	\$363		Wall-Mount Type 4X, w/ Back Panel 16" x 16" x 6"	10/14/2013
			http://buy.nemaenclosures.com/wall-mount-type-4x-enclosure-w-back-panel-24-00x24-00x6-53.html	\$421		Wall-Mount Type 4X, w/ Back Panel 24"x24"x6"	
			http://buy.nemaenclosures.com/wall-mount-type-4x-enclosure-w-back-panel-30-00x24-00x8-53.html	\$523		Wall-Mount Type 4X, w/ Back Panel 30"x24"x8"	
54	Move In Cost	NRC estimate		\$7,500			5/22/2014
55	Nitrogen Bottle Rack	Independent expert		\$5,000		Includes regulators, local instruments, hoses, and modification to the SG PORV control tubing	3/24/2014
		USA Safety	http://www.usasafety.com/gas-cylinder-rack-holder-stand-c-30.html	\$184		1-2 cylinder capacity	11/26/2013
				\$335		4-7 cylinder capacity	
56	Outfitting Costs	NRC estimate		\$750,000			2/3/2015
57	Piping Line	Independent expert		\$500,000			3/24/2014
		Resolution of Generic Safety Issues: Issue 89: Stiff Pipe Clamps (Rev. 2) (NUREG-0933, Main Report with Supplements 1-34)	http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0933/sec3/089r2.html	\$21		Used as a proxy for piping. (8-inch pipe)	2/23/2014
58	Portable Fuel Container	Grainger	http://www.grainger.com/Grainger/type-i-safety-cans/safety-storage/safety/ecatalog/N-11h	\$60		5 gallons, height: 13.5". Outside diameter: 12.5"	10/23/2013
		Lowes	http://www.lowes.com/Automotive/Gas-Cans/_/N-1z0x2mn/pl#	\$20		5 gallons, plastic diesel fuel can	10/23/2013
59	Portable Lighting and Batteries	Independent expert		\$100			3/22/2014
60	Portable Toilet	Global Industrial	http://www.globalindustrial.com/g/janitorial-maintenance/bathroom/portable-restrooms/polyjohn-pjn3-fleet-portable-restrooms	\$821		60 gallon holding tank, 43" x 45-7/10" x 83"	10/4/2013
				\$859		61 gallon holding tank, 43" x 45-7/10" x 83"	
		RS Means: Building Construction Cost Data, 2005		\$190	a, b, c	portable chemical toilet rent	10/25/2013
61	Portable Ventilation Fan	H-MAC systems	http://www.h-mac.com/Canarm-Delhi_bymfg_86-0-2.html	\$1,024		U16-1 16" Blade diameter, 3,151 CFM at 0"	5/19/2014
				\$1,961		U16-4 16" Blade diameter explosion proof,	
		Industrial Fans Direct	http://www.industrialfansdirect.com/LFI-U16-4.html	\$1,769		Model: LFI-U16-4	5/19/2014

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	Equipment and Supplies	Source	Website	Unit Cost	Notes	Comments	Date Accessed
62	Potable Water	Costco	http://www.costco.com/Nestle%2C%20Pure-Life-Purified-Water-16.9oz-7224ct-Cases-NLE-101264.product.11751427.html	\$400		Used Nestle Pure Life Purified Water as a proxy for a pallet of water. 16.9 oz bottles, 24 count cases, 72 cases for \$358.99	2/23/2014
		Emergency Essentials	http://beprepared.com/dozen-cans-of-emergency-drinking-water-12-cans.html	\$51		Case of canned drinking water (12 cans). 24 fl. oz per can	10/21/2013
		Ready Made Resources	https://www.readymaderesources.com/cart/storable-food-units/12-cans-emergency-drinking-water-30-year-shelf-life-free-shipping/prod_4480.html?review=write	\$70		12 cans of emergency drinking water. 24 fl. oz per can	2/5/2014
		Ready Store	http://www.thereadystore.com/water-storage/emergency-drinking-water/8-45-oz-aqua-blox-water-boxes-case-of-24	\$14		8.45 oz Aqua Blox water boxes. Case of 24.	10/25/2013
			http://www.thereadystore.com/water-storage/emergency-drinking-water/1-week-supply-of-canned-drinking-water	\$117		1-week supply of canned drinking water. (12 cans). 46 fl. oz per can	10/25/2013
63	Power Cables and Conduits	Independent expert		\$20			3/22/2014
64	Power Connection Cable	NRC estimate		\$150			2/23/2014
65	Pre-Staged Emergency N2 Bottle	ASCO	http://ascotorch.com/mm5/merchant.mvc?Screen=CTGY&Store_Code=ASCO&Category_Code=NITROCYL	\$238		125 cubic ft	10/3/2013
		Praxair Direct	http://www.praxairdirect.com/Product2_10152_10051_14501_-1_11828_11508_11502_ProductDisplayErrorView	\$76		Model NI 4.8-M. 114 cubic ft	10/3/2013
				\$105		Model NI 4.8-K 228 cubic ft	
66	Raceway	Grainger	http://www.grainger.com/Grainger/raceways/electrical/ecatalog/N-8ea	\$17		single channel, 0.04" steel, 120" x 0.75" x 0.53"	10/29/2013
				\$20		single channel, 60" x 7/8" x 7/16"	
				\$27		locking hinge cover, adhesive back, 96" x 1.125" x 0.625"	
67	Raceway Cable	NRC Resolution of Generic Safety Issues: Issue 156: Systematic Evaluation Program (Rev. 8) (NUREG-0933, Main Report with Supplements 1-34)	http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0933/sec3/156r8.html	\$101			2/20/2014
68	RCP Seal	NRC; Resolution of Generic Safety Issues: Issue 23: Reactor Coolant Pump Seal Failures (Rev. 1) (NUREG-0933, Main Report with Supplements 1-34)	http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0933/sec3/023r1.html	\$57,835	c		2/20/2014
69	RCS FLEX Pump	NRC estimate		\$2,500			2/23/2014
70	Regional Response Center Startup	NRC estimate		\$50,000,000		2 RRC stations Include 5 sets of emergency equipment, including emergency generators and pumps	11/14/2013
71	RRC Maintenance Cost	Industry expert		\$4,000,000			5/15/2014
72	RRC Staffing and Training Cost	Industry expert		\$8,000,000			5/15/2014
73	Self-Priming Pump	The Pump Shop Incorporated - MP Pumps	http://www.pumpshop.com/mppumps/petrolmaxx.html	\$6,113		Petroleum 40 4" x 4" Self Priming Centrifugal Pump, Model PO 40, up to 750 gpm (price does not include engine)	10/11/2013
			http://www.pumpshop.com/pdf/mp_pumps/petrolmaxx/PETROLEUM-40.pdf				

Appendix M. Order EA-12-049 - Equipment and Supplies Unit Cost References

	Equipment and Supplies	Source	Website	Unit Cost	Notes	Comments	Date Accessed
74	Seismic Condensate Transfer Pump Suction Nozzle	NRC estimate		\$2,000			2/23/2014
75	Seismic Piping and a Connection to Charging Header	Independent expert		\$10,000			3/24/2014
76	SFP Instrumentation	NRC estimate		\$1,000,000			2/23/2014
77	SG/RVP Hose	Fire Hose Direct	http://www.firehosedirect.com/2-1-2-fire-hose/	\$760		2-1/2", 500 psi, 50'	5/20/2014
78	SG/RVP Suction Hose	Kochek Co.	http://www.kochek.com/products/productList.aspx?id=381-164-22-321	\$980		6", 10'	5/20/2014
		MSC Industrial Supply Co.	http://www.mscdirect.com/browse/tn/Hose-Tube-Fittings-Valves/Hose/Plastic-Rubber-Synthetic-Hose/Water-Steam-Hose/Water-Discharge-Hose?navid=12105076#navid=12105076+4288232688	\$295		6", 150 psi, 10'	5/20/2014
		Process Hose & Equipment	http://processhose.com/6-in-i-d-goodyear-black-versiflo-150-psi-water-suction-and-discharge-hose-bulk-hose-priced-per-foot-no-end-fittings.html?gclid=CKaCuKWbu74CFaYF7AodxwsAnw	\$136		6", 150 psi, 10'	5/20/2014
79	Storage Building	NRC estimate		\$1,700,000		2 diverse ASCE 07-10 buildings	11/14/2013
				\$3,000,000		1 seismic Cat I building	
80	Storz Adapter	Kochek Co.	http://www.kochek.com/products/productList.aspx?id=381-239-153-25&pg=1	\$218		5" x 6" Rigid Male thread	5/20/2014
			http://www.kochek.com/products/productList.aspx?id=381-239-153-24&pg=1	\$265		5" x 6" Rigid Female thread	
		The Fire Store	http://www.thefirestore.com/store/product.aspx/productid/11374/Kochek-Storz-to-Rigid-Female-Thread/	\$155		6" x 6" Female thread	5/20/2014
81	Storz to NH Swivel Rocker Lug Female Thread	Cascade Fire Equipment	http://www.cascadefire.com/index.php/valves-and-fittings/storz-adapters/storz-x-female-swivel-rocker-lug.html	\$197		5" to 2-1/2" Female thread	5/20/2014
		Kochek Co.	http://www.kochek.com/products/productList.aspx?id=381-239-153-255&pg=1	\$198		5" to 2-1/2" Female thread	5/20/2014
		Harrington, Inc.	http://harrinc.com/shop/storz-x-female-swivel-rocker-lug-3/	\$199		5" to 2-1/2" Female thread	5/20/2014
82	Storz Spanner Wrench with holder	Kochek Co.	http://www.kochek.com/products/productList.aspx?id=381-375-341	\$125			5/20/2014
83	Storz, Storz Outlet, Storz Inlet	JME Ellsworth	http://www.jmesales.com/catalog/productinfo.aspx?id=10118&cid=4828&skuid=POK9904	\$1,014		5" x 5"	5/20/2014
84	Strainer	Kochek Co.	http://www.kochek.com/products/productList.aspx?id=381-155-467	\$956			5/20/2014
85	Submersible Pump Hose (Portable)	Pumpbiz	http://www.pumpbiz.com/shopping_product_detail.asp?pid=70871#tabs	\$376		150 psi, 50'	5/21/2014
86	Suction Hose	Amazon	http://www.amazon.com/Unisource-Discharge-Assembly-Aluminum-Connection/dp/B0063LAZ46	\$2,006		2-1/2", 150 psi, 15'	5/20/2014
		Nelson Jameson	http://nelsonjameson.com/Challenger-Teflon-Suction-Discharge-Hose-CTL--p8649.html	\$8,360		2-1/2", 150 psi, 100'	5/20/2014
87	Suction Hose and Discharge Hose	Dunham Rubber & Belting Corporation	http://catalog.dunhamrubber.com/item/ose-tubing-and-ducting-hose-suction-discharge-hose/otter-water-suction-and-discharge-hose/5-otter			5" Otter water suction and discharge hose	10/4/2013
		Grainger	http://www.grainger.com/Grainger/Suction-Strainer-5RWL2?Pid=search	\$13		Suction strainer, 5" diameter	10/14/2013

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	Equipment and Supplies	Source	Website	Unit Cost	Notes	Comments	Date Accessed
			http://www.grainger.com/Grainger/DAYTON-Suction-Strainer-1P689?Pid=search	\$17		Suction strainer, 5" diameter	
		MSC Industrial Supply Co.	http://www.mscdirect.com/product/32140006	\$2,131		Water & discharge hose, 5" diameter. Working pressure: 120 psi, 100 ft	10/14/2013
		RS Means: Building Construction Data, 2005	RS Means: Building Construction Data, 2005	\$150	a, b, c	discharge hose with coupling, 50' long, 6"	10/24/2013
				\$215	a, b, c	suction hose with coupling, 20' long, 6"	
88	Super Duty Pickup Truck	Ford	http://www.ford.com/trucks/superduty/	\$30,080		F-250 XL	10/7/2013
				\$30,815		F-350 XL	
				\$34,110		F-250 XLT	
				\$34,850		F-350 XLT	
		Ram	http://www.ramtrucks.com/en/lineup/	\$23,600		Ram 1500	
				\$29,420		Ram 2500	
				\$30,105		Ram 3500	
		RS Means: Building Construction Cost Data, 2005	RS Means: Building Construction Cost Data, 2005	\$573	a, b, c	3/4 ton, 2 wheel drive, rent	10/25/2013
				\$680	a, b, c	3/4 ton, 4 wheel drive, rent	
89	Survey Instrument	Ben Meadows	http://www.benmeadows.com/ez-measure-measuring-wheels_36815285/	\$83		EX Measure Measuring Wheels	10/14/2013
			http://www.benmeadows.com/durawheel-measuring-wheels_36815283/	\$162		DuraWheel Measuring Wheels	
			http://www.benmeadows.com/calculated-industries-digiroller-plus-ii-digital-measuring-wheel_s_103418/	\$179		Calculated Industries, Digital Measuring Wheel	
		Engineer Supply	http://www.engineersupply.com/theodolites.aspx	\$990		Theodolites	10/14/2013
			http://www.engineersupply.com/total-stations.aspx	\$4,340		Total Stations	
		Independent expert		\$500			3/22/2014
90	Temporary Housing	NRC estimate		\$100,000			2/23/2014
91	Trailer with Fuel Tank	APC Equipment	http://www.apcequipment.com/4x8-w-200-gallon-tank-load-trail.html	\$3,000			10/3/2013
		Quality Fuel Trailers	http://www.qualityfueltrailers.com/fuel-trailer-types/vehicle-and-equipment-fuel-trailers/transfueler-fuel-trailers	\$4,995		300 gallons single-wall cylindrical	10/3/2013
				\$5,395		300 gallons single-wall rectangular	
				\$5,795		300 gallons single-wall cylindrical, includes fuel meter, at-a-glance tank level gauge, automatic nozzle & swivel, deep-cycle battery kit: Box and automatic charger	
				\$6,195		300 gallons double-wall rectangular	
				\$6,295		300 gallons Single-Wall rectangular, includes fuel meter, at-a-glance tank level gauge, automatic nozzle & swivel, deep-cycle battery kit: Box and automatic charger	
				\$6,695		300 gallons single-wall cylindrical, includes fuel meter, at-a-glance tank level gauge, automatic nozzle & swivel, deep-cycle battery kit: Box and automatic charger, 25' UL hose and spring-rewind hose with ball stop	

Appendix M. Order EA-12-049 - Equipment and Supplies Unit Cost References

	Equipment and Supplies	Source	Website	Unit Cost	Notes	Comments	Date Accessed
				\$6,995		300 gallons double-wall rectangular, includes fuel meter, at-a-glance tank level gauge, automatic nozzle & swivel, deep-cycle battery kit: Box and automatic charger	
				\$7,195		300 gallons single-wall rectangular, includes fuel meter, at-a-glance tank level gauge, automatic nozzle & swivel, deep-cycle battery kit: Box and automatic charger, 25' UL hose and spring-rewind hose with ball stop	
				\$7,895		300 gallons double-wall rectangular, includes fuel meter, at-a-glance tank level gauge, automatic nozzle & swivel, deep-cycle battery kit: Box and automatic charger, 25' UL hose and spring-rewind hose with ball stop	
92	Training Development	NRC estimate		\$250,000			1/30/2015
93	Transfer Panel (Disconnect Switch)	NRC estimate		\$500			2/23/2014
94	Transfer Switch	Independent expert		\$4,000			3/22/2014
		Northern Tool & Equipment	http://www.northerntool.com/shop/tools/product_200196674_200196674	\$400		6 circuit, 7500 W, 30 A, 240 V, Model# 31406CRK	11/26/2013
			http://www.northerntool.com/shop/tools/product_200317085_200317085	\$500		10 Circuit, 8,000 W, 30 A, Model# 31410CRK	11/26/2013
			http://www.northerntool.com/shop/tools/product_200196674_200196674	\$700		200 A, Model# RTSY200A3	11/26/2013
95	Transformer	Independent expert		\$70,000			3/22/2014
				\$90,000			
96	Transportation Capability of RRC (First 3 Years)	NRC estimate		\$5,400,000			3/6/2014
				\$6,000,000			
97	Transportation Capability of RRC (Ongoing)	NRC estimate		\$450,000			3/6/2014
98	Water Purification Skid	US Water Systems	http://www.uswatersystems.com/commercial/harmso-poly-coat-filter-housing-147-gpm-hbc-7-3.html	\$1,502		147 gpm	1/14/2014
		NRC estimate		\$40,000			5/22/2014
99	Water Storage	Bowhead Environmental & Safety	http://www.shopbowhead.com/category/products/fuel-water-storage/fuel-water-tanks	\$14,750		20,000 gallon	5/19/2014
		Left Coast Parts	http://www.vendio.com/stores/leftcoastparts/item/business-industrial-other/20000-gallon-irrigation-or-fuel/id=11257461	\$3,999		20,000 gallon bladder	5/19/2014
100	Water Supply Truck	Cleveland Brothers (CAT)	http://www.clevelandbrothers.com/used-products/trucks-trailers/gz-water-wagon-water-trucks/up10912n	\$255,000		Used 773B W, 10,000 gallon water tank	1/15/2014
		RS Means: Building Construction Cost Data, 2005		\$7,485	a, b, c	6,000 gallon off highway water truck, rent per day	10/25/2013
101	Welding Type Receptacle	NRC estimate		\$50			2/23/2014

a) Rental price

b) Monthly rental price varies from 2% to 5% of purchase price of the equipment depending on the anticipated life of the equipment and its wearing parts.

c) The U.S. Department of Labor Bureau of Labor Statistics' Consumer Price Index for All Urban Consumers (CPI-U) was used as the inflation index to convert the value into 2013 dollars.

d) The exchange rate used was from the Treasury Reporting Rates of Exchange as of December 31, 2013. (<http://fms.treas.gov/intn.html>)