Dominion Energy Kewaunee, Inc.
5000 Dominion Boulevard, Glen Allen, VA 23060
Web Address: www.dom.com

Dominion®

~~PROPRIETARY INFORMATION – WITHHOLD UNDER 10 CFR 2.390~~

February 26, 2013

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

Serial No. 13-064
LIC/CDS/R0
Docket No. 50-305
License No. DPR-43

DOMINION ENERGY KEWAUNEE, INC.
KEWAUNEE POWER STATION
POST-SHUTDOWN DECOMMISSIONING ACTIVITIES REPORT

In accordance with 10 CFR 50.82, "Termination of license," paragraph (a)(4)(i), Dominion Energy Kewaunee, Inc. (DEK) is submitting a site-specific post-shutdown decommissioning activities report (PSDAR) for Kewaunee Power Station (KPS). By letters dated November 2, 2012, and February 25, 2013 (References 1 and 2), DEK notified NRC of its intention to permanently cease power operations at KPS on May 7, 2013. 10 CFR 50.82(a)(4)(i) requires that a PSDAR be submitted within two years following the permanent cessation of operations.

Enclosure 1 provides the KPS PSDAR. The PSDAR has been developed consistent with Regulatory Guide 1.185, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report" and has taken into consideration the proposed revision thereof in Draft Regulatory Guide DG-1272. The KPS PSDAR includes a description of the planned decommissioning activities; a schedule for their accomplishment; a site specific decommissioning cost analysis; and a discussion that provides the basis for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by appropriate, previously issued, environmental impact statements. The PSDAR also includes a discussion of the schedule and costs associated with the management of spent fuel and site restoration.

DEK's determination to permanently cease operation of KPS has resulted in changes to the timing and choice of decommissioning method assumed in DEK's previous report pursuant to 10 CFR 50.75(f)(3) (Reference 3), which provided DEK's preliminary decommissioning cost analysis, and report pursuant to 10 CFR 50.54(bb) (Reference 4), which provided DEK's Irradiated Fuel Management Plan. Consequently, the site-specific decommissioning cost analysis provided with this PSDAR, which includes the projected cost of managing spent fuel, supplants the previous preliminary decommissioning cost analysis. In addition, an update to the Irradiated Fuel Management Plan required by 10 CFR 50.54(bb) is being submitted separately. The annual cash flow analysis provided with the updated Irradiated Fuel Management Plan indicates that the existing decommissioning trust funds for KPS are adequate to fund estimated decommissioning, spent fuel management, and site restoration costs. DEK

NOTE: ENCLOSURE 2 OF THIS LETTER CONTAINS "PROPRIETARY INFORMATION – WITHHOLD UNDER 10 CFR 2.390" AND MUST BE PROTECTED ACCORDINGLY. UPON SEPARATION OF ENCLOSURE 2, THIS LETTER IS DECONTROLLED.

A001
NRR

recognizes that use of the decommissioning funds for spent fuel management necessitates further discussions with the NRC Staff. DEK has already initiated these discussions.

In accordance with 10 CFR 50.82(a)(4)(i), a copy of the KPS PSDAR is being provided to the State of Wisconsin by transmitting a copy of this letter and its attachment to the designated State Official. In addition, DEK will notify the NRC, in accordance with 10 CFR 50.82(a)(7), of any significant changes to the attached PSDAR.

The site-specific decommissioning cost analysis being submitted as an attachment to the PSDAR includes information which is proprietary in nature. DEK requests this information be withheld from public disclosure in accordance with 10 CFR 2.390. The non-proprietary version is included as Attachment 1 to the PSDAR and the proprietary version is being submitted as Enclosure 2 to this letter. The associated application and affidavit for withholding the information is included as Enclosure 3 to this letter.

If you have any questions or require additional information, please contact Mr. Craig Sly at 804-273-2784.

Sincerely,

Daniel G. Stoddard
Senior Vice President – Nuclear Operations
Dominion Energy Kewaunee, Inc.

Enclosures:

1. Kewaunee Power Station Post-Shutdown Decommissioning Activities Report.
2. *EnergySolutions* Document No. 82A9684: "2012 Decommissioning Cost Analysis of Kewaunee Nuclear Power Plant SAFSTOR Methodology," dated February 7, 2013 (Proprietary Version).
3. Application for Withholding Information and Affidavit.

References:

1. Letter from D. A. Heacock (DEK) to NRC Document Control Desk, "Certification of Permanent Cessation of Power Operations," dated November 2, 2012.
2. Letter from D. G. Stoddard (DEK) to NRC Document Control Desk, "Certification of Permanent Cessation of Power Operations," dated February 25, 2013.
3. Letter from J. A. Price (DEK) to NRC Document Control Desk, "Report Pursuant to 10 CFR 50.73(f)(3)," dated December 18, 2008. [ADAMS Accession No. ML090300120]
4. Letter from J. A. Price to NRC Document Control Desk, "Report Pursuant to 10 CFR 50.54(bb)," dated December 19, 2008. [ADAMS Accession No. ML083540651]

Commitments made in this letter: None.

cc: Regional Administrator, Region III
U. S. Nuclear Regulatory Commission
2443 Warrenville Road
Suite 210
Lisle, IL 60532-4352

Mr. K. D. Feintuch
Project Manager
U.S. Nuclear Regulatory Commission
One White Flint North, Mail Stop O8-D15
11555 Rockville Pike
Rockville, MD 20852-2738

Mr. Theodore Smith
Project Manager
U.S. Nuclear Regulatory Commission
Two White Flint North, Mail Stop O8-F5
11555 Rockville Pike
Rockville, MD 20852-2738

NRC Senior Resident Inspector
Kewaunee Power Station

Public Service Commission of Wisconsin
Electric Division
P.O. Box 7854
Madison, WI 53707

Enclosure 1

Kewaunee Power Station

Post-Shutdown Decommissioning Activities Report

Dominion Energy Kewaunee, Inc.

Kewaunee Power Station

Post-Shutdown Decommissioning Activities Report

February 2013

Table of Contents

List of Tables and Figures

List of Acronyms and Abbreviations

AIF	Atomic Industrial Forum
ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
DEK	Dominion Energy Kewaunee, Inc.
Decon Pd	Decommissioning Period
DOE	United States Department of Energy
DSC	Dry Storage Canister
GEIS	Generic Environmental Impact Statement (NUREG-0586)
Grn Pd	Site Restoration Period
GTCC	Greater than Class C
ISFSI	Independent Spent Fuel Storage Installation
KPS	Kewaunee Power Station
LLRW	Low-Level Radioactive Waste
MWt	Megawatt-thermal
NEI	Nuclear Energy Institute
NRC	United States Nuclear Regulatory Commission
PSDAR	Post-Shutdown Decommissioning Activities Report
PWR	Pressurized Water Reactor
RCS	Reactor Coolant System
REMP	Radiological Environmental Monitoring Program
SEIS	Site-specific Environmental Impact Statement (NUREG-1437, Supp. 40)
SFP	Spent Fuel Pool
SNF Pd	Spent Fuel Management Period
SSC	Structures, Systems, and Components
USAR	Updated Safety Analysis Report
WDNR	Wisconsin Department of Natural Resources
WPDES	Wisconsin Pollution Discharge Elimination System

I. INTRODUCTION AND SUMMARY

A. Introduction

In accordance with the requirements of 10 CFR 50.82, "Termination of license," paragraph (a)(4)(i), this report constitutes the Dominion Energy Kewaunee, Inc. (DEK) Post-Shutdown Decommissioning Activities Report (PSDAR) for Kewaunee Power Station (KPS). This PSDAR contains the following:

1. A description of the planned decommissioning activities along with a schedule for their accomplishment.
2. A site-specific decommissioning cost analysis[1] including the projected cost of managing spent fuel and site restoration.
3. A discussion that provides the reasons for concluding that the environmental impacts associated with site-specific decommissioning activities will be bounded by the appropriately previously issued environmental impact statements.

The PSDAR has been developed consistent with Regulatory Guide 1.185, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report" (Reference 1), and has taken into consideration the proposed revision thereof in Draft Regulatory Guide DG-1272. This report is based on currently available information and the plans discussed may be modified as additional information becomes available or conditions change. As required by 10 CFR 50.82(a)(7), DEK will notify the NRC in writing before performing any decommissioning activity inconsistent with, or making any significant schedule change from, those actions and schedules described in the PSDAR, including changes that significantly increase the decommissioning cost.

B. Background

Kewaunee Power Station is located in Town of Carlton in the southeast corner of Kewaunee County, Wisconsin, on the west shore of Lake Michigan. The city of Green Bay, Wisconsin is about 27 miles west-northwest of the site. The city of Milwaukee, Wisconsin is about 90 miles to the south-southwest of the site. The KPS site is located at longitude 87° 32.1'W and latitude 44° 20.6'N. The closest distance to the international boundary between Canada and the United States is approximately 200 miles northeast of the site. The plant site is approximately 908 acres.

[1] As used in this report, the terms "site-specific decommissioning cost estimate" and "site-specific decommissioning cost analysis" are equivalent. While the term "site-specific decommissioning cost estimate" is used in 10 CFR 50.82, DEK is submitting a document called a "site-specific decommissioning cost analysis" to meet these regulations.

Kewaunee Power Station is a single unit site with supporting facilities. The reactor coolant system is a two-loop pressurized water reactor design supplied by Westinghouse Corporation housed in a steel primary containment vessel surrounded by a concrete secondary containment building. The reactor was originally licensed to operate to a maximum power output of 1650 megawatts-thermal (MWt). In 2003, a measurement uncertainty recapture power uprate was approved, and in 2004 a stretch power uprate was approved. These two power uprates increased the licensed power output of the plant to its current maximum of 1772 MWt. Kewaunee Power Station has an on-site Independent Spent Fuel Storage Installation (ISFSI). Construction of ten ISFSI horizontal storage modules was completed in 2009. The initial loading campaign was conducted in 2009.

A brief history of the major milestones related to plant construction and operational history is as follows:

- Construction Permit Issued: August 6, 1968
- Operating License Issued: December 21, 1973
- Commercial Operation: June 16, 1974
- Renewed License Issued: February 24, 2011
- Initial Operating License Expiration: December 21, 2013
- Renewed Operating License Expiration: December 21, 2033
- Final Reactor Operation: May 7, 2013 (expected)

On October 22, 2012, Dominion Energy Kewaunee, Inc. (DEK) publically announced its intention to permanently cease power operations and decommission KPS. By letters dated November 2, 2012 and February 25, 2013 (References 2 and 3), DEK notified the NRC of its intention to permanently cease power operations at KPS as required by 10 CFR 50.82(a)(1)(i). As discussed in Reference 3, KPS is scheduled to be permanently shut down on May 7, 2013. After the reactor vessel has been defueled, DEK will submit a letter to the NRC certifying that fuel has been removed from the reactor, as required by 10 CFR 50.82(a)(1)(ii).

Upon docketing of the certification for permanent cessation of operations and certification of permanent removal of fuel from the reactor vessel, 10 CFR 50.82(a)(2) states that the 10 CFR Part 50 license for the unit no longer authorizes operation of the reactor or emplacement or retention of fuel in the reactor vessel. Pursuant to 10 CFR 50.51(b), "Continuation of license," the license for a facility that has permanently ceased operations (the KPS license is scheduled to expire on December 21, 2033), continues in effect beyond the expiration date to authorize ownership and possession of the facility until the NRC notifies the licensee in writing that the license has been terminated.

During the period that the modified license remains in effect, 10 CFR 50.51(b) requires that DEK:

1. Take actions necessary to decommission and decontaminate the facility and continue to maintain the facility including storage, control, and maintenance of the spent fuel.
2. Conduct activities in accordance with requirements applicable to the facility in accordance with NRC regulations and the 10 CFR 50 facility license.

10 CFR 50.82(a)(9) states that power reactor licensees must submit an application for termination of the license at least two years prior to the license termination date and that the application must be accompanied or preceded by a license termination plan to be submitted for NRC approval.

C. Summary of Decommissioning Alternatives

The NRC has evaluated the environmental impacts of three general methods for decommissioning power reactor facilities in NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" Supplement 1 (GEIS) (Reference 4). The three general methods evaluated are summarized as follows:

- **DECON:** The equipment, structures and portions of the facility and site that contain radioactive contaminants are removed and decontaminated to a level that permits termination of the license shortly after cessation of operations.

- **SAFSTOR:** After the plant is shutdown and defueled, the facility is placed in a safe, stable condition and maintained in that state (safe storage). The facility is decontaminated and dismantled at the end of the storage period to levels that permit license termination. During SAFSTOR, a facility is left intact or may be partially dismantled, but the fuel is removed from the reactor vessel and radioactive liquids are drained from systems and components. Radioactive decay occurs during the SAFSTOR period, thereby reducing the quantity of contamination and radioactivity that must be disposed of during decontamination and dismantlement.

- **ENTOMB:** Radioactive structures, systems, and components are encased in a structurally long-lived substance, such as concrete. The entombed structure is appropriately maintained, and continued surveillance is carried out until the radioactivity decays to a level that permits termination of the license.

The decommissioning approach that has been selected by DEK for KPS is the SAFSTOR method. The primary objectives of the KPS decommissioning project are to

remove the facility from service, reduce residual radioactivity to levels permitting unrestricted release, restore the site, perform this work safely, and complete the work in a cost effective manner. The selection of a preferred decommissioning alternative is influenced by a number of factors at the time of plant shutdown. These factors include the cost of each decommissioning alternative, minimization of occupational radiation exposure, availability of low-level waste disposal facilities, availability of a high-level waste (spent fuel) repository or DOE interim storage facility, regulatory requirements, and public concerns. In addition, 10 CFR 50.82(a)(3) requires decommissioning to be completed within 60 years of cessation of operations.

Under the SAFSTOR methodology, the facility is placed in a safe and stable condition and maintained in that state allowing levels of radioactivity to decrease through radioactive decay, followed by decontamination and dismantlement. After the safe storage period, the facility will be decontaminated and dismantled to levels that permit license termination. In accordance with 10 CFR 50.82(a)(9) a license termination plan will be developed and submitted for NRC approval at least two years prior to termination of the license.

The decommissioning approach for KPS is described in the following sections.

- Section II describes the planned decommissioning activities and the general timing of their implementation.
- Section III describes the overall decommissioning schedule, including the schedule for transfer of fuel from the spent fuel pool (SFP) to the KPS ISFSI.
- Section IV provides an analysis of expected decommissioning costs, including the costs associated with spent fuel management and site restoration.
- Section V describes the basis for concluding that the environmental impacts associated with decommissioning KPS are bounded by the most recent site-specific environmental impact statement and the NRC generic environmental impact statement related to decommissioning.

II. DESCRIPTION OF PLANNED DECOMMISSIONING ACTIVITIES

Dominion Energy Kewaunee, Inc. is currently planning to decommission KPS using a SAFSTOR method. SAFSTOR is broadly defined in Section I.C of this report.

Use of the SAFSTOR approach is consistent with the need to effectively manage spent fuel after the facility is permanently shut down. Since DEK will likely be required to manage spent fuel at the site for an extended period of time, a discussion of the Irradiated Fuel Management Plan for the site is included in this section. After the plant is shutdown and the reactor is defueled, the plant will be configured to ensure continued safe storage of spent fuel while it remains in the SFP. Then the spent fuel in the SFP will be transferred, after appropriate cooling, to the onsite ISFSI over a period of about seven years. The spent fuel will then be stored in the ISFSI until possession is transferred to DOE.

Table 2-1 provides a summary of the current decommissioning plan for KPS. The major decommissioning periods and the general sequencing of activities that will occur during each period identified in Table 2-1 are discussed in more detail in the sections that follow. The decommissioning plan consists of nine Decommissioning periods (associated with 10 CFR 50.75(c) requirements), four Spent Fuel Management periods (associated with 10 CFR 50.54(bb) requirements), and two Site Restoration periods (representing post-license termination activities). Some Decommissioning periods and Spent Fuel Management periods occur simultaneously. The Site Restoration periods follow the Decommissioning periods sequentially. Each of the periods is listed in Table 2-1 below along with the start and end date for the period, the number of years for the period, and the cost of performing the activities associated with the period (in 2012 dollars).

The planning required for each decommissioning activity, including the selection of the process to perform the work, will be performed in accordance with applicable site procedures. No decommissioning activities unique to the site have been identified as necessary, and no activities outside the bounds considered in the GEIS have been identified or are anticipated.

Radiological and environmental programs will be maintained throughout the decommissioning process to ensure radiological safety and environmental compliance is maintained. Radiological programs will be conducted in accordance with the facility Technical Specifications, Operating License, USAR, Radiological Environmental Monitoring Program, and Offsite Dose Calculation Manual. Environmental programs will be conducted in accordance with applicable requirements and permits.

Table 2-1

Kewaunee Power Station
Schedule and Costs of Decommissioning
(2012 dollars in thousands)

A. License Termination

Period No	Period Description	Start	End	Years	Cost
Decon Pd 1	SAFSTOR Planning, Preparations and Deactivation	7/1/2013	11/30/2014	1.41	$99,274
Decon Pd 2	SAFSTOR Preparation Delay During Wet Fuel Storage	11/30/2014	7/1/2020	5.58	$25,105
Decon Pd 3	Completion of SAFSTOR Preparations	7/1/2020	12/28/2020	0.49	$15,899
Decon Pd 4	Dormancy With Dry Storage	12/28/2020	10/19/2050	29.80	$51,910
Decon Pd 5	Dormancy Only	10/19/2050	4/17/2067	16.49	$28,550
Decon Pd 6	Decommissioning Planning During Dormancy	4/17/2067	6/22/2069	2.18	$42,755
Decon Pd 7	Dismantlement Site Modifications and Preparations	6/22/2069	5/24/2070	0.91	$64,972
Decon Pd 8	Systems Removal	5/24/2070	10/26/2071	1.42	$153,318
Decon Pd 9	Site Decontamination	10/26/2071	8/29/2072	0.84	$61,058
Account Total				59.12	$542,841

B. Spent Fuel

Period No	Period Description	Start	End	Years	Cost
SNF Pd 1	Spent Fuel Planning, Cooling and Transfer to Dry Storage	7/1/2013	7/1/2020	7.00	$175,227
SNF Pd 2	Dry Storage During Completion SAFSTOR Preparations	7/1/2020	12/28/2020	0.49	$2,665
SNF Pd 3	Dry Storage During Dormancy	12/28/2020	10/19/2050	29.80	$161,714
SNF Pd 4	ISFSI Demolition	3/30/2073	7/31/2073	0.33	$2,622
Account Total				37.62	$342,228

C. Greenfield

Period No	Period Description	Start	End	Years	Cost
Grn Pd 1	Clean Building Demolition	8/29/2072	7/31/2073	0.91	$30,827
Grn Pd 2	Site Restoration	7/31/2073	12/4/2073	0.34	$3,976
Account Total				1.25	$34,803
Scenario Total					$919,872

A. Discussion of Decommissioning Periods

1. SAFSTOR Planning, Preparations, and Deactivation (Decon Period 1)

The SAFSTOR Planning, Preparation and Deactivation period is the time when detailed preparations and activities are undertaken prior to and following plant shutdown. These activities are focused on ensuring a smooth transition from plant operations to SAFSTOR dormancy. The activities that will occur during this period include:

- Prepare a SAFSTOR schedule and decommissioning cost analysis.
- Develop an organizational structure to support the decommissioning plan.
- Prepare and submit required documents to the NRC, including a letter certifying cessation of power operations, the PSDAR, an updated Irradiated Fuel Management Plan, and a letter certifying permanent removal of fuel from the reactor vessel.
- Defuel the reactor vessel and re-set the head with the internals in place.
- Review, revise, and maintain plant licensing basis documents consistent with cessation of power operations and removal of fuel from the reactor. These documents include, but are not limited to, the Facility Operating License, Technical Specifications and Bases, Updated Final Safety Analysis Report, and the Technical Requirements Manual.
- Review and revise plant programs and procedures, as necessary, to reflect cessation of power operations and removal of fuel from the reactor.
- Review and re-classify plant structures, systems and components (SSCs) consistent with cessation of power operations and removal of fuel from the reactor.
- Sequentially remove from service systems no longer required based on processing of radioactive fluids and waste, and removal of hazards; while ensuring systems required for SFP cooling and makeup remain available.
- Prepare integrated work schedules.
- Procure non-engineered standard equipment needed for SAFSTOR preparations.
- Perform a general area cleanup.
- Perform radiation surveys of the plant, post caution signs, and control access as appropriate.

2. **SAFSTOR Preparations Delay during Wet Fuel Storage** (Decon Period 2)

This period represents a delay in SAFSTOR preparations until all spent fuel has been removed from the SFP. This period ends concurrent with completion of SNF Period 1.

3. **Completion of SAFSTOR Preparations** (Decon Period 3)

After the spent fuel has been transferred to the ISFSI, final preparations will be made for placing the plant in SAFSTOR Dormancy. The activities that will occur during this period include:

- Drain the SFP and process liquid wastes for disposal.
- Flush and drain systems rendered non-essential following closure of SFP.
- Remove and dispose of spent resins and filter media.
- Secure site for dormancy period.

4. **SAFSTOR Dormancy with Dry Fuel Storage** (Decon Period 4)

SAFSTOR Dormancy with Dry Fuel Storage is the period of time during which the facility will be in safe storage while spent fuel is stored in the ISFSI. SAFSTOR dormancy with dry fuel storage will occur after SAFSTOR Planning, Preparations, and Deactivation activities are complete, and after spent fuel has been transferred to the ISFSI. The SAFSTOR dormancy with dry fuel storage period ends after the spent fuel in the ISFSI has been transferred to DOE.

During this period, sufficient personnel will be retained to maintain required SSCs, site security, fire protection, environmental compliance, and to provide radiological surveillance to ensure radioactive material is not spread from the plant site to the environment. Systems that have been removed from service will be monitored, as necessary, to control radioactive materials. Other systems needed to complete future decommissioning activities and maintain dose ALARA will be maintained. In addition, the structural integrity of buildings will be monitored and maintained.

Areas that do not require routine access will be locked and secured, as appropriate. Areas containing radioactive materials or other contamination will be posted and secured as needed to prevent accidental intrusion. Shielding will be added, where necessary, to maintain radiation exposure to plant personnel ALARA. Periodic radiological inspections of contaminated buildings will be conducted. Decontamination activities will generally be limited to those necessary to maintain exposures ALARA.

5. **SAFSTOR Dormancy** (Decon Period 5)

SAFSTOR Dormancy is the period of time when the facility is in safe storage. SAFSTOR dormancy occurs after SAFSTOR planning, preparations, and deactivation activities are complete and spent fuel has been removed from the site.

During this period, sufficient personnel will be retained to maintain required SSCs, site security, fire protection, and to provide radiological surveillance to ensure radioactive material is not spread from the plant site to the environment. Systems that have been removed from service will be monitored, as needed, to control radioactive materials. Systems and equipment no longer needed may be removed from the site for asset recovery. In addition, the structural integrity of buildings will be monitored and maintained.

Areas that do not require routine access will be locked and secured as appropriate. Areas containing radioactive materials or other contamination will be posted and secured as needed to prevent accidental intrusion. Shielding will be added, where necessary, to maintain radiation exposure to plant personnel ALARA. Periodic radiological inspections of contaminated buildings will be conducted. Decontamination activities will generally be limited to those necessary to maintain exposures ALARA.

6. **Decommissioning Planning During Dormancy** (Decon Period 6)

Decommissioning Planning During Dormancy is the time period before major decommissioning activities are conducted during which detailed preparations are made to provide a smooth transition from SAFSTOR dormancy to decontamination and dismantlement activities. The required organizational structure will be established using available plant staff and outside resources, as needed.

During this period, and at least two years prior to the anticipated date of license termination, a license termination plan will be prepared and submitted in accordance with 10 CFR 50.82(a)(9). The license termination plan will define the details of the final radiological survey to be performed once decontamination activities are completed. The license termination plan will conform to the format defined in Regulatory Guide 1.179 (Reference 5) and will address the limits of 10 CFR 20, Subpart E, "Radiological Criteria for License Termination," using the pathways analysis defined in NUREG-1575 (Reference 6). Use of this guidance ensures that survey design and implementation are conducted in a manner that

provides a high degree of confidence that applicable regulatory criteria are satisfied.

The activities that will occur during this period include:

- Decommissioning planning and design.
- Design containment access modifications, as required.
- Determine and procure staffing required to accomplish the required work.
- Prepare site support and storage facilities, as required.
- Plan and design the post-SAFSTOR site characterization. Begin site characterization so that radiological, regulated, and hazardous wastes will be identified, categorized, and quantified as decommissioning progresses.
- Prepare integrated work sequences and schedules for decontamination and dismantlement activities.
- Determine transportation and disposal container requirements (including shielding and stabilization) for activated materials and/or hazardous materials.
- Develop activity specifications and task-specific work procedures for occupational exposure control, control and release of liquid and gaseous effluents, processing of radioactive waste generated during decontamination and dismantlement, site security, and industrial safety.
- Prepare license termination plan and other decommissioning licensing documents.
- Submit license termination plan for NRC review and approval.

7. **Dismantlement Site Modification and Preparations** (Decon Period 7)

During the Dismantlement and Site Modifications period final planning and preparations will be made for the major decommissioning activities that will occur in the Systems Removal period (Period 8). The activities that will occur during this period include:

- Complete decommissioning planning and design activities, as needed.
- Perform post-SAFSTOR baseline radiation survey.
- Conduct post-SAFSTOR radiation surveys of work areas, major components, and sampling of internal piping contamination levels.
- Select shipping casks and obtain shipping permits.
- Design, specify, and procure special items and materials.
- Procure non-engineered standard equipment.
- Revitalize plant infrastructure and repower site, as needed.
- Test special cutting and handling equipment and train operators.

- Modify the containment structure as needed to permit removal of large components.
- Finalize residual radiation inventory.

8. **Systems Removal** (Decon Period 8)

During the Systems Removal period, plant systems are decontaminated to minimize worker exposure, removed, appropriately packaged, and disposed. During this period the major radioactive components (as defined in 10 CFR 50.2) are segmented, removed and packaged for permanent disposal. "Major decommissioning activities" (as defined in 10 CFR 50.2) are planned to occur during this period. (See Section II.D for a detailed discussion of major decommissioning activities). Activities that will occur during this period include:

- Decontaminate components and piping systems, as required to control (i.e., minimize) worker exposure.
- Remove and dispose of low-level wastes (liquid and solid), mixed wastes, and other hazardous wastes.
- Remove, package, and dispose of piping and components that are no longer essential to support decommissioning operations.
- Remove additional systems and associated components as they become nonessential to the reactor vessel removal operations, related decommissioning activities, or worker health and safety (e.g., waste collection and processing systems, electrical and ventilation systems, etc.).
- Package GTCC components in appropriate containers for handling, storage, and disposal.
- Segment and dispose of fuel pool bridge crane.
- Remove control rod drive housings and the head service structure from the reactor vessel head and package for controlled disposal.
- Finalize reactor internals and vessel segmentation details.
- Remove steam generators and pressurizer for shipment and controlled disposal.
- Remove and dispose of reactor vessel insulation.
- Disassemble/segment the reactor internals and package in shielded casks.
- Segment/section the reactor vessel and closure head; placing segments into shielded containers. These operations are performed using a contamination control envelope. (DEK may also choose to not segment the reactor vessel and dispose of it as a whole component).
- Remove and dispose of the reactor coolant piping and pumps.

9. Site Decontamination (Decon Period 9)

During the Site Decontamination period site buildings, structures, soils and land areas are decontaminated and remaining low-level radioactive waste hazardous materials are identified, packaged, and sent for disposal.

The activities that will occur during this period include:

- Decontaminate remaining site buildings and facilities having residual contaminants. Segment, package and dispose of remaining low-level radioactive waste along with any remaining hazardous materials.
- Remove remaining components, equipment, and plant services in support of the area release survey(s).
- Remediate any contaminated soil and perform final status survey for structures and land areas demonstrating compliance with standards for unrestricted release.
- Prepare final survey status report.

The site decontamination period is considered complete after NRC has approved the license termination plan and terminated the facility license. After the NRC has approved the license termination plan, the final remediation of site facilities may commence as discussed below in Section B, "Discussion of Site Restoration Periods."

B. Discussion of Spent Fuel Management Periods

10 CFR 50.82(a)(4)(i) requires that the PSDAR contain a site-specific decommissioning cost estimate, including the projected cost of managing spent fuel. The projected costs of managing spent fuel are summarized in Table 2-1 with a corresponding detailed discussion included in the site specific decommissioning cost analysis provided in Attachment 1 of this report. In addition, an update to the Irradiated Fuel Management Plan pursuant to 10 CFR 50.54(bb) is being submitted separately.

The KPS ISFSI was designed and installed under a general license in accordance with 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High Level Radioactive Waste, and Reactor-Related Greater than Class C Waste." The spent fuel storage casks are licensed in accordance with an NRC Certificate of Compliance for the Standardized NUHOMS® Spent Fuel Storage System. The Standardized NUHOMS® System is a horizontal canister system composed of a steel dry shielded canister (DSC), a reinforced concrete horizontal storage module, and

a transfer cask. The welded DSC provides confinement and criticality control for the storage and transfer of spent fuel. The concrete module provides radiation shielding while allowing cooling of the DSC and fuel by natural convection during storage. The transfer cask is used for transferring the DSC from/to the Spent Fuel Pool Building to/from the horizontal storage module.

Following core off-load, spent fuel will be stored in the spent fuel pool until it is eligible to be transferred to the KPS ISFSI. While spent fuel is stored in the spent fuel pool, spent fuel storage and handling systems will be maintained in operation. Following transfer of all spent fuel from the spent fuel pool to the KPS ISFSI, spent fuel storage and handling systems will be removed from operation. All spent fuel will be stored at the KPS ISFSI until transferred to DOE.

The Spent Fuel Management Periods are discussed in detail below.

1. **Spent Fuel Planning, Cooling, and Transfer to Dry Storage** (SNF Period 1)

   This period begins when all spent fuel is off-loaded from the reactor vessel into the spent fuel pool and the certification of permanent defueling letter is submitted to the NRC in accordance with 10 CFR 50.82(a)(1)(ii). During this period, measures will be planned, designed and implemented to ensure spent fuel storage and handling systems are capable of functioning to support fuel storage in the spent fuel pool, and to facilitate transfer of the spent fuel to the ISFSI.

   Systems and structures needed to support the safe storage and transfer of spent fuel such as security, fire protection, and environmental and radiological monitoring, will be maintained in accordance with applicable requirements. Equipment maintenance, inspection, and operations will be performed on these systems and structures as appropriate.

   During this period, the ISFSI capacity will be expanded to accommodate transfer of all spent fuel in the SFP to dry storage.

   All spent fuel will be transferred to the ISFSI by the end of this period.

2. **Dry Storage during Completion of SAFSTOR Preparations** (SNF Period 2)

   During this period, spent fuel will have been transferred to the ISFSI while SAFSTOR preparations are completed as discussed in Decon Period 3. Programs and procedures needed to support safe operation of the ISFSI will be maintained in

accordance with applicable requirements. Equipment maintenance, monitoring, inspection, and operations will be performed as necessary.

3. **Dry Storage during Dormancy** (SNF Period 3)

This period begins concurrent with Decon Period 4, when the plant is in SAFSTOR status. The spent fuel remains in the ISFSI while the plant is in a dormant SAFSTOR condition. Programs and procedures required to support safe operation of the ISFSI will be maintained in accordance with applicable requirements. Equipment maintenance, monitoring, inspection, and operations will be performed as necessary.

As outlined in the site-specific decommissioning cost analysis (Attachment 1), DEK assumes that the DOE will begin accepting spent fuel during this period. Shipments of fuel to DOE will be from the ISFSI. Upon completion of this period, all spent fuel will have been transferred to DOE.

4. **ISFSI Decommissioning** (SNF Period 4)

After DOE acceptance of the spent fuel, any radiological decommissioning associated with the ISFSI would be accomplished as part of site decommissioning under the Part 50 license. As a generally licensed installation, the ISFSI will be included in the license termination plan as discussed above in Section II.A.9, "Site Decontamination."

C. Discussion of Site Restoration Periods

The restoration of the KPS site will be undertaken after the 10 CFR Part 50 facility license for KPS is terminated. After the NRC has terminated the facility license, non-radioactive structures and equipment will remain on the site. Demolition of the remaining portions of the containment structure and interior portions of the reactor building will be accomplished using commercial demolition techniques. Removal of remaining buildings and other site structures will also use commercial demolition techniques and will be conducted in accordance with State, Local, and Federal requirements. There are two Site Restoration periods as follows:

1. **Clean Building Demolition** (Grn Period 1)

Buildings, structures, and other facilities which are not radiologically contaminated, such as the intake structure, the discharge structure, turbine building, auxiliary

building, containment, and office buildings will be dismantled, or will have been dismantled, as part of the building demolition effort after the final license termination survey. These buildings can be removed late in the building demolition phase since there is no decommissioning operational need to remove them earlier.

2. **Site Restoration** (Grn Period 2)

Site restoration is the period beginning after license termination, when the demolition of non-radioactive structures and back-filling of any excavations remaining after decommissioning operations will occur. Restored areas on the site will be back-filled, graded, and landscaped as needed. Some onsite structures may remain and continue to be available for alternative use.

D. General Decommissioning Considerations

1. Major Decommissioning Activities

As defined in 10 CFR 50.2, "Definitions," a "major decommissioning activity" is "any activity that results in permanent removal of major radioactive components, permanently modifies the structure of the containment, or results in dismantling components for shipment containing greater than Class C waste in accordance with 10 CFR 61.55." The following discussion provides a summary of the major decommissioning activities currently planned for KPS. These activities may be modified as conditions dictate.

Prior to starting a major decommissioning activity, the affected components will be surveyed and decontaminated, as required, in order to minimize worker exposure, and a plan will be developed for the activity. Shipping casks and other equipment necessary to conduct major decommissioning activities will be designed and procured.

The initial major decommissioning activities will focus on removal, packaging and disposal of piping and components that are no longer essential to support decommissioning operations. Then additional systems and associated components would be removed as they become nonessential to the reactor vessel removal operations, related decommissioning activities, or worker health and safety.

The initial major decommissioning activity inside containment will be removal, packaging, and disposal of the control rod drive housings from the reactor vessel

head. Then the reactor vessel insulation will be removed, followed by removal and disposal of the reactor coolant piping and pumps.

Following reactor vessel and cavity reflood the reactor vessel internals will be removed from the reactor vessel and segmented as needed to separate the GTCC waste. The internals comprising the core shroud, core support structure, fuel guide plate, and upper portions of the in-core thimble guide tubes may be GTCC waste which will be segmented, packaged into fuel bundle sized containers, and transferred to the ISFSI for storage and eventual disposal. Using this approach, the internals will be packaged and disposed of independent of the reactor vessel. When the internals segmentation effort is completed, the reactor vessel and cavity will be drained and any remaining debris removed.

Removal of the reactor vessel and vessel closure head follows the removal of the reactor internals. Without the internals present, several options are available for removal and disposal of the reactor vessel: segmentation, sectioning into larger pieces, or disposal as an intact package. It is likely that the components would be removed by sectioning or segmenting performed remotely in air using a contamination control envelope. Vessel sectioning or segmenting will permit a substantial portion of the waste to be sent to a waste re-processor instead of a near surface disposal site. The segments that are GTCC will be placed into shielded canisters and stored in the ISFSI until transferred to DOE.

Additional major decommissioning activities that would be conducted include removal and disposal of the steam generators, pressurizer, spent fuel storage racks and spent fuel bridge crane. The dismantling of the containment structure would be undertaken as part of the reactor building demolition.

2. Other Decommissioning Activities

In addition to the major decommissioning activities discussed above, plant components will be removed from the Turbine Building including the Turbine Generator, Condenser, Feedwater Heaters, Moisture Separator/Reheaters, and miscellaneous system and support equipment.

3. Decontamination and Dismantlement Activities

The objectives of the decontamination effort are two-fold. The first objective is to reduce radiation levels throughout the facility in order to minimize personnel exposure during dismantlement. This objective will be achieved by allowing

radioactive decay during the SAFSTOR period, thereby reducing the quantity of contamination and radioactivity that must be disposed of during decontamination and dismantlement.

The second objective is to clean as much material as possible to unrestricted use levels, thereby permitting non-radiological demolition and disposal and minimizing the quantities of material that must be disposed of by burial as radioactive waste. The second objective will be achieved by decontaminating structural components including steel framing and concrete surfaces. The methods to accomplish this are typically mechanical, requiring the removal of the surface or surface coating, and are used regularly in industrial and contaminated sites. The need to decontaminate SSCs will be determined by the schedule to dismantle them and by plant conditions.

The decontamination and/or dismantlement of contaminated SSCs may be accomplished by decontamination in place, decontamination and dismantlement, or dismantlement and disposal. A combination of these methods may be utilized to reduce contamination levels, worker radiation exposures, and project costs. The methods chosen will be those deemed most appropriate for the particular circumstances. Material below the applicable radiological limits will be released for unrestricted disposition (e.g., scrap, recycle, or general disposal). Radioactively contaminated or activated materials will be removed from the site as necessary to allow the site to be released for unrestricted use.

Low-level radioactive waste will be processed in accordance with plant procedures and existing commercial options. Contaminated material will be characterized and segregated for additional onsite decontamination or processing, offsite processing (e.g., disassembly, chemical cleaning, volume reduction, waste treatment, etc.), and/or packaged for controlled disposal at a low-level radioactive waste disposal facility.

Contaminated concrete and structural steel components will be decontaminated and removed as required to gain access to contaminated and uncontaminated systems and components. After the systems and components are removed and processed as described above, the remaining contaminated concrete and structural steel components will be decontaminated and/or removed. Contaminated concrete will be packaged and shipped to a low-level waste disposal facility. Contaminated structural steel components may be removed to a processing area for decontamination, volume reduction, and packaging for

shipment to a processing facility or to a low-level radioactive waste disposal facility, as necessary.

Buried and imbedded contaminated components (e.g., piping, drains, etc.) will be decontaminated in place or excavated and decontaminated. Appropriate contamination controls will be employed to minimize the spread of contamination and protect personnel.

4. Radioactive Waste Management

A major component of the total cost of decommissioning KPS is the cost of packaging and disposing of SSCs, contaminated soil, resins, water, and other plant process liquids. A waste management plan will be developed to incorporate the most cost effective disposal strategy, consistent with regulatory requirements for each waste type. Currently, Class B and C waste may be disposed of at the waste disposal site in Andrews County, Texas. The waste management plan will be based on the evaluation of available methods and strategies for processing, packaging, and transporting radioactive waste in conjunction with the available disposal facility options and associated waste acceptance criteria.

Class A low level radioactive waste (LLRW) will be disposed of at a licensed disposal site (DEK currently uses the *EnergySolutions* facility located in Clive, Utah). If other licensed Class B and C LLRW facilities become available in the future, DEK may choose to use them as well.

5. Removal of Mixed Wastes

Mixed wastes and mixed wastes generated during decommissioning, if any, will be managed in accordance with applicable Federal and State regulations.

Mixed wastes from KPS will be transported by authorized and licensed transporters and shipped to authorized and licensed facilities. If technology, resources, and approved processes are available, the processes will be evaluated to render the mixed waste non-hazardous.

6. Site Characterization

During the decommissioning process, a site characterization will be performed in which radiological, regulated, and hazardous wastes will be identified, categorized, and quantified. Surveys will be conducted to establish the contamination and

radiation levels throughout the plant. This information will be used in developing procedures to ensure that hazardous, regulated, and radiologically contaminated areas are removed and ensure that worker exposure is controlled. Surveys of selected outdoor areas will also be performed including surveys of soil and groundwater near the site. As decontamination and dismantlement work proceeds, surveys will be conducted to maintain the site characterization current and ensure that decommissioning activities are adjusted accordingly.

An activity level calculation of the reactor internals, the reactor vessel, and the biological shield wall will be performed as part of the site characterization. Using the results of this analysis, these components will be classified in accordance with 10 CFR 61. The results of the analysis will form the basis for the detailed plans for their packaging and disposal. The material which is found to be Greater than Class C (GTCC) will be removed and stored at the KPS ISFSI until transferred to DOE.

7. Groundwater Protection and Radiological Decommissioning Records Program

A groundwater protection program was initiated at KPS in accordance with NEI Technical Report 07-07, "Industry Groundwater Protection Initiative, Final Guidance Document," in August 2007. A site hydrology study was completed as part of this initiative. Fourteen monitoring wells were installed around the plant to identify any leakage and transport of any radiological contaminants from the plant. No contamination attributed to plant operations has been found through the sampling program implemented as part of this initiative. The program is directed by procedures and will be maintained during decommissioning.

KPS will also continue to maintain the existing radiological decommissioning records program required by 10 CFR 50.75(g). The program is directed by procedures. The events noted in the 10 CFR 50.75(g) file were remediated to the free release criteria in place at the time of the events.

8. Changes to Management and Staffing

After the plant is shutdown and the reactor defueled, plant management and staffing levels will be adjusted to reflect the transition of the site organization from an operating plant to a plant in decommissioning status.

III. SCHEDULE OF PLANNED DECOMMISSIONING ACTIVITIES

DEK intends to pursue decommissioning of KPS utilizing a SAFSTOR methodology. The SAFSTOR method involves removal of radioactive or activated material from the site following a period of dormancy. Planning for decommissioning of the site is already underway. Work activities associated with the planning and preparation period are scheduled to commence after the plant has been permanently shut down and fuel has been removed from the reactor vessel. The schedule of decommissioning activities is provided in Table 2-1.

The schedule provided in Table 2-1 recognizes that spent fuel will be retained in the SFP for a period of time until it can be transferred to the ISFSI and ultimately transferred to DOE.

IV. ESTIMATE OF EXPECTED DECOMMISSIONING AND SPENT FUEL MANAGEMENT COSTS

10 CFR 50.82(a)(8)(iii) requires that a site-specific decommissioning cost estimate be prepared and submitted within two years following permanent cessation of operations. 10 CFR 50.82(a)(4)(i) requires that the PSDAR contain a site-specific decommissioning cost estimate including the projected costs of managing irradiated fuel.

EnergySolutions, LLC has prepared a site-specific decommissioning cost analysis for KPS, which also provides projected costs of managing spent fuel, as well as non-radiological decommissioning and site restoration costs, accounted for separately. The site-specific decommissioning cost analysis is provided in Attachment 1 and fulfills the requirements of 10 CFR 50.82(a)(4)(i) and 10 CFR 50.82(a)(8)(iii). A summary of the site-specific decommissioning cost analysis and projected cost of managing spent fuel is provided in Table 2-1. A summary of the annual costs, earnings, and trust balances associated with decommissioning, spent fuel management, and site restoration are provided in an update to the Irradiated Fuel Management Plan being submitted as a separate document in accordance with 10 CFR 50.54(bb) (Reference 7).

The methodology used by *EnergySolutions* to develop the site-specific decommissioning cost analysis follows the basic approach originally advanced by the Atomic Industrial Forum (now Nuclear Energy Institute) in their program to develop a standardized model for decommissioning cost estimates. The results of this program were published as AIF/NESP-036, "A Guideline for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," (Reference 8). This document presents a unit cost factor method for estimating direct activity costs, simplifying the estimating process. The unit cost factors used in the study reflect the latest available data at the time of the study concerning worker productivity during decommissioning.

10 CFR 50.82(c) states that for a facility that has permanently ceased operation before the expiration of its license, the collection period for any shortfall of funds will be determined, upon application by the licensee, on a case-by-case basis taking into account the specific financial situation of each licensee. At the time that operations cease at KPS, sufficient funds will be available in the plant decommissioning fund to complete the planned decommissioning activities.

10 CFR 50.82(a)(6)(ii) states that licensees shall not perform any decommissioning activities, as defined in 10 CFR 50.2, that would result in there no longer being reasonable assurance that adequate funds will be available for decommissioning.

Because adequate funding exists based on the site-specific decommissioning cost analysis in Attachment 1, no such activities have been identified.

V. ENVIRONMENTAL IMPACTS

10 CFR 50.82(a)(4)(i) requires that the PSDAR include "a discussion that provides the reasons for concluding that the environmental impacts associated with the site-specific decommissioning activities will be bounded by appropriate, previously issued environmental impact statements." The following discussion provides the reasons for reaching this conclusion and is based on three previously issued environmental impact statements:

1. NUREG-0586, Supplement 1, "Final Generic Environmental Impact Statement on Decommissioning Nuclear Facilities," (Reference 4) (Referred to as the GEIS).
2. NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 40, Regarding Kewaunee Power Station," published August 2010 (Reference 9) (Referred to as the SEIS).
3. NUREG-1496, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," dated July 1997 (Reference 10).

A. Environmental Impacts of Decommissioning KPS

The following is a summary of the reasons for reaching the conclusion that the environmental impacts of decommissioning KPS are bounded by the GEIS and SEIS. Each environmental impact standard in the GEIS is listed along with a summary as to why DEK concludes the GEIS analysis bounds the impacts of KPS decommissioning on that standard. As a general matter, KPS is smaller than the reference PWR used in NUREG-0586 to evaluate the environmental impacts of decommissioning, and is likewise smaller than a number of PWRs that were evaluated in NUREG-0586, Supplement 1 and is therefore bounded by those assessments. Further, there are no unique site-specific features or unique aspects of planned decommissioning that have been identified.

1. Onsite/Offsite Land Use

The GEIS concluded that the impacts on land use are not detectable or small for facilities having only onsite land-use changes as a result of large component removal, structure dismantlement, and low level waste packaging and storage. Construction activities that would disturb greater than one acre of soil require application and approval from WDNR prior to disturbing the soil. All construction projects must control sediment and erosion effect on water course and wetlands. DEK does not anticipate any changes in land use beyond the site boundary during

decommissioning. Therefore DEK concludes that the impacts on land use are bounded by the GEIS.

2. Water Use

After the plant is shutdown the operational demand for cooling water and makeup water will dramatically decrease. After the plant is shutdown and defueled, the amount of water used by the service water system will be much less than during normal operation of the plant. The need for cooling water will continue to decrease as the heat load of spent fuel in the SFP declines due to radioactive decay and as spent fuel is relocated from the SFP to the ISFSI. After the plant is shutdown, the use of potable water will also decrease commensurate with the expected decrease in plant staffing levels. The demand for water needed to conduct plant decommissioning activities (flushing piping, hydro-lasing, dust abatement, etc.) will be an insignificant portion of overall potable water use. Therefore, the impacts of KPS decommissioning on water use is bounded by the previously issued GEIS.

3. Water Quality – Non-Radiological

DEK has chosen to decommission the plant using the SAFSTOR method. During the SAFSTOR planning and actual storage periods, storm water runoff and drainage paths will be maintained in their current configuration. The schedule for this decommissioning method includes a 20-year roofing replacement that will ensure runoff is directed to designed drainage paths and not through the structures themselves. The WPDES permit, which regulates water discharges from the site, will remain in place. Programs and processes designed to minimize, detect, and contain spills will be maintained throughout the decommissioning process. Federal, state and local regulations and permits pertaining to water quality will remain in effect and no significant changes to water supply reliability are expected. Therefore, the impact of KPS decommissioning on water quality is bounded by the GEIS.

4. Air Quality

KPS holds an operating permit issued by the WDNR which regulates air emission sources at the power station. This permit will remain in place during decommissioning. If new sources of air emissions are added or changed at the facility to support this process, then the permit will be modified as required. As new regulations are issued that impact these sources then these requirements will be addressed at the station. In addition, there are various other regulations that

apply to air quality including hazardous air pollutants and indoor air quality. There are many types of decommissioning activities that have the potential to affect air quality. These activities are listed in the GEIS. DEK does not anticipate any activities beyond those listed in the GEIS that could potentially affect air quality.

Therefore, the impacts of KPS decommissioning on air quality is bounded by the previously issued GEIS and SEIS.

5. Aquatic Ecology

Aquatic Ecology encompasses the plants and animals in Lake Michigan and wetlands near KPS. Aquatic ecology also includes the interaction of those organisms with each other and the environment. After the plant is shutdown the amount of water withdrawn from Lake Michigan will significantly decrease thus reducing the potential impacts from impingement and entrainment of aquatic species. DEK does not anticipate disturbance of lands beyond the current operational areas of the plant. All activities within the current operational areas of the plant will be conducted in accordance with required permits. Therefore, the impacts of decommissioning KPS on aquatic ecology are bounded by the GEIS.

6. Terrestrial Ecology

Terrestrial ecology considers the plants and animals in the vicinity of KPS as well as the interaction of those organisms with each other and the environment. Evaluations of impacts to terrestrial ecology are usually directed at important habitats and species, including plant and animals that are important to industry, recreational activities, the area ecosystems, and those protected by endangered species regulations and legislation. DEK does not anticipate activities to be conducted, including ISFSI expansion that would disturb habitat beyond the operational areas of the plant. In addition, the WDNR controls significant impacts to the environment through regulation of construction activities. Therefore, the impacts of decommissioning KPS on terrestrial ecology are bounded by the GEIS.

7. Threatened and Endangered Species

It is anticipated that the potential impacts of decommissioning on threatened or endangered aquatic species will be less than during plant operations because the normal cooling system for the plant (i.e. circulating water system) will no longer be in use. Eliminating use of normal cooling water systems reduces the effects of

impingement, entrainment, thermal discharges, and effluent discharges on aquatic species.

The effects of decommissioning on threatened or endangered terrestrial species is expected to be no greater than during normal power operations.

The only example of an endangered or threatened species known to be present at the KPS site is a state-listed endangered peregrine falcon nest currently on the top of the KPS containment structure.

At some point during decommissioning, any active peregrine falcon nest on the property that will be impacted during decommissioning will be removed. Appropriate permits will be obtained, and any such action will be coordinated with, and approved by, US Fish and Wildlife and WDNR Wildlife Biologists.

Based on the above, the planned decommissioning of KPS will not result in direct mortality or major behavior changes or otherwise jeopardize the local population of any endangered or threatened species. Therefore, the impacts of decommissioning KPS on threatened and endangered species are bounded by the GEIS.

8. Radiological

Occupational Dose

The occupational radiation exposure to KPS plant personnel will be maintained ALARA and below the occupational dose limits in 10 CFR 20 during decommissioning. The need for plant personnel to routinely enter radiological areas to conduct maintenance, calibration, inspection, and other activities associated with an operating plant will be reduced, thus it is expected that the occupational dose to plant personnel will significantly decrease after the plant is shutdown and defueled.

DEK has elected to decommission KPS using the SAFSTOR alternative. It is expected that the occupational dose required to complete the decommissioning activities at KPS will be within the range of dose estimates (308 – 664 person rem) provided for the reference PWR using the SAFSTOR alternative (Table 4-1 of the GEIS). This is based on the fact that KPS is a relatively small, two loop PWR, and because the ALARA program will be maintained to ensure that occupational dose is maintained ALARA.

Public Dose

Radiation dose to the public will be maintained within regulatory limits and below comparable levels when the plant was operating through the continued application of radiation protection and contamination controls combined with the reduced source term available in the facility.

9. Radiological Accidents

The likelihood of a large offsite radiological release that impacts public health and safety after KPS is shutdown and defueled is considerably lower than the likelihood of a release from the plant during power operation. This is because the majority of the potential releases associated with power operation are not relevant after the fuel has been removed from the reactor. Furthermore, handling of spent fuel assemblies will continue to be controlled under work procedures designed to minimize the likelihood and consequences of a fuel handling accident. In addition, emergency plans and procedures will remain in place to protect the health and safety of the public while the possibility of significant radiological releases exists.

NUREG-0586, Supplement 1 also considers the possibility of a zircalloy fire. It references the NRC's 2001 Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants (NUREG-1738), as providing both the frequency of beyond design basis spent fuel pool accidents and bounding consequence analyses. Additional measures required after the terrorist attacks on September 11, 2001 have been shown to be effective in maintaining spent fuel pool cooling even if a spent fuel pool is entirely drained, further reducing risk of a zircalloy fire (Reference 11). Moreover, this remote risk diminishes as spent fuel radioactivity levels decay.

The potential for decommissioning activities to result in radiological releases not involving spent fuel (i.e. releases related to decontamination and dismantlement activities) will be minimized by use of procedures designed to minimize the likelihood and consequences of such releases.

Therefore, DEK concludes that the impacts of decommissioning on radiological accidents are small and bounded by the GEIS.

10. Occupational Issues

DEK will continue to maintain appropriate administrative controls and requirements to ensure occupational hazards are minimized and that applicable federal, state and local occupational safety standards and requirements continue to be met. DEK has reviewed the occupational hazards and injuries in the GEIS and concluded that they are not destabilizing to future decommissioning projects. Therefore, the impacts of decommissioning KPS on occupational issues are bounded by the GEIS.

11. Cost

Decommissioning costs for KPS are discussed in Section IV of this report and in Attachment 1 to this report. The GEIS recognizes that an evaluation of decommissioning cost in not a National Environmental Policy Act requirement. Therefore a bounding analysis is not applicable.

12. Socioeconomics

Decommissioning of KPS is expected to result in negative socioeconomic impacts. As KPS transitions from an operating plant to a shutdown plant and into the different phases of decommissioning, an overall decrease in plant staff will occur. The lost wages of these plant staff will result in decreases in revenues available to support the local economy and local tax authorities. Some laid-off workers may relocate, thus potentially impacting the local cost of housing and availability of public services. The GEIS recognizes that these impacts are likely and concluded that the impacts are not destabilizing. DEK has reviewed the GEIS and has determined that the decommissioning of KPS is bounded by the GEIS analysis of socioeconomic effects.

13. Environmental Justice

Executive Order 12898, dated February 16, 1994, directs Federal executive agencies to consider environmental justice under the National Environmental Policy Act. It is designed to ensure that low-income and minority populations do not experience disproportionately high and adverse human health or environmental effects because of Federal actions.

The SEIS sections 4.9.7.1 and 4.9.7.2 each analyzed the census data within 50 miles of the plant for minority and low income populations, respectively. The

conclusion was that there are no blocks of minority populations or low income populations within 20 miles of the plant. Both types of populations were located in Green Bay, WI or beyond. Based on this data, there would be little, if any, minority or low income group impacts as a result of decommissioning KPS.

Because the activities of the decommissioning plan are similar to activities performed during plant refueling outages, DEK believes that the impact of decommissioning is similar to the impact of a normal refuel outage with respect to environmental justice. Therefore, it has been concluded that the impacts of decommissioning KPS on environmental justice are bounded by the SEIS and GEIS. The GEIS states that, subsequent to the submittal of the PSDAR, the NRC staff will consider the impacts related to environmental justice from decommissioning activities.

14. Cultural, Historic, and Archeological Resources

Based on walkdowns conducted at the site in 2007 in support of the SEIS for license renewal, no known historic and archaeological resources are known to exist on the KPS site. DEK expects that most decommissioning activities will be conducted within the protected areas. DEK has a cultural resources plan in place for land disturbing activities performed outside of the protected area. Contractors who perform work activities outside the protected area are briefed to contact the site environmental coordinator if they discover archeological or cultural resources while performing their work activities.

DEK has concluded impact of decommissioning on cultural, historic, and archeological resources is bounded by the GEIS.

15. Aesthetic Issues

The impact of decommissioning activities on aesthetic resources will be temporary and remain consistent with the aesthetics of an industrial plant. After the decommissioning process is complete, site restoration activities will result in structures being removed from the site and the site being backfilled, graded and landscaped as needed. The removal of structures is generally considered beneficial to the aesthetic impact of the site.

Therefore, DEK has concluded that the impact of decommissioning on aesthetic issues is bounded by the GEIS.

16. Noise

General noise levels during the decommissioning process are not expected to any more severe than during refueling outages and are not expected to present an audible intrusion on the surrounding community. Some decommissioning activities may result in higher than normal noise levels (i.e. some types of demolition activities). However, these noise levels would be temporary and are not expected to present an audible intrusion on the surrounding community.

Therefore, DEK has concluded that the impact of decommissioning on noise is bounded by the GEIS.

17. Transportation

The transportation impacts of decommissioning are dependent on the number of shipments to and from the plant, the types of shipments, the distance the material is shipped, and the radiological waste/fixed waste quantities and disposal plans. The estimated number and volume of shipments from the plant will be much smaller than shipments to the plant during decommissioning. The shipments from the plant would be primarily radioactive wastes and non-radioactive wastes associated with dismantlement and disposal of structures, systems and components.

The estimated cubic feet of radioactive waste associated with decommissioning KPS is summarized as follows:

Class A	133,498 cubic feet
Class B	2,207 cubic feet
Class C	341 cubic feet
GTCC	58 cubic feet

The GEIS estimate for low-level waste disposal from a referenced PWR is 600 - 45,000 cubic meters (21,000 – 1.5 million cubic feet) for a PWR using the SAFSTOR alternative. DEK estimates the low-level waste burial volume (Class A, B, and C) for KPS will be 3,853 cubic meters (136,046 cubic feet) using the SAFSTOR alternative.

DEK must comply with applicable regulations when shipping radioactive waste from decommissioning and NRC has concluded in the GEIS that these regulations

are adequate to protect the public against unreasonable risk from transportation of radioactive materials.

The number of GTCC waste shipments expected to occur during decommissioning are expected to be below the number referenced in the GEIS Table 4-6. These shipments will occur over an extended period of time and will not result in significant changes to local traffic density or patterns, the need for construction of new methods of transportation, or significant dose to workers or the public.

In addition, shipments of non-radioactive wastes from the site are not expected to result in measurable deterioration of affected roads or a destabilizing increase in traffic density.

Therefore, DEK has concluded that the impact of decommissioning on transportation is bounded by the GEIS.

18. Irreversible and Irretrievable Commitment of Resources

Irreversible commitments are commitments of resources that cannot be recovered, and irretrievable commitments of resources are those that are lost for only a period of time.

Uranium is a natural resource that is irretrievably consumed during power operation. After the plant is shutdown uranium is no longer consumed. The use of the environment (air, water, land) is not considered to represent a significant irreversible or irretrievable resource commitment but rather a relatively short-term investment. Since the decommissioning plan is to release the site for unrestricted use after license termination, land is not considered an irreversible resource. The only irretrievable resources that would occur during decommissioning would be materials used to decontaminate the facility (e.g. rags, solvents, gases, and tools) and the fuel used for Decommissioning activities and transportation of materials to and from the site. However, the use of these resources is minor.

Therefore, DEK has concluded that the impact of decommissioning on irreversible and irretrievable commitment of resources is bounded by the GEIS.

B. Environmental Impacts of License Termination – NUREG-1496

According to the schedule provided in Section III of this report, a license termination plan for KPS will not be developed until approximately two years prior to final site

decontamination (approximately the year 2070). At that time, a supplemental environmental report will be submitted as required by 10 CFR 50.82(a)(9). While detailed planning for license termination activities will not be performed until after the SAFSTOR period, the absence of any unique site-specific factors, significant groundwater contamination, unusual demographics, or impediments to achieving unrestricted release suggest that impacts resulting from license termination will be similar to those evaluated in NUREG-1496.

C. Discussion of Decommissioning in the SEIS

NUREG-1437, Supplement 40, dated August 2010 was issued in conjunction with the NRC approval of a renewed facility operating license for KPS in accordance with 10 CFR 54, "Requirements for the Renewal of Operating Licenses for Nuclear Power Plants." Although KPS was issued a renewed facility operating license under 10 CFR 54 on February 24, 2011, the original license term, which ends on December 21, 2013, will not have been completed at the time KPS is permanently shutdown.

Postulated impacts associated with decommissioning are discussed in the SEIS (NUREG-1437, Supplement 40), Section 7.0, which identified six issues related to decommissioning as follows:

- Radiation Doses
- Waste Management
- Air Quality
- Water Quality
- Ecological Resources
- Socioeconomic Impacts

The NRC staff did not identify any new and significant information during their review of the most recent DEK environmental report at that time (Reference 12), the site audit, or the scoping process for license renewal. Therefore, the NRC concluded that there are no impacts related to these issues beyond those discussed in the NRC GEIS issued in 1996 and 1999 for license renewal or the NRC GEIS issued in 2002 for decommissioning. For the issues above, the GEISs concluded the impacts are small. The NRC found no site-specific issues related to decommissioning.

D. Additional Considerations

While not quantitative, the following considerations are relevant to concluding that decommissioning activities will not result in significant environmental impacts not previously reviewed:

- The release of effluents will continue to be controlled by plant license requirements and plant procedures.
- KPS will continue to comply with the Offsite Dose Calculation Manual, Radiological Environmental Monitoring Program, and Groundwater Protection Initiative Program during decommissioning.
- Releases of non-radiological effluents will continue to be controlled per the requirements of the WPDES permit and applicable State of Wisconsin permits.
- Systems used to treat or control effluents during power operation will either be maintained or replaced by temporary or mobile systems for the decommissioning activities.
- Radiation protection principles used during plant operations will remain in effect during decommissioning.
- Sufficient decontamination and source term reduction prior to dismantlement will be performed to ensure that occupational dose and public exposure will be maintained below applicable limits.
- Transport of radioactive waste will be in accordance with plant procedures, applicable Federal regulations, and the requirements of the receiving facility.
- Site access control during decommissioning will ensure that residual contamination is minimized or eliminated as a radiation release pathway to the public.

E. Conclusion

Based on the above discussions, DEK concludes that the environmental impacts associated with planned KPS site-specific decommissioning activities will be bounded by appropriate, previously issued environmental impact statements. Specifically, the environmental impacts are bounded by the GEIS (Reference 4) and the most recent SEIS for KPS (Reference 9).

1. The postulated impacts associated with the decommissioning method chosen, SAFSTOR, have already been considered in the most recent SEIS and GEIS.
2. There are no unique aspects of KPS or of the decommissioning techniques to be utilized that would invalidate the conclusions reached in the most recent SEIS and GEIS.

3. The methods to be employed to dismantle and decontaminate KPS are standard construction-based techniques fully considered in the most recent SEIS and GEIS.

Therefore, it can be concluded that the environmental impacts associated with the site-specific decommissioning activities for KPS will be bounded by appropriate previously issued environmental impact statements

10 CFR 50.82(a)(6)(ii) states that licensees shall not perform any decommissioning activities, as defined in 10 CFR 50.2, that result in significant environmental impacts not previously reviewed. No such impacts have been identified.

VI. REFERENCES

1. Regulatory Guide 1.185, "Standard Format and Content for Post-Shutdown Decommissioning Activities Report," July 2000.
2. Letter from David A. Heacock (DEK) to NRC Document Control Desk, "Certification of Permanent Cessation of Power Operations," dated November 2, 2012.
3. Letter from D. G. Stoddard (DEK) to NRC Document Control Desk, "Certification of Permanent Cessation of Power Operations," dated February 25, 2013.
4. NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities: Supplement 1, Regarding the Decommissioning of Nuclear Power Reactors," October 2002.
5. Regulatory Guide 1.179, "Standard Format and Content of License Termination Plans for Nuclear Power Reactors."
6. NUREG-1575, "Multi Agency Radiation Survey and Site Investigation Manual (MARSSIM)," Revision 1, dated August 2000.
7. Letter from D. G. Stoddard (DEK) to NRC Document Control Desk, "Update to Irradiated Fuel Management Plan Pursuant to 10 CFR 50.54(bb)," dated February 26, 2013.
8. AIF/NESP-036, "A Guideline for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates"
9. NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 40, Regarding Kewaunee Power Station," published August 2010.
10. NUREG-1496, "Generic Environmental Impact Statement in Support of Rulemaking on Radiological Criteria for License Termination of NRC-Licensed Nuclear Facilities," dated July 1997.
11. The Attorney General of Commonwealth of Massachusetts; the Attorney General of California; Denial of Petitions for Rulemaking, 73 Fed. Reg. 46,204, 46,209 (Aug. 8, 2008).
12. Dominion Energy Kewaunee, Inc. (DEK) 2008, "Kewaunee Power Station, Applicant's Environmental Report, Operating License Renewal Stage," Glen Allen, VA. [ADAMS Accession Nos. ML082341020, ML082341038, and ML082341039].

Attachment 1

EnergySolutions Document No. 82A9684:

2012 Decommissioning Cost Analysis of Kewaunee Nuclear Power Plant SAFSTOR Methodology

February 7, 2013

(Non-Proprietary Version)

ENERGY*SOLUTIONS* **Document No. 82A9684**

2012 Decommissioning Cost Analysis of the Kewaunee Nuclear Power Plant SAFSTOR Methodology

Project No. 137132

Prepared for:
Dominion Energy Kewaunee, Inc.
5000 Dominion Boulevard
Glen Allen, VA 23060

Prepared by:
Energy*Solutions*, LLC
100 Mill Plain Road
Mailbox No. 106
Danbury, CT 06811

Authored By: Jeffrey J. Martin, Senior Cost Estimator — 02-07-2013 Date

Reviewed By: Barry Sims, Senior Technical Advisor — 02-07-2013 Date

[X] New Report
[ ] Title Change
[ ] Report Revision
[ ] Report Rewrite

Effective Date 2-07-13

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

ACRONYMS AND ABBREVIATIONS

AIF	Atomic Industrial Forum
ALARA	As Low As Reasonably Achievable
ARO	Asset Retirement Obligation
BRC	Blue Ribbon Commission on America's Nuclear Future
BWR	Boiling Water Reactor
CFR	Code of Federal Regulations
CPM	Critical Path Method
DGC	Decommissioning General Contractor
DOE	U.S. Department of Energy
Dominion	Dominion Energy Kewaunee, Inc.
DSC	Dry Storage Canister
FEMA	Federal Emergency Management Agency
FSS	Final Status Survey
FTE	Full Time Equivalent
GSA	U.S. General Services Administration
GTCC	Greater Than Class C
HP	Health Physics
HSM	Horizontal Storage Modules
ISFSI	Independent Spent Fuel Storage Installation
Kewaunee	Kewaunee Power Station
LLRW	Low-Level Radioactive Waste
LLW	Low Level Waste
LLWPA	Low-Level Waste Policy Act
LOP	Life-of-Plant
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MPC	Multi-Purpose Canister
MWt	Megawatt thermal
NRC	Nuclear Regulatory Commission
NSSS	Nuclear Steam Supply System
ORISE	Oak Ridge Institute for Science and Education
PCB	Polychlorinated Biphenyl
PSDAR	Post-Shutdown Decommissioning Activities Report
PWR	Pressurized Water Reactor
RIF	Reduction In Force
TCEQ	Texas Commission on Environmental Quality
TRAGIS	Transportation Routing Analysis Geographic Information System
WBS	Work Breakdown Structure
WCS	Waste Control Specialists LLC
UCF	Unit Cost Factor

1.0 EXECUTIVE SUMMARY

This report presents an update to the 2008 Decommissioning Cost Estimate Study of the Kewaunee Nuclear Power Plant (Ref. No. 1), hereinafter referred to as the 2008 Cost Study. The Kewaunee Power Station (Kewaunee) is owned by Dominion Energy Kewaunee, Inc. (Dominion).

This update has been performed to furnish an estimate, for financial planning purposes, of the costs for (1) decommissioning Kewaunee to the extent required to terminate the plant's operating license pursuant to 10 CFR 50.75(c), (2) post-shutdown management of spent fuel until acceptance by the U.S. Department of Energy (DOE) pursuant to 10 CFR 50.54(bb), and (3) clean demolition of structures and restoration of the site to Greenfield conditions (Ref. No. 2).

The study methodology follows the basic approach originally presented in the Atomic Industrial Forum/National Environmental Studies Project Report AIF/NESP-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," (Ref. No. 3). The report was prepared in accordance with Nuclear Regulatory Commission (NRC) Regulatory Guide 1.202, "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," (Ref. No. 4). The estimate is based on compliance with current regulatory requirements and proven decommissioning technologies.

NRC requirements, set forth in Title 10 of the Code of Federal Regulations (CFR), differentiate between the post-shutdown costs associated with storage of spent fuel on-site and those associated with the decommissioning of the facility. 10 CFR 50.75(c) requires funding by the licensee of the facility for the decommissioning program, but specifically excludes the cost of removal and disposal of spent fuel and the removal of clean structures. 10 CFR 50.75(c) also excludes the cost of site restoration activities that do not involve the removal of residual radioactivity necessary to terminate the NRC license, which restore the site to either "Brownfield" or "Greenfield" conditions depending on the desired end-state. 10 CFR 50.54 (bb) requires funding by the licensee "for the management of all irradiated fuel at the reactor upon expiration of the reactor operating license until title to the irradiated fuel and possession of the fuel is transferred to the Secretary of Energy for its ultimate disposal in a repository."

Accordingly, the costs and schedules for all activities are segregated for regulatory purposes as follows: costs for "License Termination" (10 CFR 50.75(c)); costs for "Spent Fuel Management" (10 CFR 50.54(bb)); and costs for "Greenfield" (clean removal and site restoration) final site conditions. Energy*Solutions* has established a Work Breakdown Structure (WBS) and cost accounting system to differentiate between these three project accounts.

This study analyzes the following scenario, as defined by Dominion:

Scenario 1 – SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

- SAFSTOR methodology.
- Assumed shutdown on July 1, 2013.
- Termination of spent fuel pool operation seven years after permanent shutdown.
- Spent fuel will be stored in Multi-Purpose Canisters (MPCs) at an on-site Independent Spent Fuel Storage Installation (ISFSI)
- A dry transfer facility will not be necessary.

- DOE begins accepting spent fuel from shutdown reactors in 2021.
- Decommissioning will be performed by Dominion and a Decommissioning General Contractor (DGC).

In addition, this update of the 2008 study includes the following revisions:

- All costs are reported in 2012 dollars
- Incorporation of Life-of-Plant (LOP) Disposal Rates for Class A Low-Level Radioactive Waste (LLRW).
- Incorporation of disposal rates for Class B and C LLRW based on quotes recently obtained by Energy*Solutions* and Dominion for disposal at the Waste Control Specialists LLC (WCS) site in Andrews County, Texas.
- The spent fuel shipping schedule based upon best current information and assumptions, as qualified and described further below, was provided by Dominion.
- Costs for the design and construction of the ISFSI expansion, dry storage modules, DSC fuel loading and transfer were provided by Dominion.

The cost estimate results for Scenario 1 are provided in 2012 dollars in Table 1-1. Table 1-1 gives License Termination costs (which correspond to 10 CFR 50.75 (c) requirements), Spent Fuel Management costs (which correspond to 10 CFR 50.54 (bb) requirements), and Greenfield costs (which correspond to activities such as clean building demolition and site grading and re-seeding).

Table 1-1
Decommissioning Cost Summary
(2012 Dollars in Thousands)

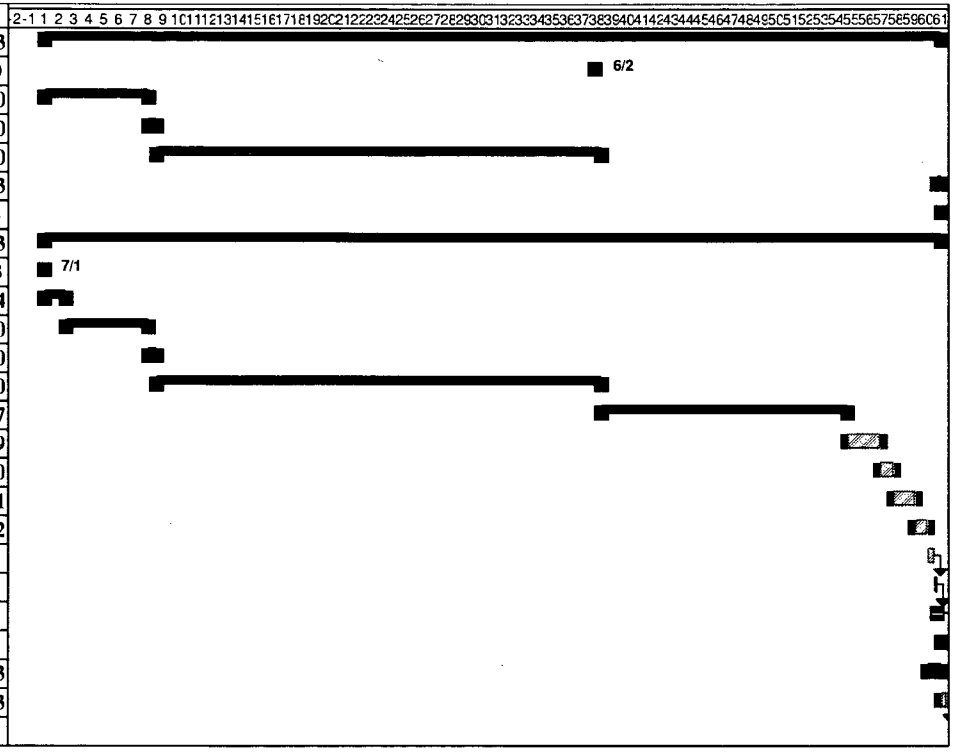
Scenario	License Termination 50.75(c)	Spent Fuel Management 50.54(bb)	Greenfield	Total
1	$542,841	$342,228	$34,803	$919,872

The estimate is based on site-specific plant systems and buildings inventories, as included in the 2008 Cost Study. These inventories, and Energy*Solutions*' proprietary Unit Cost Factors (UCFs), were used to generate required manhours, activity schedule hours and costs, and waste volume, weight, and classification. Based on the activity schedule hours and a decommissioning activities analysis, a Critical Path Method (CPM) analysis was performed to determine the decommissioning schedules. These schedules reflect the effects of sequenced activity-dependent or distributed decommissioning elements such as planning and preparations, major component removal, building decontamination, and spent fuel shipping. The schedules are divided into project phases (periods) and presented, as noted previously, by cost account "License Termination," "Spent Fuel Management," or "Greenfield." The summary schedule for Scenario 1 is shown in Figure 1-1, and may also be found in Section 6.0 of this report.

Figure 1-1
Summary Schedule

SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Task Name	Start	Finish
Post-Shutdown Spent Fuel Management	**07/01/2013**	**07/31/2073**
Spent Fuel Shipping Complete	06/02/2050	06/02/2050
SNF Pd 1 - Spent Fuel Planning, Cooling, and Transfer to Dry Storage	**7/1/2013**	**07/01/2020**
SNF Pd 2 - Dry Storage During Completion SAFSTOR Preparations	**07/01/2020**	**12/28/2020**
SNF Pd 3 - Dry Storage During Dormancy	**12/28/2020**	**10/19/2050**
SNF Pd 4 - ISFSI Decommissioning	**03/30/2073**	**07/31/2073**
Post-Shutdown Spent Fuel Management Complete	07/24/2073	07/24/2073
Part 50 License Termination	**07/01/2013**	**07/01/2073**
Unit 1 Shutdown	7/1/2013	7/1/2013
Decon Pd 1 - SAFSTOR Planning, Preparations and Deactivation	**7/1/2013**	**11/30/2014**
Decon Pd 2 - SAFSTOR Preparations Delay During Wet Fuel Storage	**11/30/2014**	**07/01/2020**
Decon Pd 3 - Completion of SAFSTOR Preparations	**07/01/2020**	**12/28/2020**
Decon Pd 4 - Dormancy With Dry Storage	**12/28/2020**	**10/19/2050**
Decon Pd 5 - Dormancy Only	**10/19/2050**	**04/17/2067**
Decon Pd 6 - Decommissioning Planning During Dormancy	**04/17/2067**	**06/22/2069**
Decon Pd 7 - Dismantlement Site Modifications and Preparations	**06/22/2069**	**05/24/2070**
Decon Pd 8 - Systems Removal	**05/24/2070**	**10/26/2071**
Decon Pd 9 - Site Decontamination	**10/26/2071**	**08/29/2072**
ORISE Verification and NRC Approval	09/01/2072	02/13/2073
Prepare Final Report of Dismantling Program	02/16/2073	03/27/2073
Decon Complete - License terminated	03/27/2073	03/27/2073
60 Year SAFSTOR Limit	07/01/2073	07/01/2073
Grn Pd 1 Clean Building Demolition	**08/29/2072**	**07/31/2073**
Grn Pd 2 Site Restoration	**07/31/2073**	**12/04/2073**
Site Restored	12/04/2073	12/04/2073



2.0 INTRODUCTION

2.1 Study Objective

This report presents an update to the 2008 Decommissioning Cost Estimate Study of the Kewaunee Nuclear Power Plant (Ref. No. 1), hereinafter referred to as the 2008 Cost Study. The Kewaunee Power Station (Kewaunee) is owned by Dominion Energy Kewaunee, Inc. (Dominion).

This update has been performed to furnish an estimate, for financial planning purposes, of the costs for (1) decommissioning Kewaunee to the extent required to terminate the plant's operating license pursuant to 10 CFR 50.75(c), (2) post-shutdown management of spent fuel until acceptance by the U.S. Department of Energy (DOE) pursuant to 10 CFR 50.54(bb), and (3) clean demolition of structures and restoration of the site to Greenfield conditions (Ref. No. 2).

The study methodology follows the basic approach originally presented in the Atomic Industrial Forum/National Environmental Studies Project Report AIF/NESP-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," (Ref. No. 3). The report was prepared in accordance with Nuclear Regulatory Commission (NRC) Regulatory Guide 1.202, "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," (Ref. No. 4). The estimate is based on compliance with current regulatory requirements and proven decommissioning technologies.

This study analyzes the following scenario as defined by Dominion:

Scenario 1 – SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

- SAFSTOR methodology.
- Shutdown on July 1, 2013.
- Termination of spent fuel pool operation seven years after permanent shutdown.
- Spent fuel will be stored in Multi-Purpose Canisters (MPCs) at an on-site Independent Spent Fuel Storage Installation (ISFSI)
- A dry transfer facility will not be necessary.
- DOE begins accepting spent fuel in 2021.
- Decommissioning will be performed by Dominion and a Decommissioning General Contractor (DGC).

In addition, this update of the 2008 study includes the following revisions:

- Incorporation of Life-of-Plant (LOP) Disposal Rates for Class A Low-Level Radioactive Waste (LLRW).
- Incorporation of disposal rates for Class B and C LLRW based on quotes recently obtained by Energy*Solutions* and Dominion for disposal at the Waste Control Specialists LLC (WCS) site in Andrews County, Texas.
- Dominion's revisions to the spent fuel shipping schedule to reflect a 2021 DOE Fuel acceptance date were incorporated.

- The overall project schedule has been revised to incorporate the revised spent fuel shipping schedule which is based upon best current information and assumptions, as qualified and described further below.

2.2 Regulatory Framework

Provisions of current laws and regulations affecting decommissioning, waste management and spent fuel management are as follows:

1. NRC regulations require a license for on-site storage of spent fuel. Wet storage in a spent fuel pool is authorized by a facility's 10 CFR Part 50 license. On-site dry storage of spent fuel at an Independent Spent Fuel Storage Installation (ISFSI) is licensed by either: (a) the general license set forth in 10 CFR72.210, which requires that a Part 50 license be in place; or (b) a site-specific ISFSI license issued pursuant to 10 CFR Part 72.

2. 10 CFR 50.75(c) requires funding by the licensee of the facility for decommissioning, but specifically excludes the cost of removal and disposal of spent fuel and the removal of clean structures.

3. 10 CFR 50.54 (bb) requires the licensee, within two years following permanent cessation of operation of the reactor or five years before expiration of the operating license, whichever occurs first, to submit written notification to the NRC for its review and preliminary approval of the program by which the licensee intends to manage and provide funding "for the management of all irradiated fuel at the reactor upon expiration of the reactor operating license until title to the irradiated fuel and possession of the fuel is transferred to the Secretary of Energy for its ultimate disposal in a repository." However, the NRC does not currently consider post-shutdown spent fuel management costs to be decommissioning costs.

4. 10 CFR Part 961 (Ref. No. 5), Appendix E, requires spent fuel to be cooled in the spent fuel pool for at least five years before it can be accepted by DOE.

Decommissioning Alternatives

The three basic methods for decommissioning are DECON, SAFSTOR, and ENTOMB, which are summarized as follows:

1. DECON: The equipment, structures, and portions of the facility and site that contain radioactive contaminants are promptly removed or decontaminated to a level that permits termination of the license after cessation of operations.

2. SAFSTOR: The facility is placed in a safe, stable condition and maintained in that state (safe storage). The facility is decontaminated and dismantled at the end of the storage period to levels that permit license termination. NRC regulations require decommissioning to be completed within 60 years of cessation of

operation. Durations less than the regulatory-allowed maximum may be referred to as Modified SAFSTOR.

3. ENTOMB: Radioactive structures, systems, and components are encased in a structurally long-lived substance, such as concrete. The entombed structure is appropriately maintained and monitored until radioactivity decays to a level that permits termination of the license. Since entombment will exceed the requirement for decommissioning to be completed within 60 years of cessation of operation, NRC handles entombment requests on a case-by-case basis.

The selection of a preferred decommissioning alternative is influenced by a number of factors pertinent at the time of final plant shutdown. These factors include the cost of each decommissioning alternative, minimization of occupational radiation exposure, availability of a low-level waste disposal facility, commencement of DOE acceptance for storage, disposal or other disposition, regulatory requirements, and public concerns.

Post-Shutdown Spent Fuel Management Alternatives

Selection of a decommissioning strategy and the associated schedule for completion is in part contingent upon an assumed start date for DOE acceptance of spent fuel and an assumed end date for completion of the transfer of all spent fuel assemblies projected to be generated during a power reactor's operating life. The basic options for long-term post-shutdown spent fuel management currently available to power plant operators are (1) wet storage consisting of continued maintenance and operation of the spent fuel pool, and (2) dry storage consisting of transfer of spent fuel from the fuel pool to on-site dry storage modules after a cooling period. Maintaining the spent fuel pool for an extended duration following cessation of operations prevents termination of the Part 50 license and typically has a higher annual maintenance and operating cost than the dry storage alternative. Transfer of spent fuel to an ISFSI requires additional capital expenditures for purchase and construction of the ISFSI and dismantlement and disposal of the ISFSI following completion of spent fuel transfer to DOE.

Since amendment of the Nuclear Waste Policy Act in 1987 decommissioning studies have based the assumed start and end dates upon DOE's latest published opening of Yucca Mountain repository. As of 2008, the projected date for start-up of the DOE's Yucca Mountain repository was 2020[1]. On March 5, 2009, Energy Secretary Steven Chu testified to the U.S. Senate that Yucca Mountain is no longer an option for spent fuel management. The Blue Ribbon Commission on America's Nuclear Future (BRC) was established as directed by the President's Memorandum for the Secretary of Energy dated January 29, 2010 to conduct a comprehensive review of policies for managing the back end of the nuclear fuel cycle and recommend a new plan. On January 27, 2012 the BRC submitted a report to the Secretary of Energy outlining their recommendations for a new national plan for spent fuel management (Ref. No. 6). The BRC strategy consists of the following eight key elements:

1. A new, consent-based approach to siting future nuclear waste management facilities.

[1] Summary, Edward F. Sproat, III, Director Office of Civilian Radioactive Waste Management, U.S. Department of Energy Before the Subcommittee on Energy and Air Quality, Committee on Energy and Commerce, U.S. House of Representatives, July 15, 2008.

2. A new organization dedicated solely to implementing the waste management program and empowered with the authority and resources to succeed.
3. Access to the funds nuclear utility ratepayers are provided for the purpose of nuclear waste management.
4. Prompt efforts to develop one or more geologic disposal facilities.
5. Prompt efforts to develop one or more consolidated interim storage facilities.
6. Prompt efforts to prepare for the eventual large-scale transport of spent nuclear fuel and high-level waste to consolidated storage and disposal facilities when such facilities become available.
7. Support for continued U.S. innovation in nuclear energy technology and for workforce development.
8. Active U.S. leadership in international efforts to address safety, waste management, non-proliferation, and security concerns.

An excerpt from a memorandum dated October 27, 2010, from Owen F. Barwell, Deputy Chief Financial Officer at the Department of Energy to Rickey R. Hass, Deputy Inspector General for Audit Services, states:

> *..."In the attached report issued to Congress, dated December 2008, the Department lays out a timetable of six years from development to acceptance of spent nuclear fuel at an interim facility – one of several alternatives that could be considered by the Blue-Ribbon Commission. While the six years assumes resolution of issues (explained in the report) and the facility is for the consolidation of fuel from decommissioned reactors, it does support the position that the year 2020 is within a yet undefined range of possibilities for addressing the Department's obligations for acceptance of spent nuclear fuel. The interim facility approach outlined in the report is modular and scalable and provides support for the Department's conclusion that the assumptions within the current spent nuclear fuel litigation model are reasonable.*

In January 2013, DOE released its "Strategy for Management and Disposal of Used Nuclear Fuel and High Level Radioactive Waste" (Ref. No. 7). The DOE Strategy contemplates building the capability to begin executing DOE's commitment to address waste disposal within the next ten years. Under this Strategy, by 2021, operation would begin of a "pilot storage facility" with an "initial focus on accepting spent fuel from shut-down reactor sites." By 2025, a "larger interim storage facility" would be available.

Note that nothing in this update, or in the assumptions and information provided by Dominion, should be construed as any sort of admission or concession regarding the legal obligations of DOE. For example, and without limitations, the assumptions for DOE performance after 2021 utilized in this update do not include consolidation, acceleration via exchanges of acceptance allocations with other utilities, and DOE is also assumed to accept loaded and canistered fuel, although the government's stated positions with respect to such acceptance, including assertions in legal proceedings, have been inconsistent.

3.0 STUDY METHODOLOGY

3.1 General Description

Energy*Solutions* maintains a proprietary decommissioning cost model based upon the fundamental technical approach established in AIF/NESP-036, "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," dated May 1986 (Ref. No. 3). The cost model has been continuously updated in accordance with regulatory requirements and industry experience. The cost model includes elements for estimating distributed and undistributed costs. Distributed costs are activity specific and include planning and preparation costs as well as the decontamination, packaging, disposal, and removal of major components and systems. For example, the segmentation, packaging, and disposal of the reactor internals is a distributed cost. Undistributed costs, sometimes referred to as collateral costs, are typically time dependent costs such as utility and decommissioning general contractor staff, property taxes, insurance, regulatory fees and permits, energy costs, and security staff.

The methodology for preparing cost estimates for a selected decommissioning alternative requires development of a site-specific detailed work activity sequence based upon the plant inventory. The activity sequence is used to define the labor, material, equipment, energy resources, and duration required for each activity. In the case of major components, individual work sequence activity analyses are performed based on the physical and radiological characteristics of the component and the packaging, transportation, and disposal options available.

In the case of structures and small components and equipment such as piping, pumps, and tanks, the work durations and costs are calculated based on UCFs. UCFs are economic parameters developed to express costs per unit of work output, piece of equipment, or time. They are developed using decommissioning experience, information on the latest technology applicable to decommissioning, and engineering judgment. The total cost of a specific decommissioning activity can be determined by multiplying the total number of units associated with that activity by the UCF, expressed as $/unit, for that activity. For example, the estimated demolition cost of a non-contaminated concrete structure can be obtained by multiplying the volume of concrete in the structure by the UCF for non-contaminated reinforced concrete demolition, expressed in $/unit volume. Each UCF has associated with it a man-hours/unit and schedule-hours/unit. From these values, total man-hours and total schedule-hours can be determined for a particular activity.

3.2 Schedule Analysis

Once the work activity durations are calculated for all distributed activities, a critical path schedule analysis is performed using MS Project. The schedule accounts for constraints such as spent fuel cooling periods and regulatory reviews. The schedule is typically delineated into phases or time periods (hereinafter referred to as period or periods) that differentiate manpower requirements and undistributed costs.

In order to differentiate between License Termination, Spent Fuel and Greenfield elements of the entire decommissioning scope of work, Energy*Solutions* has established a Work Breakdown Structure (WBS) and cost accounting system to treat each element as a subproject. Accordingly, the overall project schedule is divided into interrelated periods with major milestones defining

the beginning and ending of each period. The major milestones also serve as the basis for integrating the periods of the three subprojects. The License Termination and Greenfield project periods are scheduled sequentially while the Spent Fuel periods occur in parallel.

3.3 Decommissioning Staff

Energy*Solutions*' philosophy towards decommissioning is to assume that the project will be performed in an efficiently planned and executed manner using project personnel experienced in decommissioning. Energy*Solutions* typically assumes that the decommissioning will be performed by a highly experienced and qualified DGC, with oversight and management of the decommissioning operations performed by the Utility staff. It is also assumed that the Utility staff will be supplemented by professional consulting engineering, particularly in the planning and preparation phase.

Energy*Solutions* analyzed the Kewaunee operational staff and developed a site-specific staffing plan. The Dominion existing salary structure was then used as the basis for calculating Utility staff labor costs. Energy*Solutions* used industry data to develop DGC salary costs.

Staffing levels, for both staffing plans and for each project period, are based on the Atomic Industrial Forum (AIF) guidelines and industry experience. The sizes of the staffs are varied in each period in accordance with the requirements of the work activities. Staffing has been organized into the following departments or functional groups:

- Administration
- Engineering
- Health Physics
- Management
- Plant Maintenance
- Plant Operations
- Quality Assurance
- Security Administration
- Security Guard Force
- Waste Operations
- Fuel Pool Maintenance and Operation Staff
- Additional Staff for Spent Fuel Shipping
- DGC Staff

3.4 Waste Disposal

Waste management costs comprise a significant portion of the decommissioning cost estimate. Additionally, limited future access to disposal sites licensed for receipt of Class B and C wastes introduces a significant level of uncertainty with respect to the appropriateness of using existing

rate structures to estimate disposal costs of these wastes. Energy*Solutions*' approach to estimating waste disposal costs is discussed in the following paragraphs.

Waste Classification

Regulations governing disposal of radioactive waste are stringent in order to ensure control of the waste and preclude adverse impact on public health and safety. At present, LLRW disposal is controlled by NRC Regulation 10 CFR 61, which went into effect in December, 1983. This regulation stipulates the criteria for the establishment and operation of shallow-land LLRW burial facilities. Embodied within this new regulation are criteria and classifications for packaging LLRW such that it is acceptable for burial at licensed LLRW disposal sites.

For each waste classification, 10 CFR 61 stipulates specific criteria for physical and chemical properties that the LLRW must meet in order to be accepted at a licensed disposal site. The LLRW disposal criteria of 10 CFR 61 require that LLRW generators determine the proportional amount of a number of specific radioactive isotopes present in each container of disposable LLRW. This requirement for isotopic analysis of each container of disposable LLRW is met by employing a combination of analytical techniques such as computerized analyses based upon scaling factors, sample laboratory analyses, and direct assay methods. Having performed an isotopic analysis of each container of disposable LLRW, the waste must then be classified according to one of the classifications (Class A, B, C or Greater Than Class C (GTCC)) as defined in 10 CFR 61.

Energy*Solutions*' classification of LLRW resulting from decommissioning activities is based on AIF/NESP-036 (Ref. No. 3), NUREG/CR-0130 (Ref. No. 8), NUREG/CR-0672 (Ref. No. 9), and recent industry experience. The estimated curie content of the reactor vessel and internals at shutdown is derived from NUREG/CR-0130 for Pressurized Water Reactors (PWRs) and NUREG/CR-0672 for Boiling Water Reactors (BWRs) and adjusted for the different mass of components as well as the MWt rating and period of decay.

Packaging

Selection of the type and quantity of containers required for Class B and C wastes is based on the most restrictive of either curie content, dose-rate, container weight limit, or container volume limit. GTCC wastes from segmentation of the reactor vessel internals is packaged in fuel bundle canisters. The selection of container type for Class A waste is based on the transportation mode (rail, truck, barge, etc.) and waste form. The quantity of Class A waste containers is determined by the most restrictive of either container weight limit or container volume limit. Large components, such as steam generators, pressurizers, and reactor recirculation pumps, are shipped as their own container with shielding as required.

Container costs are obtained from manufacturers. Shielded transport cask and liner costs are obtained from the cask owners and operators.

Transportation

Transportation routes to processing and disposal facilities are determined based on available transportation modes (truck, rail, barge or combinations). Routes and distances are determined using the Transportation Routing Analysis Geographic Information System (TRAGIS) software developed by the Oak Ridge National Laboratory National Transportation Research Center (Ref. No. 10). Transportation costs for the selected routes and modes are obtained from vendor quotes or published tariffs whenever possible.

Class A Disposal Options and Rates

In accordance with the existing Life-of-Plant Disposal Agreement (Ref. No. 11), all Class A waste that meets the Clive facility waste acceptance criteria is to be disposed of at Clive. All reported waste disposal costs include packaging, transportation, and any applicable surcharges.

Class B and C Disposal Options and Rates

Currently, within the United States, there are only three operational commercial disposal facilities licensed to accept Class B and C LLRW: the Barnwell facility, operated by Energy*Solutions* in Barnwell, South Carolina, the U.S. Ecology facility in Richland, Washington, and the recently licensed facility in Andrews County, Texas operated by Waste Control Specialists. Barnwell only accepts waste from states within the Atlantic Compact, U.S. Ecology only accepts waste from states within the Northwest and Rocky Mountain Compacts. However, the WCS facility will accept waste from the Texas Compact (comprised of Texas and Vermont) and non-Compact generators. The Texas Compact Commission on March 23, 2012 approved amendments to rules allowing the import of non-compact generator LLRW for disposal at the Andrews County facility.

Greater Than Class C (GTCC)

Wastes identified as 10 CFR 61 Class A, B, and C may be disposed of at a near-surface disposal facility. Certain components are highly activated and may exceed the radionuclide concentration limitations for 10 CFR 61 Class C waste. In accordance with 10 CFR 61, these components cannot be disposed of in a near-surface LLRW disposal facility and must be transferred to a geologic repository or a similar site approved by the NRC.

Highly activated sections of the reactor vessel internals will result in GTCC waste. Presently, a facility does not exist for the disposal of wastes exceeding 10 CFR 61 Class C limitations. Energy*Solutions* assumes that the DOE will accept this waste along with spent fuel. . Although courts have held that DOE is obligated to accept and dispose of GTCC, issues regarding potential costs remain potentially unsettled. Therefore, Energy*Solutions* conservatively estimates a GTCC waste disposal cost. Energy*Solutions* assumes that the GTCC waste will be packaged in fuel bundle canisters and be shipped to a storage or disposal facility by DOE along with the spent fuel. Additionally, Energy*Solutions* assumes shipping costs for GTCC waste to be equivalent to the commercial cost of shipping a Type B licensed, shielded cask such as the CNS 8-120B cask, which is owned and operated by Energy*Solutions*.

LLRW Volume Reduction

Based on current Class A LLRW disposal rates, Energy*Solutions* does not assume on-site volume reduction techniques such as waste compaction or an aggressive decontamination, survey and release effort. These activities are not currently considered to be cost effective over disposal.

Non-Radioactive Non-Hazardous Waste Disposal

Energy*Solutions* assumes that recyclable, non-radioactive scrap metal resulting from the decommissioning program will be transported to a scrap metal dealer. However, no credit is assumed in the estimate for the value of the scrap metal. Concrete debris is assumed to be processed by size reduction, with removal of structural reinforcing steel, and used on site as engineered fill for voids. Asphalt from parking lots and roadways is assumed to be stockpiled on site and removed, at no cost to the project, by a recycler. All other demolition debris is removed from the site and disposed of at a local construction debris landfill.

Hazardous and Industrial Waste Disposal

Uncontaminated lead shielding remaining after shutdown was assumed to be removed from its installed locations and shipped offsite by entities having a need for the material. The entities receive the lead at no charge in return for providing the removal and shipping services. Non-Radioactive contaminated surfaces coated with lead based paint will be removed as non-hazardous building demolition debris. All other chemicals and hazardous materials present at shutdown are assumed to be removed and disposed of by the plant staff prior to decommissioning as a normal part of plant operations.

3.5 Final Status Survey

The cost of performing a final status survey (FSS) is based on NUREG-1575, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (12). Estimates of MARSSIM Class I, II and III survey designations are based on radiological characterization data furnished by Dominion and assumptions regarding contamination resulting from small and large component removal activities. The FSS activity cost calculation includes the in-place remote survey of underground metal and concrete pipe, soil, and groundwater sampling and analysis. Estimated costs for NRC and Oak Ridge Institute for Science and Education (ORISE) verification are also included, and the NRC review period is incorporated into the project schedule.

3.6 Contingency

Contingencies are applied to cost estimates primarily to allow for unknown or unplanned occurrences during the actual program, e.g. increased radioactive waste materials volumes over that expected; equipment breakdowns; weather delays; labor strikes, etc. This is consistent with the definition provided in the DOE Cost Estimating Guide, DOE G 430.1-1, 3-28-97 (DOE G) (Ref. No. 13): Contingency "Covers costs that may result from incomplete design, unforeseen and unpredictable conditions, or uncertainties within the defined project scope. The amount of contingency will depend on the status of design, procurement, and construction; and the complexity and uncertainties of the component parts of the project. Contingency is not to be

used to avoid making an accurate assessment of expected costs." Energy*Solutions* determines site-specific contingency factors to be applied to each estimate based on industry practices.

The DOE has established a recommended range of contingencies as a function of completeness of program design, DOE G. The ranges are:

Type of Estimate	Contingency Range as a % of Total Estimate
Planning Phase Estimate	20-30
Budget Estimate	15-25
Title I (Preliminary Design Estimate)	10-20
Title II (Definitive Design Estimate)	5-15

Energy*Solutions'* approach to assigning appropriate contingency rates is based on adaptations of published values for the specific decommissioning activities. One source for such published information is AIF/NESP-036 "Guidelines for Producing Nuclear Plant Decommissioning Cost Estimates" (Ref. No. 3). This document identifies contingencies for activities specific to a nuclear power plant decommissioning, such as reactor internals removal. The contingencies presented in this document are based on the assumption that the estimated costs are optimistic; therefore, the published contingencies are greater than they would be if the estimated costs were most probable. With the exception of the system decontamination, reactor vessel and reactor internals removal, and disposal, the contingencies presented in AIF are consistent with the values presented in DOE G 430.1-1 for a Budget/Title I estimate. The system decontamination, reactor vessel and reactor internals removal, and disposal contingencies are significantly higher than the ranges identified by the DOE, even for a planning phase document. This is due to the unique nature of these activities and the relatively small amount of historical data available at the time the AIF document was written.

Energy*Solutions* has developed contingencies specific to decommissioning estimates utilizing the information presented in AIF and consistent with DOE G. The decommissioning costs generated by Energy*Solutions* are considered most probable and, as such, the contingencies presented in AIF were reduced for each category of costs. There have also been a number of large-scale decommissioning projects since AIF was published, providing some historical information that can be used in preparing current estimates. This allows for additional reduction in contingency costs. The following table provides a summary of contingency values used in Energy*Solutions'* estimates where the plant structures, systems, and major component material inventories are well defined, as with this study.

Category	Labor	Material & Equipment	Package Ship & Bury	Other
Engineering, Utility & DGC	13%			
Contaminated components/Concrete	23%	23%	23%	
Clean components	13%	23%	13%	
Reactor Vessel and Reactor Internals	50%	23%	25%	
Other				15%

A reactor decommissioning program will be conducted under an NRC-approved Quality Assurance Program which meets the requirements of 10 CFR 50, Appendix B, of the Code of Federal Regulations. However, the development of the quality assurance program, the performance of work under that program, and the effort required to ensure compliance with the program, is already included in the detailed cost estimate. Therefore, Energy*Solutions* does not include quality assurance as an element of the contingency allowance. The same is true for contamination. Where radioactive contamination or activated materials are dealt with, the Energy*Solutions* UCFs and associated calculations fully reflect the cost impact of that material, and a separate contingency is not required specifically due to working with contamination.

3.7 Cost Reporting

Total project costs are aggregated from the distributed activity and undistributed costs into the following categories – Labor, Materials and Equipment, Waste Disposal, and Other costs. Other costs include property taxes, insurance, license fees, permits, and energy. Waste Disposal costs are the summation of packaging, transportation, base disposal rate, and any applicable surcharges. Health physics (HP) supplies and small tool costs are calculated as a component of each distributed activity cost and included in the category of Material and Equipment, with the exception that HP supplies for the Utility HP staff are calculated and reported as an undistributed line item. A line item specific contingency is then calculated for each activity cost element.

4.0 SITE SPECIFIC TECHNICAL APPROACH

4.1 Facility Description

Kewaunee is a single PWR nuclear powered electrical generating facility located in east central Wisconsin on the west shore of Lake Michigan, about 30 miles East South East of Green Bay and about 90 miles North Northeast of Milwaukee. The plant site comprises approximately 908 acres.

The power plant is a two loop Westinghouse Nuclear Steam Supply System (NSSS) and turbine generator. The construction permit was issued for an initial reactor power of 1,650 MWt with an ultimate rating of 1,721.4 MWt. In 2003, a measurement uncertainty recapture power rating was performed that increased the licensed rated power from 1,650 MWt to 1,673 MWt. In 2004, using available plant design margin, a six percent (6%) stretch power uprate was performed that increased the licensed rated power from 1,673 MWt to 1,772 MWt.

The facility currently has an existing ISFSI containing spent fuel that was transferred into MPCs to maintain full core offload capability. This study also assumes that the MPCs will be licensed under a 10 CFR Part 72 general license, using the manufacturer's Certificate of Compliance. The 10 CFR Part 50 license will be maintained until decommissioning is complete and all spent fuel has been transferred to DOE.

Appendix A provides a list of the Kewaunee systems and structures included in the material inventory for this study.

4.2 Decommissioning Periods

The project periods defined for SAFSTOR Scenario 1 consist of nine License Termination periods, four Spent Fuel Management periods, and two Greenfield periods. The License Termination periods and Spent Fuel Management periods occur simultaneously. The Greenfield periods follow the License Termination periods sequentially. The project periods defined for this site-specific study and the major activities performed during each period are as follows:

License Termination Periods

Decon Pd 1 – SAFSTOR Planning, Preparations, and Deactivation

- SAFSTOR Planning and Design
- Prepare SAFSTOR Integrated Work Schedule
- Prepare SAFSTOR Activity Specifications and Detailed Work Procedures
- Planning for SAFSTOR Baseline Radiation Survey
- Preparation of SAFSTOR License Documents
- Procure Non-Engineered Standard Equipment for SAFSTOR Preparations
- Perform Pre-SAFSTOR Baseline Radiation Survey
- Flush, Drain and De-Energize Non-Essential Systems
- General Area Cleanup
- Prepare SAFSTOR Report

Decon Pd 2 – SAFSTOR Preparations Delay During Wet Fuel Storage

Decon Pd 3 – Completion of SAFSTOR Preparations
- Flush and Drain Essential Systems Following Fuel Pool Closure
- Removal and Disposal of Spent Resins, Filter Media and Tank Sludge
- Secure Site for Dormancy Period

Decon Pd 4 – Dormancy with Dry Storage
- Bituminous Roof Replacement - 20 year

Decon Pd 5 – Dormancy Only
- Bituminous Roof Replacement - 40 year

Decon Pd 6 – Decommissioning Planning During Dormancy
- Decommissioning Planning and Design
- Prepare Integrated Work Sequence and Schedule
- Prepare Activity Specifications and Detailed Work Procedures
- Planning and Design of Post-SAFSTOR Site Characterization
- Prepare License Termination Plan
- Design Containment Access Modifications
- Preparation of Decommissioning License Documents
- Select DGC

Decon Pd 7 – Dismantlement Site Modification and Preparations
- Revitalize Infrastructure and Re-power Site
- Perform Post-SAFSTOR Baseline Radiation Survey
- Finalize Residual Radiation Inventory
- Select Shipping Casks and Obtain Shipping Permits
- Design, Specify, and Procure Special Items and Materials
- Modify Containment Access
- Construct New Change Rooms, Hot Laundry, In-Plant Laydown Areas
- Test Special Cutting and Handling Equipment and Train Operators
- Procure Non-Engineered Standard Equipment

Decon Pd 8 – Systems Removal
- Remove, Package and Dispose of Non-Essential Systems
- Remove, Package and Dispose of Essential Systems
- Finalize Internals and Vessel Segmenting Details
- Reactor Vessel Insulation Removal and Disposal
- Segment, Package and Ship Reactor Internals
- Package and Ship Reactor Pressure Vessel
- Remove and Dispose of Steam Generators
- Remove and Dispose of Pressurizer
- Remove and Dispose of Spent Fuel Storage Racks
- Segment and Dispose of Fuel Pool Bridge Crane

Decon Pd 9 – Site Decontamination
- Decon Containment Building
- Decon Fuel Handling Building
- Decon Auxiliary Building
- Decon Technical Support Building
- Decon Decontamination Building
- Segment, Package and Dispose of Contaminated Decon Equipment and Tooling
- Remediate Contaminated Soil
- Contaminated Roof Disposal
- Final Status Survey for Structures
- Final Status Survey for Land Areas
- Prepare Final Report of Dismantling Program

Spent Fuel Management Periods

SNF Pd 1 – Spent Fuel Planning, Cooling and Transfer to Dry Storage
- Design and Construct ISFSI Expansion
- Purchase of Dry Storage Modules for Fuel Assemblies
- Spent Fuel Repair, Characterization, Transfer to Dry Storage

SNF Pd 2 – Dry Storage During Completion of SAFSTOR Preparations

SNF Pd 3 – Dry Storage During Dormancy
- Preparation and NRC Review of License Termination Plan
- Verification Survey of Horizontal Storage Modules
- Preparation of Final Report on Decommissioning and NRC Review

SNF Pd 4 – ISFSI Decommissioning
- Clean Demolition of ISFSI

Greenfield Periods

Grn Pd 1 – Clean Building Demolition
- Procure Demolition Equipment
- Demolish Non-Essential Structures
- Demolish Remaining Structures
- Demolish Turbine Building
- Demolish Fuel Handling Building
- Demolish Auxiliary Building
- Demolish Decontamination Building
- Demolish Steam Generator Storage Building
- Demolish Containment Building

Grn Pd 2 – Site Restoration
- Procure Site Restoration Equipment
- Remove Temporary Structures
- Finish Grading and Re-vegetate Site

4.3 Decommissioning Staff

Energy*Solutions* developed staffing based on the assumption that decommissioning will be performed by an experienced and qualified DGC, with oversight and management of the decommissioning operations performed by the Utility staff. It is also assumed that the Utility staff will be supplemented by professional consulting engineering, particularly in the planning and preparation phase. The sizes of the Utility and DGC staffs are varied in each period in accordance with the requirements of the work activities. Details on the staff levels, by functional group, during each period are provided in Section 6.0.

4.4 Spent Fuel Management Staff

The largest spent fuel staff is in place while the fuel pool is operational during the minimum cooling period and the fuel assemblies are being transferred to dry storage. Once all spent fuel has been removed from the spent fuel pool, the staff is reduced. During spent fuel pool operations and the dry storage period, the full-time spent fuel management staff is supplemented with part-time staff to support fuel movements. Details on the staff levels, by functional group, during each period are provided in Section 6.0.

4.5 Spent Fuel Shipments

The spent fuel shipment schedules for this estimate are based on information from Dominion regarding existing fuel inventory, planned transfers to dry storage and DOE's projected date of 2021 for acceptance of spent fuel at a pilot interim storage facility with an initial focus on accepting spent fuel from shutdown reactor sites (Ref. No. 7). The spent fuel shipping schedule is provided in Appendix B. The spent fuel shipment schedule is based upon best current information and assumptions, as qualified and described elsewhere in this update, including in Section 2.2 above.

5.0 BASES OF ESTIMATE AND KEY ASSUMPTIONS

The bases of, and key assumptions for, this site-specific decommissioning estimate are presented below:

1. All cost data used in this study is current as of 2012. Totals and subtotals have been rounded to significant figures.

2. Energy*Solutions* developed a deferred dismantlement (SAFSTOR) project schedule based on a shutdown date of July 1, 2013.

3. The decommissioning will be performed under the current regulations. These regulations require a Post-Shutdown Decommissioning Activities Report (PSDAR) to be submitted prior to, or within, two years after permanent shutdown. In addition, a certificate of permanent cessation of operations must be submitted to the NRC within 30 days of a determination to permanently cease operations. Certification of the final core off-load must also be submitted to the NRC upon completion of this activity. Ninety days after the NRC receives the PSDAR and after submittal of both certifications, major decommissioning activities that meet the criteria of 10 CFR Part 50.59 may be performed, provided the NRC does not notify Dominion of any deficiencies.

4. The decommissioning will be performed using currently available technologies.

5. DOE acceptance is assumed to commence in 2021 consistent with the DOE Strategy announced in January 2013 (Ref. No. 7). The spent fuel shipment schedules are based upon best current information and assumptions, as qualified and described elsewhere in this update, including in Section 2.2 above.

6. The estimate is based on site-specific plant systems and buildings inventories, as included in the 2008 Cost Study.

7. All transformers on site following shutdown are assumed to be polychlorinated biphenyl (PCB)-free.

8. No PCBs will be on site at shutdown.

9. Cost for transportation of clean scrap metal to a recycler is included in the estimate; however, no credit is taken for the value of the scrap metal. Concrete debris is assumed to be processed by size reduction, with removal of structural reinforcing steel, and used on site as engineered fill for voids. All other demolition debris is removed from the site and disposed of at a local off-site construction landfill.

10. The estimate is based on final site restoration to Greenfield conditions, in which all existing and proposed structures, with the exception of the switchyard, will be removed. Clean demolition costs are based on structures removal to three feet below grade. Clean topsoil will be imported and placed on the top three feet. The entire disturbed

area of the site is to be graded, to restore the natural grade to the extent possible, and seeded.

11. Uncontaminated lead shielding remaining after shutdown was assumed to be removed from its installed locations and shipped offsite by entities having a need for the material. The entities receive the lead at no charge in return for providing the removal and shipping services.

12. Any chemicals and hazardous materials present at shutdown are assumed to be removed and disposed of by the plant staff prior to decommissioning, as a normal part of plant operations.

13. Site-specific information regarding contaminated soil and roof materials, as included in the 2008 Cost Study, was used as a basis for calculation of current costs for their remediation.

14. Costs for asbestos abatement is included in this study. The cost was supplied by Dominion.

15. All Class A waste is assumed to be disposed of at Energy*Solutions*' facility in Clive, Utah, in accordance with the existing Life-of-Plant Disposal Agreement between Energy*Solutions* and Dominion Energy Kewaunee, Inc. dated September 18, 2006 (Ref. No. 11). The following 2012 disposal rates will be applied:

Commercially Sensitive per 10 CFR 2.390(a)(4)

Demolition Debris and Soil -[Redacted]/Cubic Foot plus 5% Utah taxes
Oversized Debris -[Redacted]/Cubic Foot plus 5% Utah taxes
Containerized Waste Facility -[Redacted]/Cubic Foot plus 12% Utah taxes
Large Components -[Redacted]/Cubic Foot plus 5% Utah taxes
Cask Shipments -[Redacted]/Cask plus 12% Utah taxes

16. Class B, C and GTCC waste disposal costs are based on recent quotes received by Energy*Solutions* and Dominion for disposal of activated hardware and resins the WCS facility.

17. It is assumed that all Class A low-level waste currently being accumulated on site will be removed to a low-level waste processing and/or disposal facility prior to the end of the operating life of the plant. The disposition of such materials is not assumed to be a decommissioning cost.

18. Shipping cost for the Class B and C waste are based on a distance of 1,469 miles one way from Kewaunee to the WCS site, as determined by TRAGIS (Ref. No. 10).

19. Based on the deferred dismantlement schedule GTCC waste generated from the segmentation of the reactor internals will be packaged in fuel bundle sized containers and transported in a re-usable shipping cask for storage or disposal at a DOE facility at the time of segmentation.

20. Vessel and internals curie estimates were derived from the values for the Reference PWR vessel and internals in NUREG/CR-0130 (Ref. No. 8). These values were adjusted for decay period.

21. The Energy*Solutions* site-specific classification of radioactive wastes for the Kewaunee Plant identified that the Spent Fuel Assemblies and two components within the reactor vessel (the Core Baffle and the Lower Core Grid Plate) will exceed Class C limitations.

22. The spent fuel shipping schedule was developed by Dominion and furnished to Energy*Solutions*. The spent fuel shipments are based upon best current information and assumptions, as qualified and described elsewhere in this update, including in Section 2.2. above.

23. Spent fuel will remain in the spent fuel pool for seven years before being transferred to the ISFSI.

24. The costs for ISFSI construction and transfer of spent fuel to dry storage were developed by Dominion and furnished to Energy*Solutions*.

25. Costs for ISFSI demolition are included in this estimate. The ISFSI pad and HSMs are assumed to have no activated concrete or surface contamination.

26. Energy*Solutions* has assumed that the 10 CFR Part 50 license will be maintained until DOE has taken possession of the spent fuel.

27. Kewaunee annual ISFSI insurance premiums of $238,293 are assumed to be incurred until all fuel shipments have been completed and the structure is no longer in use.

28. Kewaunee Emergency Preparedness (FEMA) fees of $491,704 per year are applied until the spent fuel pool is empty. These fees were supplied by Dominion in 2005, and have been escalated to 2012 dollars using Dominion's furnished annual escalation rates.

29. Kewaunee annual Gross Receipt taxes of $7,110,890 are assumed to be incurred during the Site Modifications and Preparations period, immediately after shutdown. This tax amount was supplied by Dominion in 2005, and has been escalated to 2012 dollars using Dominion's furnished annual escalation rates.

30. Energy*Solutions* has included the annual NRC 10 CFR 171.15 fees, for reactors in decommissioning, of $211,000/yr per unit until decommissioning is completed. Following completion of decommissioning, this expense is continued as a spent fuel management cost for maintenance of the 10 CFR Part 50 license.

31. Energy*Solutions* has included NRC inspection fees during each decommissioning period based on the type and level of activities being performed.

32. Kewaunee annual insurance premiums as supplied by Dominion in 2012 dollars are as follows:

    Nuclear Property Primary - $360,125
    Nuclear Property Excess - $801,090
    Nuclear Liability - $847,040

    The premium amounts have been adjusted by Energy*Solutions* in accordance with information furnished by Dominion to meet the requirements of each period.

33. Supplies and services costs were calculated based on information provided by Dominion and adjusted by Energy*Solutions* to match the requirements of each period, based on staffing levels.

34. Utility staff positions and average direct burdened salary data in 2012 dollars were supplied by Dominion.

35. The current utility staff size is considered to be sufficiently stable to remain virtually unchanged to end of plant operation. For this reason, the utility staff is assumed to be the same size at the time of shutdown.

36. Severance costs are included. Severance costs for Reductions-in-Force (RIFs) that occur during the course of spent fuel management and decommissioning are assumed to be a decommissioning expense and are included in the estimate. However, the RIFs immediately following permanent shutdown are considered an operations expense, and are therefore excluded from the estimate.

37. Severance costs per employee were provided by Dominion.

38. DGC staff salaries, including overhead and profit, were determined by Energy*Solutions* and represent Energy*Solutions*' standard assumptions for these rates.

39. The professional personnel used for the planning and preparation activities, and DGC personnel, are assumed to be paid per diem at the rate of $123/day, based on per diem rates from U.S. General Services Administration (GSA) for Green Bay, Wisconsin.

40. Craft labor rates were furnished by Dominion during the 2005 study and have been escalated to 2012 dollars using Dominion furnished escalation rates. Craft labor rates for disciplines not furnished by Dominion have been taken from the 2012 RS Means Labor Rates for the Construction Industry (Ref. No. 14), for Green Bay, WI. Since the skilled laborers are assumed to be supplied by the local union hall, they will not be paid per diem.

41. This study has considered the impact of the September 11, 2001 terrorist attack on security force staffing and requirement. The security guard force included in this estimate has been sized accordingly.

42. This study follows the occupational exposure principles of As Low As Reasonably Achievable (ALARA) through the use of productivity loss factors that incorporate such items as the use of respiratory protection and personnel protective clothing. These factors increase the work duration and cost.

43. The costs of all required safety analyses and safety measures for the protection of the general public, the environment, and decommissioning workers are included in the cost estimates. This reflects the requirements of:

10 CFR 20	Standards for Protection Against Radiation
10 CFR 50	Domestic Licensing of Production and Utilization Facilities
10 CFR 61	Licensing Requirements for Land Disposal of Radioactive Waste
10 CFR 71	Packaging of Radioactive Material for Transport
10 CFR 72	Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste
29 CFR 1910	Occupational Safety and Health Standards
49 CFR 170-189	Department of Transportation Regulations Governing the Transport of Hazardous Materials
Reg. Guide 1.159	Assuring the Availability of Funds for Decommissioning Nuclear Reactors

44. Activity labor costs do not include any allowance for delays between activities, nor is there any cost allowance for craft labor retained on site while waiting for work to become available.

6.0 STUDY RESULTS

6.1 Scenario 1 – SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario 1 is based on the following:

- SAFSTOR methodology.
- Shutdown on July 1, 2013.
- Termination of spent fuel pool operation seven years after permanent shutdown.
- Spent fuel will be stored in MPCs at an on-site ISFSI.
- A dry transfer facility will not be necessary.
- Decommissioning will be performed by the Utility and a DGC.
- All costs are revised, or escalated from 2008 to 2012 dollars.
- LOP Disposal Rates are used for Class A LLRW.
- DOE begins accepting spent fuel from shutdown reactors in 2021.

Spent Fuel Shipping Schedule

The spent fuel shipment schedule is based on information from Dominion. The spent fuel shipping schedule is provided in Appendix B. Spent fuel shipments to DOE will begin in 2021. The spent fuel shipment schedules are based upon best current information and assumptions, as qualified and described elsewhere in this update, including in Section 2.2 above.

Cost and Schedule

Figure 6-1 is a summary project schedule. A detailed schedule is provided in Appendix C. Table 6-1 summarizes the period durations and total costs, including contingency, for License Termination, Spent Fuel, and Greenfield activities. A detailed cost table is provided in Appendix D, and a table of annual expenditures is provided in Appendix E.

Project Staffing

This scenario is based on the assumption that decommissioning will be performed by an experienced and qualified DGC, with oversight and management of the decommissioning operations performed by the Utility staff. Utility staffing levels, by organizational department and function, for each period are provided in Table 6-2. The DGC staffing levels, by organizational department and function, for each period are provided in Table 6-3.

Waste Disposal Volumes

Waste disposal is a significant element of the decommissioning project. The estimated cubic feet of waste are summarized as follows:

Class A	133,498
Class B	2,207
Class C	341
GTCC	58

Waste disposal volumes and costs, itemized by packaging, transportation, surcharges and disposal costs by waste class and facility, are provided in Table 6-4. The waste disposal costs provided in Table 6-4 do not include contingency.

Figure 6-1
Scenario 1 Summary Schedule

SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Task Name	Start	Finish
Post-Shutdown Spent Fuel Management	**07/01/2013**	**07/31/2073**
Spent Fuel Shipping Complete	06/02/2050	06/02/2050
SNF Pd 1 - Spent Fuel Planning, Cooling, and Transfer to Dry Storage	**7/1/2013**	**07/01/2020**
SNF Pd 2 - Dry Storage During Completion SAFSTOR Preparations	**07/01/2020**	**12/28/2020**
SNF Pd 3 - Dry Storage During Dormancy	**12/28/2020**	**10/19/2050**
SNF Pd 4 - ISFSI Decommissioning	**03/30/2073**	**07/31/2073**
Post-Shutdown Spent Fuel Management Complete	07/24/2073	07/24/2073
Part 50 License Termination	**07/01/2013**	**07/01/2073**
Unit 1 Shutdown	7/1/2013	7/1/2013
Decon Pd 1 - SAFSTOR Planning, Preparations and Deactivation	**7/1/2013**	**11/30/2014**
Decon Pd 2 - SAFSTOR Preparations Delay During Wet Fuel Storage	**11/30/2014**	**07/01/2020**
Decon Pd 3 - Completion of SAFSTOR Preparations	**07/01/2020**	**12/28/2020**
Decon Pd 4 - Dormancy With Dry Storage	**12/28/2020**	**10/19/2050**
Decon Pd 5 - Dormancy Only	**10/19/2050**	**04/17/2067**
Decon Pd 6 - Decommissioning Planning During Dormancy	**04/17/2067**	**06/22/2069**
Decon Pd 7 - Dismantlement Site Modifications and Preparations	**06/22/2069**	**05/24/2070**
Decon Pd 8 - Systems Removal	**05/24/2070**	**10/26/2071**
Decon Pd 9 - Site Decontamination	**10/26/2071**	**08/29/2072**
ORISE Verification and NRC Approval	09/01/2072	02/13/2073
Prepare Final Report of Dismantling Program	02/16/2073	03/27/2073
Decon Complete - License terminated	03/27/2073	03/27/2073
60 Year SAFSTOR Limit	07/01/2073	07/01/2073
Grn Pd 1 Clean Building Demolition	**08/29/2072**	**07/31/2073**
Grn Pd 2 Site Restoration	**07/31/2073**	**12/04/2073**
Site Restored	12/04/2073	12/04/2073

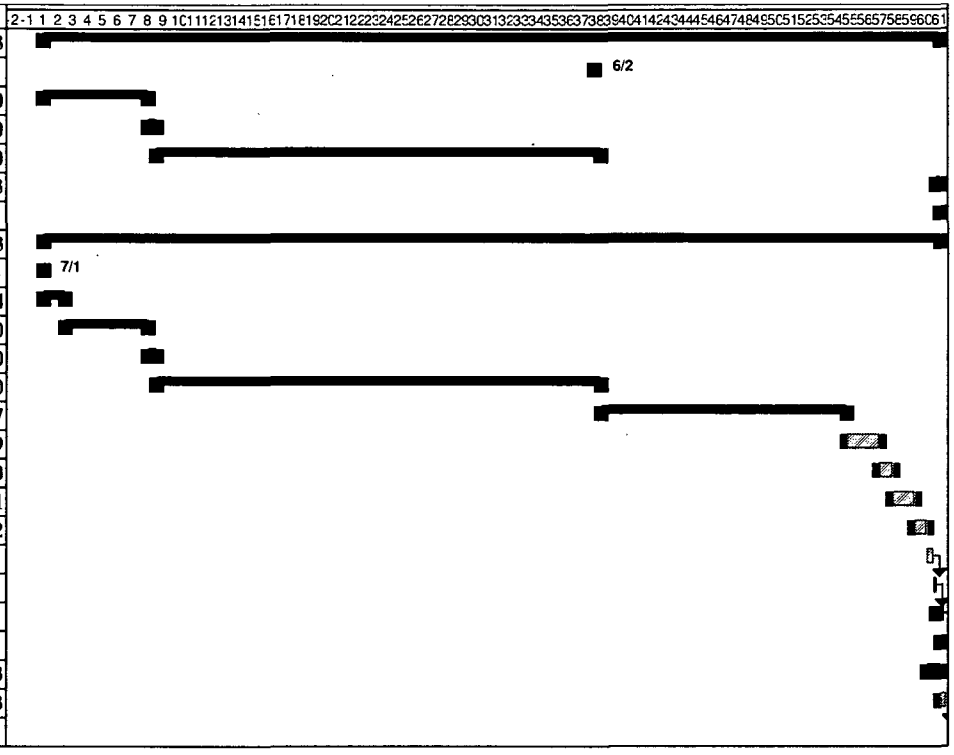


Table 6-1
Scenario 1 Cost and Schedule Summary
(2012 Dollars in Thousands)

Period No.	Period Description	Start	End	Years	Total Cost
License Termination (50.75(c))					
Decon Pd 1	SAFSTOR Planning, Preparations and Deactivation	7/1/2013	11/30/2014	1.41	$99,274
Decon Pd 2	SAFSTOR Preparation Delay During Wet Fuel Storage	11/30/2014	7/1/2020	5.58	$25,105
Decon Pd 3	Completion of SAFSTOR Preparations	7/1/2020	12/28/2020	0.49	$15,899
Decon Pd 4	Dormancy With Dry Storage	12/28/2020	10/19/2050	29.80	$51,910
Decon Pd 5	Dormancy Only	10/19/2050	4/17/2067	16.49	$28,550
Decon Pd 6	Decommissioning Planning During Dormancy	4/17/2067	6/22/2069	2.18	$42,755
Decon Pd 7	Dismantlement Site Modifications and Preparations	6/22/2069	5/24/2070	0.91	$64,972
Decon Pd 8	Systems Removal	5/24/2070	10/26/2071	1.42	$153,318
Decon Pd 9	Site Decontamination	10/26/2071	8/29/2072	0.84	$61,058
Account Total				59.12	**$542,841**
Spent Fuel (50.54(bb))					
SNF Pd 1	Spent Fuel Planning, Cooling and Transfer to Dry Storage	7/1/2013	7/1/2020	7.00	$175,227
SNF Pd 2	Dry Storage During Completion SAFSTOR Preparations	7/1/2020	12/28/2020	0.49	$2,665
SNF Pd 3	Dry Storage During Dormancy	12/28/2020	10/19/2050	29.80	$161,714
SNF Pd 4	ISFSI Demolition	3/30/2073	7/31/2073	0.33	$2,622
Account Total				37.62	**$342,228**
Greenfield					
Grn Pd 1	Clean Building Demolition	8/29/2072	7/31/2073	0.91	$30,827
Grn Pd 2	Site Restoration	7/31/2073	12/4/2073	0.34	$3,976
Account Total				1.25	**$34,803**
Scenario Total					**$919,872**

Table 6-2
Scenario 1 Utility Staff Levels

License Termination – 50.75(c) Utility Staff

Department	Decon Pd 1	Decon Pd 2	Decon Pd 3	Decon Pd 4	Decon Pd 5	Decon Pd 6	Decon Pd 7	Decon Pd 8	Decon Pd 9
Administration	16	2.54	1.29	0.54	0.54	2.54	12	12	10
Engineering	58	0.17	4.04	0.17	0.17	10.92	14	21	17
Health Physics	31	3.01	10.01	0.47	0.47	1.72	16	39	39
Management	2	1.00	1.00	0.00	0.00	0.75	2	2	2
Plant Maintenance	42	5.66	7.60	2.93	2.93	5.68	19	15	5
Plant Operations	53	0.09	4.09	0.09	0.09	0.59	15	14	11
Quality Assurance	6	0.00	0.00	0.00	0.00	0.00	2	5	3
Security Admin	4	4.00	1.00	1.00	1.00	1.50	2	4	4
Security Guard Force	12	12.00	3.00	3.00	3.00	3.00	5	12	12
Period Totals	**224**	**28.48**	**32.03**	**8.19**	**8.19**	**26.69**	**87**	**124**	**103**

Spent Fuel - 50.54(bb) Utility Staff

Department	SNF Pd 1	SNF Pd 2	SNF Pd 3	SNF Pd 4
Additional Staff for Spent Fuel Shipping	0	2	2	0
Administration	0	0	0	1
Engineering	0	1	1	1
Fuel Pool Maintenance and Operation Staff	17	0	0	0
Health Physics	0	4	4	1.5
Management	0	0	0	0.25
Plant Maintenance	0	2	2	0
Security Admin	9	7	5	0
Security Guard Force	50	25	25	0
Period Total	**76**	**41**	**39**	**3.75**

Table 6-2 (Continued)
Scenario 1 Utility Staff Levels

Greenfield - Utility Staff

Department	Grn Pd 1	Grn Pd 2
Administration	8	7
Engineering	6	3
Health Physics	2	0
Management	1	1
Plant Maintenance	3	1
Quality Assurance	2	1
Security Admin	1	1
Security Guard Force	5	5
Period Totals	**28**	**19**

Table 6-3
Scenario 1 DGC Staff Levels

License Termination – 50.75(c) DGC Staff

Department	Decon Pd 1	Decon Pd 2	Decon Pd 3	Decon Pd 4	Decon Pd 5	Decon Pd 6	Decon Pd 7	Decon Pd 8	Decon Pd 9
Administration			5			8	11	17	17
Engineering			7			7.5	12	21	15
Health Physics			13			5	21	34	34
Management			1			3	3	3	3
Quality Assurance			1			3	3	5	4
Waste Operations			8			0	9	12	12
Period Totals	**0**	**0**	**35**	**0**	**0**	**26.5**	**59**	**92**	**85**

Spent Fuel - 50.54(bb) - DGC Staff

Department	SNF Pd 5
Administration	0
Engineering	1
Health Physics	0
Management	0
Quality Assurance	0.5
Waste Operations	0
Period Totals	**1.5**

Greenfield - DGC Staff

Department	Grn Pd 1	Grn Pd 2
Administration	10	9
Engineering	13	6
Health Physics	3	1
Management	2	2
Quality Assurance	2	2
Waste Operations	11	0
Period Totals	**41**	**20**

Table 6-4
Scenario 1 Waste Disposal Volumes
(Cost Excludes Contingency - 2012 Dollars)

Facility and Waste Class	Waste Weight (LBs)	Waste Volume (CF)	Burial Volume (CF)	Packaging Cost	Transportation Cost	Surcharge Cost	Base Burial Cost	Total Disposal Cost
Class B and C Facility – Activated Hardware								
Class B	29,884	61	376	$0	$145,744	$0	$1,611,324	$1,757,068
Class C	107,303	219	1,158	$0	$1,118,956	$0	$4,969,536	$6,088,492
GTCC	28,587	58	235	$594,924	$59,465	$0	$4,351,200	$5,005,590
	165,774	**338**	**1,769**	**$594,924**	**$1,324,165**	**$0**	**$10,932,060**	**$12,851,150**
Class B and C Facility – Resins and Filters								
Class B	226,661	2,146	2,542	$78,770	$888,772	$0	$7,625,400	$8,592,943
Class C	12,952	122	146	$9,846	$26,710	$0	$437,100	$473,656
	239,613	**2,268**	**2,688**	**$88,617**	**$915,483**	**$0**	**$8,062,500**	**$9,066,599**
Energy*Solutions*								
Class A – Debris	8,360,551	102,802	133,890	$284,518	$1,158,466	$0	$7,864,328	$9,307,312
Class A – Oversized Debris	407,027	4,696	9,194	$9,822	$83,677	$0	$1,036,899	$1,130,398
Class A – Containerized Waste	2,200	240	240	$0	$9,223	$0	$55,639	$64,862
Class A – Large Component	2,868,419	25,760	34,700	$1,756,004	$2,412,467	$0	$10,190,880	$14,359,350
	11,638,197	**133,498**	**178,024**	**$2,050,344**	**$3,663,833**	**$0**	**$19,147,746**	**$24,861,924**
Other								
Local Construction Debris Landfill	31,045,308	257,076	444,861	$0	$16,355	$0	$741,038	$757,393
Process for On-Site Fill	180,783,900	2,772,020	2,772,020	$0	$0	$0	$723,136	$723,136
Scrap Metal Recycler	33,225,592	427,222	427,222	$0	$93,032	$0	$0	$93,032
	245,054,800	**3,456,318**	**3,644,103**	**$0**	**$109,387**	**$0**	**$1,464,173**	**$1,573,560**
Grand Total	**257,098,384**	**3,592,423**	**3,826,584**	**$2,733,885**	**$6,012,868**	**$0**	**$39,606,479**	**$48,353,233**

7.0 REFERENCES

1. Energy*Solutions*, LLC, "Decommissioning Cost Update of the Kewaunee Nuclear Power Plant," Document Number 82A9642, June 15, 2009.

2. U.S. Nuclear Regulatory Commission, "Domestic Licensing of Production and Utilization Facilities," 10 CFR Part 50, 2008, Available from http://www.nrc.gov/reading-rm/doc-collections/cfr/part050/full-text.html.

3. Atomic Industrial Forum, Inc., "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates," AIF/NESP-036, May 1986.

4. U.S. Nuclear Regulatory Commission, "Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors," Regulatory Guide 1.202, February 2005.

5. Federal Register, Vol. 4, "Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste," NRC 10 CFR Part 961 (DOE), January 1, 1999.

6. Blue Ribbon Commission on America's Nuclear Future, "Report to the Secretary of Energy," January 2012.

7. U.S. Department of Energy, "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste," January 26, 2013.

8. U.S. Nuclear Regulatory Commission, "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station," NUREG/CR-0130, June 1978.

9. U.S. Nuclear Regulatory Commission, "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor Power Station," NUREG/CR-0672, June 1980.

10. ORNL/NTRC-006, Rev. 0, "Transportation Routing Analysis Geographic Information System (TRAGIS) User's Manual," June 2003.

11. Life-of-Plant Disposal Agreement, between Energy*Solutions*, LLC and Dominion Energy Kewaunee, Inc. dated September 18, 2006.

12. U.S. Nuclear Regulatory Commission, "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)," NUREG-1575, Rev. 1, August 2000.

13. U.S. Department of Energy, "Cost Estimating Guide," DOE G 430.1-1, March 1997.

14. RS Means, "Labor Rates for the Construction Industry," 2012.

Appendix A

List of Systems and Structures

Kewaunee Nuclear Power Plant System and Structure List

Unit 1

Type	System Name or Description
ESS	Air Conditioning Cooling Water
ESS	Chlorination System
ESS	Component Cooling
ESS	Electrical
ESS	Fire Protection
ESS	Heating System
ESS	Hot Water Heating System
ESS	HVAC
ESS	Make Up Water
ESS	Misc. Vents, Drains & Sump Pump Piping
ESS	Potable Water
ESS	Radioactive Waste Solidification System
ESS	Reactor Coolant
ESS	Reactor Plant Misc. Vents, Drains & Sump
ESS	Residual Heat Removal
ESS	Safety Injection
ESS	Secondary Sampling Systems
ESS	Service Water
ESS	Service Water Pre-Treatment System
ESS	Service Water System Containment Cooling
ESS	Station and Instrument Air System
ESS	Turbine & Auxiliary Bldg. Traps and Drains
ESS	Waste Disposal
NON	Air Removal
NON	Aux. Feedwater
NON	Bleed Steam and Heater Vents
NON	Chemical Injection
NON	Chemical Injection System
NON	Chemical Volume Control
NON	Circulating Water System
NON	Condensate and Gland Seal Systems
NON	Containment Spray
NON	Containment Vessel Pressurization System
NON	Diesel Generator Start-up Air
NON	Feedwater
NON	Fuel Oil Exhaust and Cooling Water Piping
NON	Fuel Oil Systems
NON	Heater and Moisture Separator Drains
NON	Hydrogen-Oxygen Gas Analyzer
NON	Internal Containment Spray System
NON	Main Steam
NON	Make Up Water
NON	Miscellaneous Gas Systems
NON	Office/Warehouse Annex Steam, Condensate System
NON	Reactor Coolant
NON	Residual Heat Removal

Kewaunee Nuclear Power Plant System and Structure List

Unit 1

Type	System Name or Description
NON	Secondary Sampling Systems
NON	Spent Fuel Pool Cooling and Clean-up System
NON	Steam Generator Blowdown
NON	Steam Generator Blowdown System
NON	Turbine Oil Purification
NON	Vent System Post Loca Hydrogen Control
NON	Waste Gas
NON	Waste Neutralizing Tank Discharge Treatment
STRUC	Administration Building
STRUC	Administrative Training Bldg.
STRUC	Auxiliary Building
STRUC	Circulating Water & Discharge Piping
STRUC	Containment Building
STRUC	Control House
STRUC	Decontamination Building
STRUC	Discharge Structure
STRUC	Fuel Handling Building
STRUC	Gate House
STRUC	Maintenance Vehicle Garage
STRUC	Maintenance Waste Oil Material Storage Building
STRUC	Material Storage Building
STRUC	Meteorological Tower
STRUC	New Cable Storage Building
STRUC	New Training Building
STRUC	Nine Stall Vehicle Garage
STRUC	Office-Warehouse Annex
STRUC	Pump House 1
STRUC	Pump House 2
STRUC	Screenhouse
STRUC	Service Water Pre-Treatment Basin
STRUC	Sewage Treatment Plant
STRUC	Simulator Building
STRUC	Steam Generator Storage Facility
STRUC	Technical Support Center
STRUC	Transformer Area
STRUC	Turbine Building
STRUC	Warehouse #1

Appendix B

Spent Fuel Shipping Schedule

Kewaunee Power Station Unit 1
SAFSTOR Methodology Spent Fuel Shipping Schedule
2021 DOE Acceptance, Dry Storage

	On-Site Transfers			On-Site Inventory			Off-Site Transfers		
Year	Fuel Assemblies Discharged	No Dry Modules	Assemblies Transfered from Pool to Dry Storage	Assemblies in Fuel Pool Storage	Assemblies in Dry Storage	Total Assemblies in On Site Storage	Total Assemblies to DOE	Assemblies Shipped to DOE From Pool	Assemblies Shipped to DOE from Dry Storage
2008	45	0	0	1,081	0	1,081	0	0	0
2009	44	2	64	1,061	64	1,125	0	0	0
2010	0	2	64	997	128	1,125	0	0	0
2011	45	4	128	914	256	1,170	0	0	0
2012	44	0	0	958	256	1,214	0	0	0
2013	121	0	0	1,079	256	1,335	0	0	0
2014	0	6	192	887	448	1,335	0	0	0
2015	0	0	0	887	448	1,335	0	0	0
2016	0	0	0	887	448	1,335	0	0	0
2017	0	18	576	311	1024	1,335	0	0	0
2018	0	0	0	311	1024	1,335	0	0	0
2019	0	13	311	0	1335	1,335	0	0	0
2020	0	0	0	0	1335	1,335	0	0	0
2021	0	0	0	0	1271	1,271	64	0	64
2022	0	0	0	0	1271	1,271	0	0	0
2023	0	0	0	0	1239	1,239	32	0	32
2024	0	0	0	0	1207	1,207	32	0	32
2025	0	0	0	0	1143	1,143	64	0	64
2026	0	0	0	0	1047	1,047	96	0	96
2027	0	0	0	0	983	983	64	0	64
2028	0	0	0	0	919	919	64	0	64
2029	0	0	0	0	855	855	64	0	64
2030	0	0	0	0	823	823	32	0	32
2031	0	0	0	0	759	759	64	0	64
2032	0	0	0	0	695	695	64	0	64
2033	0	0	0	0	631	631	64	0	64
2034	0	0	0	0	599	599	32	0	32
2035	0	0	0	0	567	567	32	0	32
2036	0	0	0	0	535	535	32	0	32
2037	0	0	0	0	503	503	32	0	32
2038	0	0	0	0	439	439	64	0	64
2039	0	0	0	0	407	407	32	0	32
2040	0	0	0	0	375	375	32	0	32
2041	0	0	0	0	343	343	32	0	32
2042	0	0	0	0	279	279	64	0	64
2043	0	0	0	0	247	247	32	0	32
2044	0	0	0	0	215	215	32	0	32
2045	0	0	0	0	183	183	32	0	32
2046	0	0	0	0	151	151	32	0	32
2047	0	0	0	0	87	87	64	0	64
2048	0	0	0	0	55	55	32	0	32
2049	0	0	0	0	23	23	32	0	32
2050	0	0	0	0	0	0	23	0	23
2051	0	0	0	0	0	0	0	0	0

No. Post S/D MPCs for fuel 37
No. Post S/D MPCs for GTCC 0

Note: The assumption and information in this appendix should not be construed as any sort of admission or concession regarding the legal obligations of DOE.

Appendix C

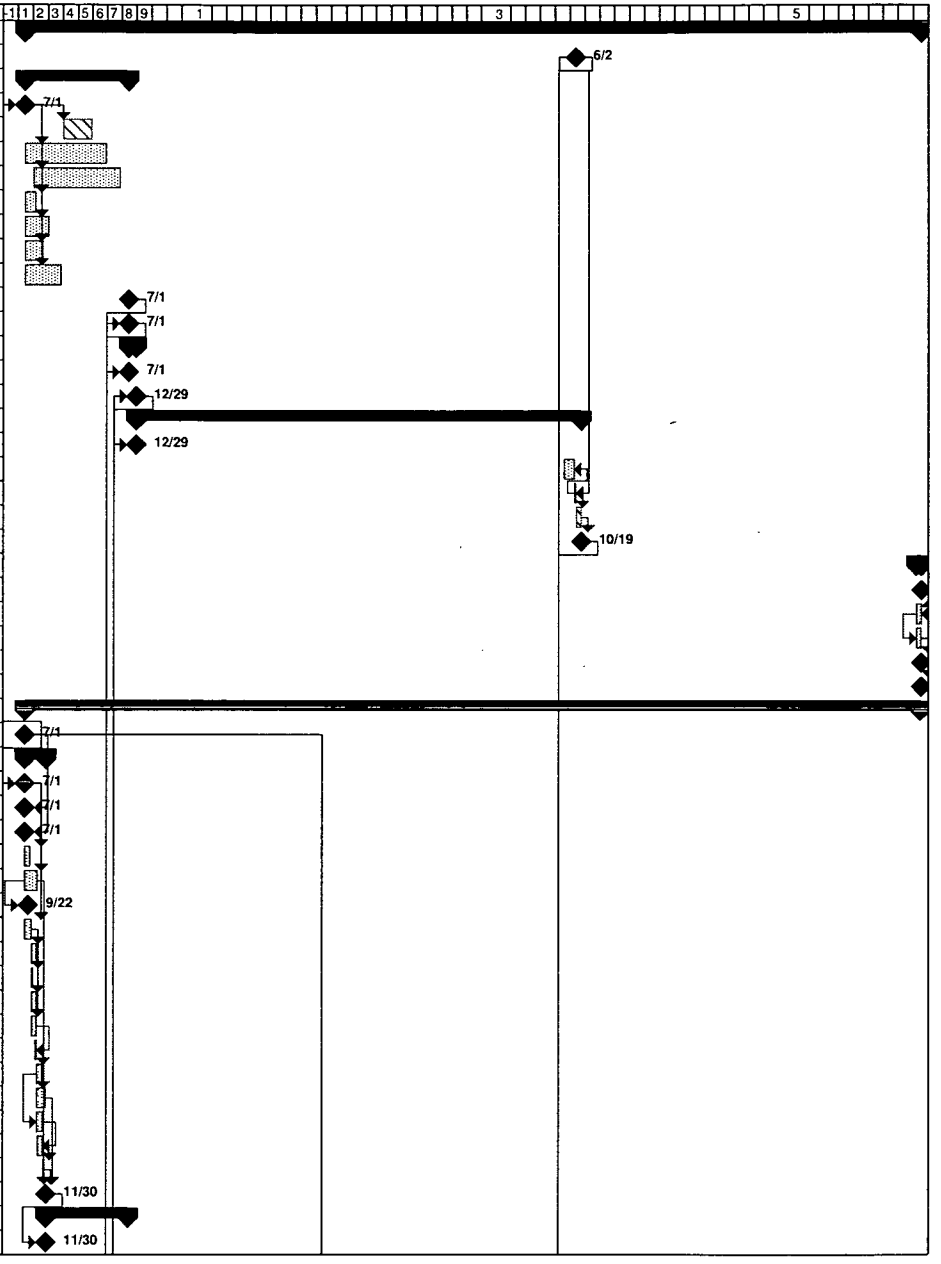
Detailed Project Schedule

Kewaunee Power Station

Detailed Project Schedule

SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

ID	Task Name	Duration	Start	Finish
1	**Post-Shutdown Spent Fuel Management**	**15678 days**	**07/01/2013**	**07/31/2073**
2	Spent Fuel Shipping Complete	0 days	06/02/2050	06/02/2050
3	**SNF Pd 1 - Spent Fuel Planning, Cooling, and Transfer to Dry Storage**	**1826 days**	**7/1/2013**	**07/01/2020**
4	SNF Pd 1 Begins	0 days	07/01/2013	07/01/2013
5	Design and Construct ISFSI Expansion	500 days	01/15/2016	12/14/2017
6	Purchase of Dry Storage Modules and HSMs for Fuel Assemblies	1420 days	07/01/2013	12/09/2018
7	Spent Fuel Repair, Characterization, Transfer to Dry Storage	1520 days	01/27/2014	11/24/2019
8	Design and Implement Spent Fuel Pool Support System Modifications	190 days	07/01/2013	03/23/2014
9	Design and Implement Control Room Relocation	415 days	07/01/2013	02/01/2015
10	Design and Implement Spent Fuel Security System Modifications	310 days	07/01/2013	09/07/2014
11	Design and Implement Beyond Design Basis Modifications	620 days	07/01/2013	11/15/2015
12	Spent Fuel Pool Empty	0 days	06/30/2020	06/30/2020
13	SNF Pd 1 Ends	0 days	06/30/2020	06/30/2020
14	**SNF Pd 2 - Dry Storage During Completion SAFSTOR Preparations**	**130 days**	**07/01/2020**	**12/28/2020**
15	SNF Pd 2 Begins	0 days	06/30/2020	06/30/2020
16	SNF Pd 2 Begins	0 days	12/28/2020	12/28/2020
17	**SNF Pd 3 - Dry Storage During Dormancy**	**7777 days**	**12/28/2020**	**10/19/2050**
18	SNF Pd 3 Begins	0 days	12/28/2020	12/28/2020
19	Preparation and NRC Review of Part 72 License Termination Plan	180 days	08/27/2049	05/05/2050
20	Verification Survey of Horizontal Storage Modules	30 days	05/05/2050	06/13/2050
21	Preparation of Final Report on Decommissioning and NRC Review	90 days	06/16/2050	10/19/2050
22	SNF Pd 3 Ends	0 days	10/19/2050	10/19/2050
23	**SNF Pd 4 - ISFSI Decommissioning**	**90 days**	**03/30/2073**	**07/31/2073**
24	SNF Pd 4 Begins	0 days	07/31/2073	07/31/2073
25	Clean Demolition of ISFSI	90 days	03/30/2073	07/31/2073
26	Clean Demolition of ISFSI Support Structures and Site Restoration	85 days	03/30/2073	07/24/2073
27	SNF Pd 4 Ends	0 days	07/24/2073	07/24/2073
28	Post-Shutdown Spent Fuel Management Complete	0 days	07/24/2073	07/24/2073
29	**Part 50 License Termination**	**15656 days**	**07/01/2013**	**07/01/2073**
30	Unit 1 Shutdown	0 days	7/1/2013	7/1/2013
31	**Decon Pd 1 - SAFSTOR Planning, Preparations and Deactivation**	**370 days**	**7/1/2013**	**11/30/2014**
32	Decon Pd 1 Begins	0 wks	07/01/2013	07/01/2013
33	Prepare Written Notification of Cessation of Operations	0 wks	07/01/2013	07/01/2013
34	Prepare Written Notification of Fuel Removal from Vessel	0 wks	07/01/2013	07/01/2013
35	Adminstrative Activities in Preparation for SAFSTOR	90 days	07/01/2013	11/03/2013
36	Preparation of SAFSTOR License Documents	220 days	07/01/2013	05/04/2014
37	Submittal of PSDAR to NRC	0 days	09/22/2013	09/22/2013
38	SAFSTOR Planning and Design	120 days	07/01/2013	12/15/2013
39	Planning for SAFSTOR Baseline Radiation Survey	90 days	12/16/2013	04/20/2014
40	Prepare SAFSTOR Integrated Work Schedule	30 days	12/16/2013	01/26/2014
41	Prepare SAFSTOR Activity Specifications	90 days	12/16/2013	04/20/2014
42	Prepare Detailed SAFSTOR Work Procedures	90 days	12/16/2013	04/20/2014
43	Procure Non-Engineered Standard Equipment For SAFSTOR Preparations	6 wks	03/10/2014	04/20/2014
44	Perform Pre-SAFSTOR Baseline Radiation Survey	90 days	04/21/2014	08/24/2014
45	Flush, Drain and De-Energize Non-Essential Systems and Secure Site	160 days	04/21/2014	11/30/2014
46	General Area Cleanup	110 days	04/21/2014	09/21/2014
47	Hazardous and Industrial Waste Disposition	90 days	05/19/2014	09/21/2014
48	Prepare SAFSTOR Report	5 wks	09/22/2014	10/26/2014
49	Decon Pd 1 Ends	0 wks	11/30/2014	11/30/2014
50	**Decon Pd 2 - SAFSTOR Preparations Delay During Wet Fuel Storage**	**1456 days**	**11/30/2014**	**07/01/2020**
51	Decon Pd 2 Begins	0 wks	11/30/2014	11/30/2014

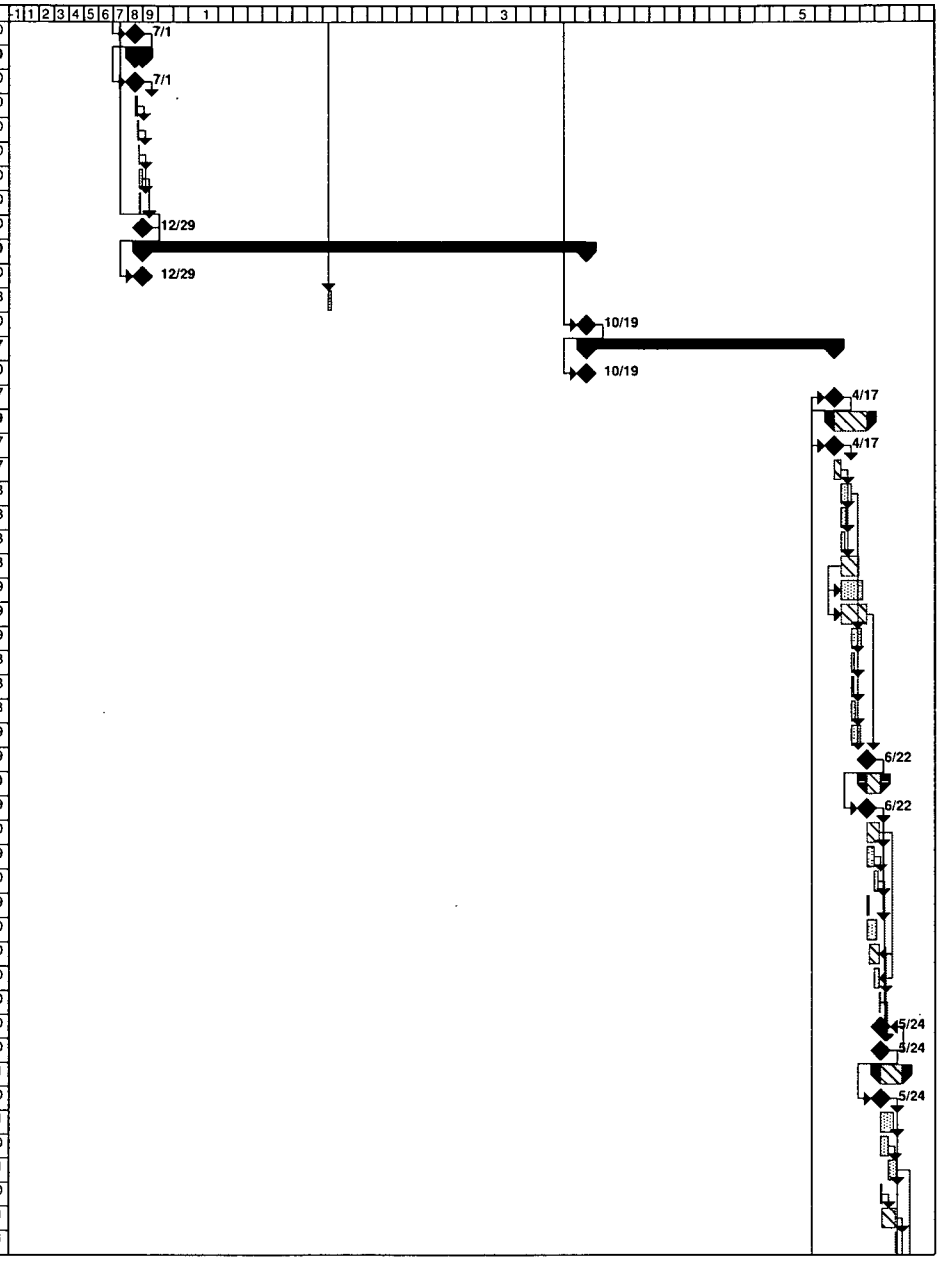


Kewaunee Power Station

Detailed Project Schedule

SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

ID	Task Name	Duration	Start	Finish
52	Decon Pd 2 Ends	0 wks	06/30/2020	06/30/2020
53	**Decon Pd 3 - Completion of SAFSTOR Preparations**	**130 days**	**07/01/2020**	**12/28/2020**
54	Decon Pd 3 Begins	0 wks	06/30/2020	06/30/2020
55	Drain Spent Fuel Pool and Process Liquid Waste	8 wks	07/02/2020	08/24/2020
56	Flush and Drain Essential Systems Following Fuel Pool Closure	4 wks	08/27/2020	09/21/2020
57	Removal and Disposal of Spent Resins, Filter Media and Tank Sludge	2 wks	09/24/2020	10/05/2020
58	Secure Site for Dormancy Period	12 wks	10/08/2020	12/28/2020
59	Segment, Package and Dispose of Spent Fuel Pool Island Equipment	5 wks	10/08/2020	11/09/2020
60	Decon Pd 3 Ends	0 wks	12/28/2020	12/28/2020
61	**Decon Pd 4 - Dormancy With Dry Storage**	**7777 days**	**12/28/2020**	**10/19/2050**
62	Decon Pd 4 Begins	0 wks	12/28/2020	12/28/2020
63	Bituminous Roof Replacement - 20 year	10 wks	06/06/2033	08/14/2033
64	Decon Pd 4 Ends	0 wks	10/19/2050	10/19/2050
65	**Decon Pd 5 - Dormancy Only**	**4303 days**	**10/19/2050**	**04/17/2067**
66	Decon Pd 5 Begins	0 days	10/19/2050	10/19/2050
67	Decon Pd 5 Ends	0 days	04/17/2067	04/17/2067
68	**Decon Pd 6 - Decommissioning Planning During Dormancy**	**570 days**	**04/17/2067**	**06/22/2069**
69	Decon Pd 6 Begins	0 wks	04/17/2067	04/17/2067
70	Decommissioning Planning and Design	24 wks	04/17/2067	10/01/2067
71	Prepare License Termination Plan	36 wks	10/02/2067	06/09/2068
72	Planning and Design of Post-SAFSTOR Site Characterization	18 wks	10/02/2067	02/04/2068
73	Prepare Integrated Work Sequence and Schedule for Decommissioning	14 wks	10/02/2067	01/07/2068
74	Prepare Decommissioning Activity Specifications	62 wks	10/02/2067	12/08/2068
75	Prepare Detailed Work Procedures for Decommissioning	75 wks	10/02/2067	03/09/2069
76	Preparation of Decommissioning License Documents	90 wks	10/02/2067	06/22/2069
77	Planning and Design of Site Revitilization	35 wks	06/10/2068	02/09/2069
78	Planning for Asbestos Abatement	10 wks	06/10/2068	08/18/2068
79	Administrative Activities	8 wks	06/10/2068	08/04/2068
80	Design Containment Access Modifications	14 wks	06/10/2068	09/15/2068
81	Select Decommissioning General Contractor	32 wks	06/10/2068	01/19/2069
82	Decon Pd 6 Ends	0 wks	06/22/2069	06/22/2069
83	**Decon Pd 7 - Dismantlement Site Modifications and Preparations**	**240 days**	**06/22/2069**	**05/24/2070**
84	Decon Pd 7 Begins	0 wks	06/22/2069	06/22/2069
85	Revitalize Infrastructure and Repower Site	44 wks	06/23/2069	04/26/2070
86	Perform Post-SAFSTOR Baseline Radiation Survey	130 days	06/23/2069	12/21/2069
87	Finalize Residual Radiation Inventory	64 days	12/22/2069	03/21/2070
88	Select Shipping Casks and Obtain Shipping Permits	40 days	06/23/2069	08/17/2069
89	Design, Specify, and Procure Special Items and Materials	175 days	06/23/2069	02/22/2070
90	Modify Containment Access	180 days	08/18/2069	04/26/2070
91	Construct New Change Rooms, Hot Laundry, In-Plant Laydown Areas	90 days	12/22/2069	04/26/2070
92	Test Special Cutting and Handling Equipment and Train Operators	20 days	04/27/2070	05/24/2070
93	Procure Non-Engineered Standard Equipment	0 wks	05/24/2070	05/24/2070
94	Decon Pd 7 Ends	0 wks	05/24/2070	05/24/2070
95	**Decon Pd 8 - Systems Removal**	**372 days**	**05/24/2070**	**10/26/2071**
96	Decon Pd 8 Begins	0 days	05/24/2070	05/24/2070
97	Asbestos Abatement	225 days	05/25/2070	04/04/2071
98	Remove, Package and Dispose of Non-Essential Systems	135 days	05/25/2070	11/29/2070
99	Remove, Package and Dispose of Essential Systems	145 days	11/30/2070	06/20/2071
100	Finalize Internals and Vessel Segmenting Details	25 days	05/25/2070	06/28/2070
101	Segment, Package and Dispose of Reactor Internals	232 days	06/29/2070	05/18/2071
102	Reactor Vessel Insulation Removal and Disposal	30 days	05/21/2071	06/29/2071

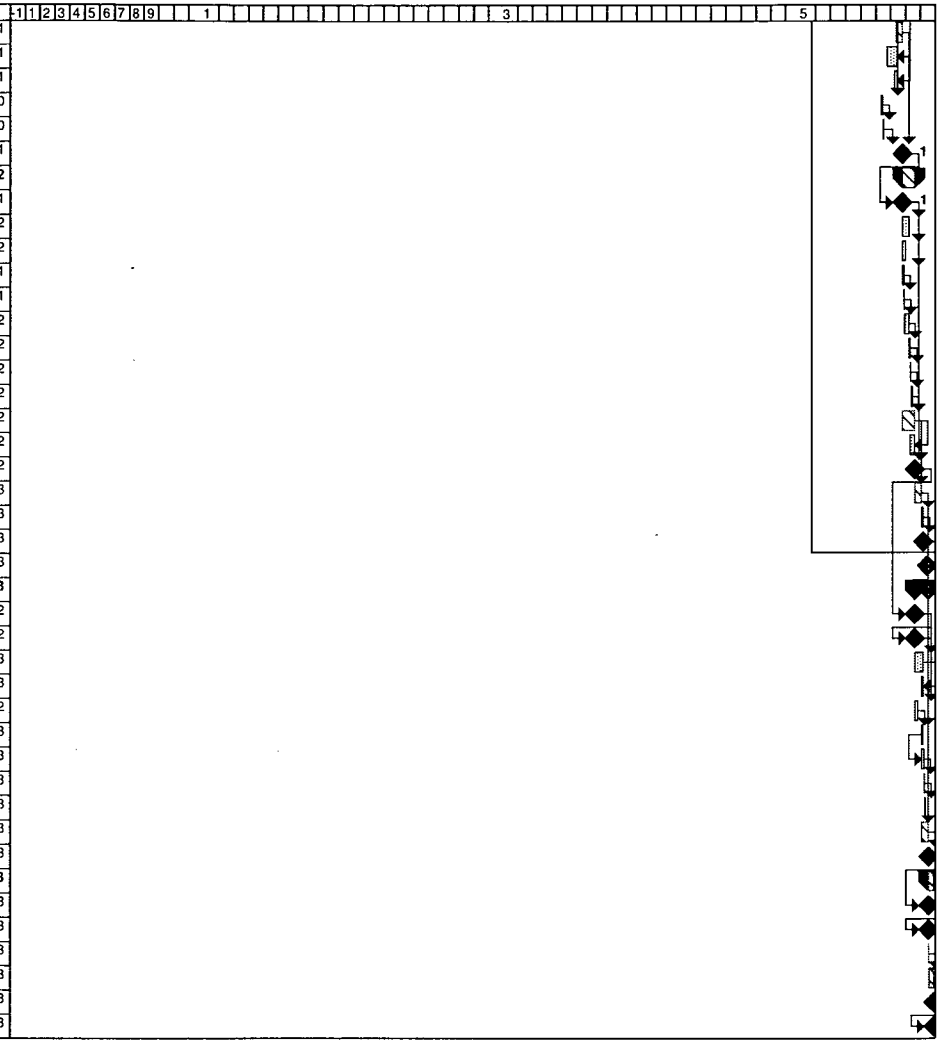


Kewaunee Power Station

Detailed Project Schedule

SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

ID	Task Name	Duration	Start	Finish
103	Segment, Package and Dispose of Reactor Pressure Vessel	115 days	05/21/2071	10/26/2071
104	Remove and Dispose of Steam Generators	36 wks	10/12/2070	06/20/2071
105	Remove and Dispose of Pressurizer	10 wks	04/12/2071	06/20/2071
106	Removal and Disposal of Spent Fuel Racks	6 wks	05/25/2070	07/05/2070
107	Segment, Package and Dispose of Refueling Bridge	15 days	07/06/2070	07/26/2070
108	Decon Pd 8 Ends	0 days	10/26/2071	10/26/2071
109	**Decon Pd 9 - Site Decontamination**	**220 days**	**10/26/2071**	**08/29/2072**
110	Decon Pd 9 Begins	0 days	10/26/2071	10/26/2071
111	Decon Containment Building	120 days	10/29/2071	04/11/2072
112	Decon Auxilary Building	60 days	10/29/2071	01/18/2072
113	Decon Technical Support Center	25 days	10/29/2071	11/30/2071
114	Decon Decontamination Building	10 days	12/03/2071	12/14/2071
115	Decon Fuel Handling Building	80 days	12/17/2071	04/04/2072
116	Remediate Soil Contamination	30 days	04/07/2072	05/16/2072
117	Contaminated Roof Disposal	5 days	05/19/2072	05/23/2072
118	Segment, Package and Dispose of Contaminated Decon Equipment	30 days	05/26/2072	07/04/2072
119	Perform Final Status Survey for Structures	220 days	10/29/2071	08/29/2072
120	Perform Final Status Survey for Land Areas	90 days	04/28/2072	08/29/2072
121	Decon Pd 9 Ends	0 days	08/29/2072	08/29/2072
122	ORISE Verification and NRC Approval	6 mons	09/01/2072	02/13/2073
123	Prepare Final Report of Dismantling Program	30 days	02/16/2073	03/27/2073
124	Decon Complete - License terminated	0 days	03/27/2073	03/27/2073
125	60 Year SAFSTOR Limit	0 days	07/01/2073	07/01/2073
126	**Grn Pd 1 Clean Building Demolition**	**240 days**	**08/29/2072**	**07/31/2073**
127	Grn Pd 1 Begins	0 days	08/29/2072	08/29/2072
128	Procure Clean Building Demolition Equipment	0 days	08/29/2072	08/29/2072
129	Demolish Non-Essential Structures	150 days	09/01/2072	03/27/2073
130	Demolish Remaining Structures	30 days	02/16/2073	03/27/2073
131	Demolish Turbine Building	60 days	09/01/2072	11/21/2072
132	Demolish Fuel Handling Building	25 days	02/16/2073	03/20/2073
133	Demolish Auxilary Building	45 days	02/16/2073	04/17/2073
134	Demolish Decontamination Building	10 days	04/20/2073	05/01/2073
135	Demolish Steam Generator Storage Building	15 days	05/04/2073	05/22/2073
136	Demolish Containment Building	120 days	02/16/2073	07/31/2073
137	Grn Pd 1 Ends	0 days	07/31/2073	07/31/2073
138	**Grn Pd 2 Site Restoration**	**90 days**	**07/31/2073**	**12/04/2073**
139	Grn Pd 2 Begins	0 days	07/31/2073	07/31/2073
140	Procure Site Restoration Equipment	0 days	07/31/2073	07/31/2073
141	Remove Temporary Structures	5 days	08/03/2073	08/07/2073
142	Finish Grading and Re-Vegetate Site	17 wks	08/10/2073	12/04/2073
143	Grn Pd 2 Ends	0 days	12/04/2073	12/04/2073
144	Site Restored	0 days	12/04/2073	12/04/2073



Appendix D

Detailed Cost Table

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
A. License Termination							
Decon Pd 1	**SAFSTOR Planning, Preparations and Deactivation**						
Distributed							
1.03	Adminstrative Activities in Preparation for SAFSTOR	$1,027	$4	$0	$0	$134	$1,165
1.04	Preparation of SAFSTOR License Documents	$2,251	$7	$0	$0	$294	$2,552
1.05	SAFSTOR Planning and Design	$328	$0	$0	$0	$43	$370
1.06	Planning for SAFSTOR Baseline Radiation Survey	$421	$3	$0	$0	$55	$480
1.07	Prepare SAFSTOR Integrated Work Schedule	$107	$4	$0	$0	$14	$125
1.08	Prepare SAFSTOR Activity Specifications	$718	$5	$0	$0	$94	$817
1.09	Prepare Detailed SAFSTOR Work Procedures	$1,547	$8	$0	$0	$202	$1,758
1.10	Procure Non-Engineered Standard Equipment For SAFSTOR Preparations	$0	$1,512	$0	$0	$227	$1,739
1.11	Perform Pre-SAFSTOR Baseline Radiation Survey	$411	$72	$0	$0	$64	$548
1.12	Flush, Drain and De-Energize Non-Essential Systems	$11	$1,339	$947	$0	$528	$2,826
1.13	General Area Cleanup	$673	$226	$166	$0	$245	$1,310
1.14	Hazardous and Industrial Waste Disposition	$243	$46	$60	$163	$105	$616
1.15	Prepare SAFSTOR Report	$63	$0	$0	$0	$8	$72
Distributed	**Subtotal**	**$7,800**	**$3,226**	**$1,173**	**$163**	**$2,013**	**$14,378**
Undistributed							
1.01	Utility Staff	$36,926	$0	$0	$0	$4,800	$41,726
1.02	Utility Staff HP Supplies	$0	$2,114	$0	$0	$317	$2,431
1.03	Security Guard Force	$1,234	$0	$0	$0	$185	$1,419
1.04	Insurance	$0	$0	$0	$202	$30	$232
1.05	NRC Decommissioning Fees	$0	$0	$0	$1,072	$161	$1,232
1.06	Materials and Services	$0	$2,272	$0	$0	$341	$2,613
1.07	DAW Disposal	$0	$0	$10	$0	$1	$11
1.08	Energy	$0	$0	$0	$7,432	$1,115	$8,546
1.11	Severance	$16,094	$0	$0	$0	$2,414	$18,508
1.12	Gross Receipt Taxes	$0	$0	$0	$7,111	$1,067	$8,178

Table 1
Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
Undistributed	**Subtotal**	**$54,254**	**$4,386**	**$10**	**$15,817**	**$10,431**	**$84,896**
Decon Pd 1	**Subtotal**	**$62,054**	**$7,612**	**$1,183**	**$15,980**	**$12,444**	**$99,274**
Decon Pd 2	**SAFSTOR Preparation Delay During Wet Fuel Storage**						
Undistributed							
1.01	Utility Staff	$10,511	$0	$0	$0	$1,366	$11,878
1.02	Utility Staff HP Supplies	$0	$974	$0	$0	$146	$1,120
1.03	Security Guard Force	$4,868	$0	$0	$0	$730	$5,598
1.04	Insurance	$0	$0	$0	$572	$86	$657
1.05	NRC Decommissioning Fees	$0	$0	$0	$1,636	$245	$1,881
1.06	Materials and Services	$0	$1,140	$0	$0	$171	$1,311
1.08	Energy	$0	$0	$0	$2,313	$347	$2,660
Undistributed	**Subtotal**	**$15,379**	**$2,114**	**$0**	**$4,521**	**$3,091**	**$25,105**
Decon Pd 2	**Subtotal**	**$15,379**	**$2,114**	**$0**	**$4,521**	**$3,091**	**$25,105**

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
Decon Pd 3	**Completion of SAFSTOR Preparations**						
Distributed							
3.02	Flush and Drain Essential Systems Following Fuel Pool Closure	$58	$1,352	$947	$0	$542	$2,899
3.03	Removal and Disposal of Spent Resins, Filter Media and Tank Sludge	$24	$27	$2,368	$0	$557	$2,976
3.04	Secure Site for Dormancy Period	$0	$0	$0	$1,500	$225	$1,725
3.05	Segment, Package and Dispose of Spent Fuel Pool Island Equipment	$6	$1	$106	$0	$26	$140
Distributed	**Subtotal**	**$88**	**$1,380**	**$3,421**	**$1,500**	**$1,350**	**$7,740**
Undistributed							
1.01	Utility Staff	$1,729	$0	$0	$0	$225	$1,954
1.02	Utility Staff HP Supplies	$0	$169	$0	$0	$25	$194
1.03	Security Guard Force	$107	$0	$0	$0	$16	$123
1.04	Insurance	$0	$0	$0	$50	$8	$58
1.05	NRC Decommissioning Fees	$0	$0	$0	$239	$36	$274
1.06	Materials and Services	$0	$113	$0	$0	$17	$130
1.07	DAW Disposal	$0	$0	$1	$0	$0	$1
1.08	Energy	$0	$0	$0	$250	$38	$288
1.09	Decommissioning General Contractor Staff	$4,403	$0	$0	$0	$572	$4,975
1.10	DGC HP Supplies	$0	$141	$0	$0	$21	$162
Undistributed	**Subtotal**	**$6,239**	**$423**	**$1**	**$539**	**$958**	**$8,159**
Decon Pd 3	**Subtotal**	**$6,327**	**$1,803**	**$3,422**	**$2,039**	**$2,308**	**$15,899**

Table 1
Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
Decon Pd 4	**Dormancy With Dry Storage**						
Distributed							
4.01	Bituminous Roof Replacement - 20 year	$524	$150	$25	$0	$105	$803
Distributed	**Subtotal**	**$524**	**$150**	**$25**	**$0**	**$105**	**$803**
Undistributed							
1.01	Utility Staff	$13,946	$0	$0	$0	$1,813	$15,759
1.02	Utility Staff HP Supplies	$0	$2,476	$0	$0	$371	$2,847
1.03	Security Guard Force	$6,494	$0	$0	$0	$974	$7,469
1.04	Insurance	$0	$0	$0	$3,051	$458	$3,509
1.05	NRC Decommissioning Fees	$0	$0	$0	$8,731	$1,310	$10,040
1.06	Materials and Services	$0	$1,750	$0	$0	$262	$2,012
1.08	Energy	$0	$0	$0	$87	$13	$100
1.14	SAFSTOR Surveillence and Maintenance	$0	$0	$0	$8,149	$1,222	$9,371
Undistributed	**Subtotal**	**$20,440**	**$4,226**	**$0**	**$20,018**	**$6,423**	**$51,107**
Decon Pd 4	**Subtotal**	**$20,964**	**$4,376**	**$25**	**$20,018**	**$6,528**	**$51,910**
Decon Pd 5	**Dormancy Only**						
Undistributed							
1.01	Utility Staff	$7,717	$0	$0	$0	$1,003	$8,720
1.02	Utility Staff HP Supplies	$0	$1,370	$0	$0	$206	$1,576
1.03	Security Guard Force	$3,593	$0	$0	$0	$539	$4,132
1.04	Insurance	$0	$0	$0	$1,688	$253	$1,941
1.05	NRC Decommissioning Fees	$0	$0	$0	$4,831	$725	$5,556
1.06	Materials and Services	$0	$968	$0	$0	$145	$1,113
1.08	Energy	$0	$0	$0	$284	$43	$327
1.14	SAFSTOR Surveillence and Maintenance	$0	$0	$0	$4,509	$676	$5,185
Undistributed	**Subtotal**	**$11,310**	**$2,338**	**$0**	**$11,312**	**$3,590**	**$28,550**
Decon Pd 5	**Subtotal**	**$11,310**	**$2,338**	**$0**	**$11,312**	**$3,590**	**$28,550**

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
Decon Pd 6	**Decommissioning Planning During Dormancy**						
Distributed							
6.01	Decommissioning Planning and Design	$328	$0	$0	$0	$43	$370
6.02	Prepare License Termination Plan	$437	$10	$0	$0	$58	$506
6.03	Planning and Design of Post-SAFSTOR Site Characterization	$421	$3	$0	$0	$55	$480
6.04	Prepare Integrated Work Sequence and Schedule for Decommissioning	$189	$0	$0	$0	$25	$213
6.05	Prepare Decommissioning Activity Specifications	$3,059	$21	$0	$0	$401	$3,481
6.06	Prepare Detailed Work Procedures for Decommissioning	$3,010	$8	$0	$0	$393	$3,411
6.07	Preparation of Decommissioning License Documents	$2,251	$7	$0	$0	$294	$2,552
6.08	Planning and Design of Site Revitilization	$1,396	$15	$0	$0	$184	$1,594
6.09	Planning for Asbestos Abatement	$181	$2	$0	$0	$24	$206
6.10	Administrative Activities	$210	$0	$0	$0	$27	$237
6.11	Design Containment Access Modifications	$297	$4	$0	$0	$39	$340
6.12	Select Decommissioning General Contractor	$344	$4	$0	$0	$45	$393
Distributed	**Subtotal**	**$12,123**	**$74**	**$0**	**$0**	**$1,588**	**$13,783**
Undistributed							
1.01	Utility Staff	$6,139	$0	$0	$0	$798	$6,937
1.02	Utility Staff HP Supplies	$0	$308	$0	$0	$46	$355
1.03	Security Guard Force	$475	$0	$0	$0	$71	$547
1.04	Insurance	$0	$0	$0	$223	$34	$257
1.05	NRC Decommissioning Fees	$0	$0	$0	$639	$96	$735
1.06	Materials and Services	$0	$417	$0	$0	$63	$480
1.08	Energy	$0	$0	$0	$392	$59	$451
1.09	Decommissioning General Contractor Staff	$16,133	$0	$0	$0	$2,097	$18,231
1.10	DGC HP Supplies	$0	$255	$0	$0	$38	$293
1.14	SAFSTOR Surveillence and Maintenance	$0	$0	$0	$597	$89	$686
Undistributed	**Subtotal**	**$22,747**	**$980**	**$0**	**$1,851**	**$3,391**	**$28,972**
Decon Pd 6	**Subtotal**	**$34,870**	**$1,054**	**$0**	**$1,851**	**$4,979**	**$42,755**

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
Decon Pd 7	**Dismantlement Site Modifications and Preparations**						
Distributed							
7.01	Revitalize Infrastructure and Repower Site	$0	$0	$0	$18,993	$2,469	$21,462
7.02	Perform Post-SAFSTOR Baseline Radiation Survey	$411	$72	$0	$0	$64	$548
7.03	Finalize Residual Radiation Inventory	$86	$6	$0	$0	$12	$104
7.04	Select Shipping Casks and Obtain Shipping Permits	$39	$0	$0	$0	$5	$44
7.05	Design, Specify, and Procure Special Items and Materials	$1,068	$4,857	$0	$0	$867	$6,792
7.06	Modify Containment Access	$351	$526	$0	$0	$125	$1,002
7.07	Construct New Change Rooms, Hot Laundry, In-Plant Laydown Areas	$0	$1,088	$0	$0	$163	$1,251
7.08	Test Special Cutting and Handling Equipment and Train Operators	$891	$0	$0	$0	$116	$1,007
7.09	Procure Non-Engineered Standard Equipment	$0	$3,209	$0	$0	$481	$3,690
Distributed	**Subtotal**	**$2,846**	**$9,758**	**$0**	**$18,993**	**$4,302**	**$35,900**
Undistributed							
1.01	Utility Staff	$8,938	$0	$0	$0	$1,162	$10,100
1.02	Utility Staff HP Supplies	$0	$633	$0	$0	$95	$728
1.03	Security Guard Force	$334	$0	$0	$0	$50	$384
1.04	Insurance	$0	$0	$0	$131	$20	$151
1.05	NRC Decommissioning Fees	$0	$0	$0	$445	$67	$512
1.06	Materials and Services	$0	$573	$0	$0	$86	$659
1.07	DAW Disposal	$0	$0	$5	$0	$1	$5
1.08	Energy	$0	$0	$0	$294	$44	$338
1.09	Decommissioning General Contractor Staff	$13,905	$0	$0	$0	$1,808	$15,713
1.10	DGC HP Supplies	$0	$419	$0	$0	$63	$482
Undistributed	**Subtotal**	**$23,177**	**$1,625**	**$5**	**$870**	**$3,396**	**$29,072**
Decon Pd 7	**Subtotal**	**$26,023**	**$11,383**	**$5**	**$19,863**	**$7,698**	**$64,972**

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
Decon Pd 8	**Systems Removal**						
Distributed							
8.01	Asbestos Abatement	$0	$0	$0	$14,088	$2,113	$16,201
8.02	Remove, Package and Dispose of Non-Essential Systems	$3,727	$400	$2,386	$0	$1,498	$8,011
8.03	Remove, Package and Dispose of Essential Systems	$4,897	$1,205	$2,420	$0	$1,960	$10,481
8.04	Finalize Internals and Vessel Segmenting Details	$24	$0	$0	$0	$5	$29
8.05	Segment, Package and Ship Reactor Internals	$3,228	$1,487	$18,421	$0	$6,561	$29,698
8.06	Reactor Vessel Insulation Removal and Disposal	$35	$8	$119	$0	$49	$213
8.07	Package and Ship Reactor Pressure Vessel	$2,229	$1,569	$4,301	$0	$2,551	$10,650
8.08	Remove and Dispose of Steam Generators	$1,476	$420	$3,756	$0	$1,300	$6,952
8.09	Remove and Dispose of Pressurizer	$249	$118	$696	$0	$244	$1,306
8.10	Remove and Dispose of Spent Fuel Storage Racks	$45	$96	$3,619	$0	$865	$4,624
8.11	Segment and Dispose of Fuel Pool Bridge Crane	$46	$11	$166	$0	$51	$273
Distributed	**Subtotal**	**$15,956**	**$5,314**	**$35,884**	**$14,088**	**$17,197**	**$88,438**
Undistributed							
1.01	Utility Staff	$18,273	$0	$0	$0	$2,376	$20,649
1.02	Utility Staff HP Supplies	$0	$1,569	$0	$0	$235	$1,804
1.03	Security Guard Force	$1,241	$0	$0	$0	$186	$1,427
1.04	Insurance	$0	$0	$0	$203	$30	$233
1.05	NRC Decommissioning Fees	$0	$0	$0	$689	$103	$792
1.06	Materials and Services	$0	$1,265	$0	$0	$190	$1,455
1.07	DAW Disposal	$0	$0	$151	$0	$23	$174
1.08	Energy	$0	$0	$0	$690	$104	$794
1.09	Decommissioning General Contractor Staff	$32,156	$0	$0	$0	$4,180	$36,337
1.10	DGC HP Supplies	$0	$1,056	$0	$0	$158	$1,215
Undistributed	**Subtotal**	**$51,670**	**$3,890**	**$151**	**$1,582**	**$7,585**	**$64,880**
Decon Pd 8	**Subtotal**	**$67,626**	**$9,204**	**$36,035**	**$15,670**	**$24,782**	**$153,318**

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
Decon Pd 9	**Site Decontamination**						
Distributed							
9.01	Decon Containment Building	$1,600	$733	$2,432	$0	$1,096	$5,860
9.02	Decon Auxilary Building	$128	$155	$217	$0	$115	$615
9.03	Decon Technical Support Building	$19	$23	$18	$0	$14	$74
9.04	Decon Decontamination Building	$9	$4	$20	$0	$7	$40
9.05	Decon Fuel Handling Building	$811	$495	$806	$0	$486	$2,598
9.06	Remediate Contaminated Soil	$34	$376	$2,421	$0	$651	$3,483
9.07	Contaminated Roof Disposal	$43	$6	$160	$0	$48	$257
9.08	Segment, Package and Dispose of Contaminated Decon Equipment and Tooling	$21	$0	$91	$0	$26	$138
9.09	Final Status Survey for Structures	$3,785	$700	$0	$1,265	$1,221	$6,971
9.10	Final Status Survey for Land Areas	$5,458	$403	$0	$0	$1,348	$7,209
9.11	Prepare Final Report of Dismantling Program	$87	$2	$0	$0	$20	$109
Distributed	**Subtotal**	**$11,995**	**$2,897**	**$6,165**	**$1,265**	**$5,032**	**$27,354**
Undistributed							
1.01	Utility Staff	$8,910	$0	$0	$0	$1,158	$10,068
1.02	Utility Staff HP Supplies	$0	$733	$0	$0	$110	$843
1.03	Security Guard Force	$735	$0	$0	$0	$110	$845
1.04	Insurance	$0	$0	$0	$120	$18	$138
1.05	NRC Decommissioning Fees	$0	$0	$0	$408	$61	$469
1.06	Materials and Services	$0	$622	$0	$0	$93	$716
1.07	DAW Disposal	$0	$0	$104	$0	$16	$120
1.08	Energy	$0	$0	$0	$336	$50	$386
1.09	Decommissioning General Contractor Staff	$17,168	$0	$0	$0	$2,232	$19,400
1.10	DGC HP Supplies	$0	$626	$0	$0	$94	$719
Undistributed	**Subtotal**	**$26,813**	**$1,981**	**$104**	**$864**	**$3,942**	**$33,704**
Decon Pd 9	**Subtotal**	**$38,808**	**$4,878**	**$6,269**	**$2,129**	**$8,974**	**$61,058**

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
A.	**License Termination Subtotal**	**$283,361**	**$44,762**	**$46,939**	**$93,383**	**$74,394**	**$542,841**

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
B. Spent Fuel							
SNF Pd 1	**Spent Fuel Planning, Cooling and Transfer to Dry Storage**						
Distributed							
10.01	Design and Construct ISFSI Expansion	$500	$0	$0	$4,000	$585	$5,085
10.02	Purchase of Dry Storage Modules for Fuel Assemblies	$690	$0	$0	$48,486	$7,376	$56,552
10.03	Spent Fuel Repair, Characterization, Transfer to Dry Storage	$12,620	$1,700	$0	$0	$1,896	$16,215
10.04	Design and Implement Spent Fuel Pool Support System Modifications	$654	$1,646	$0	$0	$332	$2,631
10.05	Design and Implement Control Room Relocation	$1,433	$1,440	$0	$0	$402	$3,274
10.06	Design and Implement Spent Fuel Security System Modifications	$865	$754	$0	$0	$226	$1,845
10.07	Design and Implement Beyond Design Basis Modifications	$800	$1,200	$0	$0	$284	$2,284
Distributed	**Subtotal**	**$17,562**	**$6,740**	**$0**	**$52,486**	**$11,101**	**$87,886**
Undistributed							
2.01	Utility Spent Fuel Staff	$7,750	$0	$0	$0	$1,007	$8,757
2.02	Utility Staff HP Supplies	$0	$1,411	$0	$0	$212	$1,622
2.03	Fuel Pool Maintenance and Operation Staff	$12,630	$0	$0	$0	$1,642	$14,272
2.05	Security Guard Force	$25,422	$0	$0	$0	$3,813	$29,235
2.06	Insurance	$0	$0	$0	$2,868	$430	$3,299
2.07	Spent Fuel Fees and Permits	$0	$0	$0	$11,676	$1,751	$13,428
2.08	Energy	$0	$0	$0	$5,982	$897	$6,879
2.09	Materials and Services	$0	$3,812	$0	$0	$572	$4,384
2.10	Spent Fuel Maintenance	$0	$0	$0	$1,714	$257	$1,971
2.12	Severance	$3,038	$0	$0	$0	$456	$3,494
Undistributed	**Subtotal**	**$48,840**	**$5,223**	**$0**	**$22,240**	**$11,037**	**$87,341**
SNF Pd 1	**Subtotal**	**$66,402**	**$11,963**	**$0**	**$74,726**	**$22,138**	**$175,227**

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
SNF Pd 2	**Dry Storage During Completion SAFSTOR Preparations**						
Undistributed							
2.01	Utility Spent Fuel Staff	$842	$0	$0	$0	$109	$951
2.02	Utility Staff HP Supplies	$0	$58	$0	$0	$9	$67
2.04	Additional Staff for Spent Fuel Shipping	$5	$0	$0	$0	$1	$6
2.05	Security Guard Force	$895	$0	$0	$0	$134	$1,029
2.06	Insurance	$0	$0	$0	$117	$18	$135
2.07	Spent Fuel Fees and Permits	$0	$0	$0	$217	$33	$250
2.08	Energy	$0	$0	$0	$14	$2	$16
2.09	Materials and Services	$0	$138	$0	$0	$21	$159
2.10	Spent Fuel Maintenance	$0	$0	$0	$45	$7	$52
Undistributed	**Subtotal**	**$1,742**	**$196**	**$0**	**$393**	**$334**	**$2,665**
SNF Pd 2	**Subtotal**	**$1,742**	**$196**	**$0**	**$393**	**$334**	**$2,665**

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
SNF Pd 3	**Dry Storage During Dormancy**						
Distributed							
12.01	Preparation and NRC Review of License Termination Plan	$87	$0	$0	$141	$30	$258
12.02	Verification Survey of Horizontal Storage Modules	$61	$25	$0	$0	$12	$98
12.03	Preparation of Final Report on Decommissioning and NRC Review	$87	$0	$0	$141	$30	$258
Distributed	**Subtotal**	**$235**	**$25**	**$0**	**$282**	**$72**	**$614**
Undistributed							
2.01	Utility Spent Fuel Staff	$43,930	$0	$0	$0	$5,711	$49,640
2.02	Utility Staff HP Supplies	$0	$3,531	$0	$0	$530	$4,060
2.04	Additional Staff for Spent Fuel Shipping	$319	$0	$0	$0	$41	$360
2.05	Security Guard Force	$54,120	$0	$0	$0	$8,118	$62,238
2.06	Insurance	$0	$0	$0	$7,103	$1,065	$8,168
2.07	Spent Fuel Fees and Permits	$0	$0	$0	$13,152	$1,973	$15,125
2.08	Energy	$0	$0	$0	$8,048	$1,207	$9,256
2.09	Materials and Services	$0	$7,919	$0	$0	$1,188	$9,106
2.10	Spent Fuel Maintenance	$0	$0	$0	$2,736	$410	$3,147
Undistributed	**Subtotal**	**$98,369**	**$11,450**	**$0**	**$31,039**	**$20,243**	**$161,100**
SNF Pd 3	**Subtotal**	**$98,604**	**$11,475**	**$0**	**$31,321**	**$20,315**	**$161,714**
SNF Pd 4	**ISFSI Demolition**						
Distributed							
13.01	Clean Demolition of ISFSI	$1,035	$541	$517	$0	$336	$2,429
Distributed	**Subtotal**	**$1,035**	**$541**	**$517**	**$0**	**$336**	**$2,429**
Undistributed							
2.01	Utility Spent Fuel Staff	$155	$0	$0	$0	$20	$175
2.08	Energy	$0	$0	$0	$7	$1	$8
2.09	Materials and Services	$0	$9	$0	$0	$1	$10
Undistributed	**Subtotal**	**$155**	**$9**	**$0**	**$7**	**$22**	**$193**
SNF Pd 4	**Subtotal**	**$1,190**	**$550**	**$517**	**$7**	**$358**	**$2,622**

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
B. Spent Fuel	**Subtotal**	**$167,938**	**$24,184**	**$517**	**$106,447**	**$43,145**	**$342,228**

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
C. Greenfield							
Grn Pd 1	**Clean Building Demolition**						
Distributed							
14.01	Procure Demolition Equipment	$0	$1,287	$0	$0	$296	$1,583
14.02	Demolish Non-Essential Structures	$1,446	$1,874	$165	$0	$644	$4,129
14.03	Demolish Remaining Structures	$1,109	$1,511	$152	$0	$514	$3,286
14.04	Demolish Turbine Building	$1,015	$331	$118	$0	$226	$1,690
14.05	Demolish Fuel Handling Building	$439	$157	$78	$0	$105	$778
14.06	Demolish Auxilary Building	$918	$312	$173	$0	$217	$1,620
14.07	Demolish Decontamination Building	$22	$7	$2	$0	$5	$35
14.08	Demolish Steam Generator Storage Building	$35	$10	$3	$0	$7	$55
14.09	Demolish Containment Building	$1,922	$416	$206	$0	$376	$2,921
Distributed	**Subtotal**	**$6,906**	**$5,905**	**$897**	**$0**	**$2,390**	**$16,097**
Undistributed							
3.01	Utility Staff	$2,737	$0	$0	$0	$356	$3,093
3.02	Security Guard Force	$334	$0	$0	$0	$50	$384
3.03	Decommissioning General Contractor Staff	$9,575	$0	$0	$0	$1,245	$10,820
3.04	Energy	$0	$0	$0	$339	$51	$390
3.05	Insurance	$0	$0	$0	$37	$6	$43
Undistributed	**Subtotal**	**$12,646**	**$0**	**$0**	**$376**	**$1,708**	**$14,730**
Grn Pd 1	**Subtotal**	**$19,552**	**$5,905**	**$897**	**$376**	**$4,098**	**$30,827**

Table 1

Kewaunee SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Scenario Number 1		License Status	Extension	Unit 1 Shut Down Date	7/1/2013
Decommissioning Alternative	SAFSTOR	Fuel Pool Systems	Modified		
Spent Fuel Alternative	Dry	DOE Acceptance Date:	1/1/2021		

2012 Dollars in Thousands

No	Item Description	Labor	Equipment	Disposal	Other	Contingency	Total
Grn Pd 2	**Site Restoration**						
Distributed							
15.01	Procure Site Restoration Equipment	$0	$115	$0	$0	$27	$142
15.03	Finish Grading and Re-Vegetate Site	$402	$305	$0	$0	$122	$829
Distributed	**Subtotal**	**$402**	**$420**	**$0**	**$0**	**$149**	**$971**
Undistributed							
3.01	Utility Staff	$585	$0	$0	$0	$76	$661
3.02	Security Guard Force	$125	$0	$0	$0	$19	$144
3.03	Decommissioning General Contractor Staff	$1,804	$0	$0	$0	$234	$2,038
3.04	Energy	$0	$0	$0	$127	$19	$146
3.05	Insurance	$0	$0	$0	$14	$2	$16
Undistributed	**Subtotal**	**$2,514**	**$0**	**$0**	**$141**	**$350**	**$3,005**
Grn Pd 2	**Subtotal**	**$2,916**	**$420**	**$0**	**$141**	**$499**	**$3,976**
C. Greenfield	**Subtotal**	**$22,468**	**$6,325**	**$897**	**$517**	**$4,597**	**$34,803**
Scenario No. 1	**Total**	**$473,767**	**$75,271**	**$48,353**	**$200,347**	**$122,136**	**$919,872**

Appendix E

Annual Cash Flow Table

Kewaunee Annual Cost By Account

Scenario No. 1 SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Unit No: Unit 1

2012 Dollars in Thousands

Year	License Termination	Spent Fuel	Greenfield	Total
2013	$30,849	$16,200	$0	$47,048
2014	$68,819	$29,023	$0	$97,842
2015	$4,492	$26,163	$0	$30,655
2016	$4,492	$27,700	$0	$32,192
2017	$4,492	$27,671	$0	$32,163
2018	$4,492	$24,510	$0	$29,002
2019	$4,492	$17,963	$0	$22,455
2020	$18,169	$8,723	$0	$26,891
2021	$1,714	$5,404	$0	$7,119
2022	$1,714	$5,404	$0	$7,119
2023	$1,714	$5,404	$0	$7,119
2024	$1,714	$5,404	$0	$7,119
2025	$1,714	$5,404	$0	$7,119
2026	$1,714	$5,404	$0	$7,119
2027	$1,714	$5,404	$0	$7,119
2028	$1,714	$5,404	$0	$7,119
2029	$1,714	$5,404	$0	$7,119
2030	$1,714	$5,404	$0	$7,119
2031	$1,714	$5,404	$0	$7,119
2032	$1,714	$5,404	$0	$7,119
2033	$2,517	$5,404	$0	$7,922
2034	$1,714	$5,404	$0	$7,119
2035	$1,714	$5,404	$0	$7,119
2036	$1,714	$5,404	$0	$7,119
2037	$1,714	$5,404	$0	$7,119
2038	$1,714	$5,404	$0	$7,119
2039	$1,714	$5,404	$0	$7,119
2040	$1,714	$5,404	$0	$7,119
2041	$1,714	$5,404	$0	$7,119
2042	$1,714	$5,404	$0	$7,119
2043	$1,714	$5,404	$0	$7,119
2044	$1,714	$5,404	$0	$7,119
2045	$1,714	$5,404	$0	$7,119
2046	$1,714	$5,404	$0	$7,119
2047	$1,714	$5,404	$0	$7,119
2048	$1,714	$5,404	$0	$7,119
2049	$1,714	$5,662	$0	$7,377

Kewaunee Annual Cost By Account

Scenario No. 1 SAFSTOR with Dry Storage, 2013 Shutdown and DOE Acceptance in 2021

Unit No: Unit 1 **2012 Dollars in Thousands**

Year	License Termination	Spent Fuel	Greenfield	Total
2050	$1,721	$4,676	$0	$6,398
2051	$1,731	$0	$0	$1,731
2052	$1,731	$0	$0	$1,731
2053	$1,731	$0	$0	$1,731
2054	$1,731	$0	$0	$1,731
2055	$1,731	$0	$0	$1,731
2056	$1,731	$0	$0	$1,731
2057	$1,731	$0	$0	$1,731
2058	$1,731	$0	$0	$1,731
2059	$1,731	$0	$0	$1,731
2060	$1,731	$0	$0	$1,731
2061	$1,731	$0	$0	$1,731
2062	$1,731	$0	$0	$1,731
2063	$1,731	$0	$0	$1,731
2064	$1,731	$0	$0	$1,731
2065	$1,731	$0	$0	$1,731
2066	$1,731	$0	$0	$1,731
2067	$13,169	$0	$0	$13,169
2068	$22,670	$0	$0	$22,670
2069	$67,698	$0	$0	$67,698
2070	$108,612	$0	$0	$108,612
2071	$99,265	$0	$0	$99,265
2072	$11,087	$0	$22,132	$33,219
2073	$109	$2,622	$12,671	$15,402
Total	$542,841	$342,228	$34,803	$919,872

Enclosure 3

Application for Withholding Information and Affidavit

Dominion Energy Kewaunee, Inc.

10 CFR § 2.390

APPLICATION FOR WITHHOLDING INFORMATION AND AFFIDAVIT OF DANIEL G. STODDARD

I, Daniel G. Stoddard, Senior Vice President - Nuclear Operations of Dominion Energy Kewaunee, Inc. state that:

1. I am authorized to execute this affidavit on behalf of Dominion Energy Kewaunee, Inc. (DEK)
2. DEK is submitting a Post-Shutdown Decommissioning Activities Report (PSDAR) to the NRC pursuant to 10 CFR 50.82(a)(4)(i) and this report is required to include a site-specific decommissioning cost estimate. Enclosure 2 of this letter contains a cost analysis which is intended to meet this requirement. Enclosure 2 of this letter contains proprietary commercial information that should be held in confidence by the NRC pursuant to the policy reflected in 10 CFR §§ 2.390(a)(4) because:
   a. This information is being held in confidence by DEK.
   b. This information is of a type that is held in confidence by DEK, and there is a rational basis for doing so because the information contains commercial information concerning a DEK contract.
   c. This information is being transmitted to the NRC in confidence.
   d. This information is not available in public sources and could not be gathered readily from other publically available information.
   e. Public disclosure of this information would create substantial harm to the competitive position of DEK by disclosing confidential contract information to other parties whose commercial interests may be adverse to those of DEK. Therefore, the use of this confidential information by competitors may permit them to use the information to develop competitive advantage over DEK.
3. Accordingly, DEK Requests that the designated document be withheld from public disclosure pursuant to the policy reflected in 10 CFR §§ 2.390(a)(4).

Daniel G. Stoddard
Senior Vice President - Nuclear Operations
Dominion Energy Kewaunee, Inc.

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

Acknowledged before me this 26th day of February, 2013

My Registration Number is: 7518653 My Commission Expires: December 31, 2016

CRAIG D SLY
Notary Public
Commonwealth of Virginia
Reg. # 7518653
My Commission Expires December 31, 2016

Notary Public