Nuclear Fuels Storage and Transportation Planning Project Inventory Basis

Fuel Cycle Research & Development

Prepared for

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Nuclear Fuels Storage and Transportation Planning Project

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SUMMARY

This report provides information on the inventory of commercial spent nuclear fuel, referred to herein as used nuclear fuel (UNF), as well as Government-owned UNF and high-level radioactive waste (HLW). Actual or estimated quantitative values for current inventories are provided along with inventory forecasts derived from examining a different future commercial nuclear power generation scenarios. The report also includes select information on the characteristics associated with the wastes examined (e.g. type, packaging, heat generation rate, decay curves). This report was produced for the U.S. Department of Energy (DOE) to support various analyses on options for storage and transport of UNF and HLW, and was sponsored by DOE's Nuclear Fuels Storage and Transportation Planning Project (NFST). The report draws from and complements a previously issued report, *Fuel Cycle Potential Waste Inventory for Disposition* [Carter, 2013], developed for DOE's UNF Disposition Research & Development Campaign.

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ACRONYMS

BRC	Blue Ribbon Commission on America's Nuclear Future
BWR	Boiling Water Reactor
Canister	the inner package which contains the fuel
Cask	or over pack, the container which provides shielding to reduce radiation exposure generally different shielded containers are used for storage and transportation
EIA	Energy Information Administration
FCRD	Fuel Cycle Research & Development
GTCC	Greater-than-Class-C (category of radioactive waste)
GWd/MT	Gigawatt-days per Metric Ton (of Initial Uranium)
HLW	High-Level Radioactive Waste
HSM	Horizontal Storage Module
INL	Idaho National Laboratory
ISF	Interim Storage Facility (generic term for both Pilot and larger ISF)
ISFSI	Independent Spent Fuel Storage Installation
Larger ISF	Larger Interim Storage Facility
MPC	Multi-Purpose Canister (used with HOLTEC and some NAC systems)
MTHM	Metric Tons Initial Heavy Metal (equivalent to MTU)
MTU	Metric Tons Initial Uranium
NFST	DOE-NE Nuclear Fuels Storage and Transportation Planning Project
NNPP	Naval Nuclear Propulsion Program
NPR	nuclear power reactor
NRC	Nuclear Regulatory Commission
NUHOMS	NUclear HOrizontal Modular Storage
NWPA	Nuclear Waste Policy Act of 1982, as amended
OCRWM	Office of Civilian Radioactive Waste Management
ORNL	Oak Ridge National Laboratory
Overpack	the shielded container used during storage or transportation to reduce radiation exposure, generally referred to as a cask
Pilot	Pilot Interim Storage Facility
PWR	Pressurized Water Reactor
R&D	Research and Development
SRNL	Savannah River National Laboratory
SRS	Savannah River Site

TSC	Transportable Storage Canister (used with certain NAC and BFS/ES systems)
TSL	Transportation Storage Logistics
UFDC	Used Fuel Disposition Campaign
UMS	Universal MPC System (used with certain NAC systems)
UNF	Used Nuclear Fuel
VCC	Ventilated Concrete Cask
VCT	Vertical Cask Transporter
VSC	Vertical Storage Cask
WTP	Waste Treatment Project

NUCLEAR FUELS STORAGE AND TRANSPORTATION PLANNING PROJECT

INVENTORY BASIS

1. Introduction

This report provides information on the inventory of commercial spent fuel, referred in this report as used nuclear (UNF), as well as Government-owned UNF and HLW in the U.S. Department of Energy (DOE) complex. Inventory forecasts for commercial UNF were made for a few selected scenarios of future commercial nuclear power generation involving the existing reactor fleet, as well as reactors under construction for one particular case. This introductory section (Section 1) provides an overview of the commercial UNF inventory and a short description of the types of waste in DOE's inventory. Section 2 presents more detailed information on the commercial UNF including the inventory forecast information. A more in-depth discussion on the Government-owned UNF and HLW is provided in Section 3. Additional and supporting information is contained in the appendices, namely information on: commercial UNF characteristics; UNF discharges by reactor; and inventory forecast break-outs by reactor, storage location, site, state and U.S. Nuclear Regulatory Commission (NRC) region. This report was sponsored by DOE's Nuclear Fuels Storage and Transportation Planning Project (NFST). It draws from and complements a previously issued report, *Fuel Cycle Potential Waste Inventory for Disposition* [Carter, 2013] developed for DOE's UNF Disposition Research & Development Campaign.

Facility Grouping Structure

For the purpose of the current report, a simple site grouping structure has been adopted and is used throughout the report. The grouping structure is provided below to provide clarity through discriminating between nuclear power generating sites at which all reactor units are operating and those sites that contain one or more shutdown units.

<u>Commercial Nuclear Power Generation Sites</u>**:**

Group A: sites with all reactors permanently shut down (<u>**A**</u>ll units shut down).

Group B: sites with at least one reactor permanently shut down co-located with at least one reactor continuing to operate (status is <u>**B**</u>etween Group A and Group C sites)

Group C: sites with all reactors operating or expected to resume operation, i.e. none permanently shut down (<u>**C**</u>ontinuing operations with all reactors)

<u>Other Sites:</u>

Group D: U.S. Department of Energy sites (<u>**D**</u>OE sites)

Group F: Non-reactor commercial fuel cycle facility sites, e.g. reprocessing, storage, etc. (<u>**F**</u>uel cycle facility)

Within each group, a numeric value of 1 is appended to the site group identifier for a site with only dry fuel storage. A value of 2 is used to identify a site with both wet and dry storage, and a value of 3 is appended to sites with fuel in wet storage only. For example, Yankee Rowe is included in Site Group A and Subgroup A1, since the entire inventory of shutdown reactor is currently in dry storage. Seabrook and Surry are included in Group C reactors and Subgroup C2, with both wet and dry stored fuel. Table 1-1 provides a list of nuclear power plants by their assigned Groups/Subgroups.

1.1 Used Nuclear Fuels and HLW Inventory

Commercial Nuclear Power Reactors (NPRs) have operated in the U.S. since about 1960. Excluding a number of civilian reactors previously categorized as experimental electric-power reactors (Vallecitos Boiling Water Reactor, Saxton Nuclear Experimental Reactor Project) or primarily used for purposes other than central-station nuclear power generation (N.S. Savannah), a total of 130 commercial NPRs have been built for civilian nuclear power generation. Nine of these were early prototype or demonstration reactors which have since been or are in a state of being decommissioned (e.g., Peach Bottom 1, Fermi 1, Shippingport) and for which UNF no longer remains on site. Another was the high temperature gas cooled Fort St. Vrain demonstration reactor which was also decommissioned and for which UNF is stored in a DOE Independent Spent Fuel Storage Installation (ISFSI) near the reactor site. Of the remaining 120 NPRs, one (Shoreham) was never operated at power to make electricity and was decommissioned. A second (Three Mile Island Unit 2) was disabled, and the fuel debris is owned by the DOE and located at Idaho National Laboratory (INL). Another 18 reactors have since shut down, currently leaving 100 NPRs licensed to operate; 94 reactors at Group C sites and six at Group B sites. Of these 18 shutdown reactors, four NPRs (on 3 sites) either ceased power generation or ceased efforts to restart in 2013, bringing the total number of shutdown reactors at sites with no continuing nuclear operations to 15 reactors on 12 sites (Group A sites). This includes UNF from 10 reactors on 9 sites (Group A1) where reactor decommissioning is complete or nearing completion as these reactors all ceased operations prior to 2000. The BRC identified these sites as "Stranded", since after decommissioning, the only nuclear operations will be monitoring the dry fuel in storage. In addition to the 15 shutdown reactors at shut down sites (Group A), UNF from three shutdown reactors is stored on sites collocated with operating reactors (Group B Sites). Recently, two operating NPRs, Vermont Yankee and Oyster Creek, have utility-announced early shutdown dates of October 2014 and 2019, respectively. This inventory report includes the impact of these “early” reactor shutdowns. For the 118 NPRs with UNF still located at commercial sites, the UNF is currently stored in pools or dry storage casks with disposal in a geologic repository envisioned in a once-through fuel cycle. Some commercial fuel assemblies have been transferred to the Idaho National Laboratory (INL) and Savannah River Site (SRS) with ownership transferred to DOE (Group D Sites). The General Electric facility at Morris, Illinois (the lone Group F Site) is currently the only NRC licensed storage facility in operation that is not co-located at a reactor site. Section 2 describes these radioactive materials. Figure 1-1 provides the commercial NPR locations. Table 1-2 provides a summary of estimated UNF inventory, by Site Group and storage method, as of December 31, 2013.

Since the inception of nuclear reactors, the DOE and its predecessor agencies operated or sponsored a variety of research, test, training, and other experimental reactors both domestically and overseas. The Naval Nuclear Propulsion Program (NNPP) has generated UNF from operation of nuclear powered submarines and surface ships, operation of land-based prototype reactor plants, operation of moored training ship reactor plants, early development of commercial nuclear power, and irradiation test programs.

Aqueous reprocessing of DOE UNF has occurred at the Hanford Site, the Idaho National Laboratory (INL), and the Savannah River Site (SRS). The INL is pursuing the use of electro-chemical processing to treat 60 MTHM of sodium bonded UNF. DOE is also responsible for clean-up of the commercial UNF reprocessing site at West Valley, New York.

The inventory from these DOE activities is fairly well understood and documented. Section 3 summarizes these radioactive materials.

Table 1-1. Nuclear Power Reactor Sites by Group/Subgroup (As of March 2014)

Group A Sites (# of Units) – 15 Rx/12 Sites			
A1		**A2**	**A3**
Big Rock Point (1)	Rancho Seco (1)	Kewaunee (1)	Crystal River (1)
Haddam Neck (1)	Trojan (1)	San Onofre (3)	
Humboldt Bay (1)	Yankee Rowe (1)		
LaCrosse (1)	Zion (2) †		
Maine Yankee (1)			

Group B Sites (# of Units) – Total 9 Rx/3 Sites		
	B2‡	
Currently All Group B Sites have both Dry and Wet Storage Capabilities	Dresden (3)	
	Indian Point (3)	
	Millstone (3)	

Group C Sites (# of Units) (Note: All Group C Sites have Wet Storage Capabilities) – 94 Rx/57 Sites			
C2			**C3**
Arkansas Nuclear (2)	Fort Calhoun (1)	Perry (1)	Beaver Valley (2)
Braidwood (2)	Ginna (1)	Point Beach (2)	Callaway (1)
Browns Ferry (3)	Grand Gulf (1)	Prairie Island (2)	Clinton (1)
Brunswick (2)	Hatch (2)	Quad Cities (2)	Fermi (1) ††
Byron (2)	Hope Creek (1) ‡‡	River Bend (1)	Pilgrim (1)
Calvert Cliffs (2)	La Salle (2)	Robinson (1)	Shearon Harris (1)
Catawba (2)	Limerick (2)	Saint Lucie (2)	South Texas (2)
Columbia Generating Station (1)	McGuire (2)	Salem (2) ‡‡	Three Mile Island (1) ††
Comanche Peak (2)	Monticello (1)	Seabrook (1)	Summer (1)
Cooper (1)	Nine Mile Point (2) ‡‡	Sequoyah (2)	Watts Bar (1)
Davis-Besse (1)	North Anna (2)	Surry (2)	Wolf Creek (1)
D.C. Cook (2)	Oconee (3)	Susquehanna (2)	
Diablo Canyon (2)	Oyster Creek (1)	Turkey Point (2)	
Duane Arnold (1)	Palisades (1)	Vermont Yankee (1)	
Farley (2)	Palo Verde (3)	Vogtle (2)	
Fitzpatrick (1) ‡‡	Peach Bottom (2) ††	Waterford (1)	

† All fuel at Zion is expected to be in dry storage by the end of 2014. This site is therefore included in A1
‡ Each of the three B2 Sites have a single shutdown reactor and 2 operating reactors
†† Does not include prototype (Fermi 1), experimental (Peach Bottom-1), or disabled (TMI-2) reactors
‡‡ Fitzpatrick and Nine Mile Point are considered as a single site, and Hope Creek and Salem are considered as a single site in this report due to proximity.

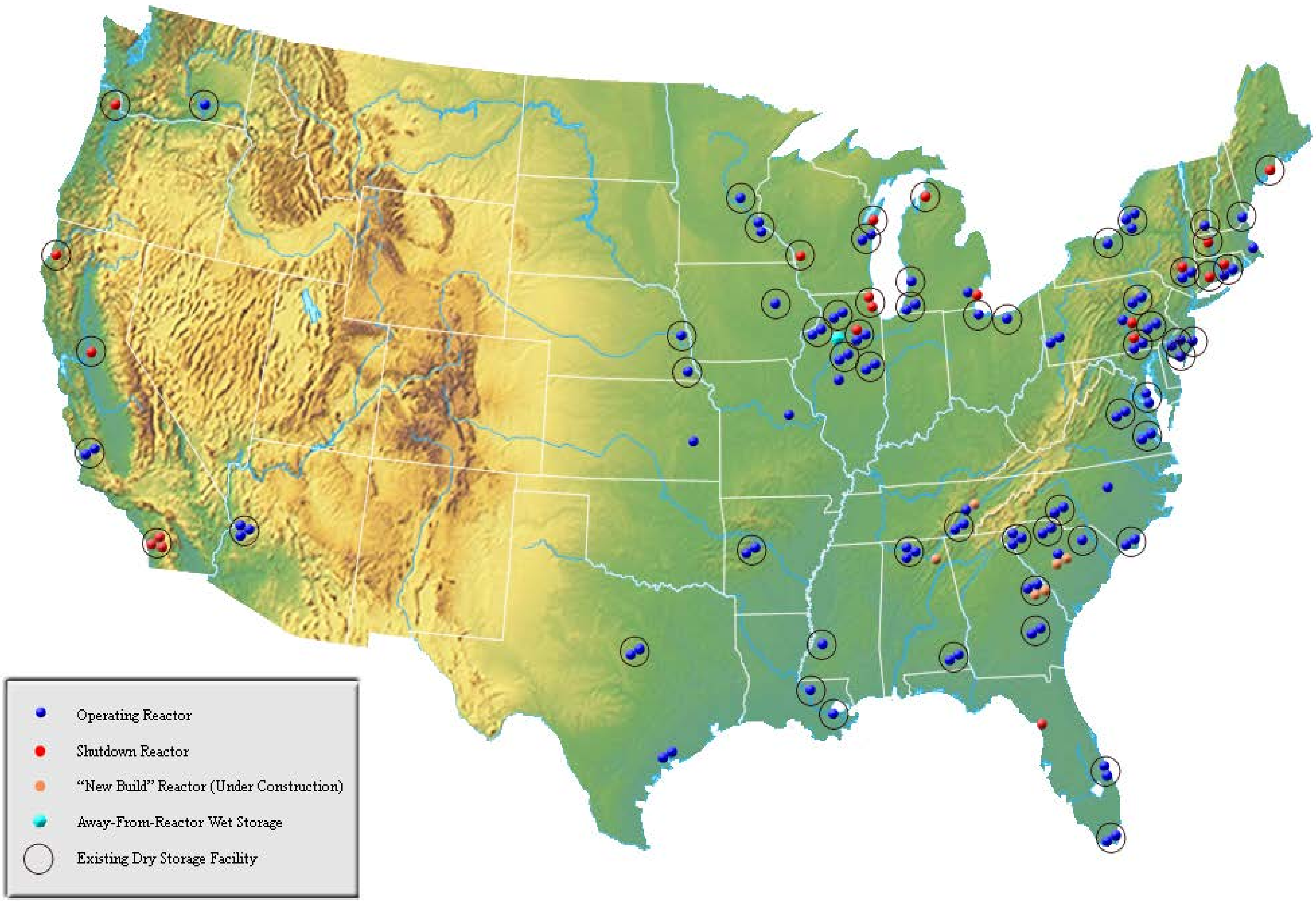

Figure 1-1. Commercial Nuclear Power Reactor Sites Currently Storing Commercial UNF

Table 1-2. Used Nuclear Fuel Inventory by Reactor Group/Subgroup (Estimate as of 12/31/2013)

Site Group/ Subgroup	Dry Inventory			Pool Inventory		Site Total	
	Assy.	Initial Uranium (MT)	Number of Casks	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Group A Sites							
A1*	5,655	2,317.81	193	2,004	495.49	7,659	2,813.30
A2	1,443	572.27	59	3,855	1,563.23	5,298	2,135.50
A3	-	-	-	1,319	611.98	1,319	611.98
A	**7,098**	**2,890.08**	**251**	**7,178**	**2,670.70**	**14,276**	**5,560.78**
Group B Sites							
B1	-	-	-	-	-	-	-
B2	5,284	1,248.78	101	12,968	3,406.93	18,252	4,655.71
B3	-	-	-	-	-	-	-
B	**5,284**	**1,248.78**	**101**	**12,968**	**3,406.93**	**18,252**	**4,655.71**
Group C Sites							
C1	-	-	-	-	-	-	-
C2	61,815	17,861.15	1,498	124,933	34,329.55	186,748	52,190.70
C3	-	-	-	27,202	8,617.10	27,202	8,617.10
C	**61,815**	**17,861.15**	**1,498**	**152,135**	**42,946.66**	**213,950**	**60,807.80**
Group D Sites (Excluding Fort St. Vrain Inventory)							
D	**225**	**70.30**	**-**	**1**	**0.12**	**226**	**70.42**
Group F Sites							
F	**-**	**-**	**-**	**3,217**	**674.29**	**3,217**	**674.29**
Total All Sites	**74,422**	**22,070.30**	**1,850**	**175,499**	**49,698.69**	**249,921**	**71,769.00**

***** Includes 2,004 assemblies currently in wet storage at Zion that are expected to be in dry storage by the end of 2014

1.2 Revision History

This document is expected to be a “living” document and expand additional information and additional scenarios to develop a broad range of potential inventory for project planning purposes.

Revision 0 contains a single projection for commercial UNF future inventory based on 1) the discharged fuel at shutdown NPRs or reactors and 2) on the currently operating reactors all obtaining a license extension and operating for 60 years (Section 2).

Revision 1 constitutes a significant revision with respect to the terminology used to identify site groups and with the respect to the addition of four new projection scenarios for commercial UNF. The new scenarios include: Alternative Scenario 1 – The incorporation of 6 new reactors that are currently under construction at four sites in addition to the assumptions of the Reference Scenario that was developed in Revision 0; Alternative Scenario 2 – The shutdown of all reactors at the end of their respective current operating license; Alternative Scenario 3 – The incorporation of the shutdown of 7 “Most Challenging” reactors as a modification to the Reference Scenario; and Alternative Scenario 4 – The incorporation of the shutdown of 14 "Most Challenging" reactors as a modification to the Reference Scenario. The "Most Challenging" reactors are determined from a number of recent publications indicating reactors with significant fiscal and political challenges. Finally, the current revision includes an update to current storage locations for UNF through 2013.

Future revisions may involve the additional, modification, or removal of projection scenarios, as well as the addition of new discharge data generated by the GC-859 process.

2. Commercial UNF Inventory

Commercial nuclear power plants have operated in the U.S. since about 1960. There are currently 100 licensed and currently in operation. UNF from these operating plants is currently stored on site in pools or dry storage casks with disposal in a geologic repository envisioned in a once-through fuel cycle. In addition, UNF from 18 shutdown reactors is currently stored at the reactor sites. The General Electric facility at Morris, Illinois is currently the only UNF licensed storage facility in operation that is not collocated at a reactor site.

Commercial UNF includes irradiated fuel discharged from pressurized water reactors (PWRs) and boiling water reactors (BWRs). The fuel used in these reactors consists of uranium dioxide pellets encased in zirconium alloy (Zircaloy) or stainless steel tubes. The fuel assemblies vary in physical configuration, depending upon reactor type and manufacturer.

Commercial UNF assemblies are categorized by physical configuration into 22 classes: 16 PWR and 6 BWR fuel assembly classes. Commercial UNF data has been collected by the Energy Information Administration for the Office of Civilian Radioactive Waste Management. Appendix A, Tables A-1 and A-2 present the assembly class, array size, fuel manufacturer, assembly version, assembly type code, length, width, and cladding material of commercial PWR UNF and commercial BWR UNF, respectively. Physical dimensions are those of unirradiated assemblies. Within an assembly class, assembly types are of a similar size. There are 134 individual fuel assembly types in these classes. Appendix A, Table A-3 presents the manufacturer, initial uranium load, enrichment, and burn-up characteristics of commercial UNF assembly types in existence at the end of 2002.

Some new fuel types have been introduced since 2002 however, similar information to that presented in Appendix A is not available from non-propriety data sources.

2.1 Current Commercial UNF Inventory

The source of current inventory data for this study is information collected in support of the Office of Civilian Radioactive Waste Management's (OCRWM) efforts for licensing the Yucca Mountain Repository [DOE, 2008]. As part of the OCRWM effort, information has been collected by the Energy Information Administration (EIA). Information collected from RW-859 forms is available on an assembly basis for UNF discharges from 1968 through 2002.

To develop an inventory estimate through 2013, fuel discharge predictions developed for the Nuclear Energy Institute in 2005 were used to estimate the number of assemblies and metric tons of uranium [Gutherman, 2009]. To estimate the average enrichment and burn-up through 2013, projections made by utilities as part of the RW Form 859 surveys were used. These projections are documented in OCRWM's "Calculation Method for the Projection of Future Spent Fuel Discharges", February 2002. [OCRWM, 2002] These projections identified a burn-up increase of 2.38% per year for BWR fuel and 1.11% per year for PWR fuel through 2010. The enrichment increased at the same rate as burn-up. Comparison of these projections made in 1998 to actual data collected through 2004 show very good agreement (PWR -

actual 46,950 MWd/MTU vs. projected 46,922 MWd/MTU; BWR - actual 43,447 MWd/MTU vs. 42,787 projected MWd/MTU).

Current commercial UNF inventory estimates will vary depending upon the selection of values for key factors in the estimating calculations. In FY2012, the UFD Campaign sponsored multiple UNF projections as a part of the logistical modeling update effort. As part of this work, different assumptions were used for the major variables that affect the projection [Kalinina, 2012]. The results of four cases indicate a range of about 5% (Table 3-6 of [Carter, 2013]). The NFST estimates therefore use a single value for each of the three most important factors:

- the maximum fuel enrichment, this parameter is set to 5.0% based upon the maximum allowed by enrichment facilities' license,
- the average annual capacity factor decrease due to age, this parameter is set to 0 since the reactor early retirement history does not support a gradual decrease due to age but one in which operating factors and/or economic factors result in an immediate cessation of operations, and
- the annual percentage increase in fuel burn-up, historically this parameter has been 1.1% for PWR and 2.4% for BWR however, more recently the number of reactors obtaining approved thermal power "uprates" has decreased and the corresponding burn-up increases are less than the percentages indicated above. This parameter is set to 0 (no) annual burn-up increase.

The projection method forecasts each NPR individually and these quantities have been adopted for this study except for four reactors. Four of the early shutdown reactors have published the actual quantities of discharged fuel. Kewaunee has discharged a total of 1,335 assemblies with 1,079 assemblies stored in the pool and 256 assemblies in dry storage [Dominion, 2013]. The 1,335 assemblies contain an estimated 513.3 MTU.

Crystal River has discharged a total of 1,319 assemblies [Nesbit, 2013] in pool storage containing an estimated 612.0 MTU. The Crystal River reported discharges include 78 fresh assemblies that were inserted into the reactor during the last refueling but were not burned. These fresh assemblies are considered a candidate for transfer to other operating reactors within the Duke fleet and may be removed from the inventory at a future date.

San Onofre, Unit 2, has discharged a total of 1,834 assemblies, while San Onofre, Unit 3, has discharged a total of 1,734 assemblies. The Unit 2 discharges include 108 fresh assemblies that were inserted into the core but not burned. The total of the UNF (i.e., not including the 108 fresh assemblies) amounts to 1,463 MTU.

These actual discharges are higher than the forecast quantities by 107 assemblies (4.0 % difference) and 34.8 MTU (3.0% difference) indicating reasonable agreement with the forecast over the 10 year time period (12/31/2002 to 12/31/2012).

Table 2-1 provides the estimated UNF inventory at the end of 2013 by reactor type. The total projected inventory is nearly 72,000 metric tons (MT) of uranium (MTU) contained in nearly 250,000 discharged assemblies. The Table is detailed to provide actual discharges through December 31, 2002 from the RW-859 data base and the projected quantities between 1/1/2003 and 12/31/2013.

Table 2-1. Estimated Current Inventory by Reactor Type, Detailed by RW-859 and Forecast Quantities

	Fuel Discharged through 12/31/2002		Forecast Discharges 1/1/03 to 12/31/13		Total Estimated Discharged Fuel through 12/31/2013	
Reactor Type	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
PWR	70,302	30,291	36,760	16,071	107,052	46,364
BWR	93,354	16,708	49,505	8,698	142,859	25,406
Totals	**163,656**	**46,999**	**86,265**	**24,769**	**249,921**	**71,769**

2.1.1 Current Inventory Storage Location

Prior to 2002, some discharged UNF was transferred to other locations. Five reactors transferred some of their discharged fuel to the pool storage facility at Morris, IL. Table 2-2 details the transfers to Morris which totals 3,217 assemblies and approximately 675 MTU.

Approximately 70 MT was transferred to the Idaho National Laboratory (INL) for research and development purposes such as fuel rod consolidation and dry storage demonstrations. Table 2-3 provides additional details on fuel transferred to INL. This fuel has been transferred to the DOE and is not stored in NRC licensed facilities.

One assembly containing approximately 0.12 MT (Table 2-4) was transferred to the Savannah River Site (SRS) for research and development purposes. This fuel has been transferred to the DOE and is not stored in NRC licensed facilities.

Since 2002, essentially all fuel generated has remained on the generating reactor sites in either pool or dry storage. Progress utility company did transfer some fuel between its operating reactors, see Table 2-5.

Table 2-2. UNF Transferred to Pool Storage at Morris, Illinois.

		Discharges as of Dec 2002		Transferred to Morris	
Reactor [Unit] (Site Subgroup)	**Operating Status**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**
Dresden 2 (B2)	Operating	3,741	678.72	753	145.19
Cooper (C2)	Operating	2,593	447.01	1,054	198.02
Monticello (C2)	Operating	2,400	434.25	1,058	198.19
San Onofre 1 (A2)	Shutdown	665	244.61	270	98.41
Haddam Neck (A1)	Shutdown	1,102	447.17	82	34.48
			Totals	**3,217**	**674.29**

Table 2-3. UNF Transferred to Idaho National Laboratory Identified in RW-859.

Reactor [Unit] (Site Subgroup)	Operating Status	Discharges as of Dec. 2002		Transferred to INL	
		Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Robinson 2 (C2)	Operating	1,149	498.94	1	0.44
Peach Bottom 2 (C2)	Operating	3,594	648.16	2	0.38
Point Beach 1 (C2)	Operating	920	350.69	6	2.36
Ginna (C2)	Operating	1,007	372.66	40	15.29
Surry 1 (C2)	Operating	1,015	464.27	1	0.45
Surry 2 (C2)	Operating	998	456.86	68	31.03
Turkey Point 3 (C2)	Operating	941	430.31	18	8.18
Dresden 1 (B2)	Shutdown	892	90.86	3	0.26
Big Rock Point (A1)	Shutdown	526	69.53	85	11.48
Haddam Neck (A1)	Shutdown	1,102	447.17	1	0.41
			Totals	**225**	**70.30**

Table 2-4. UNF Transferred to Savannah River Site.

Reactor [Unit] (Site Subgroup)	Operating Status	Discharges as of Dec. 2002		Transferred to SRS	
		Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
LaCrosse (A1)	Shutdown	334	38.09	1	0.12
			Totals	**1**	**0.12**

Table 2-5. Progress NPR UNF Transfers.

Discharge Reactor	Discharges as of Dec. 2002		Transferred to Reactor Site
	Assemblies	Estimated Initial Uranium (MT)	
Robinson	304	132.2	Brunswick
Robinson	504	219.3	Shearon Harris
Brunswick	4,391	784.4	Shearon Harris

Table 2-6 provides the end of 2013 inventory remaining at the NPR sites by storage method accounting for all known fuel transfers. The dry storage quantities as of 3/13/2014 have been derived from publicly available sources [Store Fuel, 2014] and this report assumes these are the quantities in dry storage for the end-of-2013 projections. The balance of the projected inventory remains in the reactor pools.

Table 2-6. Estimated Current Inventory at NPR sites by Storage Method

	Dry Inventory			Pool Inventory		Total Projected Discharged Fuel 12/31/2013	
Reactor Type	Assy.	Initial Uranium (MT)	Fuel Casks	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
PWR	34,277	14,968	1,239	76,385	31,856	110,662	46,824
BWR	39,920	7,032	611	95,896	17,169	135,816	24,201
Totals	**74,197**	**22,000**	**1,850**	**172,281**	**49,024**	**246,478**	**71,024**

Appendix B, Tables B-1 – B-5 provide additional detail of this estimate on a reactor specific basis.

2.1.2 Commercial UNF Inventory in DOE Possession

There is total of 222 metric tons of used fuel of commercial origin that is currently in the possession of DOE. This fuel is projected to generate 1,260 DOE standardized canisters. This fuel includes the UNF identified in RW-859 as being in DOE possession (Tables 2-3 & 2-4) but also includes UNF from R&D investigations, including early experimental and prototype reactors (i.e., Shippingport, Peach Bottom 1, CVTR, Fermi 1, Fort St. Vrain, and Three Mile Island 2 debris). Table 2-7 provides a breakdown of the decay heat characteristics of DOE standardized canisters containing UNF of commercial origin.

Table 2-7. Canister Decay Heat Characteristics of Commercial-Origin Fuel in DOE Possession.

	2010		**2030**	
Decay heat per canister (watts)	**Number of canisters**	**Cumulative %**	**Number of canisters**	**Cumulative %**
<50	691	54.9%	985	78.2%
50-100	378	84.9%	153	90.3%
100-220	79	91.1%	13	91.3%
220-300	3	91.3%	24	93.2%
300-500	70	96.9%	67	98.6%
500-1000	33	99.5%	12	99.5%
1000-1500	1	99.6%	1	99.6%
1500 - 2000	0	99.6%	0	99.6%
>2000	5	100.0%	5	100.0%
Totals	**1260**		**1260**	

2.2 Future Commercial UNF Inventory Forecast

To support systems analysis studies and programmatic planning activities, the NFST requested an estimate of future inventory. The OCRWM methods outlined above have been extended to provide the individual NPR forecasts inventory. Such forecasts vary with the estimation method parameters described above, but also with scenario specific details. Multiple scenarios have been included in the current revision of this report, as described herein. The reference projection scenario is described in the next section and assumes no new reactors and 60 years of operation for existing reactors, when early shutdowns have not been announced.

2.2.1 Reference Scenario: No Replacement Nuclear Power Generation

The NFST project has selected an initial NPR scenario that assumes no new NPRs are constructed and operated and is referred to as the "No Replacement Nuclear Power Generation" scenario. This is the Reference Scenario for the purpose of comparison to alternative scenarios. The inventory for this initial scenario includes the fuel discharged from the 18 shutdown NPRs and the 100 currently operating NPRs. Ninety-eight of the 100 operating NPRs are assumed to have one 20 year life extension and will be decommissioned after 60 years of operation. The remaining operating NPRs, Vermont Yankee and Oyster Creek, have utility-announced early shutdown dates of October 2014 and 2019, respectively. Applying these assumptions the last nuclear generator finishes operations in 2055.

Table 2-8 provides the scenario inventory by reactor type as a function of the estimate phase. Actual quantities are used for discharges prior to 2003, forecast discharges are used for the individual reactors for later time periods except for the four reactors for which the actual discharges are known (Kewaunee, Crystal River, and San Onofree, Units 2 & 3 as described above).

The scenario totals nearly 485,000 assemblies containing nearly 140,000 MTU.

Table 2-9 provides the scenario inventory detailed to provide actual discharges through December 31, 2002 from the RW-859 data base, the projected quantities between 1/1/2003 and 12/31/2013, and between 1/1/2014 and the end of the scenario, by major storage location category and by site Group. In addition to the categories previously detailed as fuel owned by DOE at SRS and INL and fuel in wet storage at Morris, IL, three additional categories are also included:

- Group A Sites that were shutdown prior to 2002 and at which there is no other ongoing nuclear operations (Subgroup A1). Table 2-10 provides additional details on this category. This fuel (from 10 reactors) is located at nine sites and totals 7,659 assemblies containing 2,813.3 MTU. Fuel at these sites was discharged prior to 2003, and the quantities are from the RW-859 database.
- Early shutdown reactor fuel (from seven reactors) at five sites are those reactors which have either ceased operations (five of the seven reactors) or plan to cease operations prior to reaching the 60 year operating lifetime. These reactors are subdivided by Site Group within Table 2-9. Table 2-11 provides the detail inventory of each of these seven reactors. Once shutdown there will be no other nuclear operations on these sites. This category includes:
    - Kewaunee which was shut down in May of 2013. Kewaunee data are based on actual known discharges as discussed above.
    - Crystal River was last operated in 2009 and has an official shutdown date of February 20, 2013. Crystal River data are based on actual known discharges as discussed above.
    - San Onofre 1 last operated in 1992 (shutdown 11/30/1992) and the inventory is based on the RW-859 database. San Onofre 2 and 3 last operated in 2012 and were officially shutdown on 6/12/2013. The inventory estimate is based on published actual known discharges as discussed previously.
    - Vermont Yankee has announced an early shutdown date in October 2014. The inventory estimate is based on the RW-859 database and the forecast for time period after 12/31/2002.
    - Oyster Creek has announced an early shutdown date in 2019. The inventory estimate is based on the RW-859 database and the forecast for time period after 12/31/2002.

- Shutdown reactor fuel (Table 2-12) is fuel discharged by three permanently shut down reactors at sites with continued nuclear operations (Group B sites). These three reactors shutdown prior to 12/31/2002 and the quantities are based on the RW-859 database. The shutdown reactors discharged 3,936 assemblies with three assemblies transferred to INL. The remaining shutdown reactor inventory is 3,933 assemblies, containing approximately 646.8 MTU.

The Group A reactors include ten reactors (counting Zion 1 & 2 that are expected to complete movement to dry storage during 2014) on nine sites that have only dry storage capabilities (A1), a single reactor (Crystal River) that currently only has fuel in wet storage (A3) and two reactors on two sites with fuel in both wet and dry storage (A2). With the completion of Zion's transition to dry storage, expected this year, all the Group A sites that shutdown prior to 2003 are Subgroup A1 sites. The Subgroup A2 and A3 sites all shutdown after 2002 and will ultimately become A1 sites following pool de-inventory and reactor decommissioning. Likewise, the two Group C sites, Oyster Creek and Vermont Yankee, have announced early shutdown dates and will evolve into Subgroup A1 sites with time. This fuel from each of these sites is expected to be migrated to dry storage, although the timetable for movement is uncertain, but expected to be complete for most of the sites prior to 2021. In the future, these categories could be combined. These additional plants will bring the total Group A site inventory to 22,967 assemblies containing approximately 7,116 MTU.

Appendix C, Tables C-1 through C-5 provides additional details for this Reference Scenario on a reactor specific basis.

Appendix D provides additional details for this Reference Scenario on a state specific basis.

Appendix E provides additional details for this Reference Scenario on a NRC Region basis.

Table 2-8. Projected UNF Inventory for Reference Scenario by Reactor Type

	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/03 to 12/31/13		Forecast Discharges 1/1/14 to 12/31/60		Total Projected Discharged Fuel	
Reactor Type	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**
PWR	70,302	30,291	36,760	16,071	99,607	43,710	206,669	90,072
BWR	93,354	16,708	49,505	8,699	135,084	23,762	277,944	49,168
Totals	**163,656**	**46,999**	**86,265**	**24,770**	**234,691**	**67,472**	**484,612**	**139,241**

Table 2-9. Projected UNF Inventory for Reference Scenario by Site Group (Group Status as of 12/31/2013)

Description	Site Group	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
		Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Operating Reactors at Group C Sites (92 Rx/55 Sites)*	C	128,629	37,273	77,238	22,071	222,407	63,867	428,274	123,211
Operating Reactors at Group B Sites (6 Rx/3 Sites)	B	10,302	2,786	4,770	1,368	10,923	3,368	25,995	7,522
Shutdown Reactors at Sites at Group B Sites (3 Rx/3 Sites)	B	3,933	647	-	-	-	-	3,933	647
Operating Reactors with Announced Shutdown Date (2 Rx/2 Sites)**	C	5,471	992	1,859	327	1,361	237	8,691	1,555
Reactors Shutdown Since 2002 (5 Rx/3 Sites)	A	4,219	1,743	2,398	1,004	-	-	6,617	2,747
Reactors Shutdown Prior to 2003 (10 Rx/9 Sites)	A	7,659	2,813	-	-	-	-	7,659	2,813
Transferred to INL	D	225	70.30	-	-	-	-	225	70.3
Transferred to SRS	D	1	0.12	-	-	-	-	1	0.12
Away From Reactor Wet Storage	F	3,217	674	-	-	-	-	3,217	674
Totals		**163,656**	**46,999**	**86,265**	**24,770**	**234,691**	**67,472**	**484,612**	**139,241**

* Excludes reactors with announced early shut downs. For the purposes of this report, Fitzpatrick and Nine Mile Point are considered as a single site. Similarly, Hope Creek and Salem are considered a single site.

** These include only Oyster Creek (2019 shutdown date) and Vermont Yankee (October 2014 shutdown date)

Table 2-10. Fuel at Group A Reactor Sites Shutdown Prior to 2003.

		Discharges Onsite as of 12/31/2002		Transferred to Group D or Group F Sites		Remaining Inventory at the end of 2013					
Reactor	**Shutdown Date**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Fuel Casks Loaded / Estimated**		**GTCC Casks Loaded / Estimated****	
Big Rock Point	8/29/1997	526*	69.53	85	11.48	441	58.05	7	-	1	-
Haddam Neck	12/5/1996	1,102	447.17	83	34.89	1,019	412.29	40	-	3	-
Humboldt Bay 3	7/2/1976	390	28.94	-	-	390	28.94	5	-	1	-
La Crosse	4/30/1987	334	38.09	1	0.12	333	37.97	5	-	-	-
Maine Yankee	12/6/1996	1,434	542.26	-	-	1.434	542.26	60	-	4	-
Rancho Seco	6/7/1989	493	228.38	-	-	493	228.38	21	-	1	-
Trojan	11/9/1992	790	358.85	-	-	790	358.85	34	-		-
Yankee Rowe	10/1/1991	533	127.13	-	-	533	127.13	15	-	1	-
Zion 1	2/21/1997	1,143	523.95	-	-	1,143	523.95	6	61	-	2
Zion 2	9/16/1996	1,083	495.49	-	-	1,083	495.49	-	-	-	2
Zion Totals	-	2,226	1,019.44	-	-	2,226	1,019.44	-	61	-	4
Totals	**-**	**7,828**	**2,859.79**	**169**	**46.49**	**7,659**	**2, 813.30**	**248**		**15**	

* One assembly at Big Rock Point was consolidated into other assemblies

** GTCC Casks estimated at 2 per reactor

Table 2-11. UNF and Stored GTCC from Group A Sites Shutdown Since 2003 and Group C Sites with Announced Early Shutdown Dates.

		Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Total Projected Discharged Fuel through 12/31/2060					
Reactor [Unit]	**(Announced) Shutdown Date**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks Loaded / Estimated**		**GTCC Casks Loaded / Estimated******	
Crystal River 3*	2/20/2013	824	382.32	495	229.67	1,319	611.98		42	-	2
Kewaunee	5/7/2013	904	347.60	431	165.73	1,335	513.33	8	42	-	2
Oyster Creek	2019	2,800	503.51	867	149.12	4,660	823.43	23	77	-	2
San Onofre 1	11/30/1992	395	146.21	-	-	395	146.21	-	-	-	-
San Onofre 2	6/12/2013	1,097	454.86	737	304.87	1,834	759.74	-	-	-	-
San Onofre 3	6/12/2013	999	412.18	735	304.05	1,734	716.23	-	-	-	-
San Onofre Totals**	-	2,491	1,013.25	1,472	608.92	3,963	1,622.17	50	166	1	6
Vermont Yankee***	10/2014	2,671	488.35	992	177.61	4,031	731.84	14	60	-	2
Totals		**9,690**	**2,735.03**	**4,257**	**1,331.04**	**15,308**	**4,302.76**		**387**		**14**

* Crystal River 3 shutdown in 2013 (last operated in 2009)

** San Onofre 1 shutdown in 1992. San Onofre 2 & 3 shutdown in 2013 (last operated in 2012).

*** 2013 announcement that Vermont Yankee will shutdown in Oct 2014

****GTCC Casks estimated at 2 per reactor

Table 2-12. UNF and Stored GTCC from Shutdown Reactors at Group B Sites

		Discharges Onsite as of 12/31/2002		Transferred to Morris (Group F Site)		Projected Remaining Onsite Inventory at the end of 2013					
Reactor [Unit]	**Shutdown Date**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Fuel Casks Loaded /**	**Estimated**	**GTCC Casks Loaded /**	**Estimated**
Dresden 1	10/31/1978	892	90.86	3	0.26	889	90.59	4	14	-	2
Indian Point 1	10/31/1974	160	30.58	-	-	160	30.58	5	5	-	2
Millstone 1	7/21/1998	2,884	525.62	-	-	2,884	525.62	-	43	-	2
Totals		**3,936**	**647.07**	**3**	**0.26**	**3,933**	**646.80**		**62**		**6**

2.2.2 Alternative Scenario 1: Addition of 6 "New Builds"

The NFST project has considered Alternative Scenario 1 that is based on the Reference Scenario with the addition of six "New Builds". This scenario has the same underlying assumptions that characterize the Reference Scenario with the additional assumption that six reactors that are currently under construction come online and begin discharging fuel over the next six years. For the purpose of the current revision to this report, these six reactors are assumed to operate for 40 years. These reactors include Watts Bar, Unit 2; Vogtle, Units 3 & 4; Summer, Units 2 & 3; and Bellefonte, Unit 1. No other modifications to the Reference Scenario assumptions are made for this alternative scenario.

Table 2-13 provides the scenario inventory by reactor type as a function of the estimate phase. Actual quantities are used for discharges prior to 2003, forecast discharges are used for the individual reactors for later time periods except for the two reactors for which the actual discharges are known (Kewaunee and Crystal River as described previously).

Table 2-14 provides the scenario inventory detailed to provide actual discharges through December 31, 2002 from the RW-859 data base and the projected quantities between 1/1/2003 and 12/31/2013, and 1/1/2014 and the end of the scenario, by major storage location category and by site Group. One additional category beyond the Reference Scenario is included:

- "New Builds" include the six new reactors at three existing and one new site in Alabama, Georgia, South Carolina, and Tennessee. Table 2-15 provides details of the projected discharges from these reactors.

The scenario totals nearly 500,000 assemblies containing approximately 145,500 MTU. The assumptions in this scenario are projected to generate an additional 14,543 UNF assemblies and 6,303 MTU beyond that of the Reference Scenario.

Table 2-13. Projected UNF Inventory for Alternative Scenario 1 by Reactor Type

	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/03 to 12/31/13		Forecast Discharges 1/1/14 to 12/31/60		Total Projected Discharged Fuel	
Reactor Type	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**
PWR	70,302	30,291	36,760	16,071	114,071	49,976	221,133	96,339
BWR	93,354	16,708	49,505	8,699	135,084	23,762	277,943	49,168
Totals	**163,656**	**46,999**	**86,265**	**24,770**	**249,155**	**73,739**	**499,076**	**145,508**

Table 2-14. Projected UNF Inventory for Alternative Scenario 1 by Site Group (Group Status as of 12/31/2013)

Description	Site Group	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
		Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Operating Reactors at Group A Sites (92 Rx/55 Sites)*	C	128,629	37,273	77,238	22,071	222,407	63,867	428,274	123,211
Operating Reactors at Group B Sites (6 Rx/3 Sites)	B	10,302	2,786	4,770	1,368	10,923	3,368	25,995	7,522
Shutdown Reactors at Sites at Group B Sites (3 Rx/3 Sites)	B	3,933	647	-	-	-	-	3,933	647
Operating Reactors with Announced Shutdown Date (2 Rx/2 Sites)**	C	5,471	992	1,859	327	1,361	237	8,691	1,555
Reactors Shutdown Since 2002 (5 Rx/3 Sites)	A	4,219	1,743	2,398	1,004	-	-	6,617	2,747
Reactors Shutdown Prior to 2003 (10 Rx/9 Sites)	A	7,659	2,813	-	-	-	-	7,659	2,813
Transferred to INL	D	225	70.30	-	-	-	-	225	70.3
Transferred to SRS	D	1	0.12	-	-	-	-	1	0.12
Away From Reactor Wet Storage	F	3,217	674	-	-	-	-	3,217	674
New Builds (6 Rx/4 Sites)		-	-	-	-	14,464	6,267	14,464	6,267
Totals		**163,656**	**46,999**	**86,265**	**24,770**	**249,155**	**73,739**	**499,076**	**145,508**

* Excludes reactors with announced early shut downs. For the purposes of this report, Fitzpatrick and Nine Mile Point are considered as a single site. Similarly, Hope Creek and Salem are considered a single site.

** These include only Oyster Creek (2019 shutdown date) and Vermont Yankee (October 2014 shutdown date)

Table 2-15. Projected UNF Inventory for Assumed "New Builds"

		Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
Reactor [Unit]	Assumed Startup Year	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Watts Bar 2	2015	-	-	-	-	2,163	994.98	2,163	994.98
Bellefonte 1	2020	-	-	-	-	2,614	1,202.44	2,614	1,202.44
Vogtle 3	2017	-	-	-	-	2,506	1,060.04	2,506	1,060.04
Vogtle 4	2018	-	-	-	-	2,504	1,059.19	2,504	1,059.19
Summer 2	2017	-	-	-	-	2,351	980.37	2,351	980.37
Summer 3	2021	-	-	-	-	2,326	969.94	2,326	969.94
Totals		**-**	**-**	**-**	**-**	**14,464**	**6,267**	**14,464**	**6,267**

2.2.3 Alternative Scenario 2: Shutdown of all Reactors after Current License

The NFST project has considered Alternative Scenario 2 that is based on the assumption that all reactors are shutdown at the end of their current license period. This is in contrast to the assumption made for the Reference Scenario that assumes a twenty-year license extension is obtained by all reactors that have not announced intentions otherwise (Oyster Creek and Vermont Yankee).

Table 2-16 provides the scenario inventory by reactor type as a function of the estimate phase. Actual quantities are used for discharges prior to 2003, forecast discharges are used for the individual reactors for later time periods except for the four reactors for which the actual discharges are known (Kewaunee, Crystal River, and San Onofre, Units 2 & 3, as described previously).

Table 2-17 provides the scenario inventory detailed to provide actual discharges through December 31, 2002 from the RW-859 data base and the projected quantities between 1/1/2003 and 12/31/2013, and 1/1/2014 and the end of the scenario, by major storage location category and by site Group.

The scenario totals approximately 431,000 assemblies containing approximately 124,000 MTU. The assumptions in this scenario are projected to result in a reduction of 53,605 UNF assemblies, totaling 15,179 MTU less than the projections of the Reference Scenario.

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Table 2-16. Projected UNF Inventory for Alternative Scenario 2 by Reactor Type

	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/03 to 12/31/13		Forecast Discharges 1/1/14 to 12/31/60		Total Projected Discharged Fuel	
Reactor Type	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**
PWR	70,302	30,291	36,760	16,071	78,185	34,222	185,247	80,584
BWR	93,354	16,708	49,505	8,699	102,901	18,071	245,760	43,477
Totals	**163,656**	**46,999**	**86,265**	**24,770**	**181,086**	**52,293**	**431,007**	**124,062**

Table 2-17. Projected UNF Inventory for Alternative Scenario 2 by Site Group (Group Status as of 12/31/2013)

Description	Site Group	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
		Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Operating Reactors at Group A Sites (92 Rx/55 Sites)*	C	128,629	37,273	77,238	22,071	170,669	49,529	376,536	108,873
Operating Reactors at Group B Sites (6 Rx/3 Sites)	B	10,302	2,786	4,770	1,368	9,056	2,527	24,128	6,681
Shutdown Reactors at Sites at Group B Sites (3 Rx/3 Sites)	B	3,933	647	-	-	-	-	3,933	647
Operating Reactors with Announced Shutdown Date (2 Rx/2 Sites)**	C	5,471	992	1,859	327	1,361	237	8,691	1,555
Reactors Shutdown Since 2002 (5 Rx/3 Sites)	A	4,219	1,743	2,398	1,004	-	-	6,617	2,747
Reactors Shutdown Prior to 2003 (10 Rx/9 Sites)	A	7,659	2,813	-	-	-	-	7,659	2,813
Transferred to INL	D	225	70.30	-	-	-	-	225	70.3
Transferred to SRS	D	1	0.12	-	-	-	-	1	0.12
Away From Reactor Wet Storage	F	3,217	674	-	-	-	-	3,217	674
Totals		**163,656**	**46,999**	**86,265**	**24,770**	**181,086**	**52,293**	**431,007**	**124,062**

* Excludes reactors with announced early shut downs. For the purposes of this report, Fitzpatrick and Nine Mile Point are considered as a single site. Similarly, Hope Creek and Salem are considered a single site.

** These include only Oyster Creek (2019 shutdown date) and Vermont Yankee (October 2014 shutdown date)

2.2.4 Alternative Scenario 3: Shutdown of 7 "Most Challenging" Sites Scenario

The NFST project has considered Alternative Scenario 3 that is based on the Reference Scenario with the additional assumption that seven of the "Most Challenging" reactors are shutdown by 2024. In July of 2013, Mark Cooper, Senior Fellow for Economic Analysis at the Institute for Energy and the Environment at the Vermont Law School published an analysis detailing the economic, operational, performance, and political issues facing the existing fleet of U.S. nuclear power reactors. The author identified twelve reactor sites that had a number of factors that indicated an increased risk of being shutdown before the ends of their current license periods. This list included Oyster Creek and Vermont Yankee, which have already indicated an early shutdown date. In November of 2013, Jeff McMahon, a contributing author for Forbes published the results of a similar, but less comprehensive analysis of the U.S. reactor fleet in which six reactor sites were identified as being at risk. Table 2-18 provides the lists published in the two articles. In addition to the lists published in the articles and listed below, there have been a number of articles published recently by NEI in which Exelon has made statements indicating that three of their operating sites are at risk of early shutdown due to market pressures. The sites mentioned by Exelon are Clinton, Byron (two units), and Quad Cities (two units). For the purpose of the current alternative scenario, it is assumed that the five sites listed in both the Forbes article and the Cooper report are shutdown by 2024. As well, the Clinton site, which was mentioned by the Cooper report and by Exelon is assumed to be shutdown by 2024. The sites affected by this scenario are shaded in Table 2-18 and include seven reactors at six sites.

Table 2-18. List of "Most Challenging" Sites

Forbes (J. McMahon)	Renaissance in Reverse (M. Cooper)	
Indian Point (two units)*	Palisades	Millstone (two units)
Ginna*	Ft. Calhoun	Clinton**
TMI	Nine Mile Point (two units)	Indian Point (two units)*
Fitzpatrick*	Fitzpatrick*	Davis Besse*
Davis Besse*	Ginna*	Pilgrim*
Pilgrim*	Oyster Creek (2019)	Vt. Yankee (10/2014)

* Indicates sites that are represented in multiple lists

** Clinton has also been mentioned as being at risk by its owner/operator (Exelon)

Table 2-19 provides the scenario inventory by reactor type as a function of the estimate phase. Actual quantities are used for discharges prior to 2003, forecast discharges are used for the individual reactors for later time periods except for the two reactors for which the actual discharges are known (Kewaunee and Crystal River as described previously).

Table 2-20 provides the scenario inventory detailed to provide actual discharges through December 31, 2002 from the RW-859 data base and the projected quantities between 1/1/2003 and 12/31/2013, and 1/1/2014 and the end of the scenario, by major storage location category and by site Group.

The scenario totals nearly 475,000 assemblies containing nearly 137,000 MTU. The assumptions in this scenario are projected to result in a reduction of 10,262 UNF assemblies, totaling 2,512 MTU less than the projections of the Reference Scenario.

Table 2-19. Projected UNF Inventory for Alternative Scenario 3 by Reactor Type

	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/03 to 12/31/13		Forecast Discharges 1/1/14 to 12/31/60		Total Projected Discharged Fuel	
Reactor Type	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**
PWR	70,302	30,291	36,760	16,071	97,029	42,567	204,091	88,930
BWR	93,354	16,708	49,505	8,699	127,400	22,392	270,259	47,798
Totals	**163,656**	**46,999**	**86,265**	**24,770**	**224,429**	**64,959**	**474,350**	**136,728**

Table 2-20. Projected UNF Inventory for Alternative Scenario 3 by Site Group (Group Status as of 12/31/2013)

Description	Site Group	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
		Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Operating Reactors at Group A Sites (92 Rx/55 Sites)*	C	128,629	37,273	77,238	22,071	213,650	62,033	419,517	121,377
Operating Reactors at Group B Sites (6 Rx/3 Sites)	B	10,302	2,786	4,770	1,368	9,418	2,690	24,490	6,844
Shutdown Reactors at Sites at Group B Sites (3 Rx/3 Sites)	B	3,933	647	-	-	-	-	3,933	647
Operating Reactors with Announced Shutdown Date (2 Rx/2 Sites)**	C	5,471	992	1,859	327	1,361	237	8,691	1,555
Reactors Shutdown Since 2002 (5 Rx/3 Sites)	A	4,219	1,743	2,398	1,004	-	-	6,617	2,747
Reactors Shutdown Prior to 2003 (10 Rx/9 Sites)	A	7,659	2,813	-	-	-	-	7,659	2,813
Transferred to INL	D	225	70.30	-	-	-	-	225	70.3
Transferred to SRS	D	1	0.12	-	-	-	-	1	0.12
Away From Reactor Wet Storage	F	3,217	674	-	-	-	-	3,217	674
Totals		**163,656**	**46,999**	**86,265**	**24,770**	**224,429**	**64,959**	**474,350**	**136,728**

* Excludes reactors with announced early shut downs. For the purposes of this report, Fitzpatrick and Nine Mile Point are considered as a single site. Similarly, Hope Creek and Salem are considered a single site.

** These include only Oyster Creek (2019 shutdown date) and Vermont Yankee (October 2014 shutdown date)

2.2.5 Alternative Scenario 4: Shutdown of 14 "Most Challenging" Sites Scenario

The NFST project has considered Alternative Scenario 4 that is based on the Reference Scenario with the additional assumption that thirteen of the "Most Challenging" reactors are shutdown by 2024. This is an extension of Alternative Scenario 3 with the additional early shutdown of seven reactors at five sites. Based on the Forbes article and the Cooper report, discussed previously, six sites (in addition to the six sites included in the Alternative Scenario 3) are assumed to be shutdown by 2024. The additional sites affected by this scenario are shaded in Table 2-21. This makes the scenario consider the closure of 14 reactors at 11 sites.

Table 2-21. List of "Most Challenging" Sites

Forbes (J. McMahon)	Renaissance in Reverse (M. Cooper)	
Indian Point (two units)*	Palisades	Millstone (two units)
Ginna*	Ft. Calhoun	Clinton**
TMI	Nine Mile Point (two units)	Indian Point (two units)*
Fitzpatrick*	Fitzpatrick*	Davis Besse*
Davis Besse*	Ginna*	Pilgrim*
Pilgrim*	Oyster Creek (2019)	Vt. Yankee (10/2014)

* Indicates sites that are represented in multiple lists

** Clinton has also been mentioned as being at risk by its owner/operator (Exelon)

Table 2-22 provides the scenario inventory by reactor type as a function of the estimate phase. Actual quantities are used for discharges prior to 2003, forecast discharges are used for the individual reactors for later time periods except for the two reactors for which the actual discharges are known (Kewaunee and Crystal River as described previously).

Table 2-23 provides the scenario inventory detailed to provide actual discharges through December 31, 2002 from the RW-859 data base and the projected quantities between 1/1/2003 and 12/31/2013, and 1/1/2014 and the end of the scenario, by major storage location category and by site Group.

The scenario totals approximately 467,000 assemblies containing nearly 135,000 MTU. The assumptions in this scenario are projected to result in a reduction of 17,480 UNF assemblies, totaling 4,511 MTU less than the projections of the Reference Scenario.

Table 2-22. Projected UNF Inventory for Alternative Scenario 4 by Reactor Type

	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/03 to 12/31/13		Forecast Discharges 1/1/14 to 12/31/60		Total Projected Discharged Fuel	
Reactor Type	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**
PWR	70,302	30,291	36,760	16,071	94,139	41,304	201,201	87,667
BWR	93,354	16,708	49,505	8,698	123,072	21,657	265,931	47,063
Totals	**163,656**	**46,999**	**86,265**	**24,770**	**217,211**	**62,961**	**467,132**	**134,730**

Table 2-23. Projected UNF Inventory for Alternative Scenario 4 by Site Group (Group Status as of 12/31/2013)

Description	Site Group	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
		Assy.	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Operating Reactors at Group A Sites (92 Rx/55 Sites)*	C	128,629	37,273	77,238	22,071	208,225	60,821	414,092	120,165
Operating Reactors at Group B Sites (6 Rx/3 Sites)	B	10,302	2,786	4,770	1,368	7,625	1,903	22,697	6,057
Shutdown Reactors at Sites at Group B Sites (3 Rx/3 Sites)	B	3,933	647	-	-	-	-	3,933	647
Operating Reactors with Announced Shutdown Date (2 Rx/2 Sites)**	C	5,471	992	1,859	327	1,361	237	8,691	1,555
Reactors Shutdown Since 2002 (5 Rx/3 Sites)	A	4,219	1,743	2,398	1,004	-	-	6,617	2,747
Reactors Shutdown Prior to 2003 (10 Rx/9 Sites)	A	7,659	2,813	-	-	-	-	7,659	2,813
Transferred to INL	D	225	70.30	-	-	-	-	225	70.3
Transferred to SRS	D	1	0.12	-	-	-	-	1	0.12
Away From Reactor Wet Storage	F	3,217	674	-	-	-	-	3,217	674
Totals		**163,656**	**46,999**	**86,265**	**24,770**	**217,211**	**62,961**	**467,132**	**134,730**

* Excludes reactors with announced early shut downs. For the purposes of this report, Fitzpatrick and Nine Mile Point are considered as a single site. Similarly, Hope Creek and Salem are considered a single site.

** These include only Oyster Creek (2019 shutdown date) and Vermont Yankee (October 2014 shutdown date)

2.2.6 Scenario Comparison Summary

To support systems analysis studies and programmatic planning activities, the NFST requested an estimate of future inventory. The OCRWM methods described previously have been extended to provide the forecast inventory based on a number of scenarios. Four alternative scenarios, in addition to the Reference Scenario have been included in the current revision of this report. A summary and comparison table is provided in Table 2-24 to illustrate the impact of the scenario assumptions for each alternative scenario, relative to the Reference Scenario. The results of the alternative scenarios considered in this revision of the report indicate a potential inventory that may vary from the Reference Scenario by a reduction of nearly 54,000 assemblies (~15,000 MTU), in the case where all reactors shutdown after their current license period, to an increase of approximately 14,500 assemblies (~6,300 MTU), in the case where the six new reactors are added to the fleet and the operating reactors obtain their 20-years license extension.

Table 2-24. Summary Table of Projected UNF Inventory for Reference and Alternative Scenarios

Scenario	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel		Delta from Reference	
	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Est. Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Reference Scenario 60 Year Operation unless Announced Otherwise	163,656	46,999	86,265	24,770	234,691	67,472	484,612	139,241	-	-
Scenario 1 Addition of 6 New Builds	163,656	46,999	86,265	24,770	249,234	73,775	499,155	145,544	14,543	6,303
Scenario 2 Shutdown at end of Current License Period	163,656	46,999	86,265	24,770	181,086	52,293	431,007	124,062	(53,605)	(15,179)
Scenario 3 7 "Most Challenging" Shutdown by 2024	163,656	46,999	86,265	24,770	224,429	64,959	474,350	136,728	(10,262)	(2,512)
Scenario 4 14 "Most Challenging" Shutdown by 2024	163,656	46,999	86,265	24,770	217,593	63,125	467,132	134,730	(17,480)	(4,511)

2.3 UNF Dry Storage Systems

UNF is initially stored at the nuclear plants in water filled pools. Most of these pools were not designed for long term storage and many facilities have run out of capacity to store all of the UNF in their pools. At these facilities, above ground dry storage systems are utilized to store the UNF. As more facilities run out of pool storage the amount of dry storage is increasing. As of March 2014, 1850 dry storage fuel casks have been loaded containing 74,197 assemblies of UNF (Table 2-6 and Appendix B). NEI estimates by 2020 over 30,000 MTU in about 2,600 casks will be in dry storage [Store Fuel, 2011].

Table 2-25 to 2-27 provides the storage systems used at the Group A and Group B shutdown sites [Leduc, 2012]. These tables also provide the transportation cask status for the anticipated storage cask [Leduc, 2012].

Except for Oyster Creek, all the reactor sites listed in these tables have implemented a dry storage system. Oyster Creek is in the planning stages for dry fuel storage and is currently planning to use the TransNuclear system indicated, although this is subject to change.

Table 2-25. Cask Systems Used at Group A Sites Shutdown Prior to 2003.

Reactor [Unit]	Type	ISFSI Load Dates[a]	Storage System/Canisters	Transport Cask Status
Big Rock Point	BWR	12/2002-03/2003	Fuel Solutions W150 Storage Overpack/W74 Canister	TS-125 (Docket No. 71-9276); Certificate expires 10/31/2017. None fabricated
Haddam Neck	PWR	05/2004-03/2005	NAC-MPC/MPC-26 and MPC-24 canisters	NAC-STC (Docket No. 71-9235); Certificate expires 5/31/2014. Foreign use versions fabricated.
Humboldt Bay 3	BWR	08/2008-12/2008	Holtec HI-STAR HB/MPC-HB canister	HI-STAR HB (Docket No. 71-9261); Certificate expires 3/31/2014. Fuel in canisters in fabricated casks. No impact limiters.
LaCrosse	BWR	07/2012- 09/2012	NAC MPC-LACBWR/MPC-LACBWR canister	NAC-STC (Docket No. 71-9235); Certificate expires 5/31/2014. Foreign use versions fabricated.
Maine Yankee	PWR	08/2002-03/2004	NAC-UMS/UMS-24 canister	NAC-UMS (Docket No. 71-9270); Certificate expires 10/31/2017. None fabricated
Rancho Seco	PWR	04/2001-08/2002	TN NUHOMS/FO-DSC, FC-DSC, and FF DSC	NUHOMS MP187 (Docket No. 71-9255); Certificate expires 11/30/2013. One cask fabricated. No impact limiters.
Trojan	PWR	12/2002-09/2003	TranStor Storage Overpack/Holtec MPC-24E and MPC-24EF canisters	HI-STAR 100 (Docket No. 71-9261) Certificate expires 3/31/2014. Units fabricated but dedicated to storage at other sites. No impact limiters
Yankee Rowe	PWR	06/2002-06/2003	NAC-MPC/MPC-36 canister	NAC-STC (Docket No. 71-9235); Certificate expires 05/31/2014. Foreign use versions fabricated
Zion 1 & 2	PWR	2013-ongoing	NAC MAGNASTOR/TSC 37 canister	NAC MAGNATRAN (Docket No. 71-9356); License under review. None fabricated

ISFSI = independent spent fuel storage installation, BWR= boiling water reactor, PWR= pressurized water reactor

a. Dates represent the dates that the used nuclear fuel was transferred to the ISFSI.

b. Additional canisters of GTCC low-level radioactive waste could be generated during decommissioning.

c. Estimated.

Table 2-26. Cask Systems used at Group A Sites Shutdown after 2002.

Reactor [Unit]	Type	ISFSI Load Dates[a]	Storage System/Canisters	Transport Cask Status
Crystal River 3	PWR	N/A	Does not have a licensed ISFSI, early selection TransNuclear, NUHOMS 32PTH1 storage canister, in a Horizontal Concrete Overpack	TN MP197HB (Docket No. 71-9302); This cask is not currently licensed for the 32PTH1 payload; One in fabrication
Kewaunee	PWR	2009-??	TransNuclear, NUHOMS 32PT storage canister, in a Horizontal Concrete Overpack	TN MP197HB (Docket No. 71-9302); This cask is not currently licensed for the 32PT payload; One in fabrication
Oyster Creek	BWR	2002-??	TransNuclear, NUHOMS 61BT storage canister, in a Horizontal Concrete Overpack	TN MP197HB (Docket No. 71-9302); One in fabrication
San Onofre	PWR	2003-??	TransNuclear, NUHOMS 24PT1 and 24 PT4 storage canister, in a Horizontal Concrete Overpack	TN MP197HB (Docket No. 71-9302); This cask is not currently licensed for the 24PT1 or 24 PT4 payload; One in fabrication

ISFSI = independent spent fuel storage installation, BWR= boiling water reactor, PWR= pressurized water reactor

a. Dates represent the dates that the used nuclear fuel was transferred to the ISFSI.

b. Additional canisters of GTCC low-level radioactive waste could be generated during decommissioning.

c. Estimated.

d. Actual Canisters loaded as of 2/5/2013.

Table 2-27. Cask Systems Used at Shutdown Group B Sites.

Reactor [Unit]	Type	ISFSI Load Dates[a]	Storage System/Canisters	Transport Cask Status
Dresden 1	BWR	2000-ongoing	HI-STORM Vertical Concrete Storage Cask containing MPC-68 DSC	HI-STAR 100 (Docket No. 71-9261) Certificate expires 3/31/2014. No impact limiters
Indian Point 1	PWR	2008	HI-STORM Vertical Concrete Storage Cask containing MPC-32 DSC	HI-STAR 100 (Docket No. 71-9261) Certificate expires 3/31/2014. No impact limiters
Millstone 1	PWR	2005	NUHOMS 32PT DSC in a horizontal concrete storage module	TN MP197HB (Docket No. 71-9302); This cask is not currently licensed for the 32PT payload; One in fabrication

ISFSI = independent spent fuel storage installation, BWR= boiling water reactor, PWR= pressurized water reactor

a. Dates represent the dates that the used nuclear fuel was transferred to the ISFSI.

b. Additional canisters of GTCC low-level radioactive waste could be generated during decommissioning.

c. Estimated.

d. Actual Canisters loaded as of 2/5/2013.

2.4 Used Nuclear Fuel Characteristics

To date UNF has been discharged with burn-ups ranging from less than 20 gigawatt-days per metric ton (GWd/MT) and projected to approach 60 GWd/MT. Tables 2-28 through 2-31 and Figures 2-1 to 2-4 present the radionuclide decay heat for the 40 and 60 GWd/MT burn-up PWR and 30 and 50 GWd/MT BWR as representative fuels. The figures and tables provide the total decay heat and decay heat by isotopic groups with similar isotopic parameters. Discharged fuel compositions (in g/MT) for representative fuels are available in Appendix C of the Used Fuel Disposition Campaign (UFDC) Inventory report [Carter 2013].

Table 2-28. PWR 40 GWd/MT Used Fuel Decay Heat.

Elements	Decay Heat (Watts/MT)							
	Time (years)							
	1	10	30	50	70	100	300	500
Gases H, C, Xe, Kr, I	0	0	0	0	0	0	0	0
Cs/Sr/Ba/Rb/Y	2,765	1,054	566	354	222	110	1	0
Noble Metals Ag, Pd, Ru, Rh	2,752	11	0	0	0	0	0	0
Lanthanides La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Ho, Tm	3,593	64	10	2	0	0	0	0
Actinides Ac, Th, Pa, U	0	0	0	0	0	0	0	0
Transuranic Np, Pu, Am, Cm, Bk, Cf, Es	819	348	332	309	287	258	159	116
Others	515	15	2	1	0	0	0	0
Totals	**10,444**	**1,492**	**910**	**666**	**509**	**368**	**160**	**116**

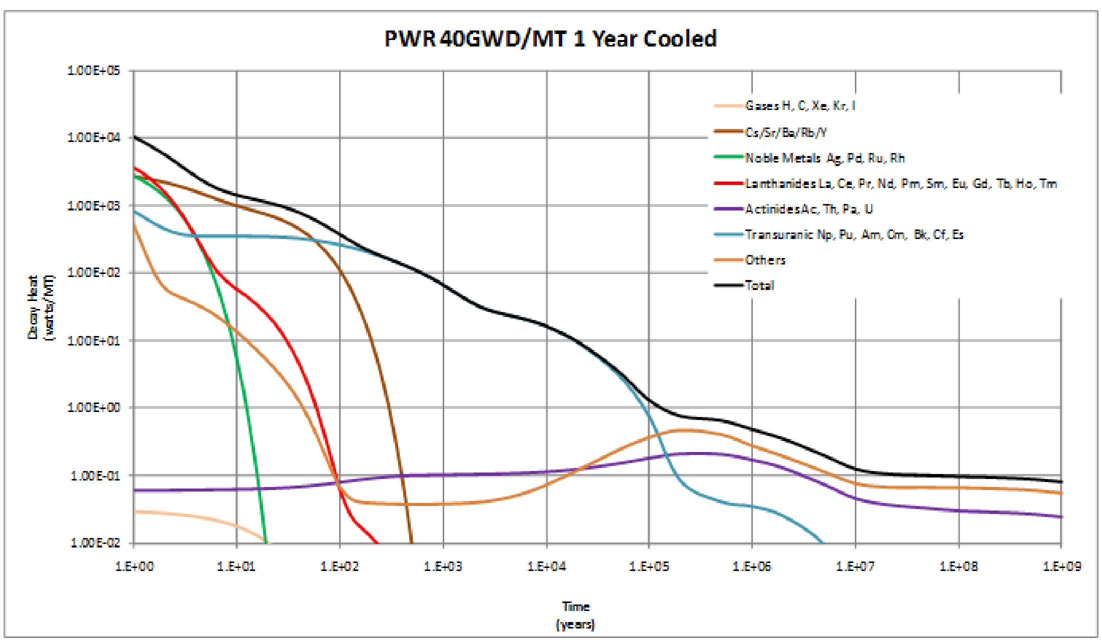

Figure 2-1. PWR 40 GWd/MT Used Fuel Decay Heat.

Table 2-29. PWR 60 GWd/MT Used Fuel Decay Heat.

Elements	Decay Heat (Watts/MT)							
	Time (years)							
	1	10	30	50	70	100	300	500
Gases H, C, Xe, Kr, I	0	0	0	0	0	0	0	0
Cs/Sr/Ba/Rb/Y	4,608	1,576	824	516	323	160	1	0
Noble Metals Ag, Pd, Ru, Rh	3,447	14	0	0	0	0	0	0
Lanthanides La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Ho, Tm	3,843	109	17	3	1	0	0	0
Actinides Ac, Th, Pa, U	0	0	0	0	0	0	0	0
Transuranic Np, Pu, Am, Cm, Bk, Cf, Es	1,515	785	613	516	449	381	199	139
Others	522	21	3	1	0	0	0	0
Totals	**13,936**	**2,505**	**1,458**	**1,036**	**773**	**541**	**201**	**139**

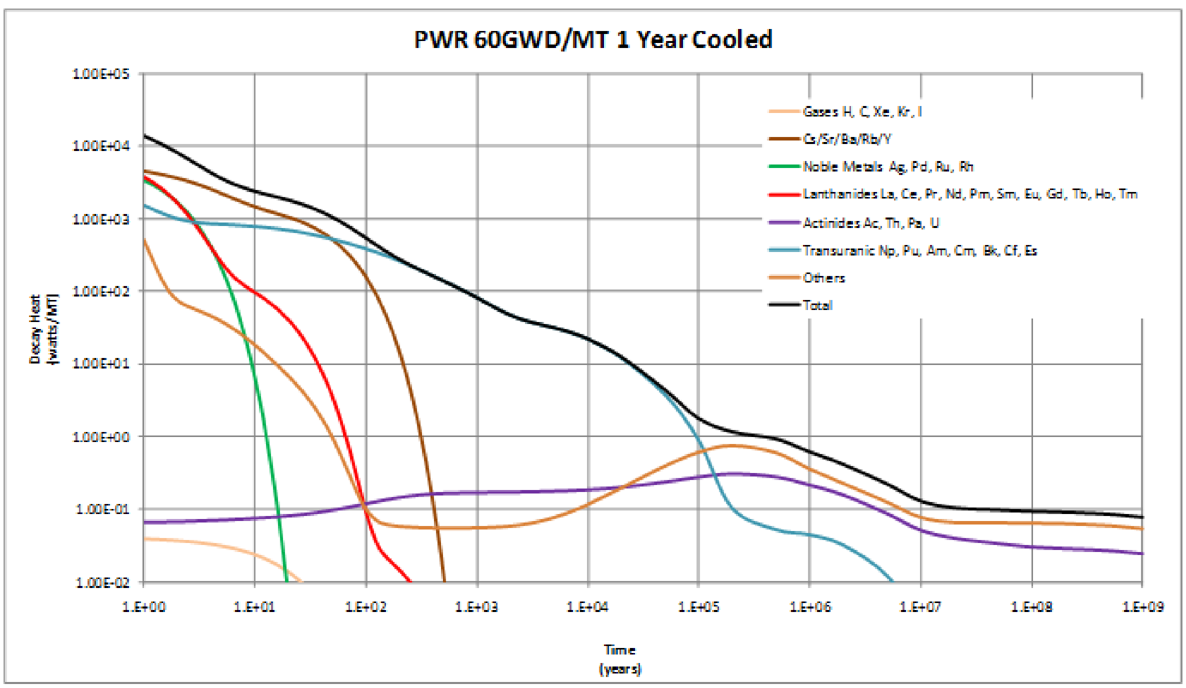

Figure 2-2. PWR 60 GWd/MT Used Fuel Decay Heat.

Table 2-30. BWR 30 GWd/MT Used Fuel Decay Heat.

Elements	Decay Heat (Watts/MT)							
	Time (years)							
	1	10	30	50	70	100	300	500
Gases H, C, Xe, Kr, I	0	0	0	0	0	0	0	0
Cs/Sr/Ba/Rb/Y	1,895	778	425	266	166	82	1	0
Noble Metals Ag, Pd, Ru, Rh	2,042	8	0	0	0	0	0	0
Lanthanides La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Ho, Tm	2,675	43	6	1	0	0	0	0
Actinides Ac, Th, Pa, U	0	0	0	0	0	0	0	0
Transuranic Np, Pu, Am, Cm, Bk, Cf, Es	588	225	234	225	213	196	127	94
Others	403	12	2	0	0	0	0	0
Totals	**7,603**	**1,067**	**667**	**493**	**380**	**278**	**128**	**94**

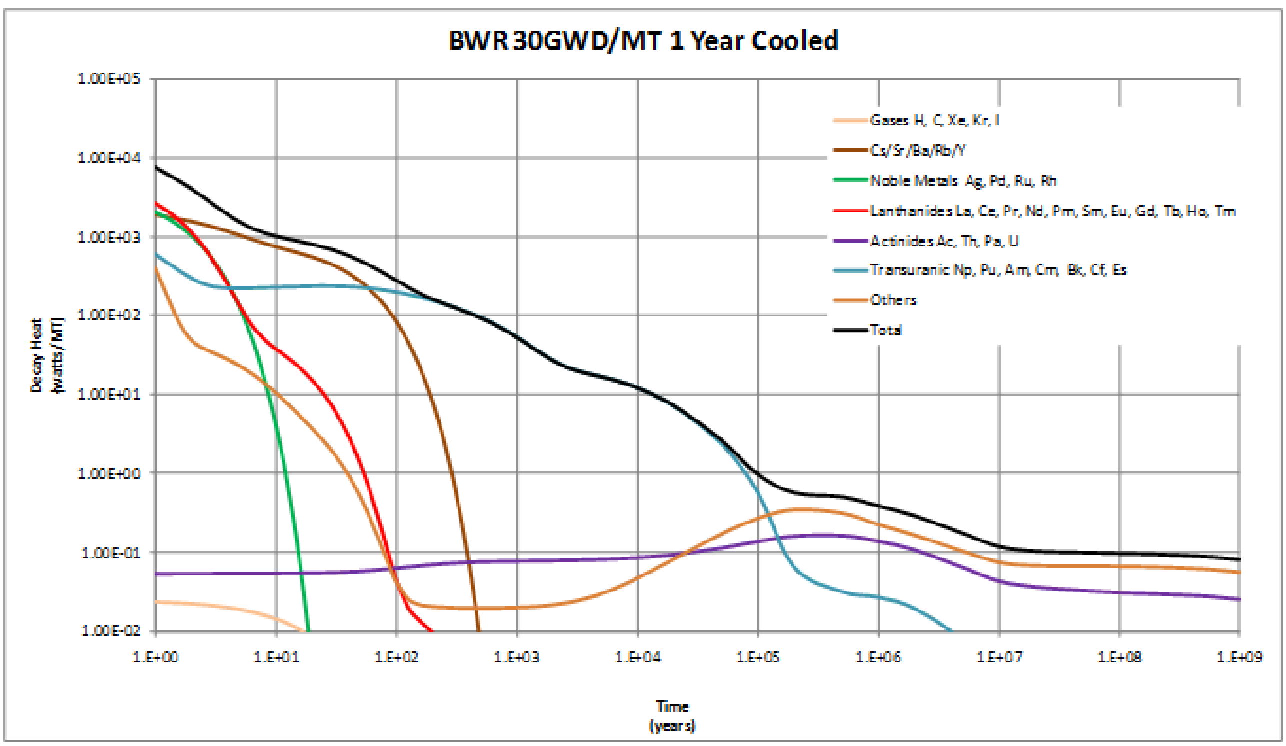

Figure 2-3. BWR 30 GWd/MT Used Fuel Decay Heat.

Table 2-30. BWR 50 GWd/MT Used Fuel Decay Heat.

Elements	Decay Heat (Watts/MT)							
	Time (years)							
	1	10	30	50	70	100	300	500
Gases H, C, Xe, Kr, I	0	0	0	0	0	0	0	0
Cs/Sr/Ba/Rb/Y	3,558	1,257	662	414	259	128	1	0
Noble Metals Ag, Pd, Ru, Rh	2,669	11	0	0	0	0	0	0
Lanthanides La, Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Ho, Tm	2,734	92	14	3	1	0	0	0
Actinides Ac, Th, Pa, U	0	0	0	0	0	0	0	0
Transuranic Np, Pu, Am, Cm, Bk, Cf, Es	1,627	760	591	496	433	369	199	139
Others	420	17	2	1	0	0	0	0
Totals	**11,008**	**2,137**	**1,271**	**914**	**693**	**498**	**200**	**139**

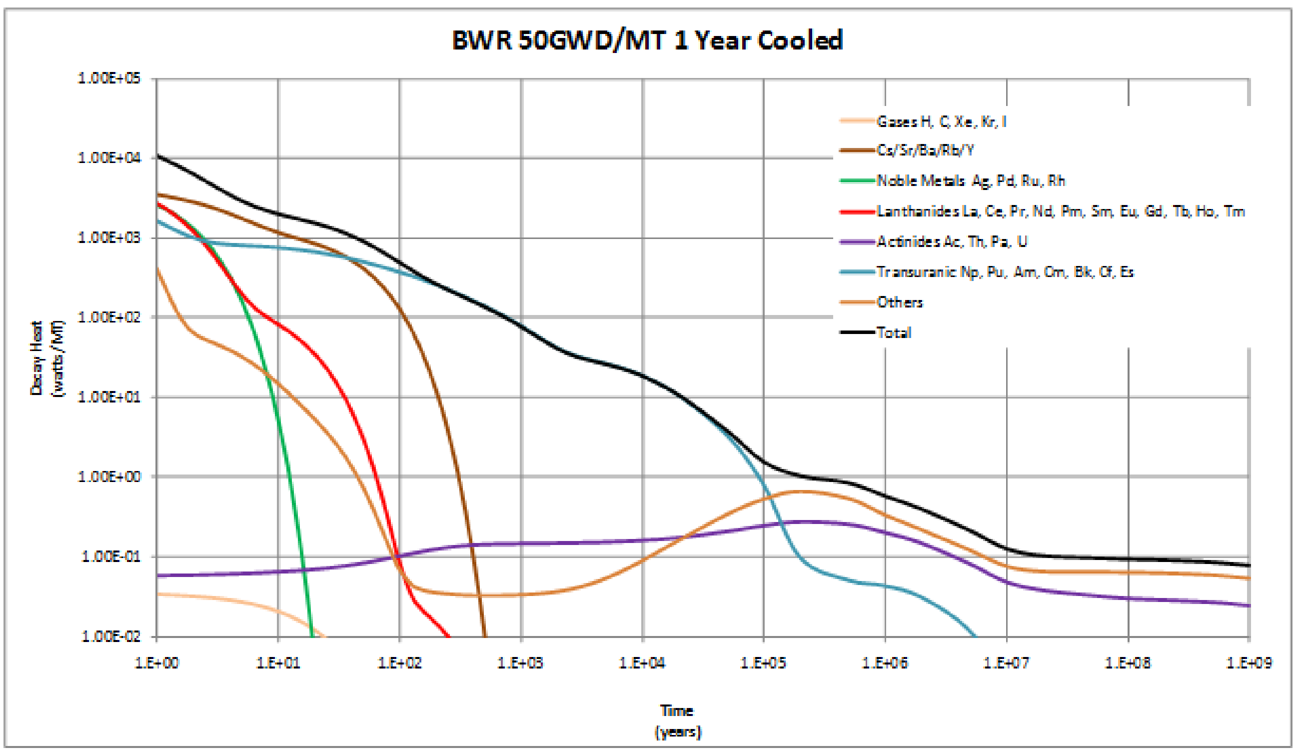

Figure 2-4. BWR 50 GWd/MT Used Fuel Decay Heat.

3. Government-owned UNF and HLW

The *Strategy* indicates that the larger ISF may also store government-owned UNF and HLW.

Since the inception of nuclear reactors, the DOE and its predecessor agencies operated or sponsored a variety of research, test, training, and other experimental reactors both domestically and overseas. The Naval Nuclear Propulsion Program (NNPP) has generated UNF from operation of nuclear powered submarines and surface ships, operation of land-based prototype reactor plants, operation of moored training ship reactor plants, early development of commercial nuclear power, and irradiation test programs.

Aqueous reprocessing of DOE UNF has occurred at the Hanford Site, the INL, and the SRS. The INL is pursuing the use of electro-chemical processing to treat 60 MTHM of sodium bonded UNF. DOE is also responsible for clean-up of the commercial UNF reprocessing site at West Valley, New York.

The waste requiring disposition from these DOE activities are fairly well understood and documented. This section summarizes these radioactive materials summarized as follows:

- DOE Used Fuel: 2,183 MTHM from government reactors and DOE-supplied fuel for research reactors
- Navy Used Fuel projected at 65 MTHM by 2035
- DOE HLW from fuel processing in liquid and dry waste forms, including glass logs in canisters

3.1 DOE Used Nuclear Fuel

Since the inception of nuclear reactors, the DOE and its predecessor agencies operated or sponsored a variety of research, test, training, and other experimental reactors with different characteristics from the commercial power reactors of today. DOE UNF generated in production reactors supported weapons and other isotope production programs. An example of UNF existing today from production reactors is the N Reactor UNF stored at Hanford.

DOE has sponsored nuclear research activities in the U.S. and overseas. There are numerous university and government research reactor sites within the United States. UNF from research reactors is stored primarily at the INL and SRS. Examples of research reactor UNF being stored within the DOE complex include the High-Flux Beam Reactor UNF stored at the SRS; the Fast Flux Test Facility UNF stored at Hanford and the INL; training, research, and isotope reactors (built by General Atomics) UNF stored at Hanford and the INL; Fort St. Vrain UNF stored in an ISFSI near Platteville, Colorado; and the Advanced Test Reactor UNF stored at the Idaho National Laboratory. Additional research reactor UNF is being returned to the U.S. from foreign research reactors as part of the DOE Foreign Research Reactor Spent Nuclear Fuel Return Program.

3.1.1 DOE UNF Inventory

The source of current inventory data for this study is information collected in support of the OCRWM efforts for licensing the Yucca Mountain Repository. [DOE, 2008] Complex wide DOE UNF data have been collected and is maintained by INL in the Spent Fuel Database.

The majority of DOE UNF (about 2,183 metric tons of heavy metal (MTHM) that has been generated is in storage. DOE continues to operate several research reactors and will be receiving UNF from universities and the foreign research reactor return program. Projected material amounts are relatively small (about 50 MTHM) and there is some uncertainty as to the total amount that will be generated or received. The inventory discussed below covers all DOE UNF, UNF which is currently in DOE storage and projected UNF generation or receipts.

DOE UNF comes from a wide range of reactor types, such as light- and heavy-water-moderated reactors, graphite-moderated reactors, and breeder reactors, with various cladding materials and enrichments, varying from depleted uranium to over 93% enriched ^{235}U. Many of these reactors, now decommissioned, had unique design features, such as core configuration, fuel element and assembly geometry, moderator and coolant materials, operational characteristics, and neutron spatial and spectral properties.

As described below, there is a large diversity of reactor and fuel designs. In addition, there is a relatively large number (over 200,000) of fuel pieces or assemblies, which range from a large number of pieces for some reactors (N Reactor) to a few individual pieces for other unique reactors (Chicago Pile-5 converter cylinders).

There are several hundred distinct types of DOE UNF, and it is not practical to attempt to determine the impact of each individual type when performing analyses covering all of this material such as considering repository performance. To support these types of analyses, the DOE UNF inventory was reduced to 34 DOE UNF groups based on fuel matrix, cladding, cladding condition, and enrichment. These parameters are the fuel characteristics that were determined to have major impacts on the release of radionuclides from the DOE UNF and contributed to nuclear criticality scenarios.

A discussion of each of the 34 groupings is presented in Appendix D of UFD Inventory [Carter 2013]. The discussions of each of the 34 groups provide a description of the fuel group and an example of fuel that makes up the group. When appropriate, a more detailed description of a fuel with the largest percentage of MTHM within each group is provided. This discussion is not intended to address each fuel in the group.

Appendix D Table D-1 of UFDC Inventory [Carter 2013] describes the typical ranges of the nominal properties for DOE UNF in the 34 groups.

3.1.2 DOE UNF Radionuclide Inventory

Process knowledge and the best available information regarding fuel fabrication, operations, and storage for DOE UNF are used to develop a conservative source-term estimate. The DOE UNF characterization process relies on precalculated results that provide radionuclide inventories for typical UNF at a range of decay times. These results are used as templates that are scaled to estimate radionuclide inventories for other similar fuels.

To estimate an UNF source term, the appropriate template is selected to model the production of activation products and transuranics by matching the reactor moderator and fuel cladding, constituents, and beginning-of-life enrichment. Precalculated radionuclide inventories are extracted from the appropriate template at the desired decay period and then scaled to account for differences in fuel mass and specific burn-up. Appendix D, Table D-2 of UFD Inventory [Carter 2013] lists the projected radionuclide inventory of DOE UNF for the nominal and bounding cases as of 2010. The nominal case is the expected or average inventory. The bounding case represents the highest burn-up assembly or accounts for uncertainties if fuel burn-up is not known.

DOE UNF Storage/Canisters

Although DOE UNF is stored throughout the U.S. at numerous facilities, a decision was made in 1995 to consolidate DOE UNF at three existing DOE sites; Hanford Site in Washington, the INL in Idaho, and the SRS in South Carolina. The vast majority of DOE UNF is currently stored at these three sites. The storage configurations vary for each of the sites and include both dry and wet storage. On a MTHM basis, a large portion of the UNF (about 2100 MTHM) is contained in about 400 sealed canisters. The majority of the remaining UNF will most likely be placed in canisters.

In support of the Yucca Mountain project it was anticipated that all DOE UNF, except a very small amount of DOE UNF of commercial origin, would be placed in sealed disposal canisters. At the Hanford Site, about 400 Multicanister Overpacks (MCO) were used to package and store UNF. The MCO is a sealed stainless steel canister which is about 24 inches in diameter and about 14 feet long. For the remaining DOE UNF, a standardized disposal canister design was developed which included canisters of 18 and 24 inch diameter and 10 and 15 feet length. Because of uncertainty in disposal and packaging efficiencies the total number of canisters to be generated ranged from 1,250 to 3,750 with a point estimate of 2,283. Currently no UNF has been packaged into the standardized disposal canister design.

Decay heat of DOE UNF is based on the estimated radionuclide inventory. In support of the Yucca Mountain License Application, an analytical process using process knowledge and the best available information regarding fuel fabrication, operations, and storage for DOE UNF was used to develop a conservative radionuclide inventory estimate. This methodology was applied to each fuel in the DOE SNF inventory to develop a radionuclide estimate. Also in support of the Yucca Mountain License Application, a packaging plan was developed using the DOE standardized canisters. These two data sources are used to estimate the decay heat per canister for DOE UNF.

The radionuclide and resulting decay heat was calculated for the year 2010 and 2030 to support the Yucca Mountain repository. Considering the time required before a repository for DOE UNF would be open to accept waste, these values are considered adequate for this scoping evaluation.

Table 3-1 provides the distribution of DOE UNF canisters based on the 2010 and 2030 nominal decay heat using the 2,283 nominal total canister count. The 2010 data indicate approximately 35% of the DOE UNF canisters will be generating decay heat of less than 50 watts. Approximately 90% of the DOE UNF canisters will be generating decay heat less than 300 watts. Nearly all the DOE UNF canisters (>99%) will be generating less than 1 kW. Since the methodology used to calculate the radionuclide inventory is very conservative, some fuels have radionuclide amounts based on bounding assumptions resulting in extreme decay heat values.

Table 3-1. DOE Spent Nuclear Fuel Canister Decay Heat.

	2010		2030	
Decay heat per canister (watts)	**Number of canisters**	**Cumulative %**	**Number of canisters**	**Cumulative %**
<50	537	34.7%	685	30.0%
50-100	187	50.6%	239	40.5%
100-220	711	72.9%	678	70.2%
220-300	630	90.8%	563	94.8%
300-500	172	97.6%	73	98.0%
500-1000	22	99.1%	29	99.3%
1000-1500	9	99.4%	3	99.4%
1500 - 2000	1	99.4%	5	99.6%
>2000	15	100.0%	8	100.0%
Totals	**2,283**		**2,283**	

Does not include the Savannah River Site Sodium Reactor Experiment fuel which is currently being processed in H-Canyon at SRS

3.2 Naval UNF

The NNPP has generated UNF from operation of nuclear powered submarines and surface ships, operation of land-based prototype reactor plants, operation of moored training ship reactor plants, early development of commercial nuclear power, and irradiation test programs. The source of naval UNF information for this report is the unclassified portion of the Yucca Mountain Repository License Application [DOE, 2008] and a recent evaluation report on options for permanent geologic disposal of spent nuclear fuel and HLW [SNL, 2014]. Since most details regarding naval UNF are classified, only limited information is presented herein.[a]

3.2.1 Naval UNF Inventory

Naval UNF consists of solid metal and metallic components that are nonflammable, highly corrosion-resistant, and neither pyrophoric, explosive, combustible, chemically reactive, nor subject to gas generation by chemical reaction or off-gassing. Approximately 27 MTHM of Naval UNF currently exists with a projected inventory of less than 65 MTHM in 2035.

[a] Before using the information in this section for studies involving naval UNF, contact the NNPP Program Manager, Navy Spent Nuclear Fuel at (202) 781-6214.

New naval nuclear fuel is highly enriched uranium. As a result of the high uranium enrichment, very small amounts of transuranics (TRU) are generated by end of life when compared to commercial UNF.

Naval UNF Radionuclide Inventory

In support of the Yucca Mountain repository, three different methods for packaging naval UNF into naval UNF canisters were developed; however, the design of the naval UNF canister is the same irrespective of packaging method. These packaging methods are based on the type of naval UNF assemblies and whether the naval UNF cladding is intact or non-intact. Each naval UNF canister would be loaded such that thermal, shielding, criticality, and other characteristics of the received waste would be within the proposed repository waste acceptance requirement limits. As a result, a radionuclide inventory for a representative naval UNF canister, five years after reactor shutdown, was developed for use in the repository source term analyses (UFD Inventory Appendix E, Table E-1 [Carter 2012]). Different packaging designs may be needed dependent upon the future disposal options.

Naval UNF Storage/Canisters

UNF from the NNPP is temporarily stored at the INL. To accommodate different naval fuel assembly designs, naval UNF is loaded in either a naval short UNF canister or a naval long UNF canister. Both were sized to fit within the proposed design for the Yucca Mountain repository waste package.

The outer diameter of the naval UNF canister is 66 in. nominal (66.5 inches maximum). The maximum external dimensions ensure naval UNF canisters fit into the waste packages. The naval short UNF canister is 185.5 inches (nominal) in length (187 inches maximum), and the naval long UNF canister is 210.5 inches (nominal) in length (212 inches maximum). With the exception of length, the other characteristics of naval UNF canisters are identical.

Approximately 400 naval UNF canisters (310 long and 90 short) are currently planned to be packaged and temporarily stored pending shipment. The average thermal load is 4,250 watts/container. Maximum is 11,800 watts/container. The NNPP is responsible for preparing and loading naval UNF canisters and began canister loading operations in 2002. As of February 2010, 27 naval UNF canisters have been loaded and are being temporarily stored at INL. Table 3-2 provides the distribution of Naval UNF canisters based on nominal decay heat. [SNL, 2014]

Table 3-2. Naval UNF Canister Decay Heat.

Decay heat per canister (watts)	Number of canisters	Cumulative %
500 to 1000	13	3.3%
1000-2500	36	12.3%
2500 - 5000	94	35.8%
>5000	257	100.0%
Total	**400**	

3.3 DOE High-Level Radioactive Waste

High-level radioactive waste is the highly radioactive material resulting from the reprocessing of UNF. Following aqueous reprocessing, HLW is in a liquid form and historically has been stored in underground metal storage tanks. Long term storage of HLW requires stabilization of the wastes into a form that will not react, nor degrade, for an extended period of time. Two treatment methods used for stabilization of the waste are vitrification or calcination. Vitrification is the transition of the HLW into a glass by mixing with a combination of silica sand and other constituents or glass forming chemicals that are melted together and poured into stainless steel canisters. HLW canisters have a nominal diameter of 2 feet and have heights of 10 or 15 feet. Calcination of HLW is accomplished by injecting the waste with calcining additives into a fluidized bed to evaporate the water and decompose the remaining constituents into a granular solid material.

Aqueous reprocessing of DOE UNF has occurred at the Hanford Site, the INL, and the SRS. Commercial UNF was reprocessed at West Valley, New York.

In addition to aqueous reprocessing, the INL is pursuing the use of electro-chemical processing to treat 60 MTHM of sodium bonded UNF. The process converts the bond sodium into sodium chloride and separates the UNF into a uranium product and HLW. The HLW is produced in two forms, ceramic and metal. The ceramic waste form primarily contains the salt electrolyte with active metal fission products and the metal waste is primarily the cladding hulls and undissolved noble metals. The process has been demonstrated and used to treat about 4 MTHM of sodium bonded UNF to date.

3.3.1 Current DOE HLW Inventory

The source of inventory data for this study is information collected in support of the OCRWM efforts for licensing the Yucca Mountain Repository. [DOE, 2008] In addition, site treatment plans were also used. [DOE, 2009; Chew, 2013]

A commercial fuel reprocessing plant located at West Valley, New York operated from 1966 through 1972 and reprocessed approximately 640 metric tons of UNF to recover the plutonium and unused uranium. Of the UNF reprocessed at West Valley, about 260 metric tons were commercial used fuel and about 380 metric tons were DOE N Reactor used fuel. During operations about 2,500 m^3 of liquid HLW was generated. The liquid HLW was vitrified between 1996 and 2001 producing 275 HLW canisters that are stored at West Valley. [DOE, 1996]

The INL reprocessed UNF from naval propulsion reactors, test reactors, and research reactors to recover uranium and generated approximately 30,000 m^3 of liquid HLW. Between 1960 and 1997, the INL converted all of their liquid HLW into about 4,400 m^3 of a solid waste form called calcine (a granular solid with the consistency of powder laundry soap). These solids are stored retrievably on-site in stainless steel bins (like grain silos but smaller) within concrete vaults.

The SRS has reprocessed defense reactor UNF and nuclear targets to recover valuable isotopes since 1954 producing more than 530,000 m^3 of liquid HLW. Through evaporation and vitrification of the waste, SRS has reduced this inventory to the current level about 136,000 m^3 of liquid HLW. [Chew, 2013] SRS began vitrifying liquid HLW in 1996 and through March 2013 has produced 3,752 HLW canisters (2 feet × 10 feet).

The Hanford Site reprocessed defense reactor UNF since the 1940s and has generated about 220,000 m^3 of liquid HLW to recover the plutonium, uranium, and other elements for defense and other federal programs. Construction of a vitrification facility is currently underway with startup scheduled for 2019. Table 3-3 summarizes the current HLW inventory.

Table 3-3. Current High-Level Waste Inventory.

Site	HLW Canisters[1]	Liquid HLW[2] (m^3)	Dry HLW[3] (m^3)
West Valley	275	N/A	N/A
Hanford	N/A	220,000	N/A
INL	N/A	N/A	4,400
SRS	3,752[4]	140,000	N/A

1. Vitrified HLW in stainless steel canisters
2. HLW stored in tanks
3. Calcined HLW stored in bins.
4. Production as of 9/30/13

The Hanford Site encapsulated Cs and Sr separated from the HLW between 1974 and 1985. Some of these capsules were leased to companies as radiation sources. After one of the capsules developed a microscopic leak, the capsules were recalled. Hanford is storing 1,335 Cs capsules and 601 Sr capsules, approximately 109 million curies (as of 8/8/06). [Fact Sheet, 2006] Table 3-4 provides the capsule inventory broken down by decay heat load.

Table 3-4. Hanford Site Encapsulated Cs and Sr Inventory.

	Cs Capsules		Sr Capsules		Total Capsules	
Decay heat per canister (watts)	Number of canisters	Cumulative %	Number of canisters	Cumulative %	Number of canisters	Cumulative %
<50	4	0.3%	43	7.2%	47	2.4%
50-100	12	1.2%	107	25.0%	119	8.6%
100-200	1,319	100.0%	240	64.9%	1,559	89.1%
200-300	-	100.0%	122	85.2%	122	95.4%
300-500	-	100.0%	89	100.0%	89	100.0%
500-1000	-	100.0%	-	100.0%	-	100.0%
1000-1500	-	100.0%	-	100.0%	-	100.0%
1500 - 2000	-	100.0%	-	100.0%	-	100.0%
>2000	-	100.0%	-	100.0%	-	100.0%
Total Canisters	**1,335**		**601**		**1,936**	
Total Decay Heat (watts)	**178,299**		**107,121**		**285,419**	

3.3.2 Projected DOE HLW Inventory

SRS currently has the only operating reprocessing facility, H Canyon. It is estimated that an additional 17,000 m^3 of liquid HLW may be generated with continued canyon operations (approximately 2019).

The projected number of HLW canisters to be generated at each site will be dependent on actual loading and final waste form. Because of this uncertainty, the actual number of HLW canisters produced may vary significantly from what is anticipated today.

SRS began conversion of the liquid defense waste into borosilicate glass in 1996 and is the only DOE site with HLW in a packaged configuration. A total of 3,752 canisters have been produced through September 2013. Therefore, the SRS inventory can be described as those canisters in the current inventory and those projected from future operations. Decay heat of the current inventory is based on radiological inventories contained in the production records for those canisters. The decay heat of future canisters is estimated based the on radionuclide composition of the HLW inventory remaining in the liquid waste storage tanks. The radionuclide and resulting decay heat was calculated based on the year the canister is/will be produced. The total Savannah River canister count is based on information supporting Savannah River Liquid Waste Disposition Plan revision.

Table 3-5 provides the projected canister distribution of SRS canisters based on the nominal decay heat at the time of production. The data indicate: 39% of the Savannah River canisters will be generating less than 50 watts; 96% of the Savannah River canisters will be generating less than 300 watts; all the SRS canisters will be generating less than 500 watts.

Table 3-5. Savannah River Canister Decay Heat Distribution (projected).

Savannah River		
Decay heat per canister (watts)	**Number of canisters**	**Cumulative %**
<50	2,948	37.7%
50-100	497	44.0%
100-200	3,592	89.9%
200-300	501	96.3%
300-500	286	100.0%
500 -1000	0	100.0%
1000-1500	0	100.0%
1500-2000	0	100.0%
>2000	0	100.0%
Totals	**7,824**	
Total Decay Heat (watts)	**805,525**	

The Hanford Waste Treatment Project (WTP) is currently under construction and therefore the Hanford borosilicate glass canisters are based on a projected inventory for their future production taken from the January 2011 Waste Treatment Plant document titled "2010 Tank Utilization Assessment". The data in Table 3-4 indicate: 83% of the Hanford canisters will be generating less than 50 watts; and 100% of the Hanford canisters will be generating less than 300 watts.

At INL several options were considered for ultimate disposal of the calcine. Alternatives included direct disposal, vitrification, or hot isostatic pressing (HIP) to compress the calcine into a volume reduced monolithic waste form. A Record of Decision issued December 2009 determined that DOE will use the HIP technology to treat the calcine.

Decay heat of DOE HLW that has been calcined and is currently stored at the Idaho site is taken from the October 2005 Idaho Cleanup Project document titled "Decay Heat and Radiation from Direct Disposed Calcine", EDF-6258 revision 0. Report EDF-6258 provides this data for direct disposal of the calcine waste. The current Record of Decision for disposal of the calcine is for it to be treated using HIP, which will result in an approximate 50% increase in the volume of quantity of calcine material (treated) in each disposal canister and a 50% increase in the decay heat per canister.

Table 3-6 provides the projected distribution of DOE calcine canisters based on the nominal decay heat in the year 2016. The data indicates that 100% of calcine canisters will be less than 50 watts.

Table 3-6. Hanford and Idaho Waste Inventory (projected).

	Hanford Borosilicate Glass[a]		Idaho Calcine[b]	
Decay heat per canister (watts)	**Number of canisters**	**Cumulative %**	**Number of canisters**	**Cumulative %**
<50	9,291	83.9%	4,391	100.0%
50-100	1,237	95.0%		
100-200	488	99.4%		
200-300	63	100.0%		
300-500	0	100.0%		
500-1000	0	100.0%		
1000-1500	0	100.0%		
1500 - 2000	0	100.0%		
>2000	0	100.0%		
Totals	**11,079**		**4,391**	
Total Decay Heat (watts)	**304,904**		**92.674**	

[a] Projected based on future waste vitrification operations.
[b] Projected by 2016.

Table 3-7 shows the estimated number of HLW canisters to be produced. The current best estimate and a potential range are provided. [Marcinowski memo to Kouts, 2008; EIS, 2002; see also Chew, 2013]

Table 3-7. Projected Total Number of DOE High-Level Waste Canisters.

	HLW Canisters[1] Best Estimate	HLW Canister Range
West Valley	275[2]	275[2]
Hanford	11,079	9,667-14,111
INL (Calcine)	4,391	1,190-11,200
INL (Electro-chemical processing)	102	82-135
SRS	7,824	5,862-7,900
Totals	**23,671**	**17,100-33,600[3]**

1. With the exception of Hanford, all HLW canisters are 2 feet × 10 feet, Hanford HLW canisters are 2 feet × 15 feet

2. All the West Valley HLW canisters currently exist

3. Rounded to nearest 100 canister

The combined inventory from all three sites is presented in Table 3-8. The data indicate: 72% of the HLW canisters will be generating less than 50 watts; ~80% of the canisters will be generating less than 100 watts; almost 99% will be generating less than 300 watts and all the canisters will be less than 500 watts. The total decay heat to be emplaced in these cases is 1.2 million watts.

Table 3-8. Decay Heat for All DOE HLW.

All DOE HLW Canisters		
Decay heat generation per canister (watts)	**Number of canisters**	**Cumulative %**
<50	17,167	67.1%
50-100	1,922	74.6%
100-200	4,503	92.2%
200-300	1,481	98.0%
300-500	458	99.8%
500-1000	22	99.9%
1000-1500	9	99.9%
1500 - 2000	1	99.9%
>2000	15	100.0%
Total	**25,577**	
Total Decay Heat (watts)	**1,745,299**	

Not included in Table 3-6 are a) 275 HLW canisters from West Valley which have low heat values, and b) the Idaho HLW to be processed through the Integrated Waste Treatment Unit and then per the associated Record of Decision will be disposed of as RH-TRU.

3.3.3 DOE HLW Radionuclide Inventory

UFD Inventory [Carter, 2013] Appendix F, Table F-1 lists the total HLW radionuclide inventory for each of the generating sites decayed to 2017. Although there may be some variation in the number of canisters produced for the sites that have not completed waste treatment, the total amount of radionuclide will not change.

OCRWM used the “projected maximum” inventory on a per canister basis for the HLW curie content supplied by SRS. The use of the “projected maximum” on a per canister basis resulted in a conservative total curie content for SRS that is approximately twice the actual SRS tank farm inventory. The expected curie content of SRS HLW is presented in UFD Inventory [Carter 2013] Table F2.

SRS is also the only site continuing reprocessing and the DOE-EM program periodically requires disposal of special isotopes via the reprocessing facility and the vitrification process. For example excess weapons plutonium has been disposed which results in the Pu concentration of some SRS canisters to be above the projected maximum inventory used in the licensing of Yucca Mountain. The potential for future EM special isotope disposal campaigns has not been assessed in this study.

The total radionuclide inventory for treatment of sodium bonded UNF is shown in UFD Inventory Table F-3. [Carter, 2013]

3.3.4 DOE HLW Storage

The HLW vitrified glass at SRS is stored in below grade concrete vaults, called Glass Waste Storage Buildings (GWSB), containing support frames for vertical storage of 2,262 HLW canisters. SRS currently has two GWSB constructed and a third planned. The HLW canisters at West Valley are currently stored in a shielded cell in the former reprocessing plant. Alternate interim storage options are being considered at West Valley to allow decommissioning of the reprocessing facility.

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Appendix A
Commercial Nuclear Fuel Characteristics

Table A-1 Physical characteristics of pressurized water reactor assembly class

Assembly Class	Array Size	Manufacturer Code	Version	Assembly Code	Length (in.)	Width (in.)	Clad Material
B&W 15 × 15	15 × 15	B&W	B&W Mark B	B1515B	165.7	8.54	Zircaloy-4
			B&W Mark B10	B1515B10	165.7	8.54	Zircaloy-4
			B&W Mark B3	B1515B3	165.7	8.54	Zircaloy-4
			B&W Mark B4	B1515B4	165.7	8.54	Zircaloy-4
			B&W Mark B4Z	B1515B4Z	165.7	8.54	Zircaloy-4
			B&W Mark B5	B1515B5	165.7	8.54	Zircaloy-4
			B&W Mark B5Z	B1515B5Z	165.7	8.54	Zircaloy-4
			B&W Mark B6	B1515B6	165.7	8.54	Zircaloy-4
			B&W Mark B7	B1515B7	165.7	8.54	Zircaloy-4
			B&W Mark B8	B1515B8	165.7	8.54	Zircaloy-4
			B&W Mark B9	B1515B9	165.7	8.54	Zircaloy-4
			B&W Mark BGD	B1515BGD	165.7	8.54	Zircaloy-4
			B&W Mark BZ	B1515BZ	165.7	8.54	Zircaloy-4
		WE	WE	B1515W	165.7	8.54	not available
B&W 17 × 17	17 × 17	B&W	B&W Mark C	B1717B	165.7	8.54	Zircaloy-4
CE 14 × 14	14 × 14	ANF	ANF	C1414A	157.0	8.10	Zircaloy-4
		CE	CE	C1414C	157.0	8.10	Zircaloy-4
		WE	WE	C1414W	157.0	8.10	Zircaloy-4
CE 16 × 16	16 × 16	CE	CE	C1616CSD	176.8	8.10	Zircaloy-4
CE System 80	16 × 16	CE	CE System 80	C8016C	178.3	8.10	Zircaloy-4

Table A-1 (continued).

Assembly Class	Array Size	Manufacturer Code	Version	Assembly Code	Length (in.)	Width (in.)	Clad Material
WE 14 × 14	14 × 14	ANF	ANF	W1414A	159.8	7.76	Zircaloy-4
		ANF	ANF Top Rod	W1414ATR	159.8	7.76	Zircaloy-4
		B&W	B&W	W1414B	159.8	7.76	not available
		WE	WE LOPAR	W1414WL	159.8	7.76	Zircaloy-4
		WE	WE OFA	W1414WO	159.8	7.76	Zircaloy-4
		WE	WE Std	W1414W	159.8	7.76	Zircaloy-4
WE 15 × 15	15 × 15	ANF	ANF	W1515A	159.8	8.44	Zircaloy-4
			ANF HT	W1515AHT	159.8	8.44	not available
			ANF Part Length	W1515APL	159.8	8.44	not available
		WE	LOPAR	W1515WL	159.8	8.44	Zircaloy-4
			OFA	W1515WO	159.8	8.44	Zircaloy-4
			WE Std	W1515W	159.8	8.44	Zircaloy
			WE Vantage 5	W1515WV5	159.8	8.44	not available
WE 17 × 17	17 × 17	ANF	ANF	W1717A	159.8	8.44	Zircaloy-4
		B&W	B&W Mark B	W1717B	159.8	8.44	not available
		WE	WE	W1717WRF	159.8	8.44	not available
			WE	W1717WVJ	159.8	8.44	not available
			WE LOPAR	W1717WL	159.8	8.44	Zircaloy-4
			WE OFA	W1717WO	159.8	8.44	Zircaloy-4
			WE Pressurized	W1717WP	159.8	8.44	not available
			WE Vantage	W1717WV	159.8	8.44	not available
			WE Vantage +	W1717WV+	159.8	8.44	ZIRLO
			WE Vantage 5	W1717WV5	159.8	8.44	Zircaloy-4
			WE Vantage 5H	W1717WVH	159.8	8.44	not available
South Texas	17 × 17	WE	WE	WST17W	199.0	8.43	Zircaloy-4

Table A-1 (continued).

Assembly Class	Array Size	Manufacturer Code	Version	Assembly Code	Length (in.)	Width (in.)	Clad Material
Ft. Calhoun	14 × 14	ANF	ANF	XFC14A	146.0	8.10	not available
		CE	CE	XFC14C	146.0	8.10	Zircaloy-4
		WE	WE	XFC14W	146.0	8.10	not available
Haddam Neck	15 × 15	B&W	B&W SS	XHN15B	137.1	8.42	SS-304
			B&W Zir	XHN15BZ	137.1	8.42	Zircaloy
		GA	Gulf SS	XHN15HS	137.1	8.42	SS
			Gulf Zir	XHN15HZ	137.1	8.42	Zircaloy
		NU	NUM SS	XHN15MS	137.1	8.42	SS
			NUM Zir	XHN15MZ	137.1	8.42	Zircaloy
		WE	WE	XHN15W	137.1	8.42	SS-304
			WE Zir	XHN15WZ	137.1	8.42	not available
Indian Point-1	13 × 14	WE	WE	XIP14W	138.8	6.27	SS
Palisades	15 × 15	ANF	ANF	XPA15A	147.5	8.20	Zircaloy-4
		CE	CE	XPA15C	147.5	8.20	Zircaloy-4
St. Lucie-2	16 × 16	CE	CE	XSL16C	158.2	8.10	Zircaloy-4
San Onofre-1	14 × 14	WE	WE	XSO14W	137.1	7.76	SS-304
			WE D	XSO14WD	137.1	7.76	not available
			WE M	XSO14WM	137.1	7.76	not available
Yankee Rowe	15 × 16	ANF	ANF	XYR16A	111.8	7.62	Zircaloy-4
		CE	CE	XYR16C	111.8	7.62	Zircaloy-4
		UNC	UNC	XYR16U	111.8	7.62	not available
	17 × 18	WE	WE	XYR18W	111.8	7.62	SS
NOTE: Some characteristics of more recently discharged UNF (post-1999) have not yet been provided							

Table A-2 Physical characteristics of boiling water reactor assembly classes.

Assembly Class	Array Size	Manufacturer Code	Version	Assembly Code	Length (in.)	Width (in.)	Clad Material
GE BWR/ 2,3	7 × 7	ANF	ANF	G2307A	171.2	5.44	Zircaloy-2
	8 × 8	ANF	ANF	G2308A	171.2	5.44	Zircaloy-2
	9 × 9	ANF	ANF	G2309A	171.2	5.44	Zircaloy-2
			ANF IX	G2309AIX	171.2	5.44	Zircaloy-2
	8 × 8	ANF	ANF Pressurized	G2308AP	171.2	5.44	Zircaloy-2
		GE	GE-10	G2308G10	171.2	5.44	Zircaloy-2
	9 × 9	GE	GE-11	G2309G11	171.2	5.44	Zircaloy-2
	7 × 7	GE	GE-2a	G2307G2A	171.2	5.44	Zircaloy-2
			GE-2b	G2307G2B	171.2	5.44	Zircaloy-2
			GE-3	G2307G3	171.2	5.44	Zircaloy-2
	8 × 8	GE	GE-4	G2308G4	171.2	5.44	Zircaloy-2
			GE-5	G2308G5	171.2	5.44	Zircaloy-2
			GE-7	G2308G7	171.2	5.44	NA
			GE-8a	G2308G8A	171.2	5.44	Zircaloy-2
			GE-8b	G2308G8B	171.2	5.44	Zircaloy-2
			GE-9	G2308G9	171.2	5.44	Zircaloy-2
			GE-Barrier	G2308GB	171.2	5.44	Zircaloy-2
			GE-Pressurized	G2308GP	171.2	5.44	Zircaloy-2
	not available	not available	not available	9X9IXQFA	171.2	5.44	not available
GE BWR/ 4-6	9 × 9	ANF	ANF	G4609A	176.2	5.44	Zircaloy-2
	10 × 10	ANF	ANF	G4610A	176.2	5.44	NA
	9 × 9	ANF	ANF 9-5	G4609A5	176.2	5.44	Zircaloy-2
			ANF 9X	G4609A9X	176.2	5.44	Zircaloy-2
			ANF IX	G4609AIX	176.2	5.44	Zircaloy-2
	10 × 10	ANF	ANF IX	G4610AIX	176.2	5.44	not available
	9 × 9	ANF	ANF X+	G4609AX+	176.2	5.44	not available
	8 × 8	ANF	ANF-Pressurized	G4608AP	176.2	5.44	Zircaloy-2
	not available	AREVA	not available	ATRIUM10	176.2	5.44	Zircaloy-2

Table A-2 (continued).

Assembly Class	Array Size	Manufacturer Code	Version	Assembly Code	Length (in.)	Width (in.)	Clad Material
GE BWR/ 4-6 (Continued)	10 × 10	ABB	CE	G4610C	176.2	5.44	not available
	8 × 8	GE	GE-10	G4608G10	176.2	5.44	Zircaloy-2
			GE-11	G4608G11	176.2	5.44	not available
	9 × 9	GE	GE-11	G4609G11	176.2	5.44	Zircaloy-2
	8 × 8	GE	GE-12	G4608G12	176.2	5.44	not available
	10 × 10	GE	GE-12	G4610G12	176.2	5.44	Zircaloy-2
	9 × 9	GE	GE-13	G4609G13	176.2	5.44	Zircaloy-2
	10 × 10	GE	GE-14	G4610G14	176.2	5.44	not available
	7 × 7	GE	GE-2	G4607G2	176.2	5.44	Zircaloy-2
			GE-3a	G4607G3A	176.2	5.44	Zircaloy-2
			GE-3b	G4607G3B	176.2	5.44	Zircaloy-2
	8 × 8	GE	GE-4a	G4608G4A	176.2	5.44	Zircaloy-2
			GE-4b	G4608G4B	176.2	5.44	Zircaloy-2
			GE-5	G4608G5	176.2	5.44	Zircaloy-2
			GE-8	G4608G8	176.2	5.44	Zircaloy-2
			GE-9	G4608G9	176.2	5.44	Zircaloy-2
			GE-Barrier	G4608GB	176.2	5.44	Zircaloy-2
			GE-Pressurized	G4608GP	176.2	5.44	Zircaloy-2
		WE	WE	G4608W	176.2	5.44	Zircaloy-2
Big Rock Point	9 × 9	ANF	ANF	XBR09A	84	6.52	Zircaloy-2
	11 × 11	ANF	ANF	XBR11A	84	6.52	Zircaloy-2
	7 × 7	GE	GE	XBR07G	84	6.52	not available
	8 × 8	GE	GE	XBR08G	84	6.52	not available
	9 × 9	GE	GE	XBR09G	84	6.52	Zircaloy-2
	11 × 11	GE	GE	XBR11G	84	6.52	Zircaloy-2
		NFS	NFS	XBR11N	84	6.52	not available

Table A-2 (continued).

Assembly Class	Array Size	Manufacturer Code	Version	Assembly Code	Length (in.)	Width (in.)	Clad Material
Dresden-1	6 × 6	ANF	ANF	XDR06A	134.4	4.28	Zircaloy-2
		GE	GE	XDR06G	134.4	4.28	Zircaloy-2
	7 × 7	GE	GE SA-1	XDR07GS	134.4	4.28	not available
	8 × 8	GE	GE PF Fuels	XDR08G	134.4	4.28	not available
	6 × 6	GE	GE Type III-B	XDR06G3B	134.4	4.28	not available
			GE Type III-F	XDR06G3F	134.4	4.28	not available
			GE Type V	XDR06G5	134.4	4.28	not available
		UNC	UNC	XDR06U	134.4	4.28	not available
Humboldt Bay	6 × 6	ANF	6 × 6 ANF	XHB06A	95	4.67	Zircaloy
		GE	GE	XHB06G	95	4.67	Zircaloy-2
	7 × 7	GE	GE Type II	XHB07G2	95	4.67	Zircaloy
LaCrosse	10 × 10	AC	AC	XLC10L	102.5	5.62	SS348H
		ANF	ANF	XLC10A	102.5	5.62	SS348H

NOTE: Some characteristics of more recently discharged UNF (post-1999) have not yet been provided.

Table A-3 Assembly types and their main characteristics as of December 31, 2002.

Reactor Type	Manufacturer Code	Assembly Code	Initial Uranium Loading (kg/assembly)		Enrichment (U^{235} wt %)			Burn-up (MW/MTU)	
			Avg.	Max.	Min.	Avg.	Max.	Avg.	Max.
BWR	not available	9X9IXQFA	170.713	170.800	3.25	3.25	3.25	39,166	39,248
BWR	AC	XLC10L	120.160	121.034	3.63	3.77	3.94	14,419	21,532
BWR	ANF	G2307A	181.574	183.797	2.56	2.64	2.65	24,256	27,826
BWR	ANF	G2308A	174.624	184.355	2.39	2.66	3.13	28,814	36,826
BWR	ANF	G2308AP	172.753	173.132	2.82	2.83	2.83	34,366	34,826
BWR	ANF	G2309A	168.097	169.520	2.78	3.10	3.15	35,941	40,818
BWR	ANF	G2309AIX	169.185	170.059	3.25	3.31	3.82	39,151	43,778
BWR	ANF	G4608AP	176.175	176.800	2.62	2.88	3.40	31,248	35,518
BWR	ANF	G4609A	172.970	174.700	0.72	3.42	3.73	36,933	47,000
BWR	ANF	G4609A5	176.147	177.000	2.90	3.28	3.55	36,536	43,555
BWR	ANF	G4609A9X	169.155	176.800	2.53	2.87	3.11	36,880	43,330
BWR	ANF	G4609AIX	174.788	177.000	3.00	3.58	3.94	24,156	36,777
BWR	ANF	G4609AX+	167.264	167.277	3.13	3.14	3.15	39,239	40,457
BWR	ANF	G4610A	176.900	176.900	3.94	3.94	3.94	38,207	39,000
BWR	ANF	G4610AIX	175.000	175.000	3.39	3.39	3.39	37,706	38,009
BWR	ANF	XBR09A	127.687	131.406	3.45	3.48	3.52	20,981	22,811
BWR	ANF	XBR11A	130.237	133.174	3.13	3.42	3.82	22,716	34,212
BWR	ANF	XDR06A	95.206	95.478	2.23	2.23	2.24	4,907	5,742
BWR	ANF	XHB06A	69.734	73.800	2.35	2.40	2.41	9,037	22,377
BWR	ANF	XLC10A	108.657	109.609	3.68	3.69	3.71	15,017	20,126
BWR	AREVA	ATRIUM10	176.900	176.900	3.94	3.94	3.94	38,406	39,000
BWR	ABB	G4610C	175.683	176.300	2.51	3.29	3.62	38,133	42,640
BWR	GE	G2307G2A	194.902	197.604	2.07	2.10	2.11	16,775	24,902
BWR	GE	G2307G2B	193.203	197.400	1.65	2.15	2.62	16,384	29,728

Table A-3 (continued).

Reactor Type	Manufacturer Code	Assembly Code	Initial Uranium Loading (kg/assembly)		Enrichment (U^{235} wt %)			Burn-up (MW/MTU)	
			Avg.	Max.	Min.	Avg.	Max.	Avg.	Max.
BWR	GE	G2307G3	187.419	189.105	1.96	2.41	2.60	25,420	38,861
BWR	GE	G2308G10	172.225	173.512	3.10	3.25	3.56	33,988	43,977
BWR	GE	G2308G4	183.991	185.496	2.19	2.51	2.76	26,087	40,523
BWR	GE	G2308G5	176.971	177.628	2.39	2.66	2.82	29,009	33,597
BWR	GE	G2308G7	178.520	179.400	2.96	2.97	2.99	31,570	35,894
BWR	GE	G2308G8A	175.695	179.584	2.55	3.09	3.40	34,848	44,933
BWR	GE	G2308G8B	172.590	178.000	2.96	3.19	3.39	36,400	42,518
BWR	GE	G2308G9	172.017	173.108	2.85	3.18	3.48	37,268	42,295
BWR	GE	G2308GB	177.983	180.060	2.62	2.80	3.39	32,014	43,381
BWR	GE	G2308GP	177.145	179.200	2.08	2.77	3.01	29,317	38,139
BWR	GE	G2309G11	165.650	169.500	3.10	3.56	3.78	40,522	45,117
BWR	GE	G4607G2	194.729	197.334	1.09	1.56	2.50	9,362	11,829
BWR	GE	G4607G3A	187.455	189.141	1.10	2.33	2.51	21,058	32,188
BWR	GE	G4607G3B	189.925	191.542	1.10	2.31	2.51	21,948	30,831
BWR	GE	G4608G10	177.778	186.094	2.63	3.24	3.70	36,695	44,343
BWR	GE	G4608G11	170.786	171.000	3.38	3.38	3.38	35,194	42,551
BWR	GE	G4608G12	180.873	181.484	3.69	3.71	3.99	32,069	34,462
BWR	GE	G4608G4A	183.931	185.221	2.19	2.62	2.99	24,931	43,430
BWR	GE	G4608G4B	186.709	187.900	2.10	2.31	2.76	21,362	32,941
BWR	GE	G4608G5	183.007	185.366	0.70	2.36	3.01	23,964	38,224
BWR	GE	G4608G8	179.801	185.854	2.95	3.19	3.40	34,905	44,640
BWR	GE	G4608G9	177.738	185.789	1.51	3.23	3.88	36,492	47,062
BWR	GE	G4608GB	184.636	186.653	0.71	2.53	3.25	26,297	45,986
BWR	GE	G4608GP	183.195	186.888	0.70	2.38	3.27	23,112	42,428
BWR	GE	G4609G11	170.123	178.136	1.46	3.56	4.14	40,351	65,149

Table A-3 (continued).

Reactor Type	Manufacturer Code	Assembly Code	Initial Uranium Loading (kg/assembly)		Enrichment (U^{235} wt %)			Burn-up (MW/MTU)	
			Avg.	Max.	Min.	Avg.	Max.	Avg.	Max.
BWR	GE	G4609G13	171.417	172.912	3.24	3.85	4.17	42,045	53,636
BWR	GE	G4610G12	176.100	182.141	3.12	3.98	4.20	44,175	52,735
BWR	GE	G4610G14	179.127	180.402	4.01	4.11	4.24	5,868	8,915
BWR	GE	XBR07G	131.500	133.000	2.88	2.88	2.88	1,643	1,690
BWR	GE	XBR08G	112.500	113.000	2.85	2.85	2.85	4,546	7,027
BWR	GE	XBR09G	137.088	141.000	3.51	3.58	3.62	15,092	22,083
BWR	GE	XBR11G	124.500	132.000	3.11	3.46	3.63	22,802	24,997
BWR	GE	XDR06G	111.352	111.352	1.47	1.47	1.47	23,522	23,522
BWR	GE	XDR06G3B	101.610	102.520	1.83	1.83	1.83	18,632	27,106
BWR	GE	XDR06G3F	102.049	102.876	2.25	2.25	2.25	22,132	28,138
BWR	GE	XDR06G5	105.857	112.257	2.26	2.26	2.26	21,095	25,886
BWR	GE	XDR07GS	59.000	59.000	3.10	3.10	3.10	29,000	29,000
BWR	GE	XDR08G	99.714	99.714	1.95	1.95	1.95	25,287	25,287
BWR	GE	XHB06G	76.355	77.000	2.35	2.43	2.52	17,170	22,876
BWR	GE	XHB07G2	76.325	77.100	2.08	2.11	2.31	18,187	20,770
BWR	NFS	XBR11N	128.991	134.414	2.16	2.83	3.51	18,940	21,850
BWR	UNC	XDR06U	102.021	103.441	1.83	2.24	2.26	17,685	26,396
BWR	WE	G4608W	156.696	171.403	2.69	2.85	3.01	28,041	33,140
PWR	ANF	C1414A	380.870	400.000	0.30	3.50	4.32	38,899	50,871
PWR	ANF	W1414A	378.274	406.840	0.71	3.42	4.50	37,500	56,328
PWR	ANF	W1414ATR	362.788	368.011	2.39	3.38	3.57	38,168	46,000
PWR	ANF	W1515A	428.888	434.792	2.01	3.00	3.60	33,344	49,859
PWR	ANF	W1515AHT	434.546	438.074	3.51	4.08	4.59	45,441	56,922
PWR	ANF	W1515APL	307.361	310.073	1.23	1.55	1.88	27,971	37,770
PWR	ANF	W1717A	413.845	460.540	2.43	4.19	4.77	45,291	53,958

Table A-3 (continued).

Reactor Type	Manufacturer Code	Assembly Code	Initial Uranium Loading (kg/assembly)		Enrichment (U^{235} wt %)			Burn-up (MW/MTU)	
			Avg.	Max.	Min.	Avg.	Max.	Avg.	Max.
PWR	ANF	XFC14A	353.345	358.811	3.50	3.57	3.80	37,205	46,048
PWR	ANF	XPA15A	396.674	408.040	1.50	3.17	4.05	34,362	51,486
PWR	ANF	XYR16A	233.555	237.300	3.49	3.78	4.02	29,034	35,088
PWR	B&W	B1515B	463.398	465.480	2.74	3.57	3.62	40,407	50,128
PWR	B&W	B1515B10	476.778	489.299	3.24	3.90	4.73	44,417	56,880
PWR	B&W	B1515B3	463.845	465.830	1.08	2.42	2.84	21,036	32,267
PWR	B&W	B1515B4	464.285	474.853	0.90	2.91	4.06	29,534	57,000
PWR	B&W	B1515B4Z	463.735	466.305	3.22	3.84	3.95	39,253	51,660
PWR	B&W	B1515B5	468.250	468.250	3.13	3.13	3.13	38,017	39,000
PWR	B&W	B1515B5Z	464.421	465.176	3.20	3.22	3.23	36,016	42,328
PWR	B&W	B1515B6	462.495	464.403	3.22	3.47	3.66	41,790	49,383
PWR	B&W	B1515B7	463.244	464.513	3.48	3.51	3.55	42,059	48,738
PWR	B&W	B1515B8	464.864	468.560	3.29	3.65	4.01	42,692	54,000
PWR	B&W	B1515B9	463.566	467.566	3.29	3.96	4.76	44,097	53,952
PWR	B&W	B1515BGD	429.552	430.255	3.92	3.92	3.92	49,027	58,310
PWR	B&W	B1515BZ	463.410	466.279	3.05	3.47	4.68	37,441	54,023
PWR	B&W	B1717B	456.722	457.929	2.64	2.84	3.04	29,517	33,904
PWR	B&W	W1414B	383.157	383.157	3.22	3.22	3.22	24,398	24,465
PWR	B&W	W1717B	455.799	466.688	2.00	3.84	4.60	40,741	54,014
PWR	B&W	XHN15B	409.913	415.060	3.00	3.99	4.02	33,776	37,833
PWR	B&W	XHN15BZ	363.921	368.072	3.40	3.80	3.91	34,278	42,956
PWR	CE	C1414C	382.437	408.508	1.03	3.20	4.48	33,597	56,000
PWR	CE	C1616CSD	413.912	442.986	1.87	3.62	4.63	37,916	63,328
PWR	CE	C8016C	421.468	442.000	1.92	3.57	4.27	38,490	56,312
PWR	CE	XFC14C	362.313	376.842	1.39	2.96	3.95	32,130	52,125

Table A-3 (continued).

Reactor Type	Manufacturer Code	Assembly Code	Initial Uranium Loading (kg/assembly)		Enrichment (U^{235} wt %)			Burn-up (MW/MTU)	
			Avg.	Max.	Min.	Avg.	Max.	Avg.	Max.
PWR	CE	XPA15C	412.442	416.780	1.65	2.47	3.06	16,020	33,630
PWR	CE	XSL16C	381.018	394.400	1.72	3.44	4.28	38,807	54,838
PWR	CE	XYR16C	228.766	233.400	3.51	3.80	3.92	24,282	35,999
PWR	GA	XHN15HS	406.163	406.163	3.99	3.99	3.99	32,151	32,151
PWR	GA	XHN15HZ	362.863	362.863	3.26	3.26	3.26	18,546	18,546
PWR	NU	XHN15MS	405.979	406.992	3.66	3.66	3.66	28,324	28,324
PWR	NU	XHN15MZ	370.776	371.039	2.95	2.95	2.95	25,643	25,643
PWR	UNC	XYR16U	238.573	241.300	3.96	3.99	4.02	27,461	31,986
PWR	WE	B1515W	461.819	464.763	3.90	4.06	4.22	36,993	49,075
PWR	WE	C1414W	403.483	411.719	2.70	3.15	3.76	30,039	37,781
PWR	WE	W1414W	393.896	403.683	2.26	3.04	3.47	27,315	39,723
PWR	WE	W1414WL	399.092	405.809	2.27	3.07	3.41	31,940	47,932
PWR	WE	W1414WO	355.724	369.265	0.99	3.92	4.95	44,730	69,452
PWR	WE	W1515W	451.193	458.091	2.21	3.00	3.35	29,324	41,806
PWR	WE	W1515WL	455.236	465.600	1.85	2.98	3.80	30,874	55,385
PWR	WE	W1515WO	460.764	465.747	1.91	3.53	4.60	39,071	56,138
PWR	WE	W1515WV5	457.793	462.934	2.99	3.92	4.80	37,556	53,056
PWR	WE	W1717WL	461.323	469.200	1.60	3.12	4.40	32,340	58,417
PWR	WE	W1717WO	425.107	459.433	1.60	3.05	4.02	32,690	53,000
PWR	WE	W1717WP	417.069	417.878	3.73	4.59	4.81	50,707	58,237
PWR	WE	W1717WRF	455.497	456.735	4.00	4.18	4.42	45,530	48,037
PWR	WE	W1717WV	425.399	426.042	4.21	4.38	4.41	44,263	48,385
PWR	WE	W1717WV+	424.010	465.469	1.61	4.16	4.66	45,430	61,685
PWR	WE	W1717WV5	424.269	430.925	1.49	4.01	4.95	43,872	56,570
PWR	WE	W1717WVH	461.954	473.962	2.11	3.87	4.95	41,081	55,496

Table A-3 (continued).

Reactor Type	Manufacturer Code	Assembly Code	Initial Uranium Loading (kg/assembly)		Enrichment (U^{235} wt %)			Burn-up (MW/MTU)	
			Avg.	Max.	Min.	Avg.	Max.	Avg.	Max.
PWR	**WE**	**W1717WVJ**	**461.518**	**465.200**	**3.71**	**3.99**	**4.40**	**43,922**	**46,847**
PWR	**WE**	**WST17W**	**540.480**	**546.600**	**1.51**	**3.38**	**4.41**	**35,926**	**54,399**
PWR	**WE**	**XFC14W**	**374.055**	**376.000**	**0.27**	**3.75**	**4.25**	**38,521**	**51,971**
PWR	**WE**	**XHN15W**	**415.557**	**421.227**	**3.02**	**3.59**	**4.00**	**27,922**	**35,196**
PWR	**WE**	**XHN15WZ**	**384.894**	**386.689**	**4.20**	**4.39**	**4.60**	**14,321**	**19,376**
PWR	**WE**	**XIP14W**	**191.152**	**200.467**	**2.83**	**4.12**	**4.36**	**16,471**	**27,048**
PWR	**WE**	**XSO14W**	**368.153**	**374.885**	**3.16**	**3.87**	**4.02**	**27,232**	**39,275**
PWR	**WE**	**XSO14WD**	**373.323**	**373.643**	**4.01**	**4.01**	**4.02**	**18,259**	**18,424**
PWR	**WE**	**XSO14WM**	**311.225**	**311.225**	**0.71**	**0.71**	**0.71**	**19,307**	**19,636**
PWR	**WE**	**XYR18W**	**273.350**	**274.100**	**4.94**	**4.94**	**4.94**	**25,484**	**31,755**

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Appendix B
December 2013 Discharged Fuel by Reactor

Table B-1 Estimated Inventory by Storage Type and Site (Group C Sites)

	Dry Inventory 3/13/2014			Pool Inventory		Site Inventory 12/31/2013	
Reactor	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Arkansas Nuclear	1,632	718.36	62	1,448	637.37	3,080	1,355.74
Beaver Valley	-	-	-	2,450	1,131.86	2,450	1,131.86
Braidwood	224	94.41	7	2,562	1,079.84	2,786	1,174.25
Browns Ferry	3,060	545.77	45	8,910	1,589.15	11,970	2,134.92
Brunswick	976	176.11	16	2,402	518.70	3,378	694.81
Byron	448	189.12	14	2,536	1,070.54	2,984	1,259.65
Callaway	-	-	-	1,788	758.55	1,788	758.55
Calvert Cliffs	1,920	750.62	72	1,453	568.04	3,373	1,318.66
Catawba	650	289.97	26	2,401	1,071.11	3,051	1,361.09
Clinton	-	-	-	3,140	567.55	3,140	567.55
Columbia Generating Station	1,836	323.20	27	2,122	373.54	3,958	696.74
Comanche Peak	576	242.06	18	1,956	822.00	2,532	1,064.06
Cooper	488	89.03	8	2,007	360.40	2,495	449.43
Davis-Besse	72	34.16	3	1,110	526.69	1,182	560.85
Diablo Canyon	928	401.34	29	1,982	857.18	2,910	1,258.52
D.C. Cook	384	168.52	12	3,100	1,360.47	3,484	1,528.99
Dresden	3,604	641.40	53	5,704	957.04	9,580	1,626.15
Duane Arnold	1,220	220.37	20	1,637	295.69	2,857	516.06
Hatch	3,808	687.26	56	4,572	825.15	8,380	1,512.41
Fermi	-	-	-	3,309	579.30	3,309	579.30
Fort Calhoun	320	117.12	10	821	300.48	1,141	417.60

Table B-1 (continued).

	Dry Inventory 3/13/2014			Pool Inventory		Site Inventory 12/31/2013	
Reactor	Assy.	Initial Uranium (MT)	Fuel Casks	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Grand Gulf	1,564	277.35	23	3,306	586.27	4,870	863.62
Robinson	392	170.30	22	373	161.59	765	331.89
Hope Creek	1,224	220.49	18	2,915	525.11	4,139	745.60
Indian Point	672	305.47	21	2,269	1,031.42	2,941	1,336.89
Fitzpatrick	1,428	258.48	21	2,232	404.01	3,660	662.49
Farley	704	310.04	22	2,356	1,037.59	3,060	1,347.64
La Salle	748	134.21	11	6,823	1,224.26	7,571	1,358.47
Limerick	1,464	261.28	24	6,149	1,097.40	7,613	1,358.68
McGuire	1,103	494.73	41	2,180	977.80	3,283	1,472.52
Millstone	576	243.62	18	2,111	892.84	2,687	1,136.46
Monticello	915	162.94	15	1,338	228.48	2,253	391.42
Nine Mile Point	976	172.08	16	5,960	1,050.83	6,936	1,222.91
North Anna	1,440	666.78	45	1,418	656.59	2,858	1,323.37
Oconee	3,168	1,476.20	132	1,624	756.74	4,792	2,232.94
Palisades	1,096	449.50	42	488	200.14	1,584	649.64
Palo Verde	2,736	1,171.76	114	2,245	961.48	4,981	2,133.23
Peach Bottom	4,352	783.90	64	5,744	1,034.60	10,096	1,818.50
Perry	408	73.59	6	3,470	625.83	3,878	699.42
Pilgrim	-	-	-	3,250	584.45	3,250	584.45
Point Beach	1,120	429.95	39	1,135	435.65	2,255	865.60
Prairie Island	1,400	511.69	35	1,055	385.60	2,455	897.29

Table B-1 (continued).

Reactor	Dry Inventory 3/13/2014			Pool Inventory		Site Inventory 12/31/2013	
	Assy.	Initial Uranium (MT)	Fuel Casks	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Quad Cities	2,380	424.96	35	6,470	1,155.24	8,850	1,580.20
River Bend	1,292	229.16	19	2,318	411.14	3,610	640.30
Ginna	192	69.93	6	1,099	399.53	1,291	469.45
Saint Lucie	832	322.52	26	2,535	982.69	3,367	1,305.22
Salem	512	235.24	16	2,344	1,076.98	2,856	1,312.23
Seabrook	448	204.93	14	751	343.52	1,199	548.45
Sequoyah	1,280	586.09	40	1,610	737.19	2,890	1,323.28
Shearon Harris	-	-	-	5,992	1,500.93	5,992	1,500.93
South Texas	-	-	-	2,297	1,231.60	2,297	1,231.60
Surry	2,174	997.65	77	720	330.58	2,894	1,328.23
Susquehanna	4,454	787.25	77	4,191	740.77	8,645	1,528.02
Three Mile Island	-	-	-	1,324	623.14	1,324	623.14
Turkey Point	576	262.67	18	2,130	971.36	2,706	1,234.04
Summer	-	-	-	1,278	548.18	1,278	548.18
Vogtle	192	83.62	6	2,700	1,167.38	2,892	1,251.00
Waterford	416	174.03	13	1,192	498.67	1,608	672.70
Watts Bar	-	-	-	861	395.99	861	395.99
Wolf Creek	-	-	-	1,513	695.57	1,513	695.57
Totals	**64,380**	**18,641.22**	**1,554**	**157,176**	**44,919.78**	**221,828**	**63,588.71**

Table B-2 Estimated Inventory by Storage Type and Site (Group A Sites Shutdown before 2003)

	Dry Inventory 3/13/2014			Pool Inventory		Site Inventory 12/31/2013	
Reactor	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Big Rock Point	441	58.05	7	-	-	441	58.05
Haddam Neck	1,019	412.29	40	-	-	1,019	412.29
Humboldt Bay	390	28.94	5	-	-	390	28.94
LaCrosse	333	37.97	5	-	-	333	37.97
Maine Yankee	1,434	542.26	60	-	-	1,434	542.26
Rancho Seco	493	228.38	21	-	-	493	228.38
Trojan	790	358.85	34	-	-	790	358.85
Yankee Rowe	533	127.13	15	-	-	533	127.13
Zion	222	523.95	6	2,004	495.49	2,226	1,019.44
Totals	**5,655**	**2,317.81**	**193**	**2,004**	**495.49**	**7,659**	**2,813.30**

Table B-3 Estimated Inventory by Storage Type and Site (Shutdown Reactors at Group B Sites)

	Dry Inventory 3/13/2014			Pool Inventory		Site Inventory 12/31/2013	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Dresden 1	272	27.71	4	Pool Empty		Remaining Inventory with Units 2 and 3	
Indian Point 1	160	30.58	5	-	-	160	30.58
Millstone 1	-	-	-	2,884	525.62	2,884	525.62
Totals	**432**	**58.29**	**9**	**2,884**	**525.62**	**3,044**	**556.21**

Table B-4 Estimated Inventory by Storage Type and Site (Group A Sites Shutdown after 2002)

	Dry Inventory 3/13/2014			Pool Inventory		Site Inventory 12/31/2013	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Kewaunee	256	98.44	8	1,079	414.89	1,335	513.33
Crystal River 3	-	-	-	1,319	611.98	1,319	611.98
San Onofre 1	395	146.21	17	-	-	395	146.21
San Onofre 2 & 3	792	327.62	33	2,776	1,148.34	3,568	1,475.96
Oyster Creek	1,403	249.70	23	2,264	402.93	3,667	652.63
Vermont Yankee	884	160.72	13	2,779	505.24	3,663	665.96
Totals	**3,730**	**982.68**	**94**	**10,217**	**3,083.39**	**13,947**	**4,066.07**

Table B-5 Estimated Inventory Totals

	Dry Inventory 3/13/2014			Pool Inventory		Site Inventory 12/31/2013	
Reactor Group	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Operating Sites	64,380	18,641.22	1,554	157,176	44,919.78	221,828	63,588.71
Group A Pre-2003	5,655	2,317.81	193	2,004	495.49	7,659	2,813.30
Shutdown Group B	432	58.29	9	2,884	525.62	3,044	556.21
Group A Post-2002	3,730	982.68	94	10,217	3,083.39	13,947	4,066.07
Grand Total	**74,197**	**22,000.01**	**1,850**	**172,281**	**49,024.29**	**246,478**	**71,024.30**

Appendix C
Reference Scenario: No Replacement Nuclear Generation Forecast – Discharged Fuel by Reactor

Table C-1. No Replacement Nuclear Generation Fuel Forecast: Discharges by Reactor

	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Arkansas Nuclear 1	1,043	482.35	420	194.74	975	452.07	2,438	1,129.15
Arkansas Nuclear 2	1,026	425.78	591	252.87	1,364	583.61	2,981	1,262.27
Beaver Valley 1	876	404.67	554	255.78	1,184	546.66	2,614	1,207.11
Beaver Valley 2	580	268.22	440	203.18	1,671	771.64	2,691	1,243.04
Braidwood 1	726	307.58	697	292.24	2,112	885.53	3,535	1,485.35
Braidwood 2	759	321.15	604	253.28	2,321	973.29	3,684	1,547.71
Browns Ferry 1	1,584	294.77	1,469	259.18	3,400	599.88	6,453	1,153.83
Browns Ferry 2	2,952	541.77	2,158	365.97	4,095	694.46	9,205	1,602.19
Browns Ferry 3	2,160	393.67	1,647	279.57	4,549	772.16	8,356	1,445.39
Brunswick 1	2,360	427.58	1,272	227.23	3,481	621.83	7,113	1,276.64
Brunswick 2	2,356	428.62	1,477	263.53	2,863	510.83	6,696	1,202.99
Byron 1	932	394.65	597	250.94	2,039	857.05	3,568	1,502.64
Byron 2	854	361.76	601	252.31	2,146	900.91	3,601	1,514.98
Callaway	1,118	479.04	670	279.51	2,180	909.46	3,968	1,668.01
Calvert Cliffs 1	1,242	477.45	529	215.72	1,161	473.45	2,932	1,166.62
Calvert Cliffs 2	1,068	409.44	534	216.05	1,305	527.99	2,907	1,153.48
Catawba 1	944	416.26	589	268.16	1,845	839.99	3,378	1,524.42
Catawba 2	836	366.16	682	310.50	1,817	827.23	3,335	1,503.90
Clinton	1,580	288.79	1,560	278.75	6,118	1,093.21	9,258	1,660.75

Table C-1 (continued).

	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Columbia Generating Station	2,244	394.68	1,714	302.06	5,017	884.16	8,975	1,580.90
Comanche Peak 1	744	319.60	637	265.36	2,629	1,095.16	4,010	1,680.12
Comanche Peak 2	529	221.11	622	257.99	2,716	1,126.52	3,867	1,605.62
Cooper	2,593	477.01	956	170.45	2,222	396.16	5,771	1,043.61
Davis-Besse	821	385.17	361	175.68	1,042	507.10	2,224	1,067.95
Diablo Canyon 1	908	397.20	627	264.30	1,886	795.02	3,421	1,456.52
Diablo Canyon 2	828	363.64	547	233.37	1,925	821.28	3,300	1,418.29
D.C. Cook 1	1,238	556.11	585	266.17	1,241	564.66	3,064	1,386.94
D.C. Cook 2	960	412.88	701	293.82	1,552	650.52	3,213	1,357.22
Dresden 2	3,741	678.72	1,498	258.61	2,565	442.82	7,804	1,380.15
Dresden 3	2,976	532.01	1,229	211.41	2,818	484.74	7,023	1,228.16
Duane Arnold	1,912	347.85	945	168.21	2,331	414.92	5,188	930.98
Hatch 1	3,079	560.00	1,161	206.91	3,025	539.10	7,265	1,306.01
Hatch 2	2,756	500.50	1,384	245.01	3,388	599.78	7,528	1,345.28
Fermi 2	1,708	304.58	1,601	274.72	4,757	816.26	8,066	1,395.56
Fort Calhoun	839	304.95	302	112.65	804	299.91	1,945	717.51
Grand Gulf 1	3,160	560.16	1,710	303.46	5,579	990.05	10,449	1,853.66
Robinson 2	1,149	498.94	425	184.88	790	343.65	2,364	1,027.46
Hope Creek 1	2,376	431.47	1,763	314.13	5,717	1,018.66	9,856	1,764.26
Indian Point 2	1,078	491.16	516	231.89	1,109	498.38	2,703	1,221.43

Table C-1 (continued).

Reactor [Unit]	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Indian Point 3	833	381.87	514	231.97	1,214	547.88	2,561	1,161.72
Fitzpatrick	2,664	483.71	996	178.77	2,716	487.49	6,376	1,149.98
Farley 1	1,050	473.60	570	241.24	1,221	516.77	2,841	1,231.61
Farley 2	961	430.15	479	202.64	1,443	610.47	2,883	1,243.27
La Salle 1	2,194	397.21	1,450	256.81	5,178	917.06	8,822	1,571.08
La Salle 2	1,912	347.34	2,015	357.12	5,715	1,012.87	9,642	1,717.33
Limerick 1	2,335	419.87	1,351	239.96	5,484	974.06	9,170	1,633.89
Limerick 2	2,266	404.09	1,661	294.76	5,677	1,007.42	9,604	1,706.27
McGuire 1	1,072	476.90	603	274.50	1,703	775.25	3,378	1,526.65
McGuire 2	1,020	453.43	588	267.69	1,869	850.87	3,477	1,571.99
Millstone 2	1,020	401.42	474	188.86	1,245	496.06	2,739	1,086.34
Millstone 3	654	300.82	539	245.35	1,972	897.65	3,165	1,443.83
Monticello	2,400	434.25	911	155.35	1,902	324.35	5,213	913.96
Nine Mile Point 1	2,524	458.37	1,015	172.45	2,034	345.58	5,573	976.40
Nine Mile Point 2	1,932	343.18	1,465	248.90	6,015	1,021.95	9,412	1,614.03
North Anna 1	926	427.76	518	240.74	1,208	561.41	2,652	1,229.90
North Anna 2	964	445.79	450	209.08	1,324	615.17	2,738	1,270.05
Oconee 1	1,186	553.04	433	201.11	905	420.33	2,524	1,174.48
Oconee 2	1,156	538.79	417	191.53	950	436.34	2,523	1,166.66
Oconee 3	1,103	513.70	497	234.77	1,015	479.46	2,615	1,227.94

Table C-1 (continued).

Reactor [Unit]	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Palisades	1,081	433.11	503	216.53	923	397.33	2,507	1,046.97
Palo Verde 1	948	399.46	697	304.43	2,344	1,023.80	3,989	1,727.69
Palo Verde 2	948	399.32	711	310.34	2,433	1,061.95	4,092	1,771.60
Palo Verde 3	851	358.99	826	360.70	2,514	1,097.81	4,191	1,817.49
Peach Bottom 2	3,594	648.16	1,456	260.72	3,535	632.99	8,585	1,541.87
Peach Bottom 3	3,333	605.13	1,715	304.87	3,611	641.92	8,659	1,551.92
Perry 1	2,088	378.36	1,790	321.06	5,444	976.44	9,322	1,675.86
Pilgrim 1	2,274	413.90	976	170.55	2,033	355.25	5,283	939.69
Point Beach 1	920	350.69	264	104.27	537	212.09	1,721	667.04
Point Beach 2	802	304.41	275	108.60	626	247.20	1,703	660.21
Prairie Island 1	909	336.62	299	105.04	852	299.31	2,060	740.97
Prairie Island 2	906	336.04	341	119.59	828	290.38	2,075	746.01
Quad Cities 1	3,161	569.96	1,490	259.05	3,159	549.23	7,810	1,378.24
Quad Cities 2	2,955	536.56	1,244	214.63	3,179	548.47	7,378	1,299.66
River Bend 1	2,148	383.88	1,462	256.42	4,428	776.64	8,038	1,416.94
Ginna	1,007	372.66	324	112.09	699	241.81	2,030	726.56
Saint Lucie 1	1,369	524.37	526	209.87	1,263	503.94	3,158	1,238.18
Saint Lucie 2	909	346.35	563	224.63	1,474	588.11	2,946	1,159.08
Salem 1	992	457.82	530	241.22	1,386	630.81	2,908	1,329.85
Salem 2	812	374.84	522	238.35	1,622	740.61	2,956	1,353.79

Table C-1 (continued).

	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Seabrook 1	624	287.24	575	261.21	2,198	998.49	3,397	1,546.94
Sequoyah 1	815	375.22	623	282.84	1,541	699.61	2,979	1,357.67
Sequoyah 2	884	407.35	568	257.87	1,700	771.80	3,152	1,437.02
Shearon Harris 1	577	259.14	520	238.16	1,618	741.04	2,715	1,238.34
South Texas 1	627	339.21	534	283.55	1,871	993.50	3,032	1,616.26
South Texas 2	627	338.56	509	270.28	1,939	1,029.61	3,075	1,638.44
Surry 1	1,015	464.27	507	234.13	939	433.63	2,461	1,132.03
Surry 2	998	456.86	443	204.46	1,043	481.39	2,484	1,142.71
Susquehanna 1	2,956	521.39	1,383	245.48	5,720	1,015.30	10,059	1,782.17
Susquehanna 2	2,584	455.50	1,722	305.65	5,968	1,059.32	10,274	1,820.47
Three Mile Island 1	898	416.08	426	207.06	882	428.70	2,206	1,051.84
Turkey Point 3	941	430.31	460	208.38	829	375.54	2,230	1,014.22
Turkey Point 4	939	429.57	384	173.95	994	450.28	2,317	1,053.81
Summer	812	353.86	466	194.32	1,447	603.40	2,725	1,151.58
Vogtle 1	900	397.26	612	259.01	2,243	949.29	3,755	1,605.57
Vogtle 2	739	323.56	641	271.16	2,367	1,001.29	3,747	1,596.01
Waterford 3	960	396.35	648	276.35	2,269	967.66	3,877	1,640.36
Watts Bar 1	297	136.55	564	259.44	2,359	1,085.14	3,220	1,481.13
Wolf Creek 1	925	427.26	588	268.30	1,984	905.30	3,497	1,600.87
Totals	**141,932**	**40,658.91**	**82,008**	**23,438.75**	**233,330**	**67,234.88**	**457,270**	**131,332.54**

Table C-2. No Replacement Nuclear Generation Fuel Discharges by Reactor (Group A Sites Shutdown before 2003)

	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Big Rock Point	526	69.53	-	-	-	-	526	69.53
Haddam Neck	1,102	447.17	-	-	-	-	1,102	447.17
Humboldt Bay	390	28.94	-	-	-	-	390	28.94
LaCrosse	334	38.09	-	-	-	-	334	38.09
Maine Yankee	1,434	542.26	-	-	-	-	1,434	542.26
Rancho Seco	493	228.38	-	-	-	-	493	228.38
Trojan	790	358.85	-	-	-	-	790	358.85
Yankee Rowe	533	127.13	-	-	-	-	533	127.13
Zion 1	1,143	523.95	-	-	-	-	1,143	523.95
Zion 2	1,083	495.49	-	-	-	-	1,083	495.49
Totals	**7,828**	**2,859.79**	**-**	**-**	**-**	**-**	**7,828**	**2,859.79**

Table C-3. No Replacement Nuclear Generation Fuel Discharges by Reactor (Shutdown Reactors at Group B Sites)

	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
Reactor [Unit]	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Dresden 1	892	90.86	-	-	-	-	892	90.86
Indian Point 1	160	30.58	-	-	-	-	160	30.58
Millstone 1	2,884	525.62	-	-	-	-	2,884	525.62
Totals	**3,936**	**647.07**	**-**	**-**	**-**	**-**	**3,936**	**647.07**

Table C-4. No Replacement Nuclear Generation Fuel Discharges by Reactor Site (Group A Sites Shutdown after 2002)

	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
Reactor [Unit]	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Kewaunee	904	347.60	431	165.73	-	-	1,335	513.33
Crystal River 3	824	382.32	495	229.67	-	-	1,319	611.98
San Onofre 1	665	244.61	-	-	-	-	665	244.61
San Onofre 2	1,097	454.86	737	304.87	-	-	1,834	759.74
San Onofre 3	999	412.18	735	304.05	-	-	1,734	716.23
Oyster Creek	2,800	503.51	867	149.12	993	170.80	4,660	823.43
Vermont Yankee	2,671	488.35	992	177.61	368	65.89	4,031	731.84
Totals	**9,960**	**2,833.44**	**4,257**	**1,331.04**	**1,361**	**236.68**	**15,578**	**4,401.16**

Table C-5. No Replacement Nuclear Generation Fuel Discharges by Reactor Site (Totals)

	Fuel Discharges Onsite as of 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Operating Reactors	141,932	40,658.91	82,008	23,438.75	233,330	67,234.88	457,270	131,332.54
Group A Pre-2003	7,828	2,859.79	-	-	-	-	7,828	2,859.79
Shutdown Group B	3,936	647.07	-	-	-	-	3,936	647.07
Group A Post-2002	9,960	2,833.44	4,257	1,331.04	1,361	236.68	15,578	4,401.16
Grand Total	**163,656**	**46,999.20**	**86,265**	**24,769.80**	**234,691**	**67,471.56**	**484,612**	**139,240.56**

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Appendix D
Reference Scenario: No Replacement Nuclear Generation Forecast – Discharged Fuel by State

Table D-1. Estimated and Projected Inventory by State

State	Fuel Discharged Prior to 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel		Past Inter-State Transfer Adjustments		State's Forecasted Remaining Inventory	
	Assy.	Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Alabama	8,707	2,134	6,323	1,349	14,708	3,194	29,738	6,676	-	-	29,738	6,676
Arizona	2,747	1,158	2,234	975	7,291	3,184	12,272	5,317	-	-	12,272	5,317
Arkansas	2,069	908	1,011	448	2,339	1,036	5,419	2,391	-	-	5,419	2,391
California	5,380	2,130	2,646	1,107	3,811	1,616	11,837	4,853	(270)	(98)	11,567	4,754
Connecticut	5,660	1,675	1,013	434	3,217	1,394	9,890	3,503	(83)	(35)	9,807	3,468
Florida	4,982	2,113	2,428	1,047	4,560	1,918	11,970	5,077	(18)	(8)	11,952	5,069
Georgia	7,474	1,781	3,798	982	11,023	3,089	22,295	5,853	-	-	22,295	5,853
Idaho	-	-	-	-	-	-	-	-	225	70	225	70
Illinois	24,908	5,846	12,985	2,885	37,350	8,665	75,243	17,396	2,461	529	77,704	17,925
Iowa	1,912	348	945	168	2,331	415	5,188	931	-	-	5,188	931
Kansas	925	427	588	268	1,984	905	3,497	1,601	-	-	3,497	1,601
Louisiana	3,108	780	2,110	533	6,697	1,744	11,915	3,057	-	-	11,915	3,057
Maine	1,434	542	-	-	-	-	1,434	542	-	-	1,434	542
Maryland	2,310	887	1,063	432	2,466	1,001	5,839	2,320	-	-	5,839	2,320
Massachusetts	2,807	541	976	171	2,033	355	5,816	1,067	-	-	5,816	1,067
Michigan	5,513	1,776	3,390	1,051	8,473	2,429	17,376	5,256	(85)	(11)	17,291	5,245
Minnesota	4,215	1,107	1,551	380	3,582	914	9,348	2,401	(1,058)	(198)	8,290	2,203
Mississippi	3,160	560	1,710	303	5,579	990	10,449	1,854	-	-	10,449	1,854

Table D-1 (continued).

State	Fuel Discharged Prior to 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel		Past Inter-State Transfer Adjustments		State's Forecasted Remaining Inventory	
	Assy.	Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Missouri	1,118	479	670	280	2,180	909	3,968	1,668	-	-	3,968	1,668
Nebraska	3,432	782	1,258	283	3,026	696	7,716	1,761	(1,054)	(198)	6,662	1,563
New Hampshire	624	287	575	261	2,198	998	3,397	1,547	-	-	3,397	1,547
New Jersey	6,980	1,768	3,682	943	9,718	2,561	20,380	5,271	-	-	20,380	5,271
New York	10,198	2,562	4,830	1,176	13,787	3,143	28,815	6,881	(40)	(15)	28,775	6,865
North Carolina	7,385	2,046	4,460	1,271	11,534	3,500	23,379	6,817	808	351	24,187	7,168
Ohio	2,909	764	2,151	497	6,486	1,484	11,546	2,744	-	-	11,546	2,744
Oregon	790	359	-	-	-	-	790	359	-	-	790	359
Pennsylvania	19,422	4,143	10,708	2,317	33,732	7,078	63,862	13,539	(2)	(0.38)	63,860	13,538
South Carolina	7,186	3,241	3,509	1,585	8,769	3,950	19,464	8,776	(808)	(352)	18,656	8,425
Tennessee	1,996	919	1,755	800	5,600	2,557	9,351	4,276	-	-	9,351	4,276
Texas	2,527	1,218	2,302	1,077	9,155	4,245	13,984	6,540	-	-	13,984	6,540
Vermont	2,671	488	992	178	368	66	4,031	732	-	-	4,031	732
Virginia	3,903	1,795	1,918	888	4,514	2,092	10,335	4,775	(69)	(31)	10,266	4,743
Washington	2,244	395	1,714	302	5,017	884	8,975	1,581	-	-	8,975	1,581
Wisconsin	2,960	1,041	970	379	1,163	459	5,093	1,879	(7)	(2)	5,086	1,876
Totals	**163,656**	**46,999**	**86,265**	**24,770**	**234,691**	**67,472**	**484,612**	**139,241**	**-**	**-**	**484,612**	**139,241**

Table D-2. Estimated Inventory by State and by Storage Configuration at the end of 2013

	Dry Inventory			Pool Inventory		Site Inventory	
State	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Alabama	3,764	856	67	11,266	2,627	15,030	3,483
Arizona	2,736	1,172	114	2,245	961	4,981	2,133
Arkansas	1,632	718	62	1,448	637	3,080	1,356
California	2,998	1,132	105	4,758	2,006	7,756	3,138
Connecticut	1,595	656	58	4,995	1,418	6,590	2,074
Florida	1,408	585	44	5,984	2,566	7,392	3,151
Georgia	4,000	771	62	7,272	1,993	11,272	2,763
Idaho	225	70	-	-	-	225	70
Illinois	7,898	2,036	130	32,456	7,224	40,354	9,260
Iowa	1,220	220	20	1,637	296	2,857	516
Kansas	-	-	-	1,513	696	1,513	696
Louisiana	1,708	403	32	3,510	910	5,218	1,313
Maine	1,434	542	60	-	-	1,434	542
Maryland	1,920	751	72	1,453	568	3,373	1,319
Massachusetts	533	127	15	3,250	584	3,783	712
Michigan	1,921	676	61	6,897	2,140	8,818	2,816
Minnesota	2,315	675	50	2,393	614	4,708	1,289
Mississippi	1,564	277	23	3,306	586	4,870	864
Missouri	-	-	-	1,788	759	1,788	759
Nebraska	808	206	18	2,828	661	3,636	867
New Hampshire	448	205	14	751	344	1,199	548
New Jersey	3,139	705	57	7,523	2,005	10,662	2,710
New York	3,428	837	69	11,560	2,886	14,988	3,722
North Carolina	2,079	671	57	10,574	2,997	12,653	3,668
Ohio	480	108	9	4,580	1,153	5,060	1,260
Oregon	790	359	34	-	-	790	359
Pennsylvania	10,270	1,832	165	19,858	4,628	30,128	6,460
South Carolina	4,210	1,936	180	5,677	2,538	9,887	4,474
Tennessee	1,280	586	40	2,471	1,133	3,751	1,719
Texas	576	242	18	4,253	2,054	4,829	2,296
Vermont	884	161	13	2,779	505	3,663	666
Virginia	3,614	1,664	122	2,138	987	5,752	2,652
Washington	1,836	323	27	2,122	374	3,958	697
Wisconsin	1,709	566	52	2,214	851	3,923	1,417
Totals	**74,422**	**22,070**	**1,850**	**175,499**	**49,699**	**249,921**	**71,769**

Table D-3. Estimated Pool Inventory of Group A Sites by State at the end of 2013

State	A1		A2		A3		A	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
California	-	-	2,776	1,148	-	-	2,776	1,148
Florida	-	-	-	-	1,319	612	1,319	612
Illinois*	2,004	495	-	-	-	-	2,004	495
Wisconsin	-	-	1,079	415	-	-	1,079	415
Totals	**2,004**	**495**	**3,855**	**1,563**	**1,319**	**612**	**7,178**	**2,671**

* Includes 2,004 assemblies currently in wet storage at Zion that are expected to be in dry storage by the end of 2014

Table D-4. Estimated Pool Inventory of Group B Sites by State at the end of 2013

State	B2		B3		B	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Connecticut	4,995	1,418	-	-	4,995	1,418
Illinois	5,704	957	-	-	5,704	957
New York	2,269	1,031	-	-	2,269	1,031
Totals	**12,968**	**3,407**	**-**	**-**	**12,968**	**3,407**

Table D-5. Estimated Pool Inventory of Group C Sites by State at the end of 2013

	C2		C3		C	
State	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**
Alabama	11,266	2,627	-	-	11,266	2,627
Arizona	2,245	961	-	-	2,245	961
Arkansas	1,448	637	-	-	1,448	637
California	1,982	857	-	-	1,982	857
Florida	4,665	1,954	-	-	4,665	1,954
Georgia	7,272	1,993	-	-	7,272	1,993
Illinois	18,391	4,530	3,140	568	21,531	5,097
Iowa	1,637	296	-	-	1,637	296
Kansas	-	-	1,513	696	1,513	696
Louisiana	3,510	910	-	-	3,510	910
Maryland	1,453	568	-	-	1,453	568
Massachusetts	-	-	3,250	584	3,250	584
Michigan	3,588	1,561	3,309	579	6,897	2,140
Minnesota	2,393	614	-	-	2,393	614
Mississippi	3,306	586	-	-	3,306	586
Missouri	-	-	1,788	759	1,788	759
Nebraska	2,828	661	-	-	2,828	661
New Hampshire	751	344	-	-	751	344
New Jersey	7,523	2,005	-	-	7,523	2,005
New York	9,291	1,854	-	-	9,291	1,854
North Carolina	4,582	1,496	5,992	1,501	10,574	2,997
Ohio	4,580	1,153	-	-	4,580	1,153
Pennsylvania	16,084	2,873	3,774	1,755	19,858	4,628
South Carolina	4,398	1,989	1,278	548	5,676	2,538
Tennessee	1,610	737	861	396	2,471	1,133
Texas	1,956	822	2,297	1,232	4,253	2,054
Vermont	2,779	505	-	-	2,779	505
Virginia	2,138	987	-	-	2,138	987
Washington	2,122	374	-	-	2,122	374
Wisconsin	1,135	436	-	-	1,135	436
Totals	**124,933**	**34,330**	**27,202**	**8,617**	**152,135**	**42,947**

Table D-6. Estimated Pool Inventory of Group D & F Sites by State at the end of 2013

State	D		F	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Illinois	-	-	3,217	674
South Carolina	1	0.12	-	-
Totals	**1**	**0.12**	**3,217**	**674**

Table D-7. Estimated Pool Inventory by Group and by State at the end of 2013

State	A		B		C		D		F		Totals	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Alabama	-	-	-	-	11,266	2,627	-	-	-	-	11,266	2,627
Arizona	-	-	-	-	2,245	961	-	-	-	-	2,245	961
Arkansas	-	-	-	-	1,448	637	-	-	-	-	1,448	637
California	2,776	1,148	-	-	1,982	857	-	-	-	-	4,758	2,006
Connecticut	-	-	4,995	1,418	-	-	-	-	-	-	4,995	1,418
Florida	1,319	612	-	-	4,665	1,954	-	-	-	-	5,984	2,566
Georgia	-	-	-	-	7,272	1,993	-	-	-	-	7,272	1,993
Illinois*	2,004	495	5,704	957	21,531	5,097	-	-	3,217	674	32,456	7,224
Iowa	-	-	-	-	1,637	296	-	-	-	-	1,637	296
Kansas	-	-	-	-	1,513	696	-	-	-	-	1,513	696
Louisiana	-	-	-	-	3,510	910	-	-	-	-	3,510	910
Maryland	-	-	-	-	1,453	568	-	-	-	-	1,453	568
Massachusetts	-	-	-	-	3,250	584	-	-	-	-	3,250	584
Michigan	-	-	-	-	6,897	2,140	-	-	-	-	6,897	2,140
Minnesota	-	-	-	-	2,393	614	-	-	-	-	2,393	614
Mississippi	-	-	-	-	3,306	586	-	-	-	-	3,306	586
Missouri	-	-	-	-	1,788	759	-	-	-	-	1,788	759
Nebraska	-	-	-	-	2,828	661	-	-	-	-	2,828	661
New Hampshire	-	-	-	-	751	344	-	-	-	-	751	344

Table D-7 (continued).

State	A		B		C		D		F		Totals	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
New Jersey	-	-	-	-	7,523	2,005	-	-	-	-	7,523	2,005
New York	-	-	2,269	1,031	9,291	1,854	-	-	-	-	11,560	2,886
North Carolina	-	-	-	-	10,574	2,997	-	-	-	-	10,574	2,997
Ohio	-	-	-	-	4,580	1,153	-	-	-	-	4,580	1,153
Pennsylvania	-	-	-	-	19,858	4,628	-	-	-	-	19,858	4,628
South Carolina	-	-	-	-	5,676	2,538	1	0.12	-	-	5,677	2,538
Tennessee	-	-	-	-	2,471	1,133	-	-	-	-	2,471	1,133
Texas	-	-	-	-	4,253	2,054	-	-	-	-	4,253	2,054
Vermont	-	-	-	-	2,779	505	-	-	-	-	2,779	505
Virginia	-	-	-	-	2,138	987	-	-	-	-	2,138	987
Washington	-	-	-	-	2,122	374	-	-	-	-	2,122	374
Wisconsin	1,079	415	-	-	1,135	436	-	-	-	-	2,214	851
Totals	**7,178**	**2,671**	**12,968**	**3,407**	**152,135**	**42,947**	**1**	**0.12**	**3,217**	**674**	**175,499**	**49,699**

* Includes 2,004 assemblies currently in wet storage at Zion that are expected to be in dry storage by the end of 2014

Table D-8. Estimated Dry Inventory of Group A Sites by State at the end of 2013

	A1			A2			A3			A		
State	**Assy.**	**Estimated Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Estimated Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Estimated Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Estimated Initial Uranium (MT)**	**Fuel Casks**
California	883	257	26	1,187	474	50	-	-	-	2,070	731	76
Connecticut	1,019	412	40	-	-	-	-	-	-	1,019	412	40
Illinois	222	524	6	-	-	-	-	-	-	222	524	6
Maine	1,434	542	60	-	-	-	-	-	-	1,434	542	60
Massachusetts	533	127	15	-	-	-	-	-	-	533	127	15
Michigan	441	58	7	-	-	-	-	-	-	441	58	7
Oregon	790	359	34	-	-	-	-	-	-	790	359	34
Wisconsin	333	38	5	256	98	8	-	-	-	589	136	13
Totals	**5,655**	**2,318**	**193**	**1,443**	**572**	**58**	**-**	**-**	**-**	**7,098**	**2,890**	**251**

Table D-9. Estimated Dry Inventory of Group B Sites by State at the end of 2013

State	B2			B3			B		
	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks
Connecticut	576	244	18	-	-	-	576	244	18
Illinois	3,876	669	57	-	-	-	3,876	669	57
New York	832	336	26	-	-	-	832	336	26
Totals	**5,284**	**1,249**	**101**	**-**	**-**	**-**	**5,284**	**1,249**	**101**

Table D-10. Estimated Dry Inventory of Group C Sites by State at the end of 2013

State	C2			C3			C		
	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks
Alabama	3,764	856	67	-	-	-	3,764	856	67
Arizona	2,736	1,172	114	-	-	-	2,736	1,172	114
Arkansas	1,632	718	62	-	-	-	1,632	718	62
California	928	401	29	-	-	-	928	401	29
Florida	1,408	585	44	-	-	-	1,408	585	44
Georgia	4,000	771	62	-	-	-	4,000	771	62
Illinois	3,800	843	67	-	-	-	3,800	843	67
Iowa	1,220	220	20	-	-	-	1,220	220	20
Louisiana	1,708	403	32	-	-	-	1,708	403	32
Maryland	1,920	751	72	-	-	-	1,920	751	72
Michigan	1,480	618	54	-	-	-	1,480	618	54
Minnesota	2,315	675	50	-	-	-	2,315	675	50
Mississippi	1,564	277	23	-	-	-	1,564	277	23
Nebraska	808	206	18	-	-	-	808	206	18
New Hampshire	448	205	14	-	-	-	448	205	14
New Jersey	3,139	705	57	-	-	-	3,139	705	57
New York	2,596	500	43	-	-	-	2,596	500	43
North Carolina	2,079	671	57	-	-	-	2,079	671	57
Ohio	480	108	9	-	-	-	480	108	9
Pennsylvania	10,270	1,832	165	-	-	-	10,270	1,832	165
South Carolina	4,210	1,936	180	-	-	-	4,210	1,936	180
Tennessee	1,280	586	40	-	-	-	1,280	586	40
Texas	576	242	18	-	-	-	576	242	18
Vermont	884	161	13	-	-	-	884	161	13
Virginia	3,614	1,664	122	-	-	-	3,614	1,664	122
Washington	1,836	323	27	-	-	-	1,836	323	27
Wisconsin	1,120	430	39	-	-	-	1,120	430	39
Totals	**61,815**	**17,861**	**1,498**	**-**	**-**	**-**	**61,815**	**17,861**	**1,498**

Table D-11. Estimated Dry Inventory of Group D & F Sites by State at the end of 2013

	D			F		
State	**Assy.**	**Estimated Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Estimated Initial Uranium (MT)**	**Fuel Casks**
Idaho	225	70.3	-	-	-	-
Totals	**225**	**70.3**	**-**	**-**	**-**	**-**

Table D-12. Estimated Dry Inventory by Group by State at the end of 2013

State	A			B			C			D		Totals		
	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Fuel Casks
Alabama	-	-	-	-	-	-	3,764	856	67	-	-	3,764	856	67
Arizona	-	-	-	-	-	-	2,736	1,172	114	-	-	2,736	1,172	114
Arkansas	-	-	-	-	-	-	1,632	718	62	-	-	1,632	718	62
California	2,070	731	76	-	-	-	928	401	29	-	-	2,998	1,132	105
Connecticut	1,019	412	40	576	244	18	-	-	-	-	-	1,595	656	58
Florida	-	-	-	-	-	-	1,408	585	44	-	-	1,408	585	44
Georgia	-	-	-	-	-	-	4,000	771	62	-	-	4,000	771	62
Idaho	-	-	-	-	-	-	-	-	-	225	70.3	225	70.3	-
Illinois	222	524	6	3,876	669	57	3,800	843	67	-	-	7,898	2,036	130
Iowa	-	-	-	-	-	-	1,220	220	20	-	-	1,220	220	20
Louisiana	-	-	-	-	-	-	1,708	403	32	-	-	1,708	403	32
Maine	1,434	542	60	-	-	-	-	-	-	-	-	1,434	542	60
Maryland	-	-	-	-	-	-	1,920	751	72	-	-	1,920	751	72
Massachusetts	533	127	15	-	-	-	-	-	-	-	-	533	127	15
Michigan	441	58	7	-	-	-	1,480	618	54	-	-	1,921	676	61
Minnesota	-	-	-	-	-	-	2,315	675	50	-	-	2,315	675	50
Mississippi	-	-	-	-	-	-	1,564	277	23	-	-	1,564	277	23
Nebraska	-	-	-	-	-	-	808	206	18	-	-	808	206	18
New Hampshire	-	-	-	-	-	-	448	205	14	-	-	448	205	14

Table D-12 (continued).

State	A Assy.	A Estimated Initial Uranium (MT)	A Fuel Casks	B Assy.	B Estimated Initial Uranium (MT)	B Fuel Casks	C Assy.	C Estimated Initial Uranium (MT)	C Fuel Casks	D Assy.	D Estimated Initial Uranium (MT)	Totals Assy.	Totals Estimated Initial Uranium (MT)	Totals Fuel Casks
New Jersey	-	-	-	-	-	-	3,139	705	57	-	-	3,139	705	57
New York	-	-	-	832	336	26	2,596	500	43	-	-	3,428	837	69
North Carolina	-	-	-	-	-	-	2,079	671	57	-	-	2,079	671	57
Ohio	-	-	-	-	-	-	480	108	9	-	-	480	108	9
Oregon	790	359	34	-	-	-	-	-	-	-	-	790	359	34
Pennsylvania	-	-	-	-	-	-	10,270	1,832	165	-	-	10,270	1,832	165
South Carolina	-	-	-	-	-	-	4,210	1,936	180	-	-	4,210	1,936	180
Tennessee	-	-	-	-	-	-	1,280	586	40	-	-	1,280	586	40
Texas	-	-	-	-	-	-	576	242	18	-	-	576	242	18
Vermont	-	-	-	-	-	-	884	161	13	-	-	884	161	13
Virginia	-	-	-	-	-	-	3,614	1,664	122	-	-	3,614	1,664	122
Washington	-	-	-	-	-	-	1,836	323	27	-	-	1,836	323	27
Wisconsin	589	136	13	-	-	-	1,120	430	39	-	-	1,709	566	52
Totals	**7,098**	**2,890**	**251**	**5,284**	**1,249**	**101**	**61,815**	**17,861**	**1,498**	**225**	**70.3**	**74,422**	**22,070**	**1,850**

Table D-13. Estimated Total Inventory of Group A Sites by State at the end of 2013

State	A1		A2		A3		A	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
California	883	257	3,963	1,622	-	-	4,846	1,879
Connecticut	1,019	412	-	-	-	-	1,019	412
Florida	-	-	-	-	1,319	612	1,319	612
Illinois	2,226	1,019	-	-	-	-	2,226	1,019
Maine	1,434	542	-	-	-	-	1,434	542
Massachusetts	533	127	-	-	-	-	533	127
Michigan	441	58	-	-	-	-	441	58
Oregon	790	359	-	-	-	-	790	359
Wisconsin	333	38	1,335	513	-	-	1,668	551
Totals	**7,659**	**2,813**	**5,298**	**2,135**	**1,319**	**612**	**14,276**	**5,561**

Table D-14. Estimated Total Inventory of Group B Sites by State at the end of 2013

State	B2		B3		B	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Connecticut	5,571	1,662	-	-	5,571	1,662
Illinois	9,580	1,626	-	-	9,580	1,626
New York	3,101	1,367	-	-	3,101	1,367
Totals	**18,252**	**4,656**	**-**	**-**	**18,252**	**4,656**

Table D-15. Estimated Total Inventory of Group A Sites by State at the end of 2013

	C2		C3		C	
State	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**
Alabama	15,030	3,483	-	-	15,030	3,483
Arizona	4,981	2,133	-	-	4,981	2,133
Arkansas	3,080	1,356	-	-	3,080	1,356
California	2,910	1,259	-	-	2,910	1,259
Florida	6,073	2,539	-	-	6,073	2,539
Georgia	11,272	2,763	-	-	11,272	2,763
Illinois	22,191	5,373	3,140	568	25,331	5,940
Iowa	2,857	516	-	-	2,857	516
Kansas	-	-	1,513	696	1,513	696
Louisiana	5,218	1,313	-	-	5,218	1,313
Maryland	3,373	1,319	-	-	3,373	1,319
Massachusetts	-	-	3,250	584	3,250	584
Michigan	5,068	2,179	3,309	579	8,377	2,758
Minnesota	4,708	1,289	-	-	4,708	1,289
Mississippi	4,870	864	-	-	4,870	864
Missouri	-	-	1,788	759	1,788	759
Nebraska	3,636	867	-	-	3,636	867
New Hampshire	1,199	548	-	-	1,199	548
New Jersey	10,662	2,710	-	-	10,662	2,710
New York	11,887	2,355	-	-	11,887	2,355
North Carolina	6,661	2,167	5,992	1,501	12,653	3,668
Ohio	5,060	1,260	-	-	5,060	1,260
Pennsylvania	26,354	4,705	3,774	1,755	30,128	6,460
South Carolina	8,608	3,926	1,278	548	9,886	4,474
Tennessee	2,890	1,323	861	396	3,751	1,719
Texas	2,532	1,064	2,297	1,232	4,829	2,296
Vermont	3,663	666	-	-	3,663	666
Virginia	5,752	2,652	-	-	5,752	2,652
Washington	3,958	697	-	-	3,958	697
Wisconsin	2,255	866	-	-	2,255	866
Totals	**186,748**	**52,191**	**27,202**	**8,617**	**213,950**	**60,808**

Table D-16. Estimated Total Inventory of Group A Sites by State at the end of 2013

	D		F	
State	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**
Idaho	225	70.3	-	-
Illinois	-	-	3,217	674
South Carolina	1	0.12	-	-
Totals	**226**	**70.42**	**3,217**	**674**

Table D-17. Estimated Total Inventory of Group A Sites by State at the end of 2013

State	A		B		C		D		F		Totals	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Alabama	-	-	-	-	15,030	3,483	-	-	-	-	15,030	3,483
Arizona	-	-	-	-	4,981	2,133	-	-	-	-	4,981	2,133
Arkansas	-	-	-	-	3,080	1,356	-	-	-	-	3,080	1,356
California	4,846	1,879	-	-	2,910	1,259	-	-	-	-	7,756	3,138
Connecticut	1,019	412	5,571	1,662	-	-	-	-	-	-	6,590	2,074
Florida	1,319	612	-	-	6,073	2,539	-	-	-	-	7,392	3,151
Georgia	-	-	-	-	11,272	2,763	-	-	-	-	11,272	2,763
Idaho	-	-	-	-	-	-	225	70	-	-	225	70
Illinois	2,226	1,019	9,580	1,626	25,331	5,940	-	-	3,217	674	40,354	9,260
Iowa	-	-	-	-	2,857	516	-	-	-	-	2,857	516
Kansas	-	-	-	-	1,513	696	-	-	-	-	1,513	696
Louisiana	-	-	-	-	5,218	1,313	-	-	-	-	5,218	1,313
Maine	1,434	542	-	-	-	-	-	-	-	-	1,434	542
Maryland	-	-	-	-	3,373	1,319	-	-	-	-	3,373	1,319
Massachusetts	533	127	-	-	3,250	584	-	-	-	-	3,783	712
Michigan	441	58	-	-	8,377	2,758	-	-	-	-	8,818	2,816
Minnesota	-	-	-	-	4,708	1,289	-	-	-	-	4,708	1,289
Mississippi	-	-	-	-	4,870	864	-	-	-	-	4,870	864
Missouri	-	-	-	-	1,788	759	-	-	-	-	1,788	759

Table D-17 (continued).

State	A		B		C		D		F		Totals	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Nebraska	-	-	-	-	3,636	867	-	-	-	-	3,636	867
New Hampshire	-	-	-	-	1,199	548	-	-	-	-	1,199	548
New Jersey	-	-	-	-	10,662	2,710	-	-	-	-	10,662	2,710
New York	-	-	3,101	1,367	11,887	2,355	-	-	-	-	14,988	3,722
North Carolina	-	-	-	-	12,653	3,668	-	-	-	-	12,653	3,668
Ohio	-	-	-	-	5,060	1,260	-	-	-	-	5,060	1,260
Oregon	790	359	-	-	-	-	-	-	-	-	790	359
Pennsylvania	-	-	-	-	30,128	6,460	-	-	-	-	30,128	6,460
South Carolina	-	-	-	-	9,886	4,474	1	0.12	-	-	9,887	4,474
Tennessee	-	-	-	-	3,751	1,719	-	-	-	-	3,751	1,719
Texas	-	-	-	-	4,829	2,296	-	-	-	-	4,829	2,296
Vermont	-	-	-	-	3,663	666	-	-	-	-	3,663	666
Virginia	-	-	-	-	5,752	2,652	-	-	-	-	5,752	2,652
Washington	-	-	-	-	3,958	697	-	-	-	-	3,958	697
Wisconsin	1,668	551	-	-	2,255	866	-	-	-	-	3,923	1,417
Totals	**14,276**	**5,561**	**18,252**	**4,656**	**213,950**	**60,808**	**226**	**70**	**3,217**	**674**	**249,921**	**71,769**

Table D-18. Projected Inventory for Current Group A Sites by State through 2060

	A1		A2		A3		A	
State	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
California	883	257	3,963	1,622	-	-	4,846	1,879
Connecticut	1,019	412	-	-	-	-	1,019	412
Florida	-	-	-	-	1,319	612	1,319	612
Illinois	2,226	1,019	-	-	-	-	2,226	1,019
Maine	1,434	542	-	-	-	-	1,434	542
Massachusetts	533	127	-	-	-	-	533	127
Michigan	441	58	-	-	-	-	441	58
Oregon	790	359	-	-	-	-	790	359
Wisconsin	333	38	1,335	513	-	-	1,668	551
Totals	**7,659**	**2,813**	**5,298**	**2,135**	**1,319**	**612**	**14,276**	**5,561**

Table D-19. Projected Inventory for Current Group B Sites by State through 2060

	B2		B3		B	
State	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Connecticut	8,788	3,056	-	-	8,788	3,056
Illinois	14,963	2,554	-	-	14,963	2,554
New York	5,424	2,414	-	-	5,424	2,414
Totals	**29,175**	**8,023**	**-**	**-**	**29,175**	**8,023**

Table D-20. Projected Inventory for Current Group C Sites by State through 2060

State	C2		C3		C	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Alabama	29,738	6,676	-	-	29,738	6,676
Arizona	12,272	5,317	-	-	12,272	5,317
Arkansas	5,419	2,391	-	-	5,419	2,391
California	6,721	2,875	-	-	6,721	2,875
Florida	10,633	4,457	-	-	10,633	4,457
Georgia	22,295	5,853	-	-	22,295	5,853
Illinois	48,040	12,017	9,258	1,661	57,298	13,678
Iowa	5,188	931	-	-	5,188	931
Kansas	-	-	3,497	1,601	3,497	1,601
Louisiana	11,915	3,057	-	-	11,915	3,057
Maryland	5,839	2,320	-	-	5,839	2,320
Massachusetts	-	-	5,283	940	5,283	940
Michigan	8,784	3,791	8,066	1,396	16,850	5,187
Minnesota	8,290	2,203	-	-	8,290	2,203
Mississippi	10,449	1,854	-	-	10,449	1,854
Missouri	-	-	3,968	1,668	3,968	1,668
Nebraska	6,662	1,563	-	-	6,662	1,563
New Hampshire	3,397	1,547	-	-	3,397	1,547
New Jersey	20,380	5,271	-	-	20,380	5,271
New York	23,351	4,452	-	-	23,351	4,452
North Carolina	16,577	4,926	7,610	2,242	24,187	7,168
Ohio	11,546	2,744	-	-	11,546	2,744
Pennsylvania	56,349	10,036	7,511	3,502	63,860	13,538
South Carolina	15,930	7,273	2,725	1,152	18,655	8,424
Tennessee	6,131	2,795	3,220	1,481	9,351	4,276
Texas	7,877	3,286	6,107	3,255	13,984	6,540
Vermont	4,031	732	-	-	4,031	732
Virginia	10,266	4,743	-	-	10,266	4,743
Washington	8,975	1,581	-	-	8,975	1,581
Wisconsin	3,418	1,325	-	-	3,418	1,325
Totals	**380,473**	**106,016**	**57,245**	**18,896**	**437,718**	**124,912**

Table D-21. Projected Inventory for Group D & F Sites by State through 2060

	D		F	
State	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**
Idaho	225	70.3	-	-
Illinois	-	-	3,217	674
South Carolina	1	0.12	-	-
Totals	**226**	**70.42**	**3,217**	**674**

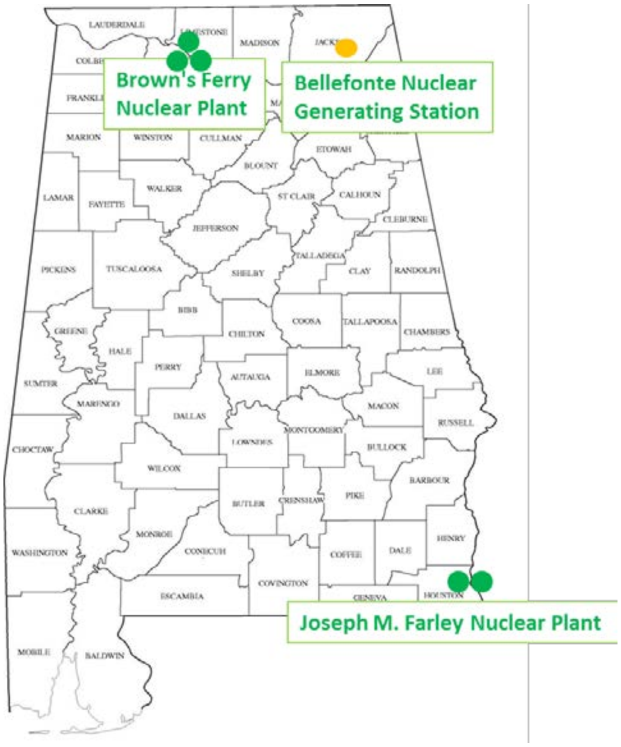
Table D-22. Projected Inventory by Current Group and by State through 2060

State	A		B		C		D		F		Totals	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Alabama	-	-	-	-	29,738	6,676	-	-	-	-	29,738	6,676
Arizona	-	-	-	-	12,272	5,317	-	-	-	-	12,272	5,317
Arkansas	-	-	-	-	5,419	2,391	-	-	-	-	5,419	2,391
California	4,846	1,879	-	-	6,721	2,875	-	-	-	-	11,567	4,754
Connecticut	1,019	412	8,788	3,056	-	-	-	-	-	-	9,807	3,468
Florida	1,319	612	-	-	10,633	4,457	-	-	-	-	11,952	5,069
Georgia	-	-	-	-	22,295	5,853	-	-	-	-	22,295	5,853
Idaho	-	-	-	-	-	-	225	70	-	-	225	70
Illinois	2,226	1,019	14,963	2,554	57,298	13,678	-	-	3,217	674	77,704	17,925
Iowa	-	-	-	-	5,188	931	-	-	-	-	5,188	931
Kansas	-	-	-	-	3,497	1,601	-	-	-	-	3,497	1,601
Louisiana	-	-	-	-	11,915	3,057	-	-	-	-	11,915	3,057
Maine	1,434	542	-	-	-	-	-	-	-	-	1,434	542
Maryland	-	-	-	-	5,839	2,320	-	-	-	-	5,839	2,320
Massachusetts	533	127	-	-	5,283	940	-	-	-	-	5,816	1,067
Michigan	441	58	-	-	16,850	5,187	-	-	-	-	17,291	5,245
Minnesota	-	-	-	-	8,290	2,203	-	-	-	-	8,290	2,203
Mississippi	-	-	-	-	10,449	1,854	-	-	-	-	10,449	1,854
Missouri	-	-	-	-	3,968	1,668	-	-	-	-	3,968	1,668

Table D-22 (continued).

State	A		B		C		D		F		Totals	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Nebraska	-	-	-	-	6,662	1,563	-	-	-	-	6,662	1,563
New Hampshire	-	-	-	-	3,397	1,547	-	-	-	-	3,397	1,547
New Jersey	-	-	-	-	20,380	5,271	-	-	-	-	20,380	5,271
New York	-	-	5,424	2,414	23,351	4,452	-	-	-	-	28,775	6,865
North Carolina	-	-	-	-	24,187	7,168	-	-	-	-	24,187	7,168
Ohio	-	-	-	-	11,546	2,744	-	-	-	-	11,546	2,744
Oregon	790	359	-	-	-	-	-	-	-	-	790	359
Pennsylvania	-	-	-	-	63,860	13,538	-	-	-	-	63,860	13,538
South Carolina	-	-	-	-	18,655	8,424	1	0.12	-	-	18,656	8,425
Tennessee	-	-	-	-	9,351	4,276	-	-	-	-	9,351	4,276
Texas	-	-	-	-	13,984	6,540	-	-	-	-	13,984	6,540
Vermont	-	-	-	-	4,031	732	-	-	-	-	4,031	732
Virginia	-	-	-	-	10,266	4,743	-	-	-	-	10,266	4,743
Washington	-	-	-	-	8,975	1,581	-	-	-	-	8,975	1,581
Wisconsin	1,668	551	-	-	3,418	1,325	-	-	-	-	5,086	1,876
Totals	**14,276**	**5,561**	**29,175**	**8,023**	**437,718**	**124,912**	**226**	**70**	**3,217**	**674**	**484,612**	**139,241**

Alabama

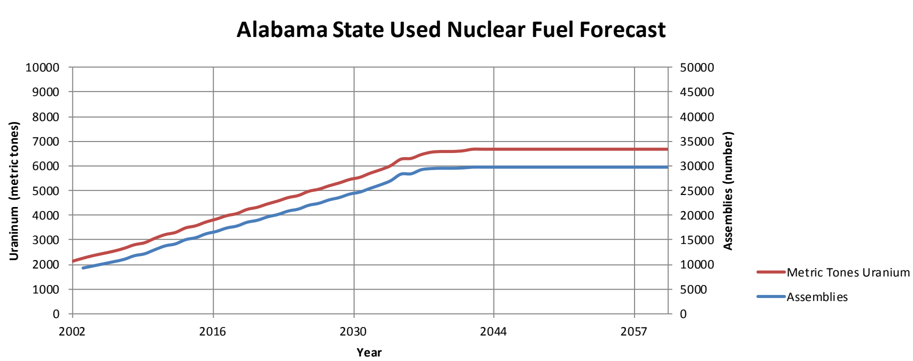


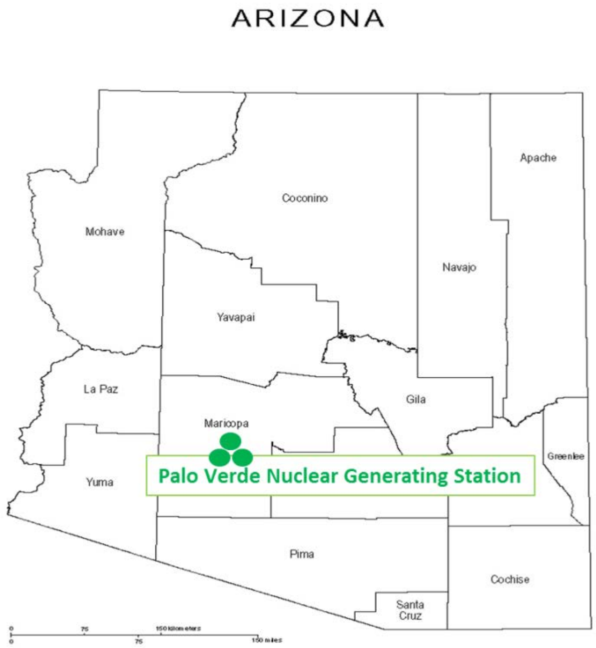
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power
Browns Ferry Nuclear Plant, Unit 1	Tenessee Valley Authority	BWR-MARK 1	12/20/2033	12/20/2033	3,458
Browns Ferry Nuclear Plant, Unit 2		BWR-MARK 1	6/28/2034	6/28/2034	3,458
Browns Ferry Nuclear Plant, Unit 3		BWR-MARK 1	7/2/2036	7/2/2036	3,458
Joseph M. Farley Nuclear Plant, Unit 1	Southern Nuclear Operating Co.	PWR-DRYAMB	6/25/2037	6/25/2037	2,775
Joseph M. Farley Nuclear Plant, Unit 2		PWR-DRYAMB	3/31/2041	3/31/2041	2,775

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Browns Ferry Nuclear Plant	3,060	546	45	8,910	1,589	11,970	2,135
Joseph M. Farley Nuclear Plant	704	310	22	2,356	1,038	3,060	1,348
Alabama Total	**3,764**	**856**	**67**	**11,266**	**2,627**	**15,030**	**3,483**



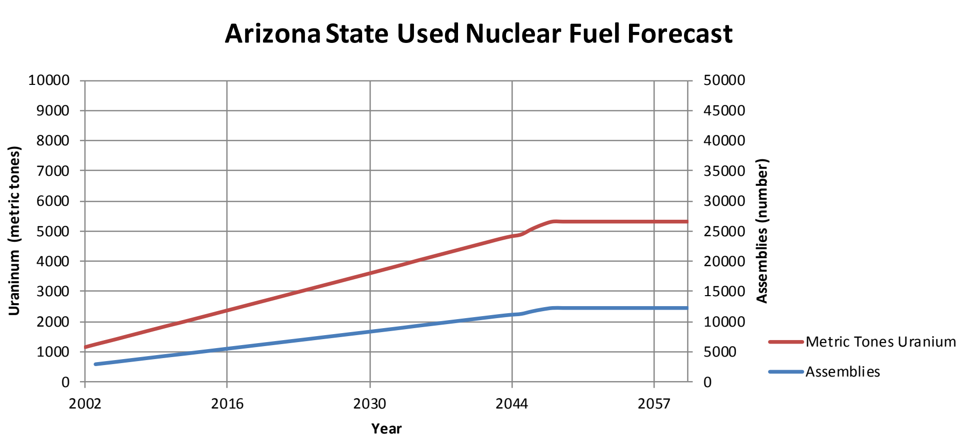


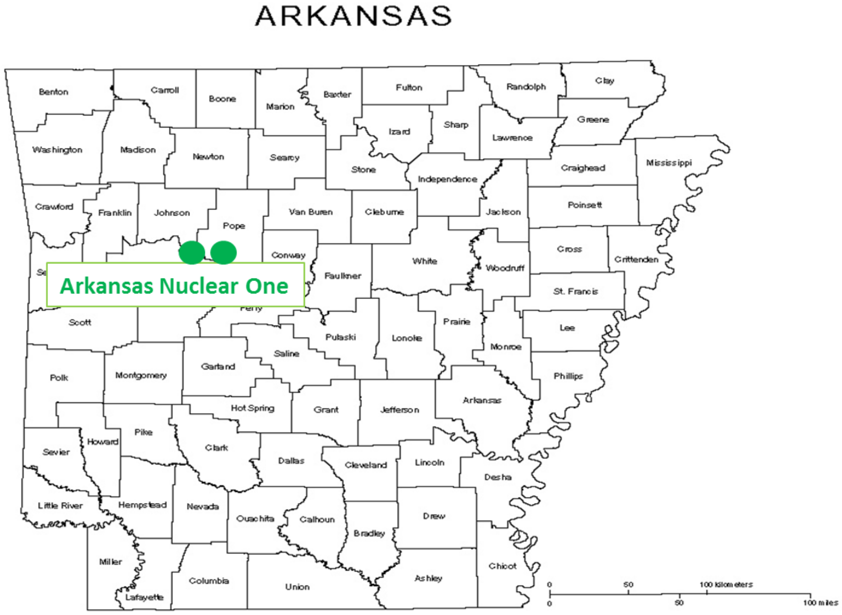
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Palo Verde Nuclear Generating Station, Unit 1	Arizona Public Service Company	PWR-DRYAMB	12/31/2044	12/31/2044	3,990
Palo Verde Nuclear Generating Station, Unit 2		PWR-DRYAMB	4/24/2046	4/24/2046	3,990
Palo Verde Nuclear Generating Station, Unit 3		PWR-DRYAMB	11/25/2047	11/25/2047	3,990

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Palo Verde Nuclear Generating Station	2,736	1,172	114	2,245	961	4,981	2,133
Arizona Total	**2,736**	**1,172**	**114**	**2,245**	**961**	**4,981**	**2,133**



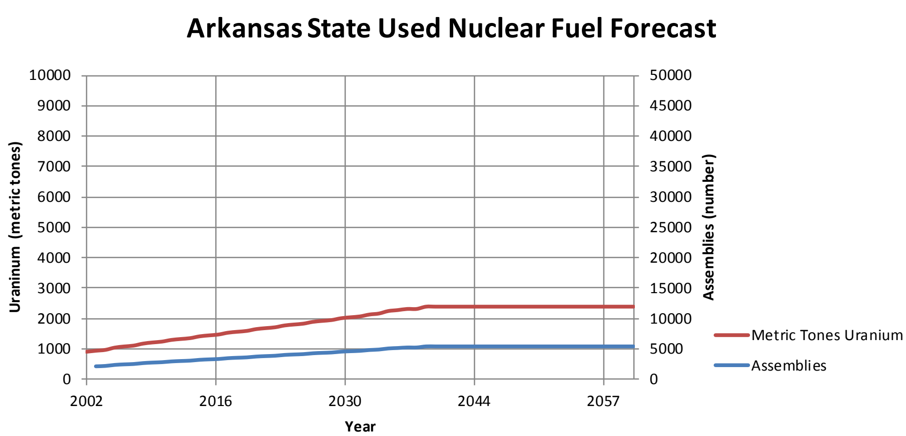


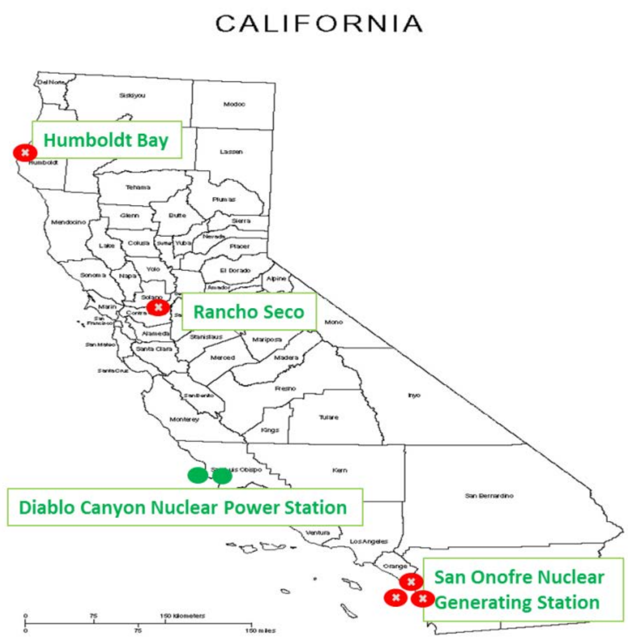
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Arkansas Nuclear One, Unit 1	Entergy Nuclear Operations, Inc.	PWR-DRYAMB	5/20/2034	5/20/2034	2,568
Arkansas Nuclear One, Unit 2		PWR-DRYAMB	7/17/2038	7/17/2038	3,026

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Arkansas Nuclear One	1,632	718	62	1,448	637	3,080	1,356
Arkansas Total	**1,632**	**718**	**62**	**1,448**	**637**	**3,080**	**1,356**



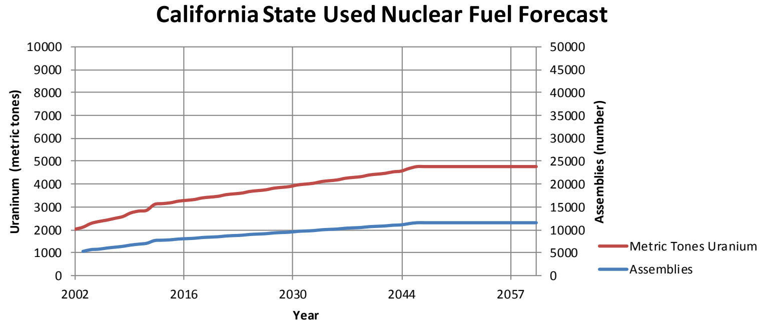


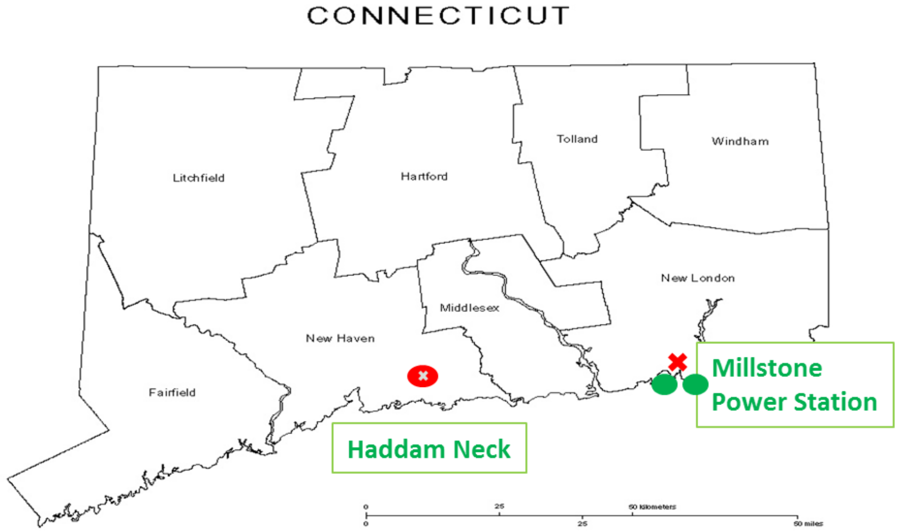
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Diablo Canyon Nuclear Power Plant, Unit 1	Pacific Gas & Electric Co.	PWR-DRYAMB	11/2/2024	11/3/2044	3,411
Diablo Canyon Nuclear Power Plant, Unit 2		PWR-DRYAMB	8/26/2025	8/27/2045	3,411
San Onofre Nuclear Generating Station, Unit 1		PWR	11/30/1992	Shut Down	n/a
San Onofre Nuclear Generating Station, Unit 2	Southern California Edison Co.	PWR-DRYAMB	2/16/2022	Shut Down	n/a
San Onofre Nuclear Generating Station, Unit 3		PWR-DRYAMB	11/15/2022	Shut Down	n/a
Humboldt Bay 3	Pacific Gas & Electric Co.	BWR	7/2/1976	Shut Down	n/a
Rancho Seco	Sacramento Municipal Utility District	PWR	6/7/1989	Shut Down	n/a

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Diablo Canyon Nuclear Power Plant	928	401	29	1,982	857	2,910	1,259
San Onofre Nuclear Generating Station, Unit 1	395	146	17			395	146
San Onofre Nuclear Generating Station, Unit 2, 3	792	328	33	2,776	1,148	3,568	1,476
Humboldt Bay	390	29	5			390	29
Rancho Seco	493	228	21			493	228
California Total	**2,998**	**1,132**	**105**	**4,758**	**2,006**	**7,756**	**3,138**



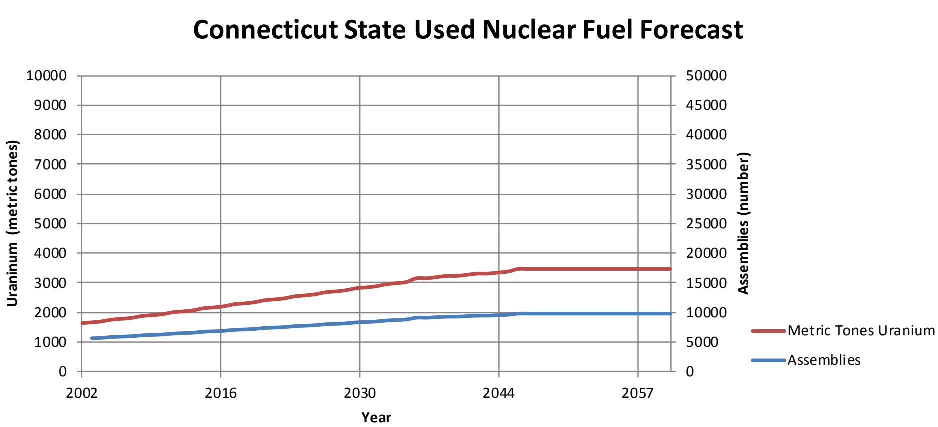


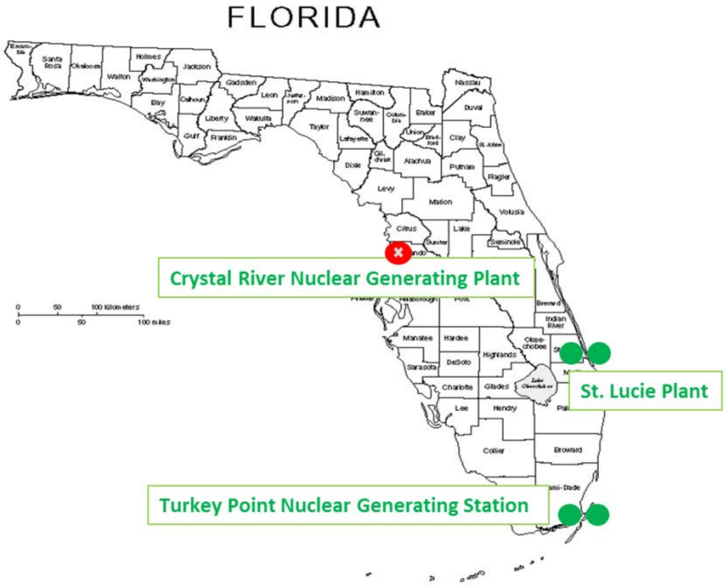
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Millstone Power Station, Unit 1		BWR	7/21/1998	Shut Down	n/a
Millstone Power Station, Unit 2	Dominion Nuclear Conneticut, Inc.	PWR-DRYAMB	7/31/2035	7/31/2035	2,700
Millstone Power Station, Unit 3		PWR-DRYSUB	11/25/2045	11/25/2045	3,650
Haddam Neck	Connecticut Yankee Atomic Power Co.	PWR	12/5/1996	Shut Down	n/a

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Millstone Power Station, Unit 1				2,884	526	2,884	526
Millstone Power Station, Unit 2, 3	576	244	18	2,111	893	2,687	1,136
Haddam Neck	1,019	412	40			1,019	412
Connecticut Total	**1,595**	**656**	**58**	**4,995**	**1,418**	**6,590**	**2,074**



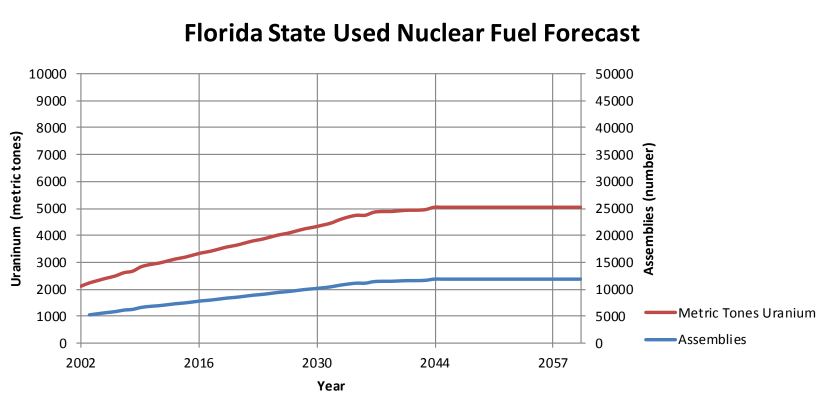


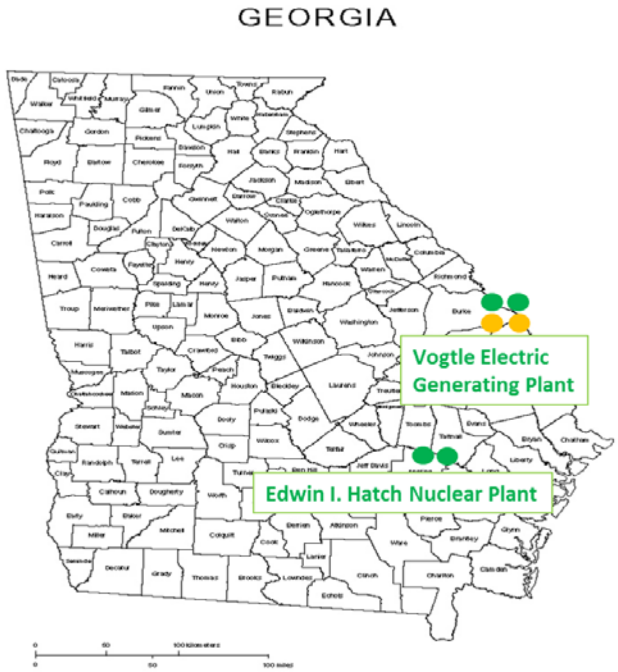
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Crystal River Nuclear Generating Plant, Unit 3	Florida Power Corp.	PWR-DRYAMB	12/3/2016	Shutdown	2,609
St. Lucie Plant, Unit 1	Florida Power & Light Co.	PWR-DRYAMB	3/1/2036	3/1/2036	2,700
St. Lucie Plant, Unit 2		PWR-DRYAMB	4/6/2043	4/6/2043	2,700
Turkey Point Nuclear Generating, Unit 3	Florida Power & Light Co.	PWR-DRYAMB	7/19/2032	7/19/2032	2,300
Turkey Point Nuclear Generating, Unit 4		PWR-DRYAMB	4/10/2033	4/10/2033	2,300

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Crystal River Nuclear Generating Plant				1,319	612	1,319	612
St. Lucie Plant	832	323	26	2,535	983	3,367	1,305
Turkey Point Nuclear Generating	576	263	18	2,130	971	2,706	1,234
Florida Total	**1,408**	**585**	**44**	**5,984**	**2,566**	**7,392**	**3,151**





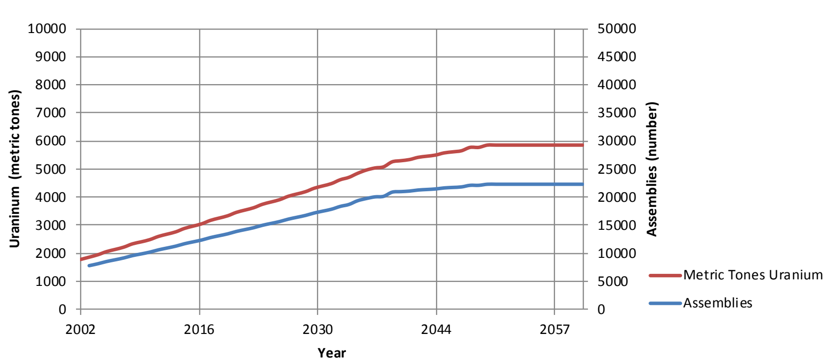
Reactor Demographics

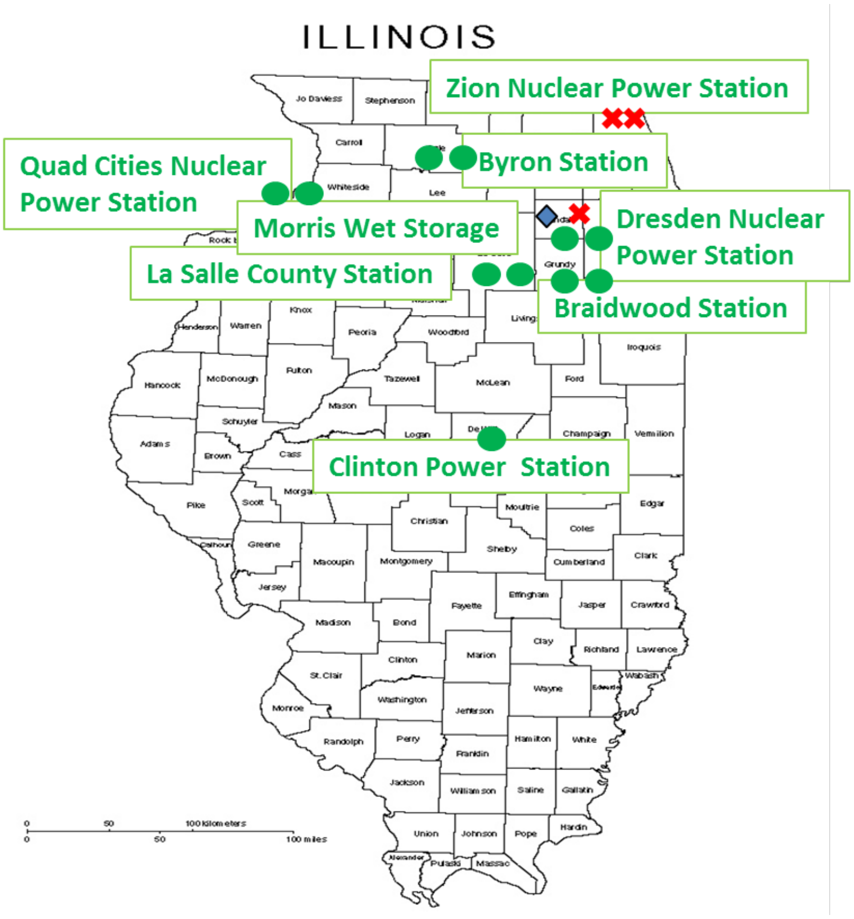
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Edwin I. Hatch Nuclear Plant, Unit 1	Southern Nuclear Operating Co.	BWR-MARK 1	8/6/2034	8/6/2034	2,804
Edwin I. Hatch Nuclear Plant, Unit 2		BWR-MARK 1	6/13/2038	6/13/2038	2,804
Vogtle Electric Generating Plant, Unit 1	Southern Nuclear Operating Co.	PWR-DRYAMB	1/16/2047	1/16/2047	3,625
Vogtle Electric Generating Plant, Unit 2		PWR-DRYAMB	2/9/2049	2/9/2049	3,625

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Edwin I. Hatch Nuclear Plant	3,808	687	56	4,572	825	8,380	1,512
Vogtle Electric Generating Plant	192	84	6	2,700	1,167	2,892	1,251
Georgia Total	**4,000**	**771**	**62**	**7,272**	**1,993**	**11,272**	**2,763**

Georgia State Used Nuclear Fuel Forecast





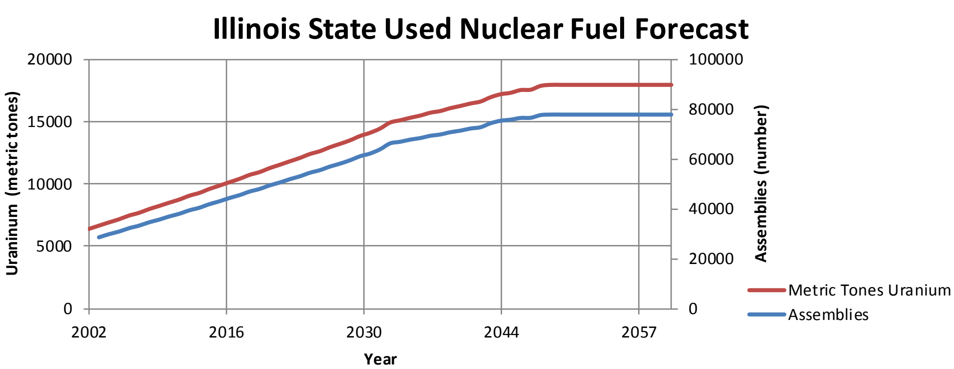
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Braidwood Station, Unit 1	Exelon Generation Co., LLC	PWR-DRYAMB	10/17/2026	7/3/2047	3,587
Braidwood Station, Unit 2		PWR-DRYAMB	12/18/2027	5/21/2048	3,587
Byron Station, Unit 1	Exelon Generation Co., LLC	PWR-DRYAMB	10/31/2024	2/15/2045	3,587
Byron Station, Unit 2		PWR-DRYAMB	11/6/2026	1/31/2047	3,587
Dresden Nuclear Power Station, Unit 1		BWR	10/31/1978	Shut Down	n/a
Dresden Nuclear Power Station, Unit 2	Exelon Generation Co., LLC	BWR-MARK 1	12/22/2029	12/22/2029	2,957
Dresden Nuclear Power Station, Unit 3		BWR-MARK 1	1/12/2031	1/12/2031	2,957
LaSalle County Station, Unit 1	Exelon Generation Co., LLC	BWR-MARK 2	4/17/2022	4/18/2042	3,546
LaSalle County Station, Unit 2		BWR-MARK 2	12/16/2023	12/17/2043	3,546
Quad Cities Nuclear Power Station, Unit 1	Exelon Generation Co., LLC	BWR-MARK 1	12/14/2032	12/14/2032	2,957
Quad Cities Nuclear Power Station, Unit 2		BWR-MARK 1	12/14/2032	12/14/2032	2,957
Zion 1		PWR	2/21/1997	Shut Down	n/a
Zion 2		PWR	9/19/1996	Shut Down	n/a
Clinton Power Station, Unit 1	Exelon Generation Co., LLC	BWR-MARK 3	9/29/2026	4/18/2047	3,473

Illinois, Continued

Estimated Used Fuel Inventory December 2013

Facility	Dry Inventory			Pool Inventory		Site Inventory	
	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Braidwood Station	224	94	7	2,562	1,080	2,786	1,174
Byron Station	448	189	14	2,536	1,071	2,984	1,260
Dresden Nuclear Power Station, Unit 1	272	28	4				
Dresden Nuclear Power Station, Unit 2, 3	3,604	641	53	5,704	957	9,580	1,626
LaSalle County Station,	748	134	11	6,823	1,224	7,571	1,358
Quad Cities Nuclear Power Station	2,380	425	35	6,470	1,155	8,850	1,580
Zion	222	524	6	2,004	495	2,226	1,019
Clinton Power Station				3,140	568	3,140	568
Morris Wet Storage Facility				3,217	674	3,217	674
Illinois Total	**7,898**	**2,036**	**130**	**32,456**	**7,224**	**40,354**	**9,260**



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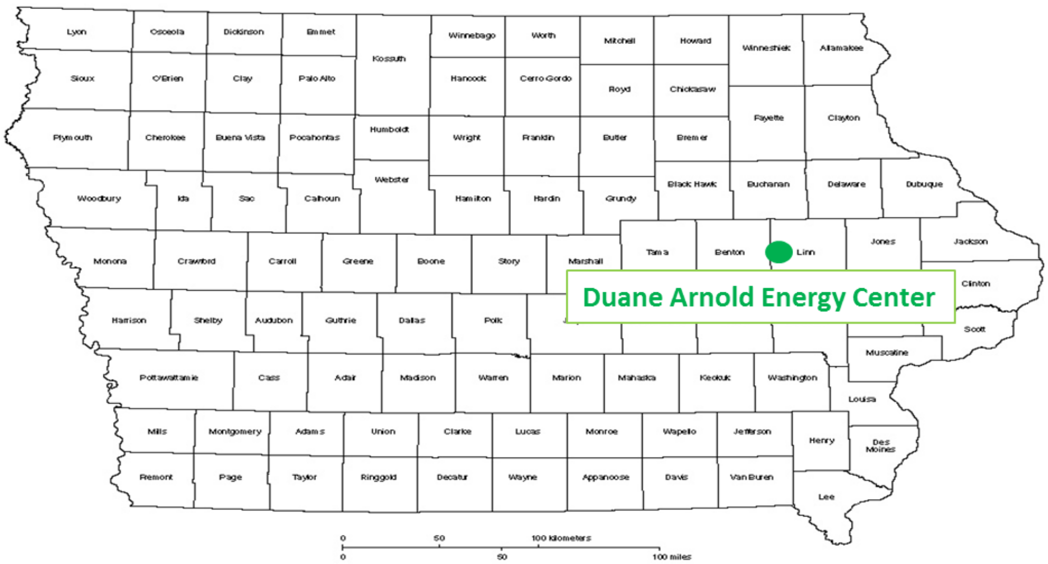


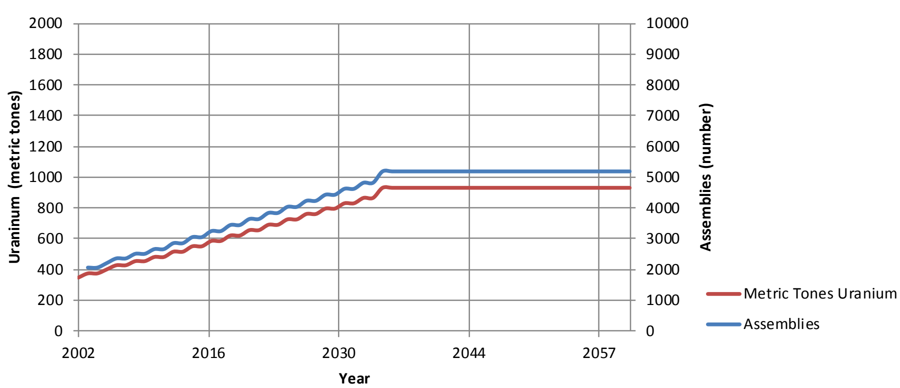
Reactor Demographics

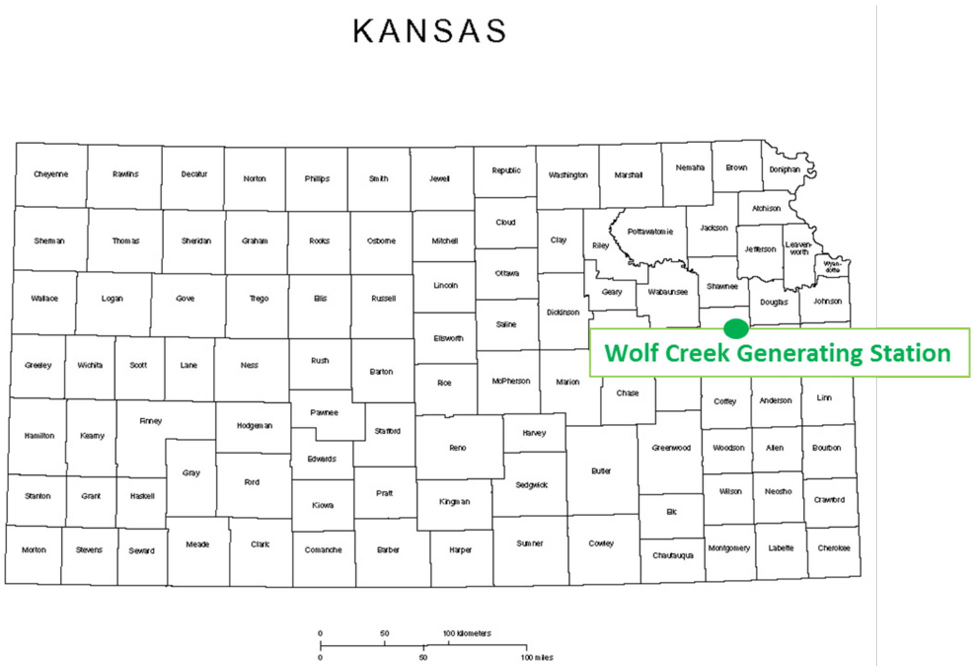
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Duane Arnold Energy Center	FPL Energy Duane Arnold, LLC	BWR-MARK 1	2/21/2034	2/21/2034	1,912

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Duane Arnold Energy Center	1,220	220	20	1,637	296	2,857	516
Iowa Total	**1,220**	**220**	**20**	**1,637**	**296**	**2,857**	**516**

Iowa State Used Nuclear Fuel Forecast



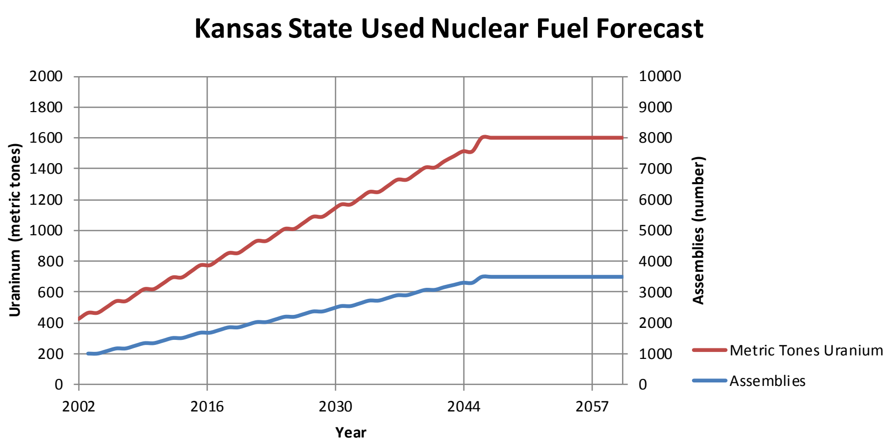


Reactor Demographics

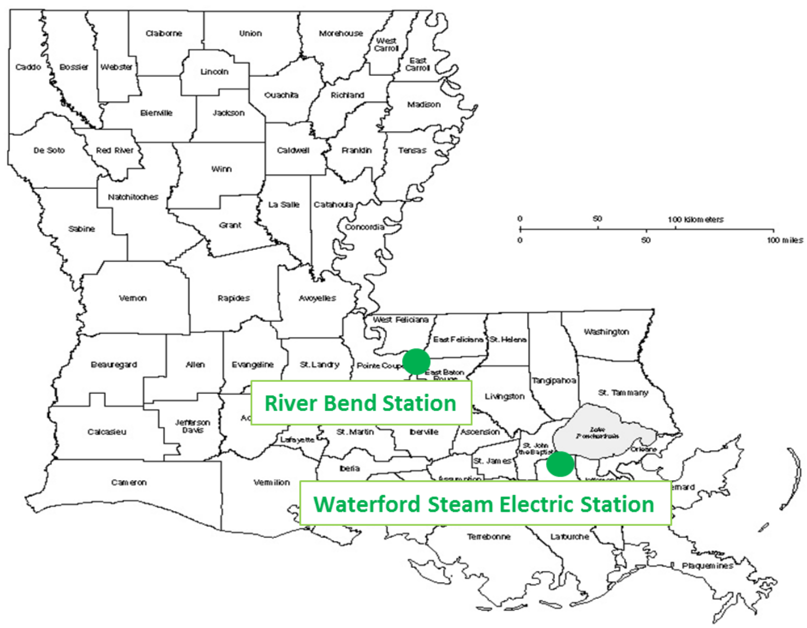
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Wolf Creek Generating Station, Unit 1	Wolf Creek Nuclear Operating Corp.	PWR-DRYAMB	3/11/2045	3/11/2045	3,565

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Wolf Creek Generating Station				1,513	696	1,513	696
Kansas Total	**-**	**-**	**-**	**1,513**	**696**	**1,513**	**696**



LOUISIANA



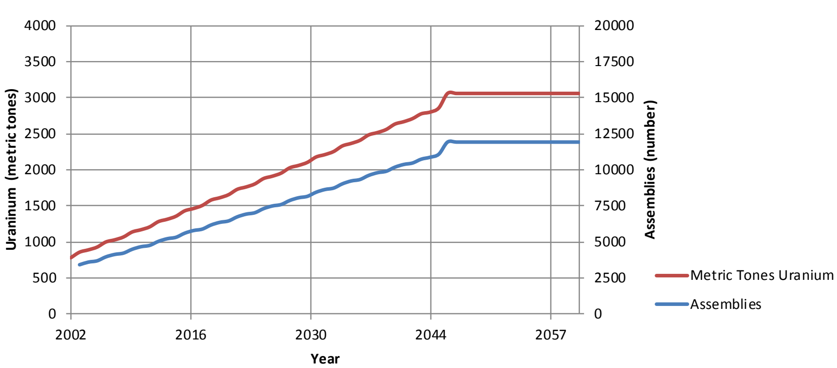
Reactor Demographics

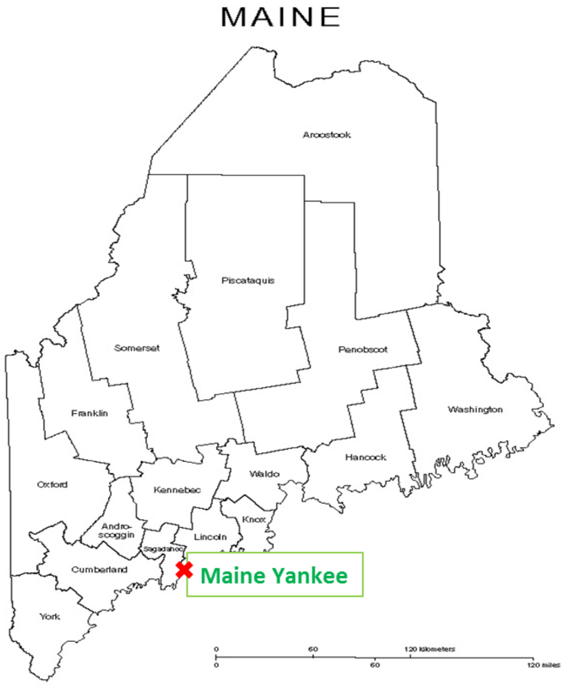
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
River Bend Station, Unit 1	Entergy Nuclear Operations, Inc.	BWR-MARK 3	8/29/2025	11/21/2045	3,091
Waterford Steam Electric Station, Unit 3	Entergy Nuclear Operations, Inc.	PWR-DRYAMB	12/18/2024	3/17/2045	3,716

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
River Bend Station	1,292	229	19	2,318	411	3,610	640
Waterford Steam Electric Station	416	174	13	1,192	499	1,608	673
Louisiana Total	**1,708**	**403**	**32**	**3,510**	**910**	**5,218**	**1,313**

Louisiana State Used Nuclear Fuel Forecast



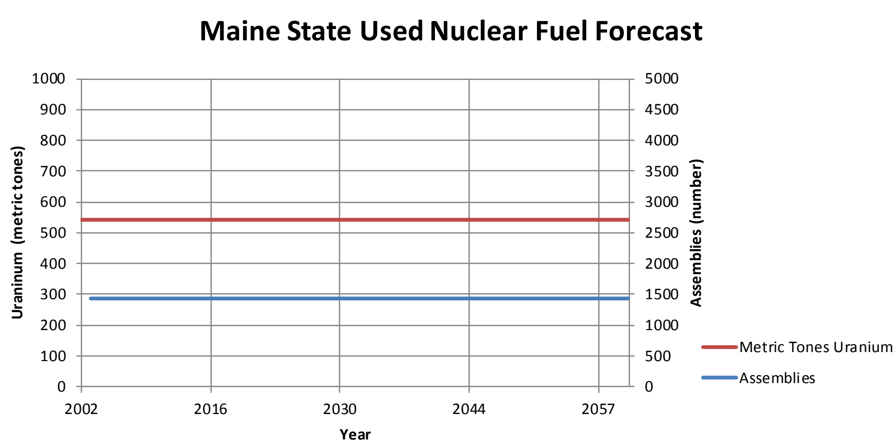


Reactor Demographics

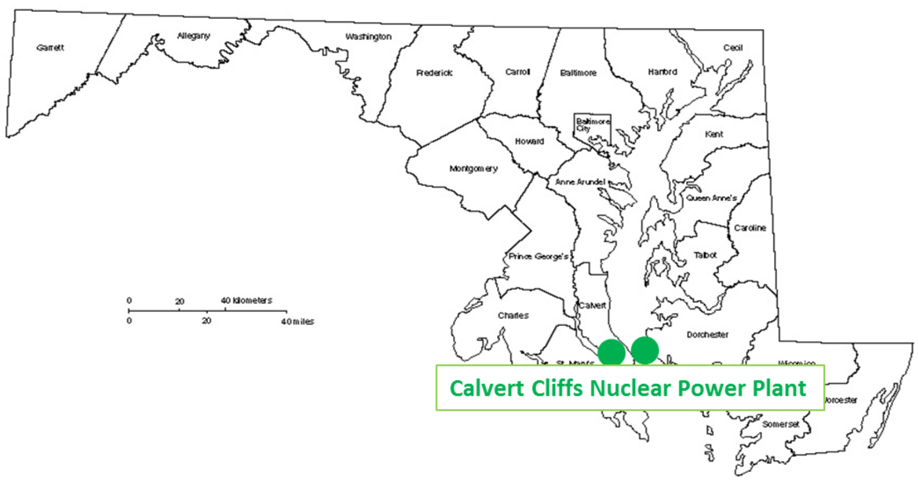
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Maine Yankee	Maine Yankee Atomic Power Co.	PWR	12/6/1996	Shut Down	n/a

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Maine Yankee	1,434	542	60			1,434	542
Maine Total	**1,434**	**542**	**60**	**-**	**-**	**1,434**	**542**



MARYLAND



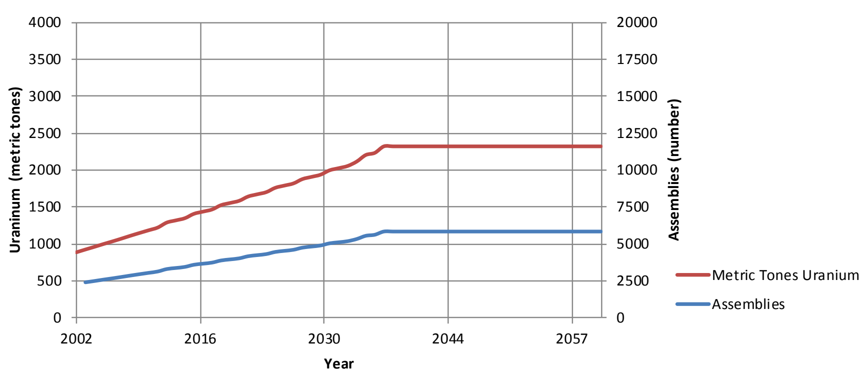
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Calvert Cliffs Nuclear Power Plant, Unit 1	Calvert Cliffs Nuclear Power Plant Inc.	PWR-DRYAMB	7/31/2034	7/31/2034	2,737
Calvert Cliffs Nuclear Power Plant, Unit 2		PWR-DRYAMB	8/13/2036	8/13/2036	2,737

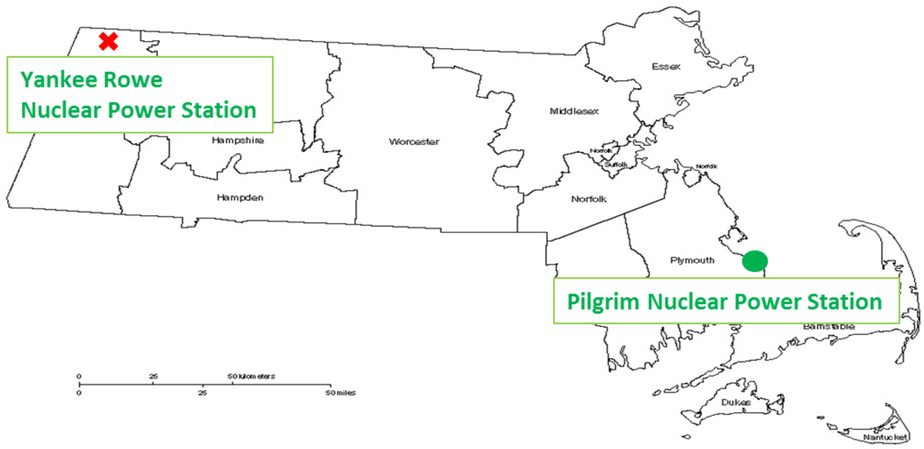
Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Calvert Cliffs Nuclear Power Plant	1,920	751	72	1,453	568	3,373	1,319
Maryland Total	**1,920**	**751**	**72**	**1,453**	**568**	**3,373**	**1,319**

Maryland State Used Nuclear Fuel Forecast



MASSACHUSETTS



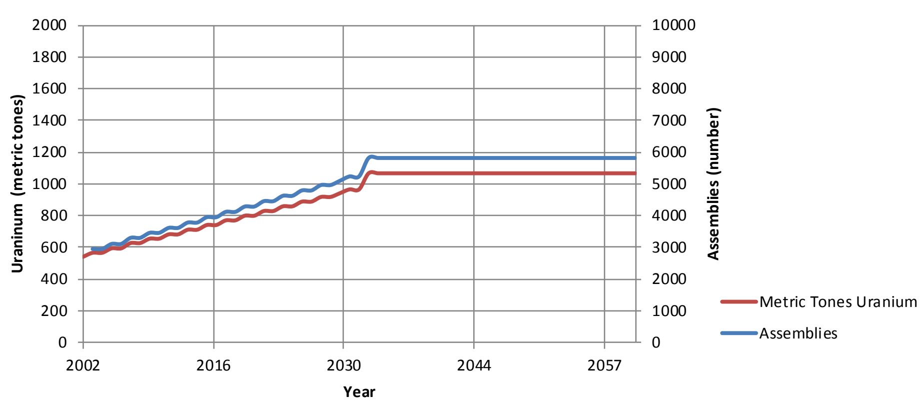
Reactor Demographics

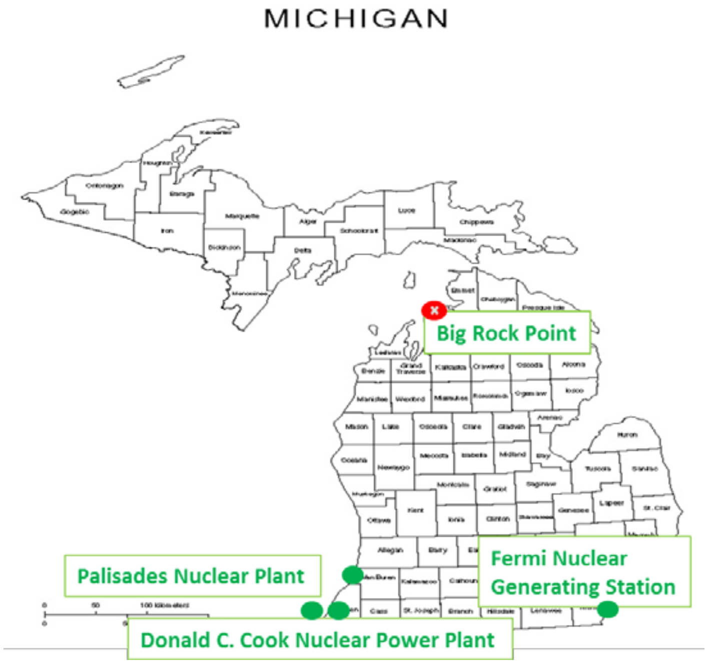
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Pilgrim Nuclear Power Station	Entergy Nuclear Operations, Inc.	BWR-MARK 1	6/8/2012	6/9/2032	2,028
Yankee Rowe	Yankee Atomic Electric Co.	PWR	10/1/1991	Shut Down	n/a

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Pilgrim Nuclear Power Station				3,250	584	3,250	584
Yankee Rowe	533	127	15			533	127
Massachusetts Total	**533**	**127**	**15**	**3,250**	**584**	**3,783**	**712**

Massachusetts State Used Nuclear Fuel Forecast



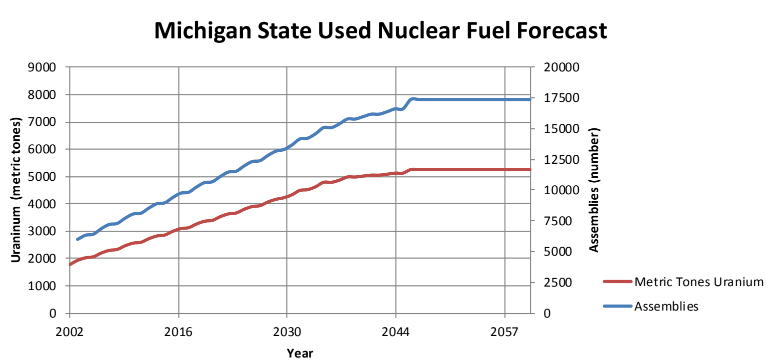


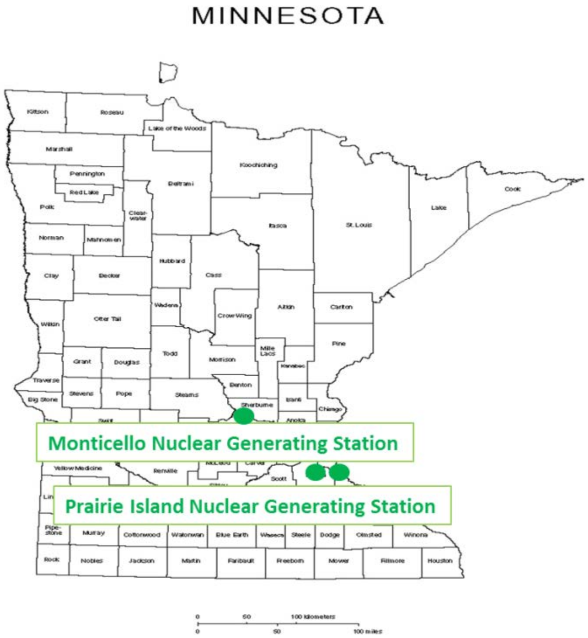
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Donald C. Cook Nuclear Power Plant, Unit 1	Indiana Michigan Power Co.	PWR-ICECND	10/25/2034	10/25/2034	3,304
Donald C. Cook Nuclear Power Plant, Unit 2		PWR-ICECND	12/23/2037	12/23/2037	3,468
Palisades Nuclear Plant	Entergy Nuclear Operations, Inc.	PWR-DRYAMB	3/24/2031	3/24/2031	2,565
Big Rock Point	Entergy Nuclear Operations	BWR	8/29/1997	Shut Down	n/a
Fermi, Unit 2	Detroit Edison Co.	BWR-MARK 1	3/20/2025	7/16/2045	3,430

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Donald C. Cook Nuclear Power Plant	384	169	12	3,100	1,360	3,484	1,529
Palisades Nuclear Plant	1,096	449	42	488	200	1,584	650
Big Rock Point	441	58	7			441	58
Fermi, Unit 2				3,309	579	3,309	579
Michigan Total	**1,921**	**676**	**61**	**6,897**	**2,140**	**8,818**	**2,816**



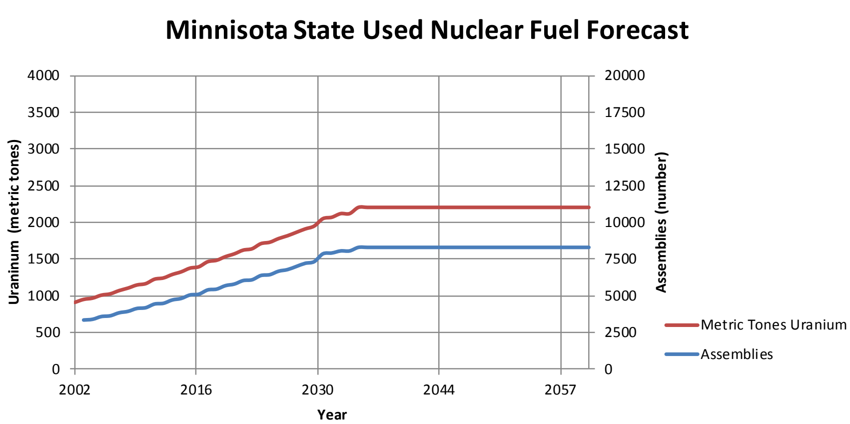


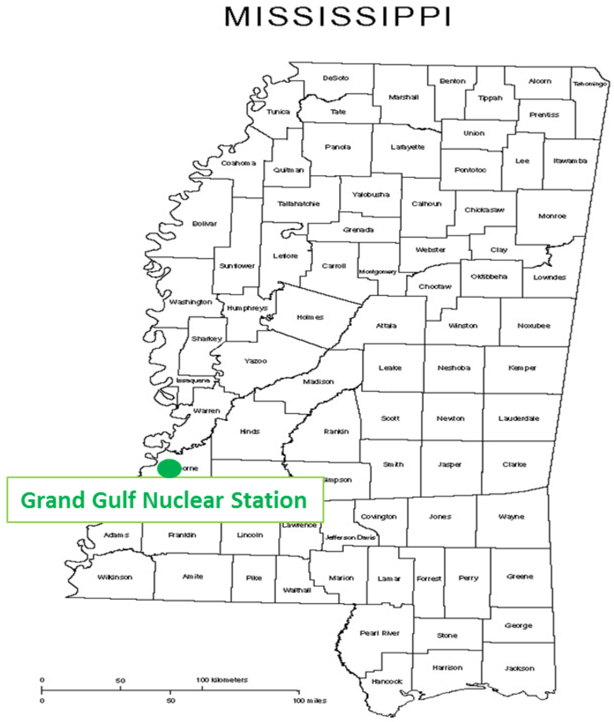
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Monticello Nuclear Generating Plant, Unit 1	Northern States Power Company	BWR-MARK 1	9/8/2030	9/8/2030	1,775
Prairie Island Nuclear Generating Plant, Unit 1	Northern States Power Co. Minnesota	PWR-DRYAMB	8/9/2033	8/9/2033	1,677
Prairie Island Nuclear Generating Plant, Unit 2		PWR-DRYAMB	10/29/2034	10/29/2034	1,677

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Monticello Nuclear Generating Plant	915	163	15	1,338	228	2,253	391
Prairie Island Nuclear Generating Plant	1,400	512	35	1,055	386	2,455	897
Minnesota Total	**2,315**	**675**	**50**	**2,393**	**614**	**4,708**	**1,289**



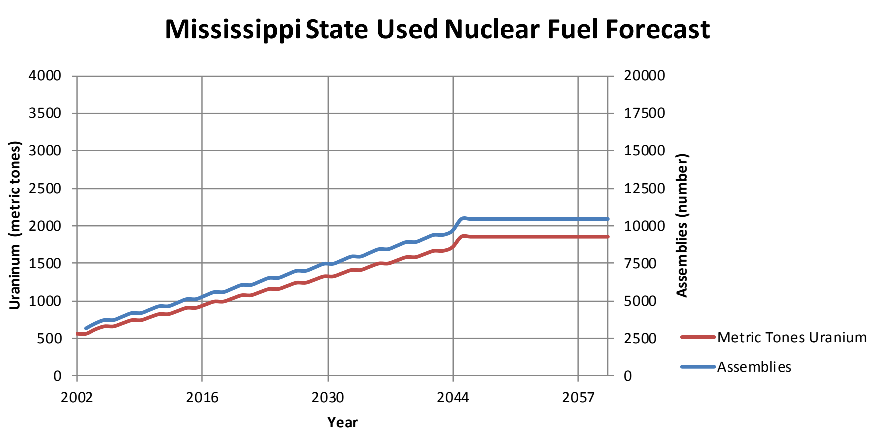


Reactor Demographics

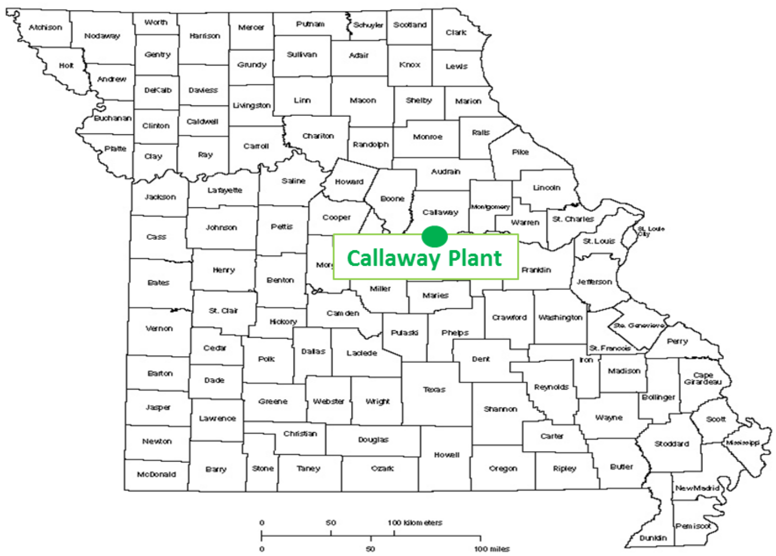
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Grand Gulf Nuclear Station, Unit 1	Entergy Nuclear Operations, Inc.	BWR-MARK 3	11/1/2024	11/2/2044	3,898

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Grand Gulf Nuclear Station	1,564	277	23	3,306	586	4,870	864
Mississippi Total	**1,564**	**277**	**23**	**3,306**	**586**	**4,870**	**864**



MISSOURI



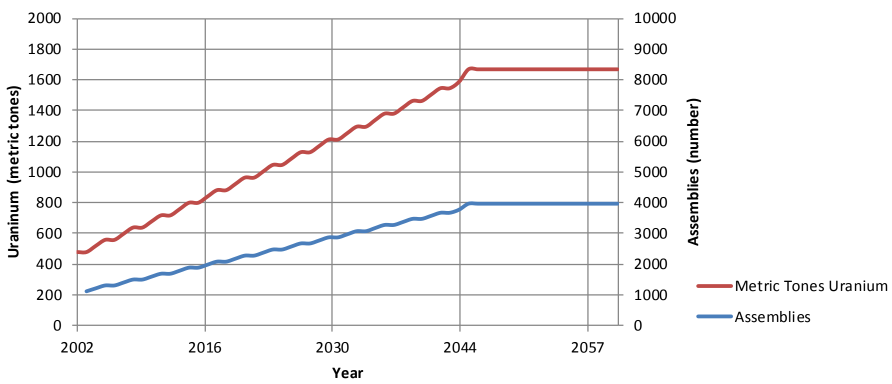
Reactor Demographics

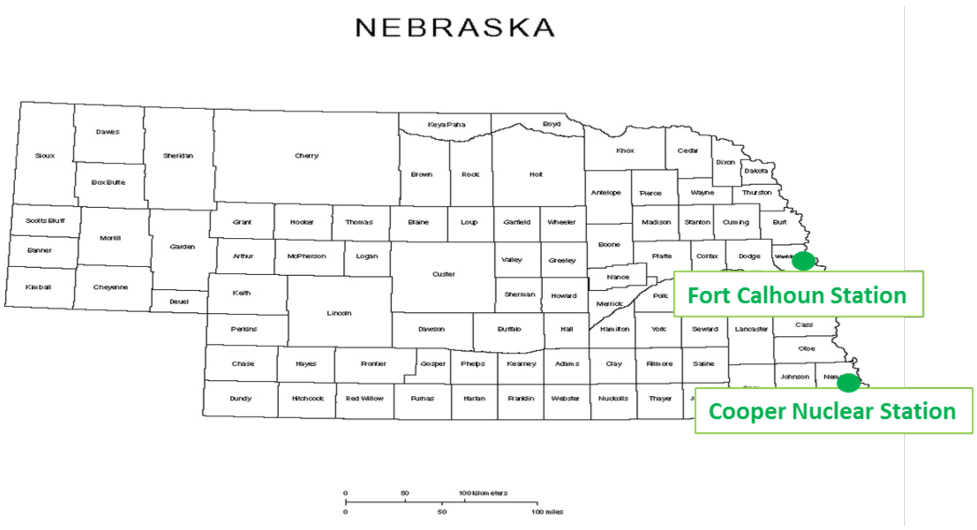
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Callaway Plant	Union Electric Co.	PWR-DRYAMB	10/18/2024	10/19/2044	3,565

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Callaway Plant				1,788	759	1,788	759
Missouri Total	-	-	-	**1,788**	**759**	**1,788**	**759**

Missouri State Used Nuclear Fuel Forecast





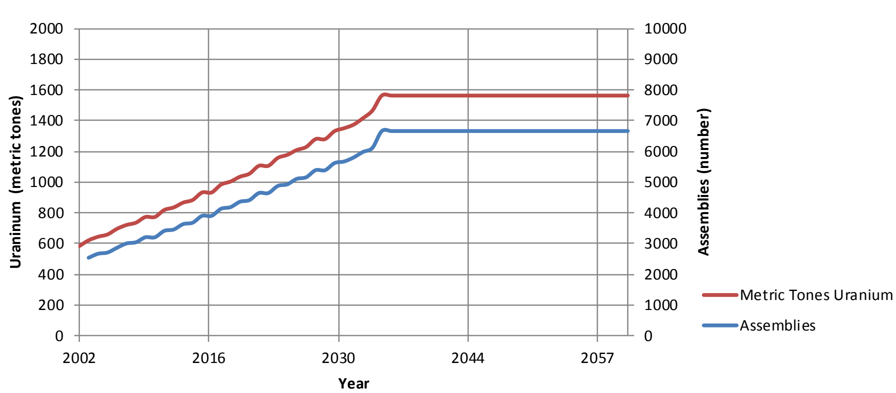
Reactor Demographics

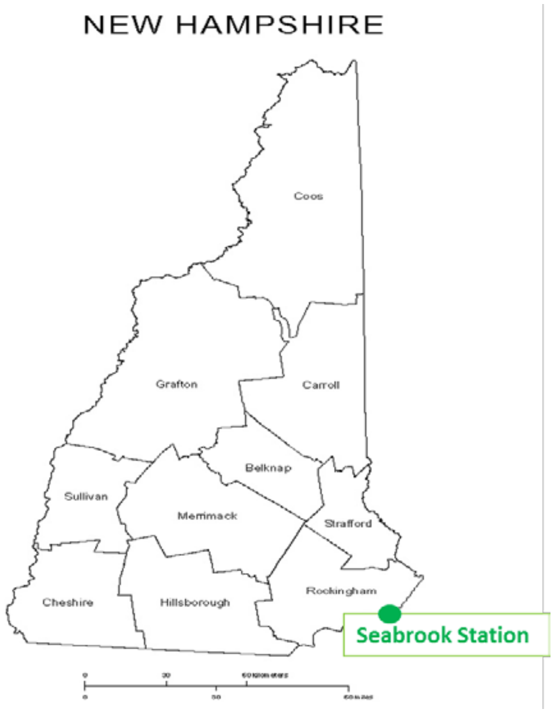
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Cooper Nuclear Station	Nebraska Public Power District	BWR-MARK 1	1/18/2034	1/18/2034	2,419
Fort Calhoun Station, Unit 1	Omaha Public Power District	PWR-DRYAMB	8/9/2033	8/9/2033	1,500

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Cooper Nuclear Station	488	89	8	2,007	360	2,495	449
Fort Calhoun Station	320	117	10	821	300	1,141	418
Nebraska Total	**808**	**206**	**18**	**2,828**	**661**	**3,636**	**867**

Nebraska State Used Nuclear Fuel Forecast



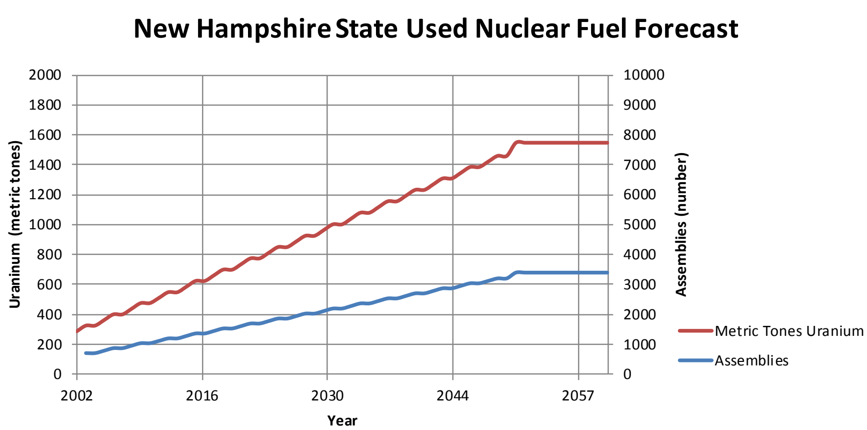


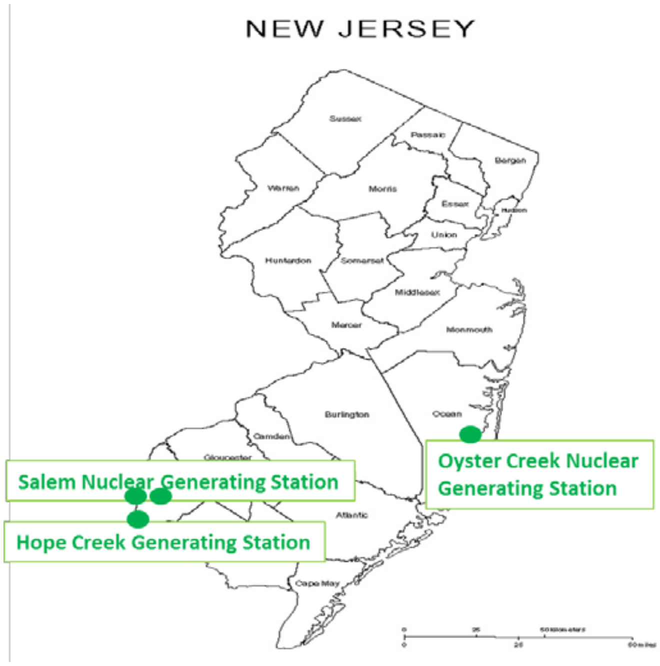
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Seabrook Station, Unit 1	FPL Energy Seabrook, LLC	PWR-DRYAMB	3/15/2030	3/16/2050	3,648

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Seabrook Station	448	205	14	751	344	1,199	548
New Hampshire Total	**448**	**205**	**14**	**751**	**344**	**1,199**	**548**



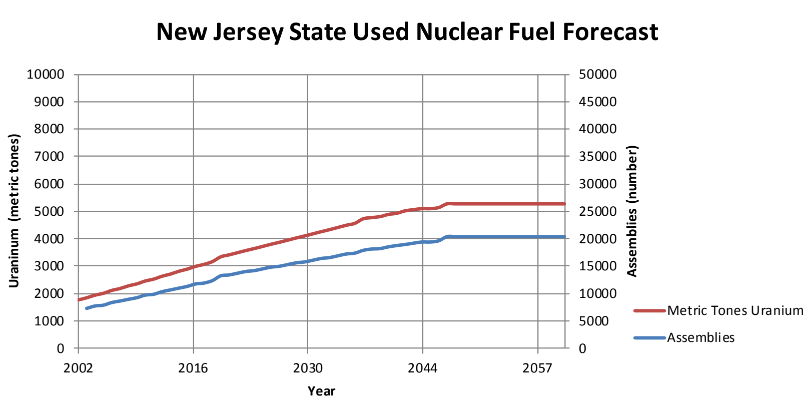


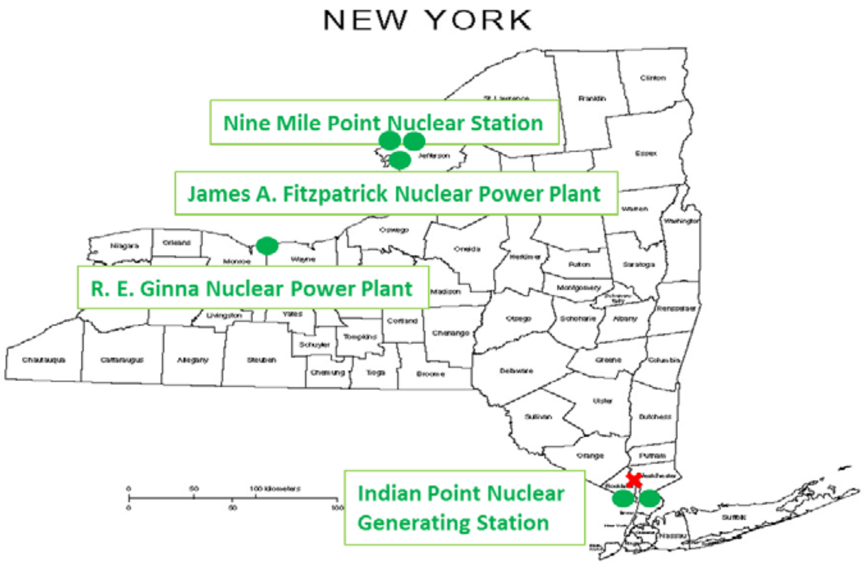
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Hope Creek Generating Station, Unit 1	PSEG Nuclear, LLC	BWR-MARK 1	4/11/2046	4/11/2046	3,840
Oyster Creek Nuclear Generating Station, Unit 1	Exelon Generation Co., LLC	BWR-MARK 1	4/9/2029	4/9/2029	1,930
Salem Nuclear Generating Station, Unit 1	PSEG Nuclear, LLC	PWR-DRYAMB	8/13/2036	8/13/2036	3,459
Salem Nuclear Generating Station, Unit 2		PWR-DRYAMB	4/18/2040	4/18/2040	3,459

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Hope Creek Generating Station	1,224	220	18	2,915	525	4,139	746
Oyster Creek Nuclear Generating Station	1,403	250	23	2,264	403	3,667	653
Salem Nuclear Generating Station	512	235	16	2,344	1,077	2,856	1,312
New Jersey Total	**3,139**	**705**	**57**	**7,523**	**2,005**	**10,662**	**2,710**



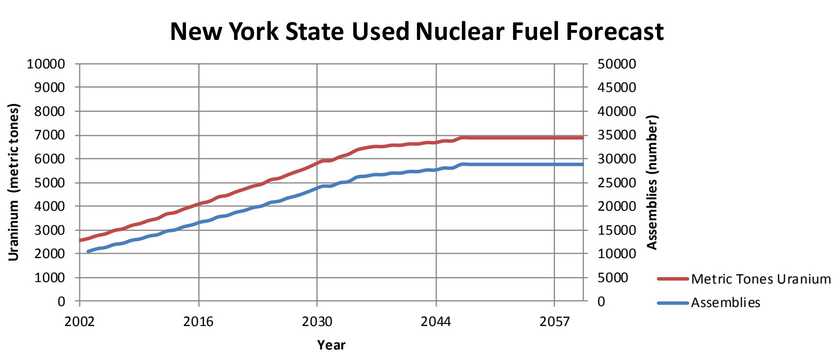


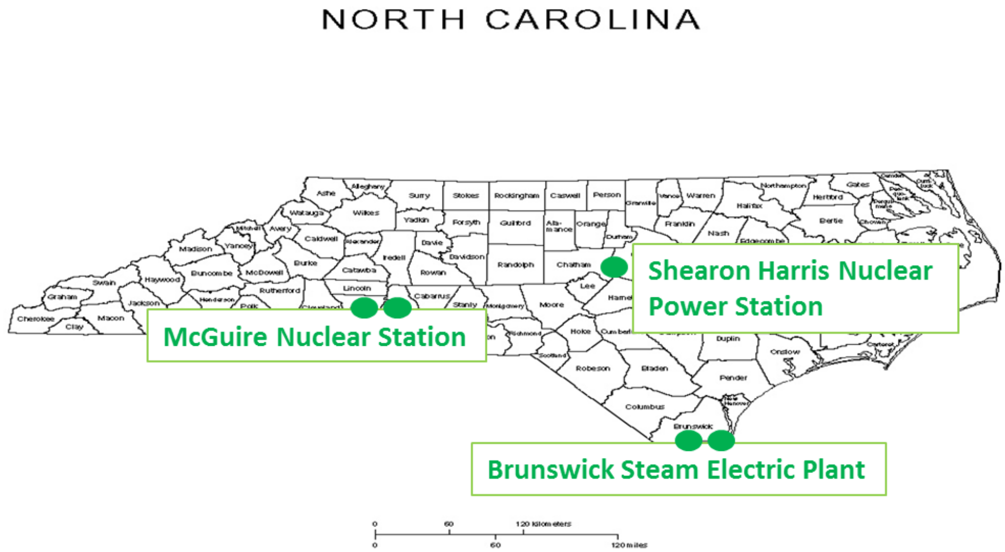
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Indian Point Nuclear Generating, Unit 1		PWR	10/31/1974	Shut Down	n/a
Indian Point Nuclear Generating, Unit 2	Entergy Nuclear Operations, Inc.	PWR-DRYAMB	9/28/2013	9/29/2033	3,216
Indian Point Nuclear Generating, Unit 3		PWR-DRYAMB	12/12/2015	12/13/2035	3,216
James A. FitzPatrick Nuclear Power Plant	Entergy Nuclear Operations, Inc.	BWR-MARK 1	10/17/2034	10/17/2034	2,536
Nine Mile Point Nuclear Station, Unit 1	Nine Mile Point Nuclear Station, LLC	BWR-MARK 1	8/22/2029	8/22/2029	1,850
Nine Mile Point Nuclear Station, Unit 2		BWR-MARK 2	10/31/2046	10/31/2046	3,988
R.E. Ginna Nuclear Power Plant	R.E. Ginna Nuclear Power Plant, LLC	PWR-DRYAMB	9/18/2029	9/18/2029	1,775

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Indian Point Nuclear Generating, Unit 1	160	31	5			160	31
Indian Point Nuclear Generating, Unit 2, 3	672	305	21	2,269	1,031	2,941	1,337
James A. FitzPatrick Nuclear Power Plant	1,428	258	21	2,232	404	3,660	662
Nine Mile Point Nuclear Station	976	172	16	5,960	1,051	6,936	1,223
R.E. Ginna Nuclear Power Plant	192	70	6	1,099	400	1,291	469
New York Total	**3,428**	**837**	**69**	**11,560**	**2,886**	**14,988**	**3,722**



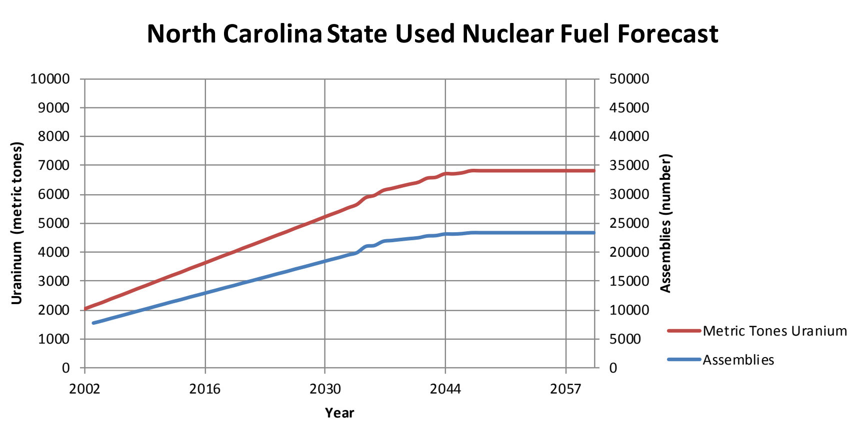


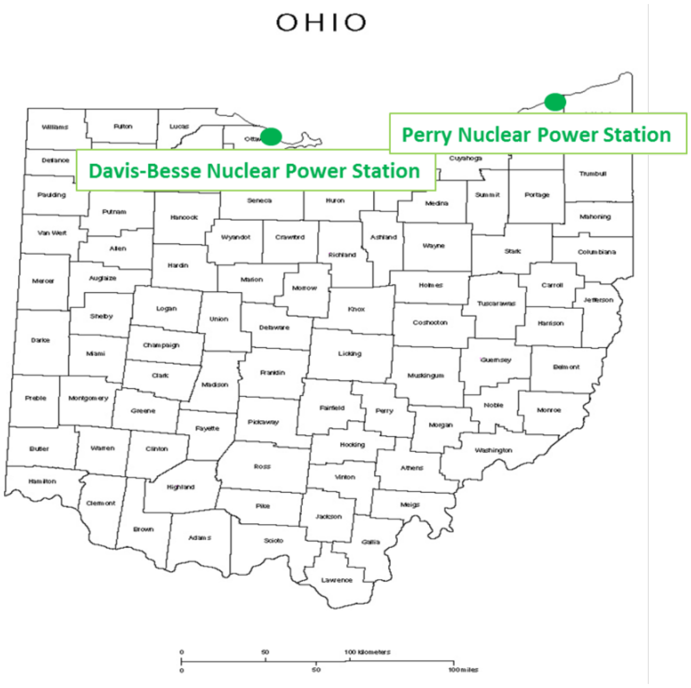
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Brunswick Steam Electric Plant, Unit 1	Carolina Power & Light Co.	BWR-MARK 1	9/8/2036	9/8/2036	2,923
Brunswick Steam Electric Plant, Unit 2		BWR-MARK 1	12/27/2034	12/27/2034	2,923
McGuire Nuclear Station, Unit 1	Duke Energy Carolinas, LLC	PWR-ICECND	6/12/2041	6/12/2041	3,411
McGuire Nuclear Station, Unit 2		PWR-ICECND	3/3/2043	3/3/2043	3,411
Shearon Harris Nuclear Power Plant, Unit 1	Carolina Power & Light Co.	PWR-DRYAMB	10/24/2046	10/24/2046	2,900

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Brunswick Steam Electric Plant	976	176	16	2,402	519	3,378	695
McGuire Nuclear Station	1,103	495	41	2,180	978	3,283	1,473
Shearon Harris Nuclear Power Plant				5,992	1,501	5,992	1,501
North Carolina Total	**2,079**	**671**	**57**	**10,574**	**2,997**	**12,653**	**3,668**





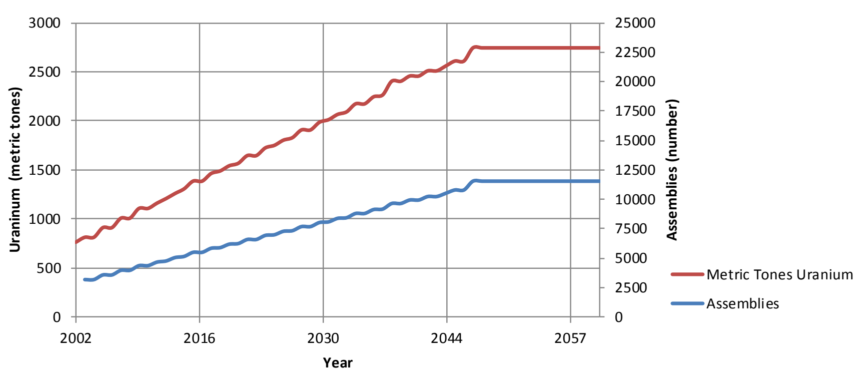
Reactor Demographics

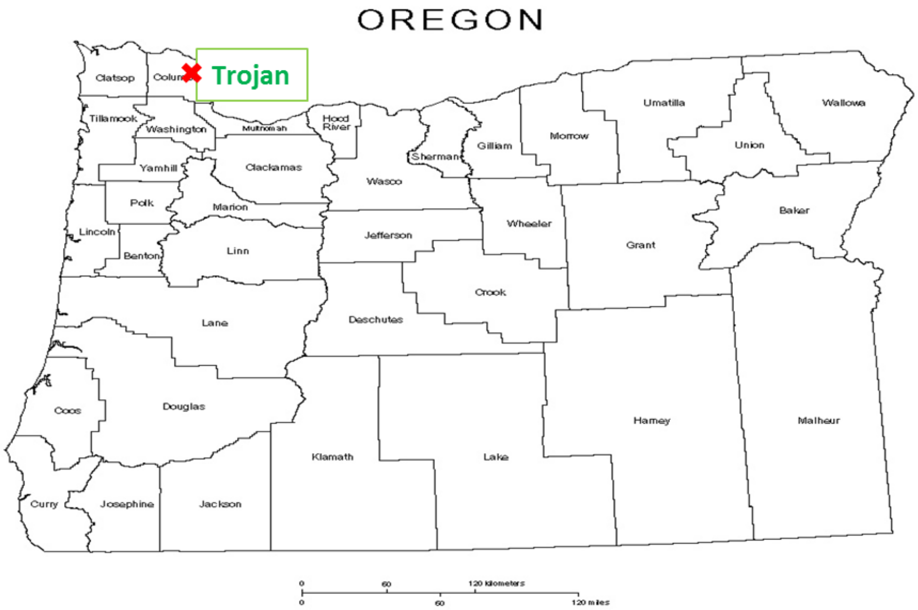
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Davis-Besse Nuclear Power Station, Unit 1	First Energy Nuclear Operating Co.	PWR-DRYAMB	4/22/2017	4/23/2037	2,817
Perry Nuclear Power Plant, Unit 1	First Energy Nuclear Operating Co.	BWR-MARK 3	3/18/2026	11/14/2046	3,758

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Davis-Besse Nuclear Power Station	72	34	3	1,110	527	1,182	561
Perry Nuclear Power Plant	408	74	6	3,470	626	3,878	699
Ohio Total	**480**	**108**	**9**	**4,580**	**1,153**	**5,060**	**1,260**

Ohio State Used Nuclear Fuel Forecast



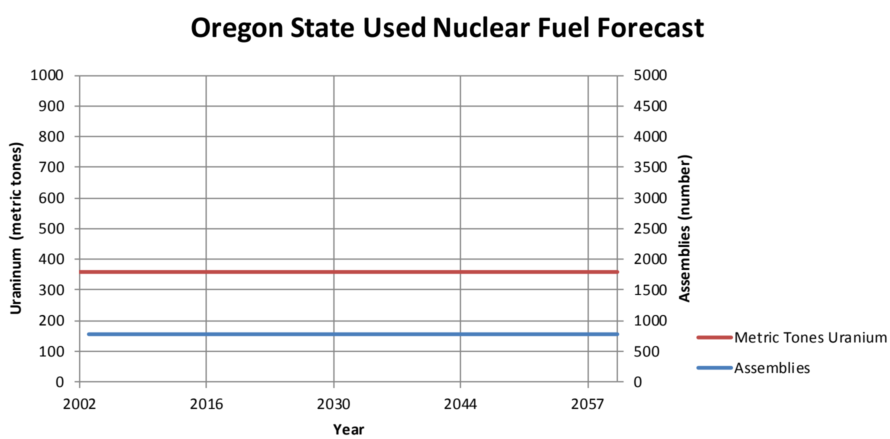


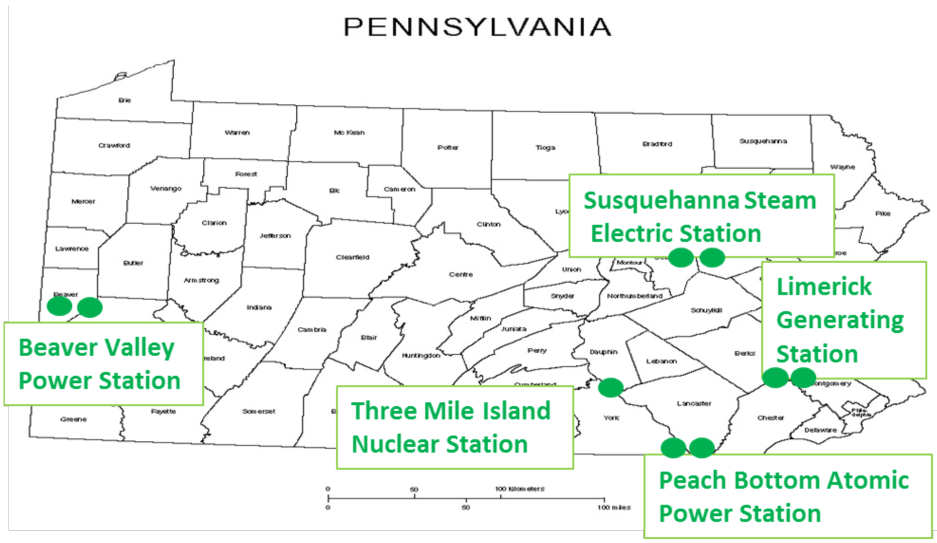
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Trojan		PWR	11/9/1992	Shut Down	n/a

Estimated Used Fuel Inventory December 2013

Facility	Dry Inventory			Pool Inventory		Site Inventory	
	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Trojan	790	359	34			790	359
Oregon Total	**790**	**359**	**34**	**-**	**-**	**790**	**359**



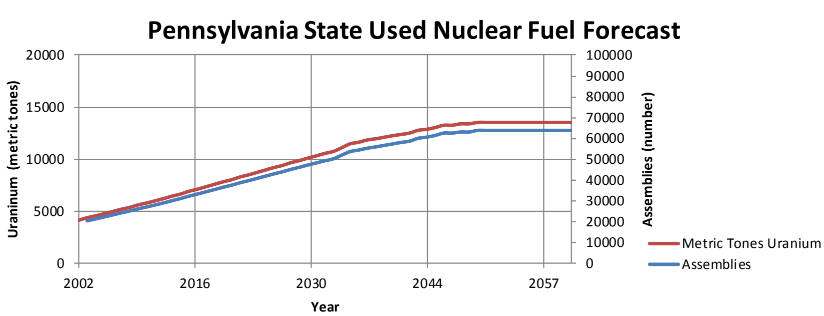


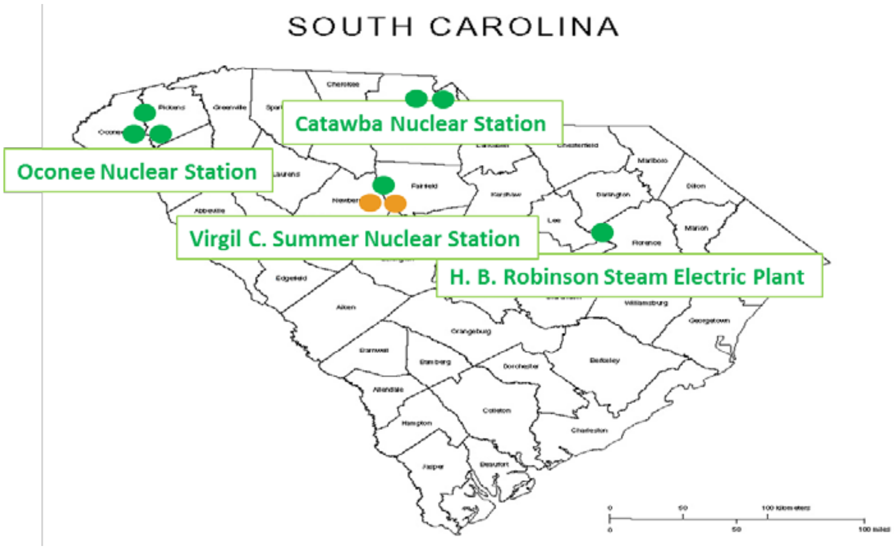
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Beaver Valley Power Station, Unit 1	First Energy Nuclear Operating Co.	PWR-DRYAMB	1/29/2036	1/29/2036	2,900
Beaver Valley Power Station, Unit 2		PWR-DRYAMB	5/27/2047	5/27/2047	2,900
Limerick Generating Station, Unit 1	Exelon Generation Co., LLC	BWR-MARK 2	10/26/2024	8/9/2045	3,515
Limerick Generating Station, Unit 2		BWR-MARK 2	6/22/2029	8/26/2049	3,515
Peach Bottom Atomic Power Station, Unit 2	Exelon Generation Co., LLC	BWR-MARK 1	8/8/2033	8/8/2033	3,514
Peach Bottom Atomic Power Station, Unit 3		BWR-MARK 1	7/2/2034	7/2/2034	3,514
Susquehanna Steam Electric Station, Unit 1	PPL Susquehanna, LLC	BWR-MARK 2	7/17/2042	7/17/2042	3,952
Susquehanna Steam Electric Station, Unit 2		BWR-MARK 2	3/23/2044	3/23/2044	3,952
Three Mile Island Nuclear Station, Unit 1	Exelon Generation Co., LLC	PWR-DRYAMB	4/19/2034	4/19/2034	2,568

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Beaver Valley Power Station				2,450	1,132	2,450	1,132
Limerick Generating Station	1,464	261	24	6,149	1,097	7,613	1,359
Peach Bottom Atomic Power Station	4,352	784	64	5,744	1,035	10,096	1,819
Susquehanna Steam Electric Station	4,454	787	77	4,191	741	8,645	1,528
Three Mile Island Nuclear Station				1,324	623	1,324	623
Pennsylvania Total	**10,270**	**1,832**	**165**	**19,858**	**4,628**	**30,128**	**6,460**



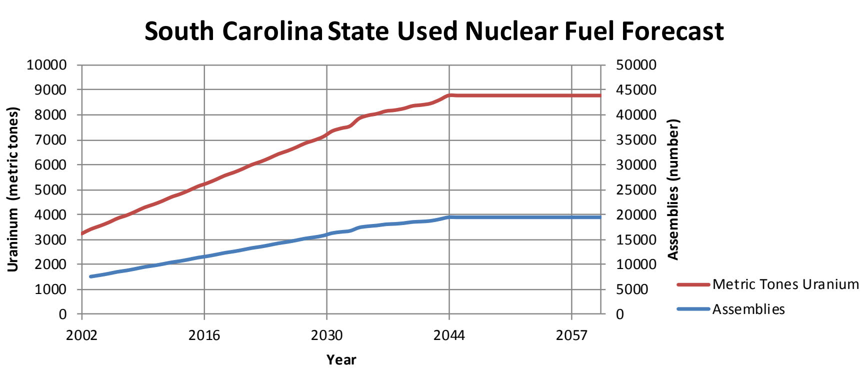


Reactor Demographics

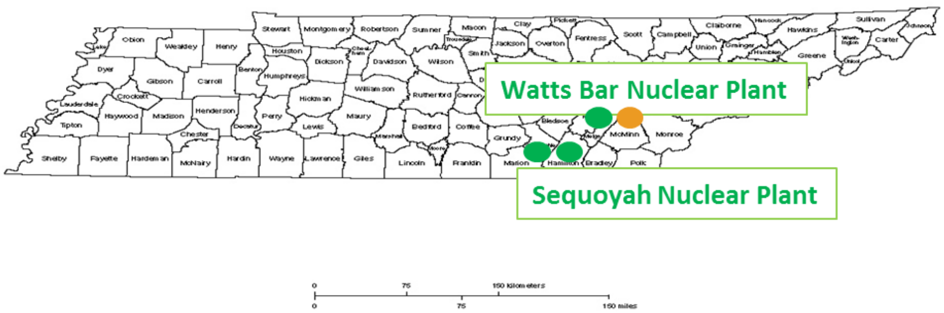
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Catawba Nuclear Station, Unit 1	Duke Energy Carolinas, LLC	PWR-ICECND	12/5/2043	12/5/2043	3,411
Catawba Nuclear Station, Unit 2		PWR-ICECND	12/5/2043	12/5/2043	3,411
H. B. Robinson Steam Electric Plant, Unit 2	Carolina Power & Light Co.,	PWR-DRYAMB	7/31/2030	7/31/2030	2,339
Virgil C. Summer Nuclear Station, Unit 1	South Carolina Electric & Gas Co.	PWR-DRYAMB	8/6/2042	8/6/2042	2,900
Oconee Nuclear Station, Unit 1	Duke Energy Carolinas, LLC	PWR-DRYAMB	2/6/2033	2/6/2033	2,568
Oconee Nuclear Station, Unit 2		PWR-DRYAMB	10/6/2033	10/6/2033	2,568
Oconee Nuclear Station, Unit 3		PWR-DRYAMB	7/19/2034	7/19/2034	2,568

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Catawba Nuclear Station	650	290	26	2,401	1,071	3,051	1,361
H. B. Robinson Steam Electric Plant	392	170	22	373	162	765	332
Virgil C. Summer Nuclear Station				1,278	548	1,278	548
Oconee Nuclear Station	3,168	1,476	132	1,624	757	4,792	2,233
South Carolina Total	**4,210**	**1,936**	**180**	**5,676**	**2,538**	**9,886**	**4,474**



TENNESSEE



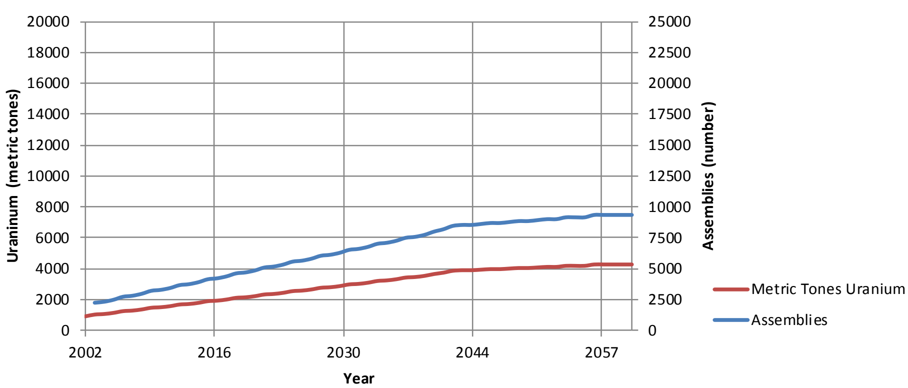
Reactor Demographics

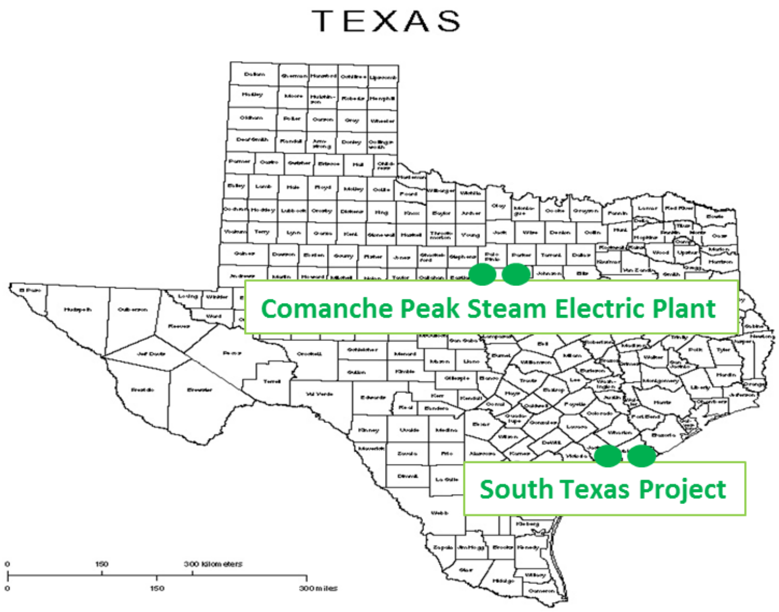
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Sequoyah Nuclear Plant, Unit 1	Tenessee Valley Authority	PWR-ICECND	9/17/2020	9/18/2040	3,455
Sequoyah Nuclear Plant, Unit 2		PWR-ICECND	9/15/2021	9/16/2041	3,455
Watts Bar Nuclear Plant, Unit 1	Tenessee Valley Authority	PWR-ICECND	11/9/2035	2/8/2056	3,459

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Sequoyah Nuclear Plant	1,280	586	40	1,610	737	2,890	1,323
Watts Bar Nuclear Plant				861	396	861	396
Tennessee Total	**1,280**	**586**	**40**	**2,471**	**1,133**	**3,751**	**1,719**

Tennessee State Used Nuclear Fuel Forecast



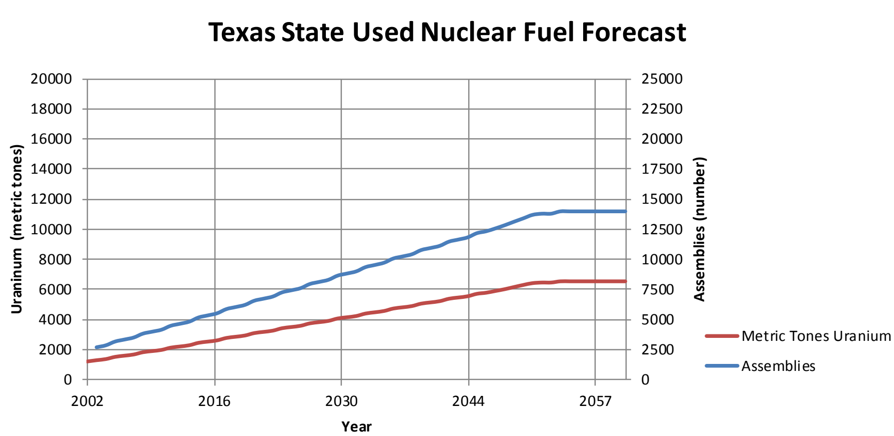


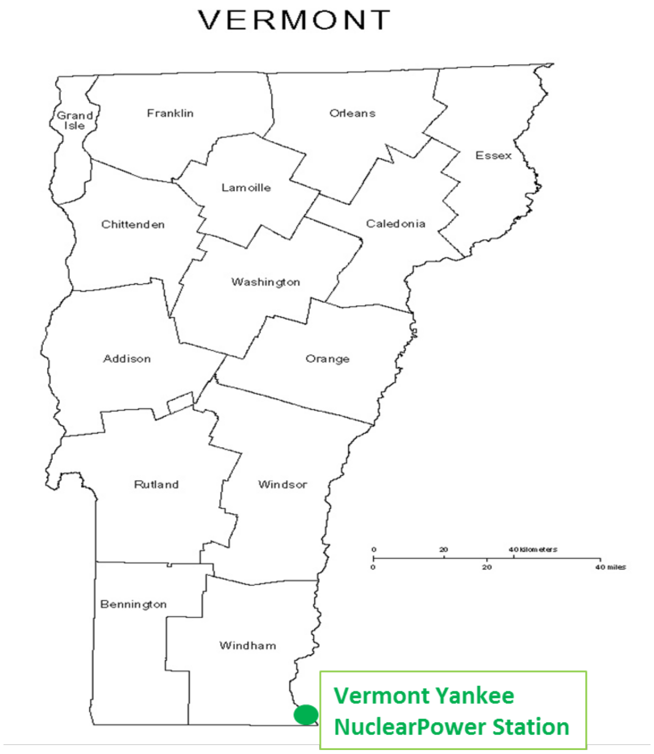
Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Comanche Peak Steam Electric Station, Unit 1	Luminant Generation Co., LLC	PWR-DRYAMB	2/8/2030	4/18/2050	3,612
Comanche Peak Steam Electric Station, Unit 2		PWR-DRYAMB	2/2/2033	4/7/2053	3,458
South Texas Project, Unit 1	STP Nuclear Operating Co.	PWR-DRYAMB	8/20/2027	3/23/2048	3,853
South Texas Project, Unit 2		PWR-DRYAMB	12/15/2028	3/29/2049	3,853

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Comanche Peak Steam Electric Station	576	242	18	1,956	822	2,532	1,064
South Texas Project				2,297	1,232	2,297	1,232
Texas Total	**576**	**242**	**18**	**4,253**	**2,054**	**4,829**	**2,296**



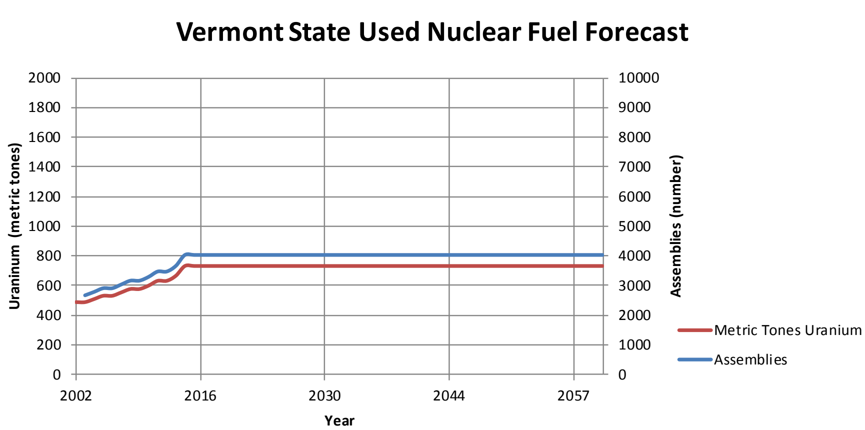


Reactor Demographics

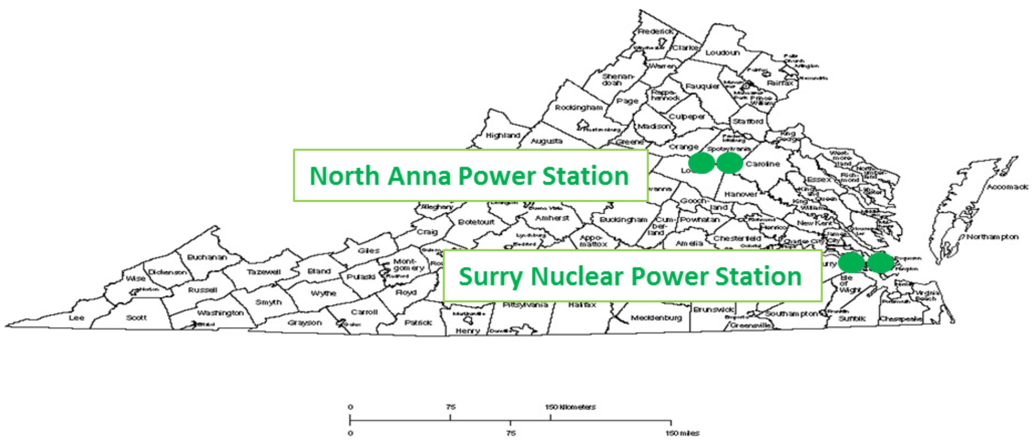
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Vermont Yankee Nuclear Power Plant, Unit 1	Entergy Nuclear Operations, Inc.	BWR-MARK 1	3/21/2012	3/21/2012	1,912

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Vermont Yankee Nuclear Power Plant	884	161	13	2,779	505	3,663	666
Vermont Total	**884**	**161**	**13**	**2,779**	**505**	**3,663**	**666**



VIRGINIA



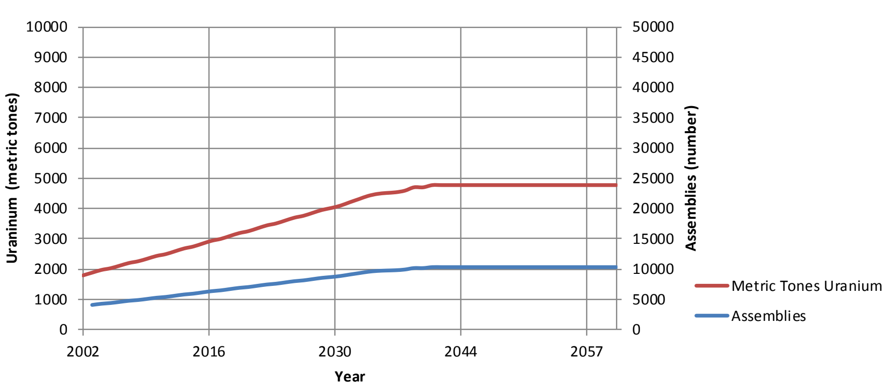
Reactor Demographics

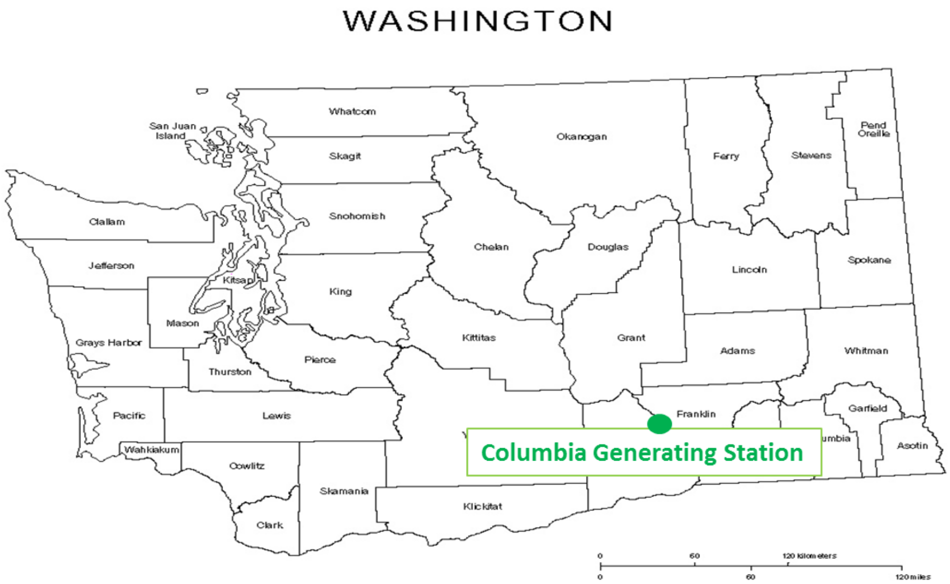
Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
North Anna Power Station, Unit 1	Virginia Electric & Power Co.	PWR-DRYSUB	4/1/2038	4/1/2038	2,940
North Anna Power Station, Unit 2		PWR-DRYSUB	8/21/2040	8/21/2040	2,940
Surry Nuclear Power Station, Unit 1	Virginia Electric & Power Co.	PWR-DRYSUB	5/25/2032	5/25/2032	2,857
Surry Nuclear Power Station, Unit 2		PWR-DRYSUB	1/29/2033	1/29/2033	2,857

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
North Anna Power Station	1,440	667	45	1,418	657	2,858	1,323
Surry Nuclear Power Station	2,174	998	77	720	331	2,894	1,328
Virginia Total	**3,614**	**1,664**	**122**	**2,138**	**987**	**5,752**	**2,652**

Virginia State Used Nuclear Fuel Forecast



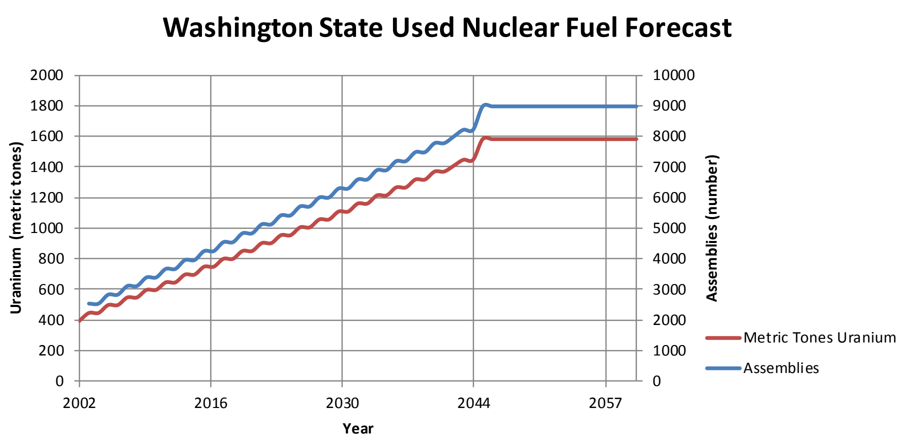


Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Columbia Generating Station, Unit 2	Energy Northwest	BWR-MARK 2	12/20/2023	4/14/2044	3,486

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Columbia Generating Station	1,836	323	27	2,122	374	3,958	697
Washington Total	**1,836**	**323**	**27**	**2,122**	**374**	**3,958**	**697**

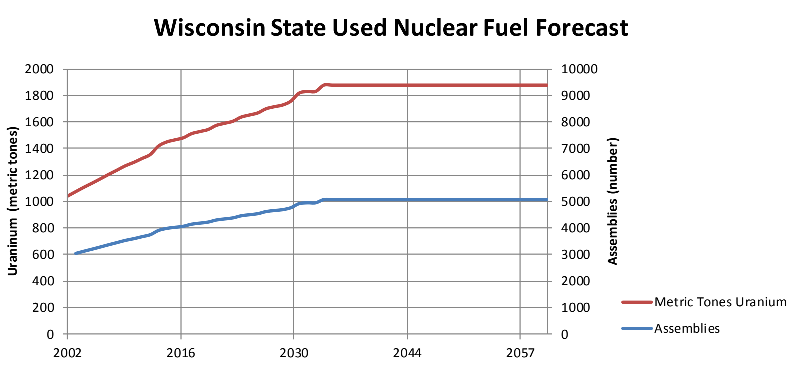


Reactor Demographics

Facility	Owner	Type	License Expires	60-Year End-of-Life Date	August 2011 Licensed Power (MWt)
Point Beach Nuclear Plant, Unit 1	NextEra Energy Point Beach, LLC	PWR-DRYAMB	10/5/2030	10/5/2030	1,800
Point Beach Nuclear Plant, Unit 2		PWR-DRYAMB	3/8/2033	3/8/2033	1,800
Kewaunee Power Station	Dominion Energy Kewaunee, Inc.	PWR-DRYAMB	12/21/2033	12/21/2033	1,772
LaCrosse Boiling Water Reactor	Dairyland Power Cooperative	BWR	4/30/1987	Shut Down	n/a

Estimated Used Fuel Inventory December 2013

	Dry Inventory			Pool Inventory		Site Inventory	
Facility	assemblies	Estimated Initial Uranium (MT)	Fuel Casks	assemblies	Estimated Initial Uranium (MT)	assemblies	Estimated Initial Uranium (MT)
Point Beach Nuclear Plant	1,120	430	39	1,135	436	2,255	866
Kewaunee Power Station	256	98	8	1,079	415	1,335	513
LaCrosse Boiling Water Reactor	333	38	5			333	38
Wisconsin Total	**1,709**	**566**	**52**	**2,214**	**851**	**3,923**	**1,417**



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Appendix E
Reference Scenario: No Replacement Nuclear Generation Forecast – Discharged Fuel by NRC Region

Table E-1. Estimated and Projected Inventory by NRC Region

NRC Region	Fuel Discharged Prior to 12/31/2002		Forecast Discharges 1/1/2003 to 12/31/2013		Forecast Future Discharges 1/1/2014 to 12/31/2060		Total Projected Discharged Fuel		Past Inter-Region Transfer Adjustments		Region's Forecasted Remaining Inventory	
	Assy.	Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
1	52,106	12,893	23,839	5,912	67,519	16,597	143,464	35,402	(125)	(51)	143,339	35,351
2	43,213	14,317	25,751	8,201	66,826	21,393	135,790	43,911	(88)	(40)	135,702	43,871
3	40,837	10,593	20,432	5,081	53,267	13,273	114,536	28,946	1,311	317	115,847	29,263
4	27,500	9,196	16,243	5,576	47,079	16,210	90,822	30,982	(1,324)	(296)	89,498	30,686
DOE	-	-	-	-	-	-	-	-	226	70.42	226	70.42
Totals	**163,656**	**46,999**	**86,265**	**24,770**	**234,691**	**67,472**	**484,612**	**139,241**	**-**	**-**	**484,612**	**139,241**

Table E-2. Estimated Inventory by NRC Region and by Storage Configuration at the end of 2013

NRC Region	Dry Inventory			Pool Inventory		Site Inventory	
	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
1	23,651	5,816	523	52,169	12,938	75,820	18,754
2	20,355	7,070	572	48,521	15,408	68,876	22,478
3	15,543	4,281	322	47,037	11,709	62,580	15,990
4	14,648	4,833	433	27,771	9,643	42,419	14,476
DOE	225	70.3	-	1	0.12	226	70.42
Totals	**74,422**	**22,070**	**1,850**	**175,499**	**49,699**	**249,921**	**71,769**

Table E-3. Estimated Pool Inventory of Group A Sites by NRC Region at the end of 2013

NRC Region	A1		A2		A3		A	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
1	-	-	-	-	-	-	-	-
2	-	-	-	-	1,319	612	1,319	612
3*	2,004	495	1,079	415	-	-	3,083	910
4	-	-	2,776	1,148	-	-	2,776	1,148
DOE	-	-	-	-	-	-	-	-
Totals	**2,004**	**495**	**3,855**	**1,563**	**1,319**	**612**	**7,178**	**2,671**

* Includes 2,004 assemblies currently in wet storage at Zion that are expected to be in dry storage by the end of 2014

Table E-4. Estimated Pool Inventory of Group B Sites by NRC Region at the end of 2013

NRC Region	B2		B3		B	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
1	7,264	2,450	-	-	7,264	2,450
2	-	-	-	-	-	-
3	5,704	957	-	-	5,704	957
4	-	-	-	-	-	-
DOE	-	-	-	-	-	-
Totals	**12,968**	**3,407**	**-**	**-**	**12,968**	**3,407**

Table E-5. Estimated Pool Inventory of Group C Sites by NRC Region at the end of 2013

NRC Region	C2		C3		C	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
1	37,881	8,149	7,024	2,339	44,905	10,488
2	35,931	11,784	11,271	3,013	47,202	14,796
3	31,724	8,588	3,309	579	35,033	9,168
4	19,397	5,809	5,598	2,686	24,995	8,494
DOE	-	-	-	-	-	-
Totals	**124,933**	**34,330**	**27,202**	**8,617**	**152,135**	**42,947**

Table E-6. Estimated Pool Inventory of Group D & F Sites by NRC Region at the end of 2013

	D		F	
NRC Region	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**
1	-	-	-	-
2	-	-	-	-
3	-	-	3,217	674
4	-	-	-	-
DOE	1	0.12	-	-
Totals	**1**	**0.12**	**3,217**	**674**

Table E-7. Estimated Pool Inventory by Group and by NRC Region at the end of 2013

NRC Region	A		B		C		D		F		Totals	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
1	-	-	7,264	2,450	44,905	10,488	-	-	-	-	52,169	12,938
2	1,319	612	-	-	47,202	14,796	-	-	-	-	48,521	15,408
3	3,083	910	5,704	957	35,033	9,168	-	-	3,217	674	47,037	11,709
4	2,776	1,148	-	-	24,995	8,494	-	-	-	-	27,771	9,643
DOE	-	-	-	-	-	-	1	0.12	-	-	1	0.12
Totals	**7,178**	**2,671**	**12,968**	**3,407**	**152,135**	**42,947**	**1**	**0.12**	**3,217**	**674**	**175,499**	**49,699**

Table E-8. Estimated Dry Inventory of Group A Sites by NRC Region at the end of 2013

NRC Region	A1			A2			A3			A		
	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks
1	2,986	1,082	115	-	-	-	-	-	-	2,986	1,082	115
2	-	-	-	-	-	-	-	-	-	-	-	-
3	996	620	18	256	98	8	-	-	-	1,252	718	26
4	1,673	616	60	1,187	474	50	-	-	-	2,860	1,090	110
DOE	-	-	-	-	-	-	-	-	-	-	-	-
Totals	**5,655**	**2,318**	**193**	**1,443**	**572**	**58**	**-**	**-**	**-**	**7,098**	**2,890**	**251**

Table E-9. Estimated Dry Inventory of Group B Sites by NRC Region at the end of 2013

NRC Region	B2			B3			B		
	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks
1	1,408	580	44	-	-	-	1,408	580	44
2	-	-	-	-	-	-	-	-	-
3	3,876	669	57	-	-	-	3,876	669	57
4	-	-	-	-	-	-	-	-	-
DOE	-	-	-	-	-	-	-	-	-
Totals	**5,284**	**1,249**	**101**	**-**	**-**	**-**	**5,284**	**1,249**	**101**

Table E-10. Estimated Dry Inventory of Group C Sites by NRC Region at the end of 2013

NRC Region	C2			C3			C		
	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks
1	19,257	4,155	364	-	-	-	19,257	4,155	364
2	20,355	7,070	572	-	-	-	20,355	7,070	572
3	10,415	2,893	239	-	-	-	10,415	2,893	239
4	11,788	3,743	323	-	-	-	11,788	3,743	323
DOE	-	-	-	-	-	-	-	-	-
Totals	**61,815**	**17,861**	**1,498**	**-**	**-**	**-**	**61,815**	**17,861**	**1,498**

Table E-11. Estimated Dry Inventory of Group D & F Sites by NRC Region at the end of 2013

State	D			F		
	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks
1	-	-	-	-	-	-
2	-	-	-	-	-	-
3	-	-	-	-	-	-
4	-	-	-	-	-	-
DOE	225	70.3	-	-	-	-
Totals	**225**	**70.3**	**-**	**-**	**-**	**-**

Table E-12. Estimated Dry Inventory by Group by NRC Region at the end of 2013

NRC Region	A			B			C			D		Totals		
	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Fuel Casks
1	2,986	1,082	115	1,408	580	44	19,257	4,155	364	-	-	23,651	5,816	523
2	-	-	-	-	-	-	20,355	7,070	572	-	-	20,355	7,070	572
3	1,252	718	26	3,876	669	57	10,415	2,893	239	-	-	15,543	4,281	322
4	2,860	1,090	110	-	-	-	11,788	3,743	323	-	-	14,648	4,833	433
DOE	-	-	-	-	-	-	-	-	-	225	70.3	225	70.3	-
Totals	**7,098**	**2,890**	**251**	**5,284**	**1,249**	**101**	**61,815**	**17,861**	**1,498**	**225**	**70.3**	**74,422**	**22,070**	**1,850**

Table E-13. Estimated Total Inventory of Group A Sites by NRC Region at the end of 2013

NRC Region	A1		A2		A3		A	
	Assy.	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**
1	2,986	1,082	-	-	-	-	2,986	1,082
2	-	-	-	-	1,319	612	1,319	612
3	3,000	1,115	1,335	513	-	-	4,335	1,629
4	1,673	616	3,963	1,622	-	-	5,636	2,238
DOE	-	-	-	-	-	-	-	-
Totals	**7,659**	**2,813**	**5,298**	**2,135**	**1,319**	**612**	**14,276**	**5,561**

Table E-14. Estimated Total Inventory of Group B Sites by NRC Region at the end of 2013

NRC Region	B2		B3		B	
	Assy.	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**
1	8,672	3,030	-	-	8,672	3,030
2	-	-	-	-	-	-
3	9,580	1,626	-	-	9,580	1,626
4	-	-	-	-	-	-
DOE	-	-	-	-	-	-
Totals	**18,252**	**4,656**	**-**	**-**	**18,252**	**4,656**

Table E-15. Estimated Total Inventory of Group A Sites by NRC Region at the end of 2013

	C2		C3		C	
NRC Region	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**
1	57,138	12,304	7,024	2,339	64,162	14,643
2	56,286	18,853	11,271	3,013	67,557	21,866
3	42,139	11,482	3,309	579	45,448	12,061
4	31,185	9,552	5,598	2,686	36,783	12,238
DOE	-	-	-	-	-	-
Totals	**186,748**	**52,191**	**27,202**	**8,617**	**213,950**	**60,808**

Table E-16. Estimated Total Inventory of Group A Sites by NRC Region at the end of 2013

	D		F	
NRC Region	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**
1	-	-	-	-
2	-	-	-	-
3	-	-	3,217	674
4	-	-	-	-
DOE	226	70.42	-	-
Totals	**226**	**70.42**	**3,217**	**674**

Table E-17. Estimated Total Inventory of Group A Sites by NRC Region at the end of 2013

NRC Region	A		B		C		D		F		Totals	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
1	2,986	1,082	8,672	3,030	64,162	14,643	-	-	-	-	75,820	18,754
2	1,319	612	-	-	67,557	21,866	-	-	-	-	68,876	22,478
3	4,335	1,629	9,580	1,626	45,448	12,061	-	-	3,217	674	62,580	15,990
4	5,636	2,238	-	-	36,783	12,238	-	-	-	-	42,419	14,476
DOE	-	-	-	-	-	-	226	70.42	-	-	226	70.42
Totals	**14,276**	**5,561**	**18,252**	**4,656**	**213,950**	**60,808**	**226**	**70.42**	**3,217**	**674**	**249,921**	**71,769**

Table E-18. Projected Inventory for Current Group A Sites by NRC Region through 2060

NRC Region	A1		A2		A3		A	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
1	2,986	1,082	-	-	-	-	2,986	1,082
2	-	-	-	-	1,319	612	1,319	612
3	3,000	1,115	1,335	513	-	-	4,335	1,629
4	1,673	616	3,963	1,622	-	-	5,636	2,238
DOE	-	-	-	-	-	-	-	-
Totals	**7,659**	**2,813**	**5,298**	**2,135**	**1,319**	**612**	**14,276**	**5,561**

Table E-19. Projected Inventory for Current Group B Sites by NRC Region through 2060

NRC Region	B2		B3		B	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
1	14,212	5,470	-	-	14,212	5,470
2	-	-	-	-	-	-
3	14,963	2,554	-	-	14,963	2,554
4	-	-	-	-	-	-
DOE	-	-	-	-	-	-
Totals	**29,175**	**8,023**	**-**	**-**	**29,175**	**8,023**

Table E-20. Projected Inventory for Current Group C Sites by NRC Region through 2060

NRC Region	C2		C3		C	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
1	113,347	24,358	12,794	4,442	126,141	28,800
2	111,570	36,723	22,813	6,535	134,383	43,259
3	85,266	23,011	8,066	1,396	93,332	24,406
4	70,290	21,924	13,572	6,524	83,862	28,447
DOE	-	-	-	-	-	-
Totals	**380,473**	**106,016**	**57,245**	**18,896**	**437,718**	**124,912**

Table E-21. Projected Inventory for Group D & F Sites by NRC Region through 2060

NRC Region	D		F	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
1	-	-	-	-
2	-	-	-	-
3	-	-	3,217	674
4	-	-	-	-
DOE	226	70.42	-	-
Totals	**226**	**70.42**	**3,217**	**674**

Table E-22. Projected Inventory by Current Group and by NRC Region through 2060

NRC Region	A		B		C		D		F		Totals	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
1	2,986	1,082	14,212	5,470	126,141	28,800	-	-	-	-	143,339	35,351
2	1,319	612	-	-	134,383	43,259	-	-	-	-	135,702	43,871
3	4,335	1,629	14,963	2,554	93,332	24,406	-	-	3,217	674	115,847	29,263
4	5,636	2,238	-	-	83,862	28,447	-	-	-	-	89,498	30,686
DOE	-	-	-	-	-	-	226	70.42	-	-	226	70.42
Totals	**14,276**	**5,561**	**29,175**	**8,023**	**437,718**	**124,912**	**226**	**70.42**	**3,217**	**674**	**484,612**	**139,241**