Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report

Spent Fuel and Waste Disposition

Prepared for
U.S. Department of Energy
Spent Fuel and Waste Disposition
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DISCLAIMER

This is a technical report that does not take into account contractual limitations or obligations under the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (Standard Contract) (10 CFR Part 961). For example, under the provisions of the Standard Contract, spent nuclear fuel in multi-assembly canisters is not an acceptable waste form, absent a mutually agreed to contract amendment.

To the extent discussions or recommendations in this report conflict with the provisions of the Standard Contract, the Standard Contract governs the obligations of the parties, and this report in no manner supersedes, overrides, or amends the Standard Contract.

This report reflects technical work which could support future decision making by DOE. No inferences should be drawn from this report regarding future actions by DOE, which are limited both by the terms of the Standard Contract and a lack of Congressional appropriations for the Department to fulfill its obligations under the Nuclear Waste Policy Act including licensing and construction of a spent nuclear fuel repository.

SUMMARY

This report provides information on the inventory of commercial spent fuel (SNF) and high-level radioactive waste (HLW) in the United States, as well as non-commercial SNF and HLW in the U.S. Department of Energy (DOE) complex. Actual or estimated quantitative values for current inventories are provided along with inventory forecasts derived from examining 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 SNF and HLW and sponsored by DOE's Office of Spent Fuel and Waste Disposition (SFWD). The report draws from and complements a previously issued report, *Fuel Cycle Potential Waste Inventory for Disposition* [Carter, 2013], developed for DOE's Used Nuclear Fuel Research & Development Campaign. The current report is not intended as a revision to either *Fuel Cycle Potential Waste Inventory for Disposition* [Carter, 2013] or *Evaluation of Options for Permanent Geologic Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste in Support of a Comprehensive National Nuclear Fuel Cycle Strategy* [SNL, 2014] from which some underlying data is used as referenced in the current report. Rather, this report is intended as a stand-alone report providing estimates of current and projected SNF and HLW inventory and has been generated for SFWD planning purposes.

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ACRONYMS

ATR	Advanced Test Reactor
BWR	Boiling Water Reactor
DOE	Department of Energy
EIA	Energy Information Administration
GTCC	Greater-than-Class-C (category of radioactive waste)
GWd/MT	Gigawatt-days per Metric Ton (of Initial Uranium)
GWSB	Glass Waste Storage Building
HIP	Hot Isostatic Pressing
HLW	High-Level Radioactive Waste
INL	Idaho National Laboratory
ISF	Interim Storage Facility
ISFSI	Independent Spent Fuel Storage Installation
LLRW	Low-Level Radioactive Waste
MCO	Multi-Canister Overpack
MT	Metric Tons
MTHM	Metric Tons Initial Heavy Metal (typically equivalent to MTU)
MTU	Metric Tons Initial Uranium
NIST	National Institute of Standards and Technology
NNPP	Naval Nuclear Propulsion Program
NPR	nuclear power reactor
NRC	Nuclear Regulatory Commission
NSNFP	National Spent Nuclear Fuel Program
OCRWM	Office of Civilian Radioactive Waste Management
ORNL	Oak Ridge National Laboratory
PWR	Pressurized Water Reactor
R&D	Research and Development
SFD	Spent Fuel Database
SFWD	DOE's Office of Spent Fuel and Waste Disposition
SNF	Spent Nuclear Fuel
SRNL	Savannah River National Laboratory
SRS	Savannah River Site
TREAT	Transient Reactor Test Facility
TMI	Three Mile Island

TRU	Transuranic
UFDC	Used Fuel Disposition Campaign
WEST	Waste Encapsulation and Storage Facility
WTP	Waste Treatment Project

SPENT NUCLEAR FUEL AND HIGH-LEVEL RADIOACTIVE WASTE INVENTORY REPORT

1. Introduction

This report provides information on the inventory of commercial spent fuel (SNF) and high-level radioactive waste (HLW) in the United States, as well as non-commercial SNF and HLW in the U.S. Department of Energy (DOE) complex. Inventory forecasts for commercial SNF 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 SNF inventory and a short description of the types of waste in DOE's inventory. Section 2 presents more detailed information on the commercial SNF and HLW including the inventory forecast information. A more in-depth discussion on the non-commercial SNF and HLW is provided in Section 3. Additional and supporting information is contained in the appendices, namely information on: commercial SNF characteristics; SNF discharges by reactor; and inventory forecast break-outs by reactor, storage location, site, state, U.S. Nuclear Regulatory Commission (NRC) region, and Congressional Districts. This report was sponsored by DOE's Office of Spent Fuel and Waste Disposition (SFWD). It draws from and complements a previously issued report, *Fuel Cycle Potential Waste Inventory for Disposition* [Carter, 2013] developed for DOE's Used Nuclear Fuel Research & Development Campaign. The current report is not intended as a revision to either *Fuel Cycle Potential Waste Inventory for Disposition* [Carter, 2013] or *Evaluation of Options for Permanent Geologic Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste in Support of a Comprehensive National Nuclear Fuel Cycle Strategy* [SNL, 2014] from which some underlying data is used as referenced in the current report. Rather, this report is intended as a stand-alone report providing estimates of current and projected SNF and HLW inventory and has been generated for SFWD planning purposes.

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This report is not intended to provide an over-arching estimate for Greater-Than-Class C (GTCC) Low-Level Radioactive Waste (LLRW) associated with decommissioning the U.S. fleet of current and future commercial reactors. For estimates of GTCC LLRW, the reader is referred to Final Environmental Impact Statement for the Disposal of GTCC LLRW and GTCC-Like Waste [DOE, 2016].

1.1 Inventory Summary

The U.S Inventory of SNF and HLW is located at 113 sites in 39 states. Figure 1-1 provides the approximate locations for: 98 operating commercial power generating reactors (see Table 2-1), 21 shutdown commercial power generating reactors (See Table 2-1), 1 away from reactor commercial SNF storage facility (see Table 2-3), 31 non-DOE research reactors (see Section 4.0, SNF from these reactors is transferred to DOE and is

included in the non-commercial SNF in Section 3.0), 1 commercial HLW storage location (see Section 2.2) and 6 DOE sites with SNF and/or HLW (see Section 3.0).

The total U.S. SNF inventory is approximately 84,780 MTHM at the end of 2018 and, as indicated by Table 1-1, is comprised of about 82,460 MTHM of commercial SNF and about 2,318 MTHM of non-commercial SNF. The total number of HLW canisters at the end of 2018 is 4,451, with DOE HLW canisters constituting the vast majority (4,173) and with commercial HLW canisters comprising a much smaller portion (278).

Table 1-1 U.S. SNF and HLW Inventory Summary for 2018

Material Category	**SNF (MTHM)**	**HLW (canisters)** [a]
Commercial SNF[e] and HLW	82,463 [b]	278 [c]
Non-commercial SNF and HLW	2,318 [d]	4,173
Total	84,781	4,451

[a] Accounts only for the current inventory of HLW canisters produced through December 31, 2018. HLW which has yet to be processed into canisters is not included. All HLW canisters produced thus far are 2 feet in diameter × 10 feet tall.

[b] Commercial power reactor (identified in Table 2-1) discharges estimated through December 31, 2018. Table 1-1 includes approximately 82 MTHM of Three Mile Island Unit 2 core debris and 24 MTHM for Ft St. Vrain SNF (both in Colorado and Idaho).

[c] West Valley HLW canisters, including 2 canisters used to evacuate the melter prior to decommissioning and 1 non-routine (end-of-process) HLW canister.

[d] Includes SNF from research and production activities and Navy SNF.

[e] Commercial SNF inventories in this report include: SNF discharged from commercial light water reactors listed in Table 2-1 regardless of current SNF storage location; Three Mile Island Unit 2 fuel debris; and SNF discharged from the decommissioned Ft. St. Vrain gas-cooled reactor. SNF inventories from other reactors, including some early power reactor demonstration program reactors are accounted for in the "Non-commercial SNF" category for the purposes of this report.

Some commercial fuel was reprocessed at an aqueous reprocessing facility at West Valley, New York (See Section 2.2).

Since the inception of nuclear reactors, the DOE and its predecessor agencies operated reactors to produce defense nuclear materials. Some of this SNF remains in storage while most underwent aqueous reprocessing at the Hanford Site, the Idaho National Laboratory (INL), and the Savannah River Site (SRS). The resulting High-Level Waste is (or is planned to be treated) prior to disposal. See Section 3.3.

DOE also operated or sponsored a variety of early electrical power generating reactors (see section 2.0) research, test, training, and other experimental reactors for their own use (see section 3.1) or university programs (see section 4.0). The SNF from these reactors is managed by DOE. The INL is using electro-chemical processing to treat up to 60 MTHM of sodium bonded SNF from one of these electrical power generating demonstration reactors.

The Naval Nuclear Propulsion Program (NNPP) has generated SNF 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 (see Section 3.2).

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. A description of the revision history for this report is provided in Appendix G.

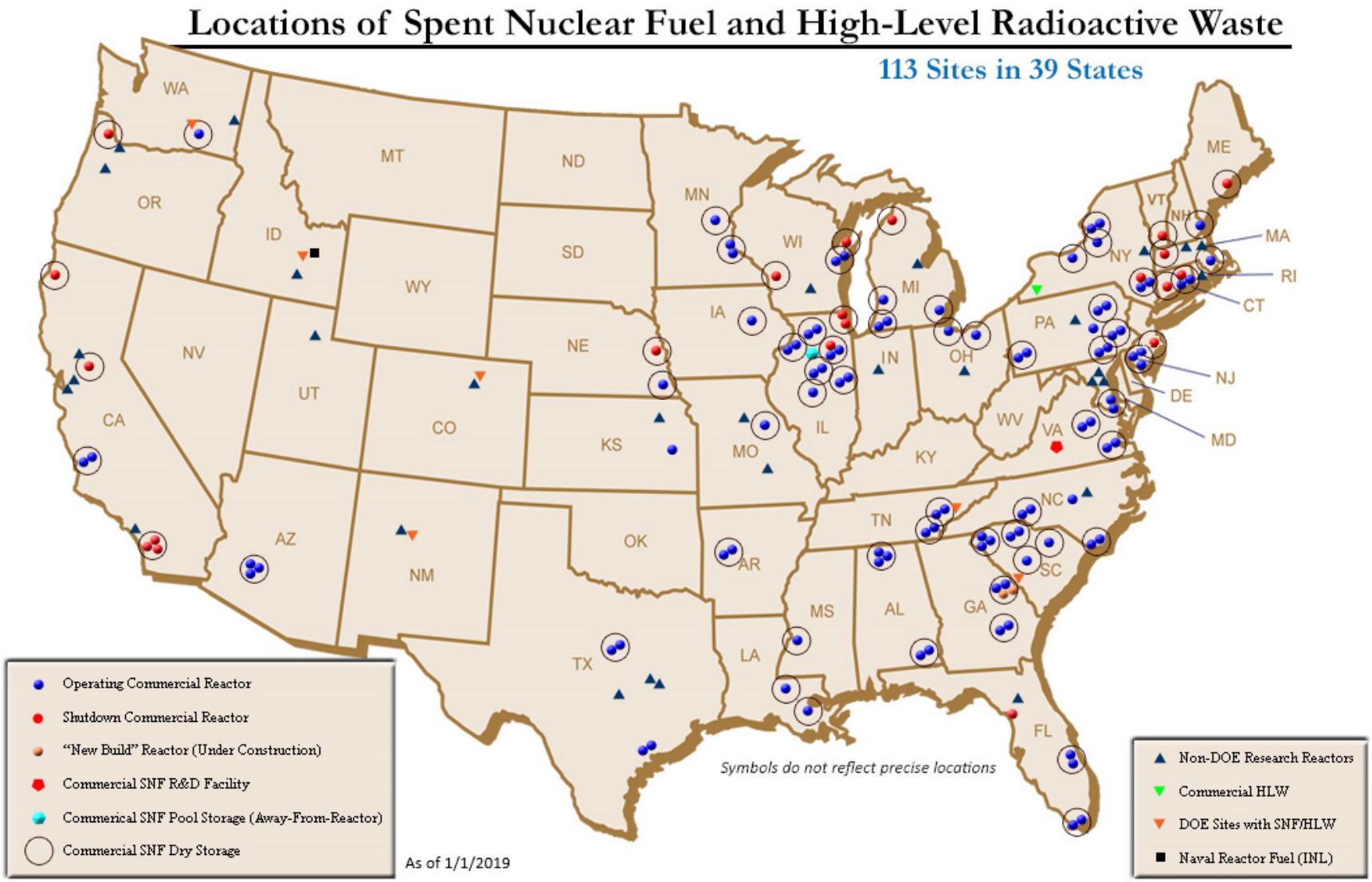


Figure 1-1. Sites Currently Storing Spent Nuclear Fuel and High-Level Radioactive Waste

2. Commercial SNF and HLW Inventory

Commercial Nuclear Power Reactors (NPRs) have operated in the U.S. since about 1960. Excluding a number of civilian reactors categorized as experimental electric-power reactors (e.g.,Vallecitos Boiling Water Reactor, Saxton Nuclear Experimental Reactor Project) or primarily used for purposes other than central-station nuclear power generation (e.g., N.S. Savannah), 131 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 and Shippingport in Pennsylvania and Fermi 1in Illinois) and for which SNF no longer remains on site (remaining SNF from these reactors is discussed in Section 3). Another was the high temperature gas cooled Fort St. Vrain demonstration reactor in Colorado which was also decommissioned, however SNF discharged from this reactor is currently managed by DOE and stored partly in an Independent Spent Fuel Storage Installation (ISFSI) near the reactor site and partly at the Idaho National Laboratory (INL). Of the remaining 121 NPRs, one (Shoreham in New York) never operated at full power and was decommissioned, the fuel was transferred to another reactor and discharged there. A second (Three Mile Island Unit 2, in Pennsylvania) was disabled, and the fuel debris is managed by the DOE and located at INL. Another 21 reactors have since shutdown, currently leaving 98 NPRs licensed to operate.

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.

Commercial Nuclear Power Generation Sites**:**

Group A: sites with all reactors permanently shutdown (**A**ll units shutdown).

Group B: sites with at least one reactor permanently shutdown co-located with at least one reactor continuing to operate (status is **B**etween Group A and Group C sites)

Group C: sites with all reactors operating or expected to resume operation, i.e., none permanently shutdown (**C**ontinuing operations with all reactors)

Other Sites:

Group F: Non-reactor commercial fuel cycle facility sites, e.g., reprocessing, storage, etc. (**F**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 SNF 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 2-1 provides a list of nuclear power plants by their assigned Groups/Subgroups. Ninety-two reactors are at Group C sites and six are at Group B sites. Seven of the Group C reactors (Pilgrim in Massachusetts, Duane Arnold in Iowa, Indian Point 2 and 3 in New York, Palisades in Michigan and Diablo Canyon 1 and 2 in California) have utility-announced early shutdown dates before the end of 2025.

Of the 21 shutdown reactors with fuel remaining onsite, 18 are reactors at 15 sites with no continuing nuclear operations (Group A sites). This includes SNF from 10 reactors on 9 sites that ceased operations prior to 2000 and where all SNF is in dry storage and reactor decommissioning is complete or nearing completion. This subgroup is sometimes referred to as “legacy” shutdown reactor sites, since these sites have not had an operating reactor on the site for at least 20 years. Group A also includes SNF from 8 reactors on 6 sites that ceased operations after 2000. This subgroup is sometimes referred to “Early Shutdown Reactors” since operations were halted prior to achieving 60 years of operations. Three of these early shutdown reactors, on 3 sites have recently completed moving the SNF into dry storage, bringing the

total number of subgroup A-1 reactors to 13 reactors on 12 sites. Five reactors on 3 sites in Group A still have SNF both in the pools and in dry storage.

In addition to the 18 shutdown reactors at 15 shutdown sites, SNF from 3 shutdown reactors (i.e., Dresden 1 in Illinois, Millstone 1 in Connecticut, and Indian Point 1 in New York) is stored on sites co-located with operating reactors (Group B). Figure 1-1 illustrates the locations of these shutdown commercial power reactors.

For the 119 NPRs with SNF still located at commercial sites, the SNF 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 has been transferred to DOE (see Section 2.1.2). The General Electric facility at Morris, Illinois (the lone Group F Site) is currently the only non-DOE operated, NRC licensed storage facility that is not co-located at a reactor site.

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

Commercial SNF assemblies are categorized by physical configuration into 22 classes: 16 PWR and 6 BWR fuel assembly classes. Commercial SNF data has been collected by the Energy Information Administration for the Office of Standard Contract Management within the Office of General Counsel (former Office of Civilian Radioactive Waste Management [OCRWM]). 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 SNF and commercial BWR SNF, 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 burnup characteristics of commercial SNF 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.

Table 2-1 Nuclear Power Generation Sites by Group/Subgroup (as of December 2018)

Group A: All Units Shutdown Sites (# of Units) – 18 Reactors/15 Sites			
A1 (Dry Storage)		**A2 (Dry and Pool Storage)**	**A3 (Pool Storage)**
Reactors Shutdown Prior to 2000		Fort Calhoun (1)	
Big Rock Point (1)	Rancho Seco (1)	Oyster Creek (1)	
Haddam Neck (1)	Trojan (1)	San Onofre (3)	
Humboldt Bay (1)	Yankee Rowe (1)		
La Crosse (1)	Zion (2)		
Maine Yankee (1)			
Reactors Shutdown After 2000			
Crystal River (1)	Vermont Yankee (1)		
Kewaunee (1)			

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

Group C: All Units Operating (# of Units)– 92 Reactors /55 Sites (Note: All Group C Sites have Wet Storage Capabilities)			
C2 (Dry and Pool Storage)			**C3 (Pool Storage)**
Arkansas Nuclear (2)	Fitzpatrick (1)	Point Beach (2)	Shearon Harris (1)
Beaver Valley (2)	Fermi (1) ††	Prairie Island (2)	South Texas (2)
Braidwood (2)	Ginna (1)	Quad Cities (2)	Three Mile Island (1) ††
Browns Ferry (3)	Grand Gulf (1)	River Bend (1)	Wolf Creek (1)
Brunswick (2)	Hatch (2)	Robinson (1)	
Byron (2)	Hope Creek (1) ‡‡	Saint Lucie (2)	
Calvert Cliffs (2)	La Salle (2)	Salem (2) ‡‡	
Callaway (1)	Limerick (2)	Seabrook (1)	
Catawba (2)	McGuire (2)	Sequoyah (2)	
Clinton (1)	Monticello (1)	Summer (1)	
Columbia Generating Station (1)	Nine Mile Point (2)	Surry (2)	
Comanche Peak (2)	North Anna (2)	Susquehanna (2)	
Cooper (1)	Oconee (3)	Turkey Point (2)	
Davis-Besse (1)	Palisades (1)	Vogtle (2)	
D.C. Cook (2)	Palo Verde (3)	Waterford (1)	
Diablo Canyon (2)	Peach Bottom (2) ††	Watts Bar (2)	
Duane Arnold (1)	Perry (1)		
Farley (2)	Pilgrim (1)		

‡ Each of the three B2 Sites has a single shutdown reactor and 2 operating reactors.

†† Does not include prototype (Fermi 1), experimental (Peach Bottom-1), or disabled (TMI-2) reactors.

‡‡ Hope Creek and Salem are considered as a single site in this report due to proximity and shared ISFSI.

2.1 Current Commercial SNF Inventory

The source of historical inventory data for this study is information collected by the Energy Information Administration (EIA). Information collected from GC-859 forms is available on an assembly basis for SNF discharges from 1968 through June 2013.

To develop an inventory estimate through 2018 and beyond, fuel discharge projections were developed using the U.S. Commercial Spent Fuel Projection tool [Vinson, 2015]. The methodology used by the tool are documented in "Description and Validation of a Revised Tool for Projecting U.S. Commercial Spent Nuclear Fuel Inventory", March 2015 [Vinson, 2015]. The tool allows for multiple methodologies for handling plant capacity factors, reactor uprates, and other operating inputs. Based on the validation report findings, the methodology utilized in this report makes no adjustment for reactor-specific capacity factors or EIA-forecast nuclear energy demand data. This methodology was found to provide the best agreement to preliminary GC-859 data (<1.4% difference between preliminary GC-859 and projected assembly discharged data between the beginning of 2003 and the end of 2012) [Vinson 2015].

The projection method forecasts each NPR individually and these quantities have been adopted for this study except for shutdown reactors that have published the actual quantities of discharged fuel. Actual discharges from reactors shutdown prior to June 2013 are taken from the GC-859 EIA survey. Data for reactors shutdown after this date are a combination of the historical data and the forecast discharges up to the announced shutdown date.

Table 2-2 provides the estimated SNF discharged at the end of 2018 by reactor type. The total projected inventory is more than 82,350 metric tons (MT) of uranium (MTU) contained in approximately 285,960 discharged assemblies. The table is detailed to provide actual discharges through December 31, 2012 from the GC-859 data set and the projected quantities between 1/1/2013 and 12/31/2018[a].

Table 2-2. Estimated Reactor Discharges by Reactor Type, Detailed by GC-859* and Forecast Quantities

	Fuel Discharged through 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Total Estimated Discharged Fuel through 12/31/2018	
Reactor Type	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
PWR	103,605	44,894	19,407	8,513	123,012	53,407
BWR	136,533	24,293	26,411	4,658	162,944	28,952
Totals	**240,138**	**69,187**	**45,818**	**13,171**	**285,956**	**82,358**

***** Excludes SNF that was reprocessed at West Valley in NY, removed from TMI Unit 2, or discharged from the decommissioned Fort St. Vrain reactor.

[a] The actual quantities reported by GC-859 are used for the period 1/1/2013 to 6/30/2013. These amounts are included in the forecast discharges to provide "end of year values" for this information.

2.1.1 Fuel Transfers

The values reported in Table 2-2 indicate reported and forecast discharge quantities by reactor type and do not reflect subsequent transfer of discharged fuel assemblies. Utilities did not report (via GC-859 forms) fuel that was transferred to West Valley, NY for reprocessing. Prior to 2000, some discharged SNF was transferred to other locations. Five reactors transferred some of their discharged fuel to the pool storage facility at Morris, IL. Table 2-3 details the transfers to Morris which totals 3,217 assemblies and approximately 674 MTU.

The EIA survey process (in RW-859 forms data reported in 2002) indicates approximately 70 MT of the inventory listed in Table 2-1 was transferred to DOE for research and development purposes such as fuel rod consolidation and dry storage demonstrations. This fuel has been transferred to the DOE and is not stored in NRC licensed facilities. However, this is not a complete listing of the commercial SNF being managed by DOE. Commercial SNF managed by DOE, such as the TMI-2 fuel debris that is stored in an NRC-licensed ISFSI at INL, is discussed in Section 2.1.2.

Since 2000, essentially all fuel generated has remained on the generating reactor sites in either pool or dry storage. Some utilities did transfer some fuel between its operating reactors, see Table 2-4.

Table 2-3. SNF Transferred to Pool Storage at Morris, Illinois

		Discharges as of Dec 2012		Transferred to Morris	
Reactor [Unit] (Site Subgroup)	**Operating Status**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**
Cooper (C2)	Operating	3,604	657.69	1,054	198.02
Dresden 2 (B2)	Operating	5,001	895.48	753	145.19
Monticello (C2)	Operating	3,148	561.19	1,058	198.19
Haddam Neck (A1)	Shutdown	1,102	448.42	82	34.48
San Onofre 1 (A2)	Shutdown	665	244.61	270	98.41
			Totals	**3,217**	**674.29**

Table 2-4. Nuclear Power Reactor SNF Transfers

Discharge Reactor	Transferred Fuel		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
Oconee	300	139.8	McGuire

Table 2-5 provides a summary of estimated SNF inventory, by Site Group and storage method, as of December 31, 2018. Table 2-5 excludes discharges that were reprocessed at West Valley, NY, and transfers to DOE for research and development purposes and therefore represents the quantity of fuel stored at the 119 power reactor sites and the away from reactor pool storage location at Morris, IL. Figure 2-1 illustrates the current distribution by site group and storage method, and Figure 2-2 illustrates the current distribution of storage casks by site group.

Table 2-6 provides the end of 2018 inventory remaining at the NPR sites (this does not include the inventory at Morris) by storage method accounting for all known fuel transfers. The dry storage quantities as of 12/31/2018 have been derived from publicly available sources [Store Fuel, 2019]. The balance of the projected inventory remains in the reactor pools. Appendix B provides additional details on a reactor specific basis and site group basis. Appendix B reflects known transfers.

Table 2-5. Spent Nuclear Fuel Inventory by Reactor Group/Subgroup (Estimate as of 12/31/2018)

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 Pre 2000	7,660	2,815	248	-	-	7,660	2,815
A1 Post 2000	6,455	1,805	135	-	-	6,455	1,805
A2	4,654	1,419	123	5,009	1,458	9,663	2,877
A3	-	-	-	-	-	-	-
A	**18,769**	**6,038**	**506**	**5,009**	**1,458**	**23,778**	**7,496**
Group B Sites							
B1	-	-	-	-	-	-	-
B2	7,736	1,943	154	12,768	3,360	20,504	5,302
B3	-	-	-	-	-	-	-
B	**7,736**	**1,942**	**154**	**12,768**	**3,360**	**20,504**	**5,302**
Group C Sites							
C1	-	-	-	-	-	-	-
C2	98,382	28,152	2,276	127,503	36,008	225,885	64,160
C3	-	-	-	12,346	4,665	12,346	4,655
C	**98,382**	**28,152**	**2,276**	**139,849**	**40,663**	**238,231**	**68,815**
Group F Sites							
F	**-**	**-**	**-**	**3,217**	**674**	**3,217**	**674**
Total All Sites	**124,887**	**36,133**	**2,936**	**160,843**	**46,155**	**285,730**	**82,288**

* Discharges exclude commercial SNF reprocessed at West Valley in NY , removed from TMI Unit 2, discharged from the decommissioned Fort St. Vrain reactor, or transferred to DOE for R&D purposes.

** Dry storage quantities at the end of 2018 are as reported in Storefuel Vol 21 No. 245, Jan. 8, 2019.

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

	Dry Inventory 12/31/2018			Pool Inventory		Total Projected Discharged Fuel 12/31/2018	
Reactor Type	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
PWR	55,515	23,821	1,891	71,097	30,047	126,612	53,868
BWR	69,372	12,312	1,045	86,529	15,434	155,901	27,746
Totals	**124,887**	**36,133**	**2,936**	**157,626**	**45,481**	**282,513**	**81,614**

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

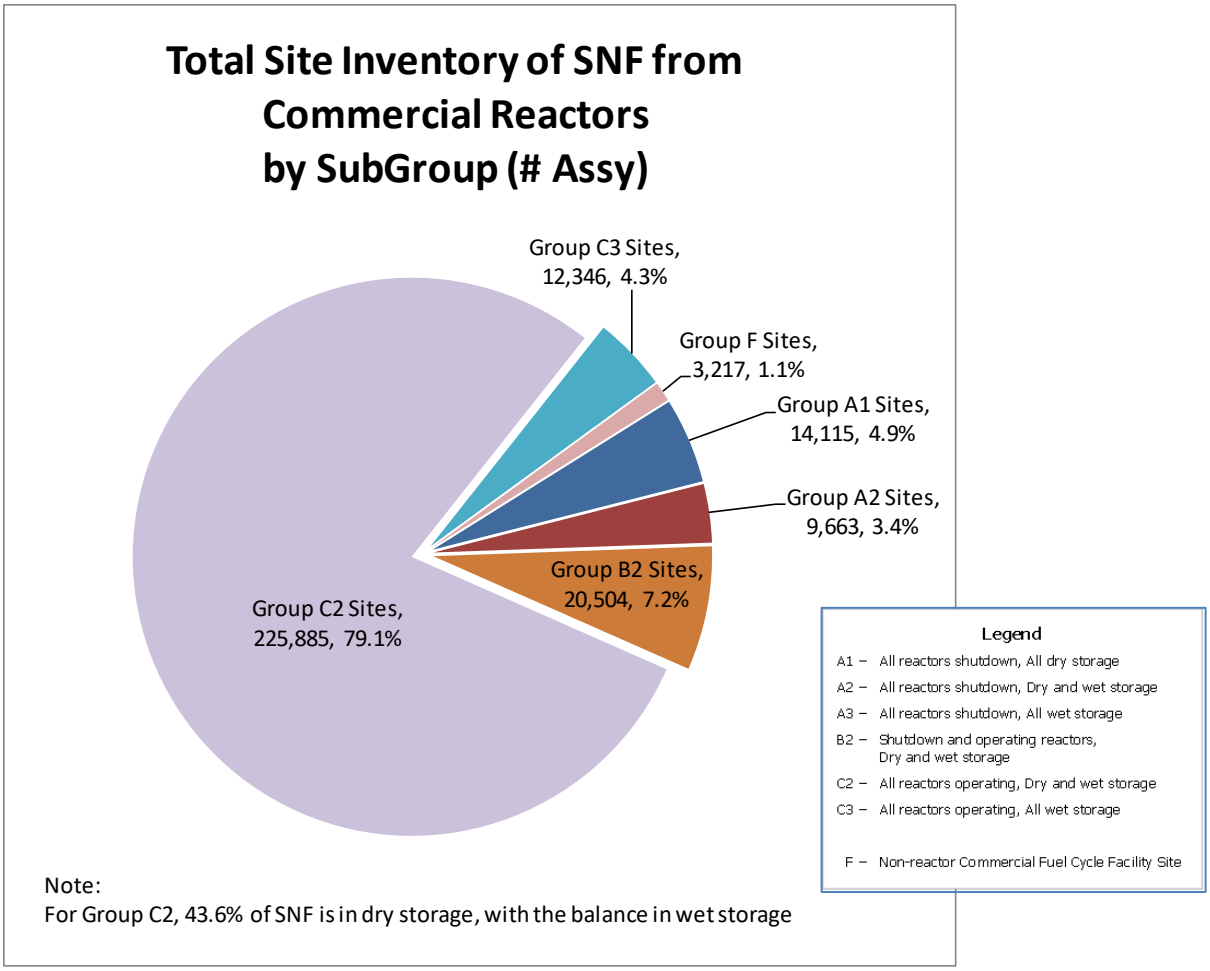


Figure 2-1. Commercial Nuclear Power Reactor Sites Currently Storing Commercial SNF

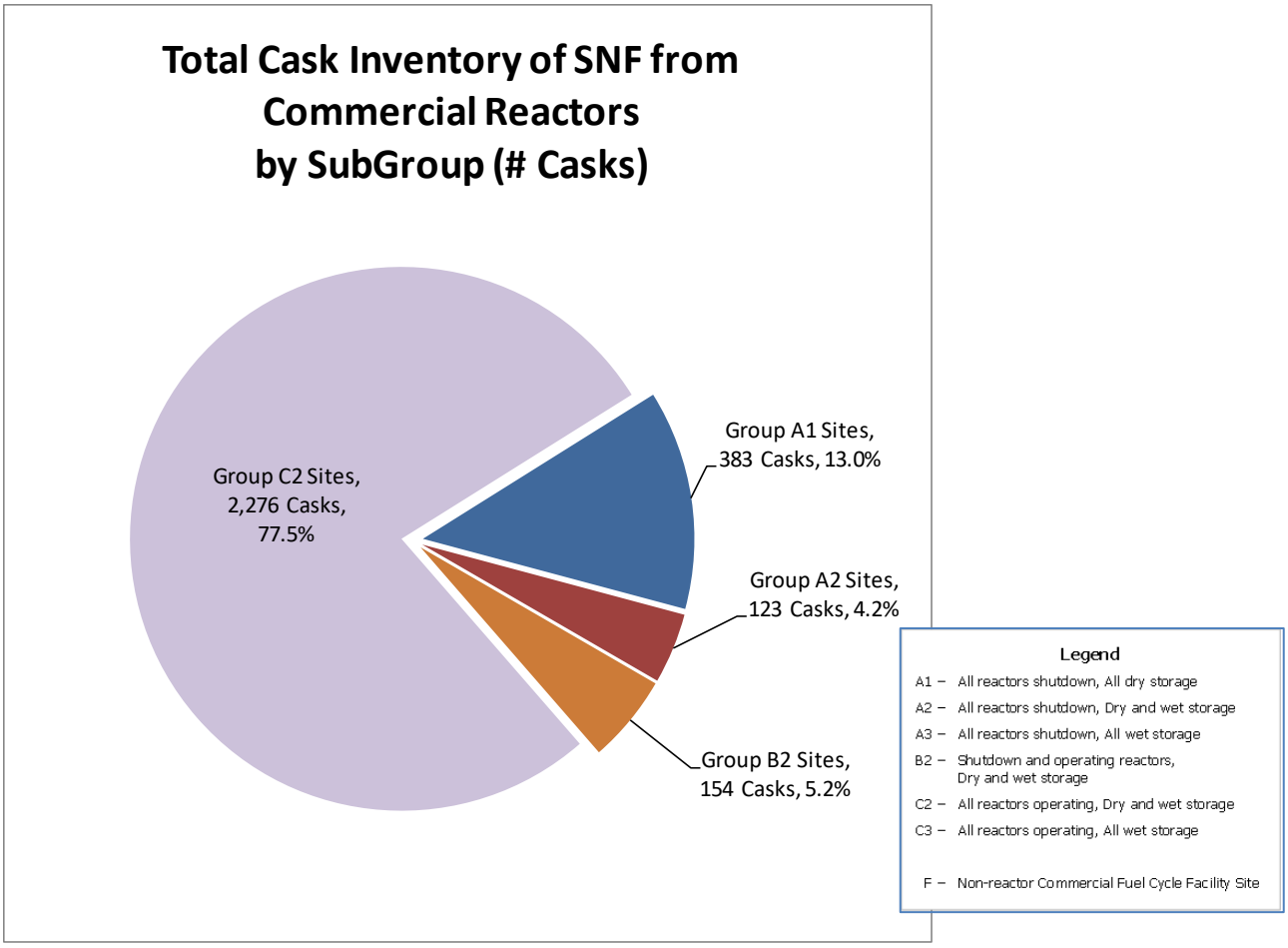


Figure 2-2. Dry SNF Storage at Commercial Nuclear Power Reactor Sites

2.1.2 Commercial SNF Inventory in DOE Possession

The Spent Fuel Database (SFD) maintained by the National Spent Nuclear Fuel Program at the INL [NSNFP, 2018] tracks spent fuel of commercial origin which is being managed by DOE. For this study commercial SNF is identified as having been discharged from the reactors in Table 2-1 as well as Three Mile Island Unit 2 debris, and Ft. St. Vrain. SNF from early demonstration power reactors is excluded from this section but included in Section 3 as part of the DOE research and development activities.

There is total of 173.6 MTU of SNF of commercial origin that is currently managed by DOE. The major contributors to this total include 81.6 MTU of Three Mile Island Unit 2 core debris, 23.6 MTU for Ft St. Vrain SNF (both in Colorado and Idaho), and 68.4MTU from other commercial sites (e.g., Surry, Ginna, and Robinson) used in various research and development programs. This fuel includes the SNF identified in RW-859 (end of 2002) as being in DOE possession. The last GC-859 survey (2013) did not include fuel transfer information.

The intact portion of this fuel is assumed to be transported and disposed in approximately six 21/44 PWR/BWR waste packages. The non-intact portion of this fuel will be loaded into standard canisters (see Section 3.1.3 for a description of the standard canister) before shipment and disposal. The non-intact portion is projected to generate 832 DOE standardized canisters. Table 2-7 provides a breakdown of the decay heat characteristics for all 838 canisters containing SNF of commercial origin.

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

Decay heat per canister (watts)	2030	
	Number of canisters	Cumulative %
<50	797.3	95.1%
50 - 100	1.2	95.2%
100 - 220	1.8	95.5%
220 - 300	0.8	95.6%
300 - 500	3.0	95.9%
500 - 1000	25.9	99.0%
1000 - 1500	1.1	99.2%
1500 - 2000	0	99.2%
>2000	7.0	100.0%
Totals	**838**	

2.2 Commercial HLW Inventory

A commercial fuel reprocessing plant located at West Valley, New York operated from 1966 through 1972 and reprocessed approximately 640 metric tons of fuel to recover the plutonium and unused uranium [NFS, 1973]. Of the fuel reprocessed at West Valley, about 260 metric tons were commercial fuel and about 380 metric tons were DOE N Reactor fuel. Included in this amount processed were approximately 30 MTHM of unirradiated fuel for the N Reactor and 3 MTHM of unirradiated fuel for the Pathfinder reactor. During operations, about 2,500 m^3 of liquid HLW was generated. The liquid HLW was vitrified between 1996 and 2001 producing 278 canisters, including 275 canisters of vitrified HLW, two additional canisters used to evacuate the melter prior to decommissioning, and one non-routine HLW canister (WV-413), that are stored at West Valley [DOE, 1996]. Appendix F provides the equivalent MTHM contained in these canisters based upon the historical factor of 2.3 MTHM per canister established in DOE/DP 0020/1. This factor is conservative for the West Valley canisters, recognizing that a portion of the fuel processed was unirradiated.

Table 2-8. Current Commercial High-Level Waste Inventory

Site	HLW Canisters[1]	Liquid HLW (m^3)	Dry HLW (m^3)
West Valley	278[2]	N/A	N/A

1. Vitrified HLW in stainless steel canisters.
2. Includes 2 canisters used to evacuate the melter prior to decommissioning in 2002 and 1 non-routine HLW canister (WV-413).

2.3 Future Commercial SNF Inventory Forecast

The methods outlined above (Section 2.1) have been extended to provide the individual NPR forecasts inventory. Such forecasts vary with the estimation method parameters described above, and 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.

2.3.1 Reference Scenario: No Replacement Nuclear Power Generation

The "No Replacement Nuclear Power Generation" scenario assumes no new NPRs are constructed and operated. 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 21 shutdown NPRs and the 98 currently operating NPRs. Ninety-one of the 98 operating NPRs are assumed to have one 20 year life extension and will be decommissioned after 60 years of operation. The following operating NPRs have utility-announced early shutdown dates as indicated:

- Pilgrim, 2019
- Duane Arnold, 2020
- Indian Point Unit 2, 2020
- Indian Point Unit 3, 2021
- Palisades, 2022
- Diablo Canyon Unit 1, 2024
- Diablo Canyon Unit 2, 2025

Applying these assumptions, the last nuclear generator finishes operations in 2075 (Watts Bar Unit 2).

Table 2-9 provides the scenario inventory by reactor type as a function of the estimate phase. Actual quantities are used for discharges through June 2013, forecast discharges are used for the individual reactors for later time periods.

The scenario totals nearly 469,500 assemblies containing nearly 136,200 MTU.

Table 2-10 provides the scenario inventory detailed to provide actual discharges through December 31, 2012 from the GC-859 database, the projected quantities between 1/1/2013 and 12/31/2018, and between 1/1/2019 and the end of the scenario, by major storage location category and by site Group. In addition to the categories previously detailed three additional categories are also included:

- Group A Sites that were shutdown prior to 2000 and at which there is no other ongoing nuclear operations. Table 2-11 and Figure 2-3 provides additional details on this category. This fuel (from 10 reactors) is located at nine sites and totals 7,660 assemblies containing 2,815 MTU. Fuel at these sites was discharged prior to 2000, and the quantities are from the GC-859 database.
- Early shutdown reactor fuel (from eight reactors) at six sites are those reactors which have ceased operations since 2000 and prior to reaching the 60-year operating lifetime. These reactors are subdivided by Site Group within Table 2-10. Table 2-12 and Figure 2-4 provides the detailed inventory of each of these eight reactors. There are no nuclear operations on these sites. This category includes:
    - Crystal River was last operated in 2009 and has an official shutdown date of February 20, 2013. Crystal River data are based on the GC-859 database.

- Kewaunee was shutdown in May of 2013. Kewaunee data are based on the GC-859 database.
- San Onofre 1 last operated in 1992 (shutdown 11/30/1992) and the inventory is based on the GC-859 database. San Onofre 2 and 3 last operated in 2012 and were officially shutdown on 6/12/2013. The inventory is based on the GC-859 database.
- Vermont Yankee has an official shutdown date of December 29, 2014. The inventory estimate is based on the GC-859 database and the forecast beyond 12/31/2012.
- Fort Calhoun was shutdown in October of 2016. Fort Calhoun data are based on the GC-859 database and the forecast for the time period after 12/31/2012.
- Oyster Creek last operated 9/17/2018 and the inventory is based on the GC-859 database and the forecast beyond 12/31/2012.

- Recently several utilities have announced their intentions to shutdown seven additional reactors on five sites prior to reaching the 60-year operating lifetime. Table 2-13 and Figure 2-5 details the scenario inventory based on GC-859 and forecast discharges from these reactors. Once shutdown, there will be no other nuclear operations on these sites.
- Shutdown reactor fuel discharged by three permanently shutdown reactors at sites with continued nuclear operations (Group B sites) are detailed in Table 2-14 and Figure 2-6. These three reactors shutdown prior to 2000 and the quantities are based on the GC-859 database. The shutdown reactors discharged 3,936 assemblies with three assemblies transferred to DOE. The remaining shutdown reactor inventory is 3,933 assemblies, containing approximately 646.8 MTU.

The Group A reactors include thirteen reactors on twelve sites that have only dry storage capabilities (A1). and five reactors on three sites with fuel in both wet and dry storage (A2). All of the Group A sites that shutdown prior to 2000 (10 reactors on 9 sites) are Subgroup A1 sites. Three of the Group A sites shutdown after 2000 (Crystal River, Kewaunee and Vermont Yankee) recently completed fuel pool de-inventory as a part of the decommissioning process and become Subgroup A1 sites. By 2025, combining the existing Group A inventory with the announced shutdown reactor inventory will bring the total Group A site inventory to over 42,000 assemblies containing approximately 13,400 MTU in nearly 1,100 fuel casks.

Figure 2-7 provides the reference scenario quantities at two points in time assuming an interim storage facility and/or repository is not available before 2045.

Appendix C, Tables C-1 through C-5 provides additional details for this Reference Scenario on a reactor specific basis. Appendix C is discharged SNF information and does not reflect transfers.

Appendices D and E provide summary information for the Reference Scenario by state, and by NRC Region, respectively.

Appendix F and H provides additional congressional district and state detail for the reference scenario and also non-commercial SNF and HLW, see Section 3 for additional discussion of these non-commercial materials.

Table 2-9. Projected SNF Inventory at NPR sites and Morris for Reference Scenario by Reactor Type

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/13 to 12/31/18		Forecast Discharges 1/1/19 to 12/31/75		Total Projected Discharged Fuel	
Reactor Type	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**
PWR	103,605	44,894	19,407	8,513	80,809	35,648	203,821	89,055
BWR	136,533	24,293	26,411	4,658	102,736	18,154	265,680	47,106
Totals	**240,138**	**69,187**	**45,818**	**13,171**	**183,545**	**53,803**	**469,501**	**136,161**

Table 2-10. Projected SNF Inventory at NPR Sites and Morris for Reference Scenario by Site Group (Group Status as of 12/31/2018)

Description	Site Group	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Discharges 1/1/2019 to 12/31/2075		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 (87 Rx/51 Sites)*	C	186,593	53,901	39,666	11,507	174,240	51,042	400,499	116,450
Operating Reactors at Group C Sites with Announced Shutdown Date (5 Rx/4 Sites)	C	10,160	2,867	1,812	541	2,313	745	14,285	4.153
Operating Reactors at Group B Sites (6 Rx/3 Sites)*	B	11,098	2,606	2,105	519	6,511	1,798	19,714	4,923
Operating Reactors at Group B Sites with Announced Shutdown Date (2 Rx/1 Site)	B	2,815	1,280	553	250	481	218	3,849	1,748
Shutdown Reactors at Group B Sites (3 Rx/3 Sites)	B	3,933	647	-	-	-	-	3,933	647
Reactors Shutdown Since 2000 (8 Rx/6 Sites)	A	14,436	4,327	1,682	355	-	-	16,118	4,681
Reactors Shutdown Prior to 2000 (10 Rx/9 Sites)	A	7,660	2,815	-	-	-	-	7,660	2,815
Away From Reactor Wet Storage	F	3,217	674	-	-	-	-	3,217	674
Totals		**239,912**	**69,117**	**45,818**	**13,171**	**183,545**	**53,803**	**469,275**	**136,090**

* Excludes reactors with announced early shutdowns.

Table 2-11. SNF and Stored GTCC LLRW at Group A Sites Shutdown Prior to 2000

		Discharges		Transferred		Remaining Inventory at the end of 2018				
Reactor	Shutdown Date	Assemblies	Initial Uranium (MT)	Assemblies	Initial Uranium (MT)	Assemblies	Initial Uranium (MT)	Fuel Casks Loaded / Estimated		GTCC LLRW Casks Loaded
Big Rock Point	8/29/1997	526	69.40	85	11.48	441	57.92	7	7	1
Haddam Neck	12/5/1996	1,102	448.42	83	34.89	1,019	413.53	40	40	3
Humboldt Bay 3	7/2/1976	390	28.94	-	-	390	28.94	5	5	1
La Crosse	4/30/1987	334	38.09	1	0.12	333	37.97	5	5	-
Maine Yankee	12/6/1996	1,434	542.26	0	0	1,434	542.26	60	60	4
Rancho Seco	6/7/1989	493	228.38	0	0	493	228.38	21	21	1
Trojan	11/9/1992	791	359.26	0	0	791	359.26	34	34	0
Yankee Rowe	10/1/1991	533	127.13	0	0	533	127.13	15	15	1
Zion 1	2/21/1997	1,143	523.94	0	0	1,143	523.94	-	-	2
Zion 2	9/19/1996	1,083	495.47	0	0	1,083	495.47	-	-	2
Zion Totals	-	2,226	1,019.41	0	0	2,226	1,019.41	61	61	4
Totals	**-**	**7,829**	**2,861.28**	**169**	**46.49**	**7,660**	**2,814.79**	**248**		**15**

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

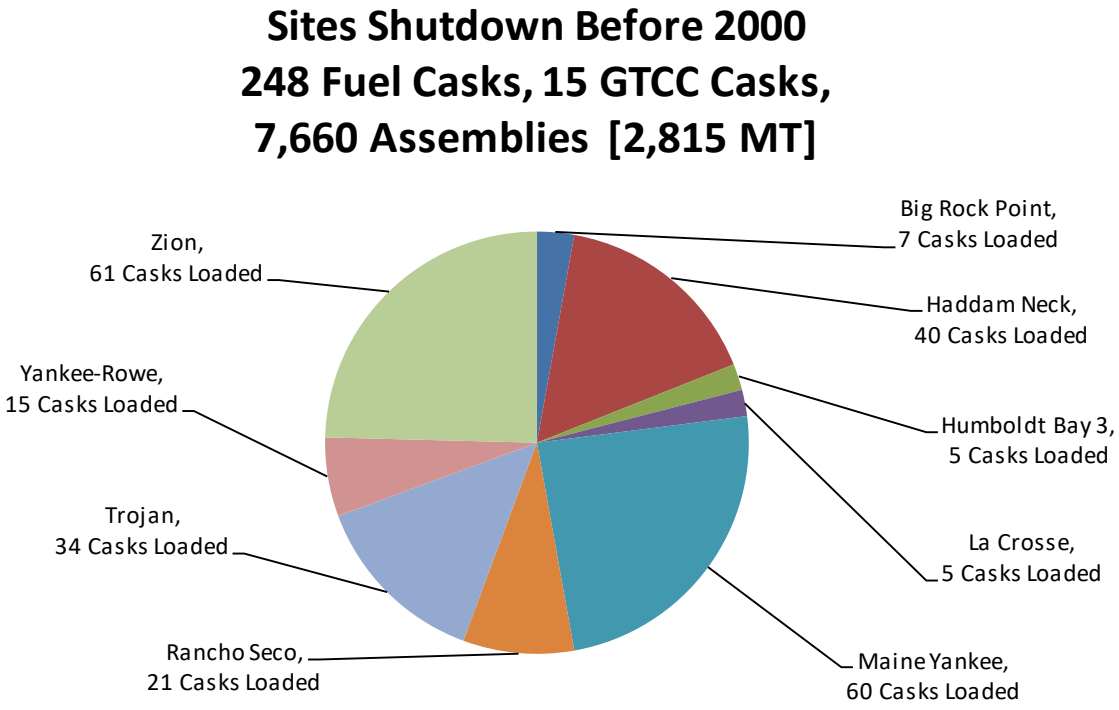


Figure 2-3. Dry SNF Storage at Group A Sites Shutdown Before 2000

Table 2-12. SNF and Stored GTCC LLRW from Group A Sites Shutdown After 2000

		Discharges as of 12/31/2012†		Forecast Discharges 1/1/2013 to 12/31/2018		Total Projected Discharged Fuel through 12/31/2075†					
Reactor [Unit]	**Shutdown Date**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks Loaded / Estimated**		**GTCC LLRW Casks Loaded / Estimated****	
Crystal River 3	2/20/2013	1,243	582.23	-	-	1,243	582.23	39	39	-	2
Fort Calhoun	10/24/2016	1,091	399.38	175	65.97	1,266	465.35	10	40	-	2
Kewaunee	5/7/2013	1,214	470.97	121	47.73	1,335	518.70	38	38	-	2
Oyster Creek	9/17/2018	3,644	649.27	898	153.38	4,542	802.64	34	75	-	2
San Onofre 1	11/30/1992	395	146.20	-	-	395	146.20	-	-	1	1
San Onofre 2	6/12/2013	1,726	730.00	-	-	1,726	730.00	-	-	-	2
San Onofre 3	6/12/2013	1,734	732.61	-	-	1,734	732.61	-	-	-	2
San Onofre Totals*	-	3,855	1,608.82	-	-	3,855	1,608.82	79	123	1	5
Vermont Yankee	12/29/2014	3,389	615.97	488	87.69	3,877	703.66	58	58	-	2
Totals		**14,436**	**4,326.63**	**1,682**	**354.77**	**16,118**	**4,681.39**	**258**	**373**	**1**	**15**

† These inventory data reflect fuel assembly transfers.

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

**For simplicity GTCC Casks are estimated at 2 per reactor unless decommissioning is complete. More detailed information on estimates of GTCC LLRW can be found in [DOE, 2016] and supporting documentation.

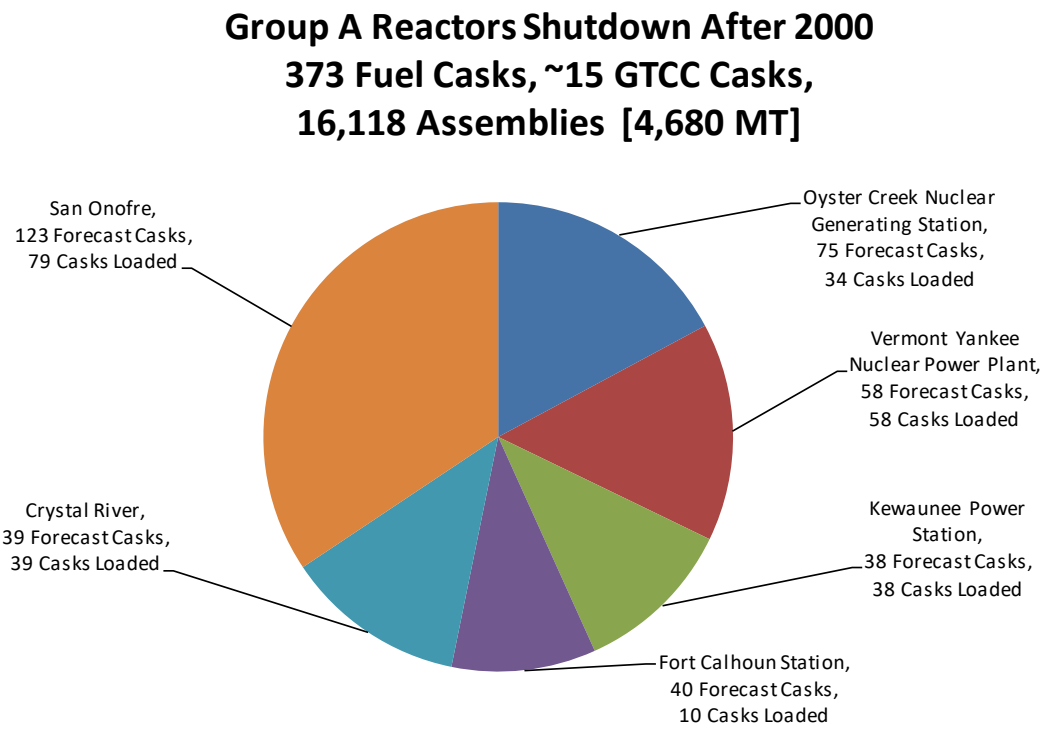


Figure 2-4. Dry SNF Storage at Group A Sites Shutdown After 2000

Table 2-13. SNF and Stored GTCC LLRW from Groups B&C Sites with Announced Early Shutdown Dates

		Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Total Projected Discharged Fuel through the Announced Shutdown date					
Reactor [Unit]	**Announced Shutdown Date**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks Loaded / Estimated**		**GTCC LLRW Casks Loaded / Estimated***	
Duane Arnold	12/1/2020	2,824	511	456	82	3,648	659	20	60	-	2
Diablo Canyon 1	11/2/2024	1,412	610	376	159	2,357	1,010	58	74	-	2
Diablo Canyon 2	8/26/2025	1,346	582	276	117	2,094	898	N/A	66	-	2
Indian Point 2	4/30/2020	1,517	688	270	122	1,980	897	42	62	-	2
Indian Point 3	4/30/2021	1,298	592	283	128	1,869	851	N/A	59	-	2
Palisades	5/1/2022	1,509	617	240	104	2,073	860	46	69	-	2
Pilgrim	5/31/2019	3,069	547	464	80	4,113	726	17	61	-	2
Totals		**12,975**	**4,147**	**2,365**	**791**	**18,134**	**5,901**	**183**	**451**	**-**	**14**

* For simplicity GTCC Casks are estimated at 2 per reactor unless decommissioning is complete. More detailed information on estimates of GTCC LLRW can be found in [DOE, 2016] and supporting documentation.

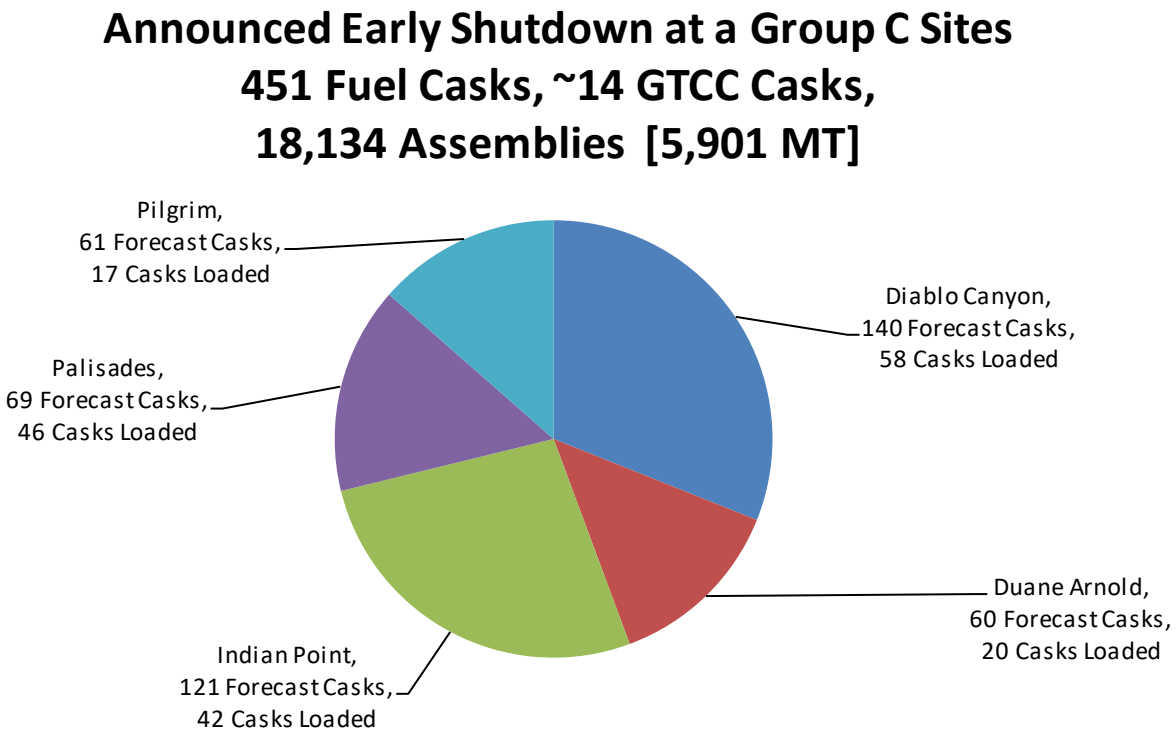


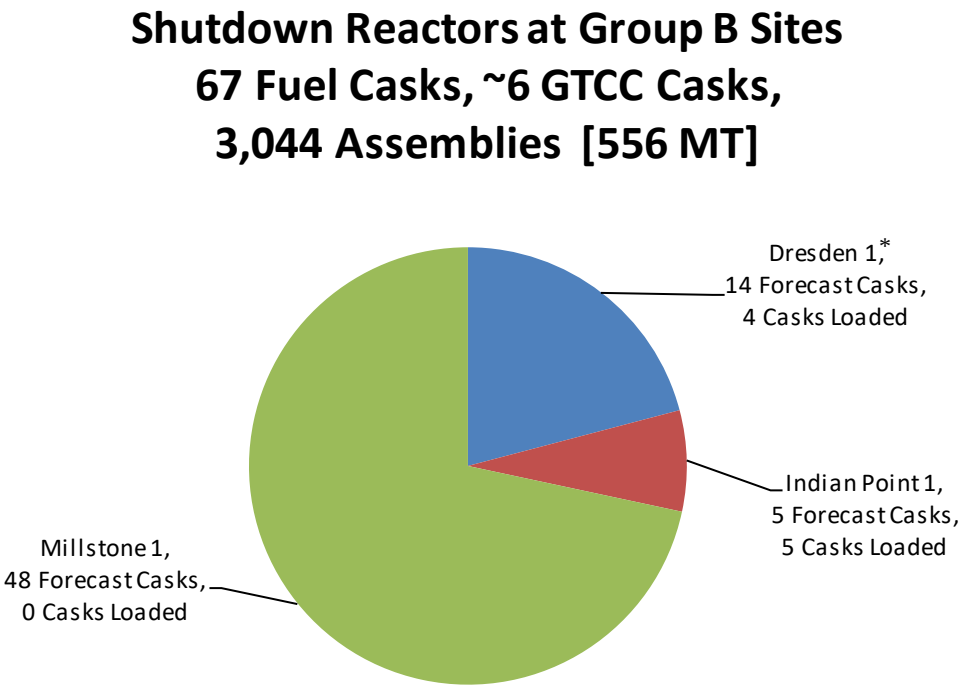
Figure 2-5. Dry SNF Storage at Group C Sites with Announced Early Shutdown Dates

Table 2-14. SNF and Stored GTCC LLRW from Shutdown Reactors at Group B Sites

		Discharges as of 12/31/2012		Transferred to Morris (Group F Site)		Projected Remaining Onsite Inventory at the end of 2018					
Reactor [Unit]	**Shutdown Date**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Fuel Casks**		**GTCC LLRW Casks****	
								Loaded / Estimated		**Loaded / Estimated**	
Dresden 1*	10/31/1978	892	90.87	3	0.26	889	90.60	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	-	48	-	2
Totals		**3,936**	**647.07**	**3**	**0.26**	**3,933**	**646.81**	**67**		**6**	

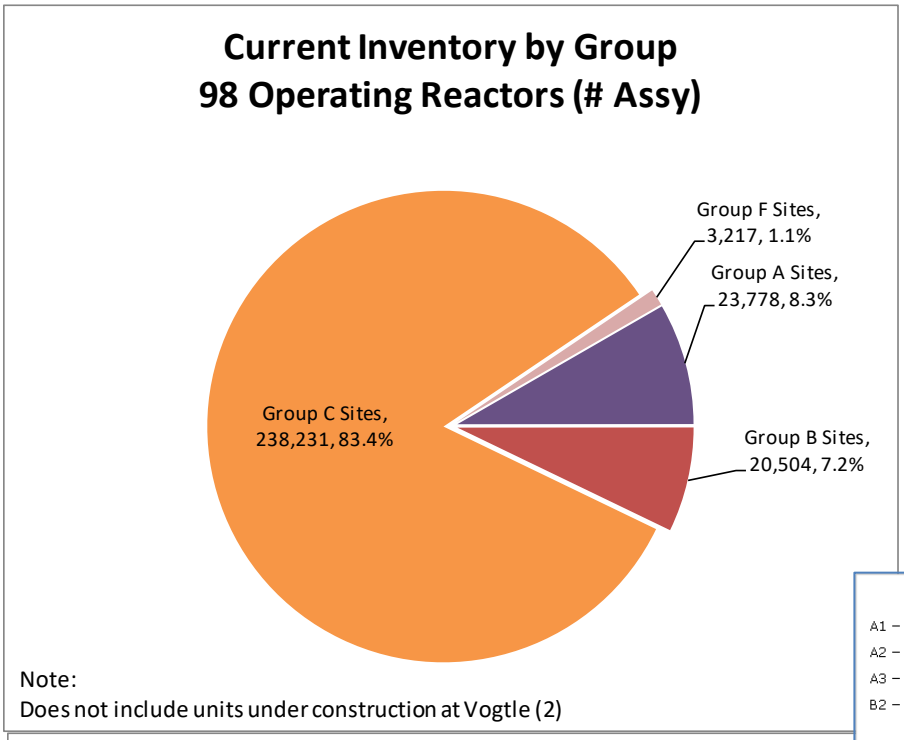
* 617 Dresden 1 assemblies (~63.2MTU) are co-mingled with unit 2 and 3 fuel. This SNF is being moved to dry canister storage in a co-mingled fashion.

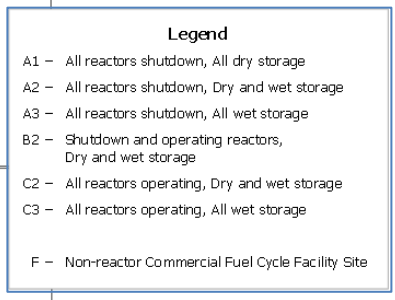
** For simplicity GTCC Casks are estimated at 2 per reactor unless decommissioning is complete. More detailed information on estimates of GTCC LLRW can be found in [DOE, 2016] and supporting documentation.



* 617 Dresden 1 assemblies (~63.2MTU) are co-mingled with unit 2 and 3 fuel are excluded from this Figure.

Figure 2-6. Dry SNF Storage from Shutdown Reactors at Group B Sites





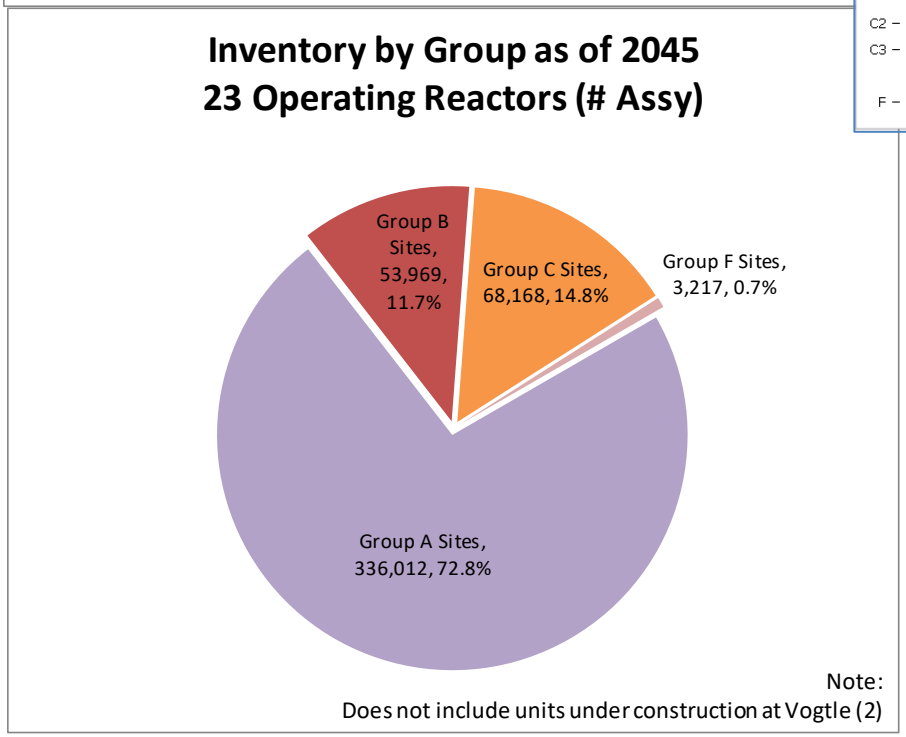


Figure 2-7. Projected Change in Distribution of Commercial Reactor SNF by Group with Time (without interim storage facility or repository available before 2045)

2.3.2 Alternative Scenario 1: Addition of "New Builds"

Alternative Scenario 1 is based on the Reference Scenario with the addition of two "New Builds". This scenario has the same underlying assumptions that characterize the Reference Scenario with the additional assumption that two 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 reactors, Vogtle, Units 3 & 4, are assumed to operate for 60 years. No other modifications to the Reference Scenario assumptions are made for this alternative scenario.

Table 2-15 provides the scenario inventory by reactor type as a function of the estimate phase. Actual quantities are used for discharges prior to 2013. Forecast discharges are used for the individual reactors for later time periods.

Table 2-16 provides the scenario inventory detailed to provide actual discharges through December 31, 2012 from the GC-859 database and the projected quantities between 1/1/2013 and 12/31/2018, and between 1/1/2019 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" includes two new reactors at an existing site in Georgia. Table 2-17 provides details of the projected discharges from these reactors.

The scenario totals approximately 476,700 assemblies containing approximately 139,200 MTU. The assumptions in this scenario are projected to generate an additional 7,172 SNF assemblies and approximately 3,030 MTU beyond that of the Reference Scenario.

Table 2-15. Projected SNF Inventory at NPR sites and Morris for Alternative Scenario 1 by Reactor Type

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/13 to 12/31/18		Forecast Discharges 1/1/19 to 12/31/82		Total Projected Discharged Fuel	
Reactor Type	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**
PWR	103,605	44,894	19,407	8,513	87,981	38,682	210,993	92,089
BWR	136,533	24,293	26,411	4,658	102,736	18,154	265,680	47,106
Totals	**240,138**	**69,187**	**45,818**	**13,171**	**190,717**	**56,836**	**476,673**	**139,195**

Table 2-16. Projected SNF Inventory at NPR sites and Morris for Alternative Scenario 1 by Site Group (Group Status as of 12/31/2018)

Description	Site Group	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Discharges 1/1/2019 to 12/31/2082		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 (87 Rx/51 Sites)*	C	186,593	53,901	39,666	11,507	174,240	51,042	400,499	116,450
Operating Reactors at Group C Sites with Announced Shutdown Date (5 Rx/4 Sites)	C	10,160	2,867	1,812	541	2,313	745	14,285	4,153
Operating Reactors at Group B Sites (6 Rx/3 Sites)	B	11,098	2,606	2,105	519	6,511	1,798	19,714	4,923
Operating Reactors at Group B Sites with Announced Shutdown Date (2 Rx/1 Site)	B	2,815	1,280	553	250	481	218	3,849	1,748
Shutdown Reactors at Group B Sites (3 Rx/3 Sites)	B	3,933	647	-	-	-	-	3,933	647
Reactors Shutdown Since 2000 (8 Rx/6 Sites)	A	14,436	4,327	1,682	355	-	-	16,118	4,681
Reactors Shutdown Prior to 2000 (10 Rx/9 Sites)	A	7,660	2,815	-	-	-	-	7,660	2,815
Away From Reactor Wet Storage	F	3,217	674	-	-	-	-	3,217	674
New Builds (4 Rx/2 Sites)		-	-	-	-	7,172	3,034	7,172	3,034
Totals		**239,912**	**69,117**	**45,818**	**13,171**	**190,717**	**56,836**	**476,673**	**139,124**

* Excludes reactors with announced early shutdowns.

Table 2-17. Projected SNF Inventory for Assumed "New Builds"

Reactor [Unit]	Assumed Startup Year	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2082		Total Projected Discharged Fuel	
		Assy.	Initial Uranium (MT)	Assy.	Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Initial Uranium (MT)
Vogtle 3	2021	-	-	-	-	3,586	1,517	3,586	1,517
Vogtle 4	2022	-	-	-	-	3,586	1,517	3,586	1,517
Totals		**-**	**-**	**-**	**-**	**7,172**	**3,034**	**7,172**	**3,034**

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

Alternative Scenario 2 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.

Table 2-18 provides the scenario inventory by reactor type as a function of the estimate phase. Actual quantities are used for discharges to June 30, 2013. Forecast discharges are used for the individual reactors for later time periods.

Table 2-19 provides the scenario inventory detailed to provide actual discharges through December 31, 2012 from the GC-859 database and the projected quantities between 1/1/2013 and 12/31/2018, and between 1/1/2019 and the end of the scenario, by major storage location category and by site Group.

The scenario totals approximately 454,400 assemblies containing approximately 131,600 MTU. The assumptions in this scenario are projected to result in a reduction of 15,100 SNF assemblies, totaling 4,600 MTU relative to the projections of the Reference Scenario.

This difference has been reduced compared to previous revisions due to the completion of several license renewals. Only 9 reactors (Clinton, Comanche Peak Units 1 and 2, Riverbend, Perry, Seabrook, Waterford and Watts Bar 1 and 2) do not have license extensions. Note: Indian Point Units 2 and 3, and Diablo Canyon Units 1 and 2 do not have extended operating licenses but have announced shutdown dates prior to 2025.

Table 2-18. Projected SNF Inventory at NPR sites and Morris for Alternative Scenario 2 by Reactor Type

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/13 to 12/31/18		Forecast Discharges 1/1/19 to 12/31/75		Total Projected Discharged Fuel	
Reactor Type	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**
PWR	103,605	44,894	19,407	8,513	73,572	32,468	196,584	85,875
BWR	136,533	24,293	26,411	4,658	94,826	16,741	257,770	45,693
Totals	**240,138**	**69,187**	**45,818**	**13,171**	**168,398**	**49,209**	**454,354**	**131,568**

Table 2-19. Projected SNF Inventory at NPR sites and Morris for Alternative Scenario 2 by Site Group (Group Status as of 12/31/2018)

Description	Site Group	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Discharges 1/1/2019 to 12/31/2075		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 (87 Rx/51 Sites)*	C	186,593	53,901	39,666	11,507	159,093	46,449	385,352	111,857
Operating Reactors at Group C Sites with Announced Shutdown Date (5 Rx/4 Sites)	C	10,160	2,867	1,812	541	2,313	745	14,285	4,153
Operating Reactors at Group B Sites (6 Rx/3 Sites)	B	11,098	2,606	2,105	519	6,511	1,798	19,714	4,923
Operating Reactors at Group B Sites with Announced Shutdown Date (2 Rx/1 Site)	B	2,815	1,280	553	250	481	218	3,849	1,748
Shutdown Reactors at Group B Sites (3 Rx/3 Sites)	B	3,933	647	-	-	-	-	3,933	647
Reactors Shutdown Since 2000 (8 Rx/6 Sites)	A	14,436	4,327	1,682	355	-	-	16,118	4,681
Reactors Shutdown Prior to 2000 (10 Rx/9 Sites)	A	7,660	2,815	-	-	-	-	7,660	2,815
Away From Reactor Wet Storage	F	3,217	674	-	-	-	-	3,217	674
Totals		**239,912**	**69,117**	**45,818**	**13,171**	**168,398**	**49,209**	**454,128**	**131,497**

* Excludes reactors with announced early shutdowns.

2.3.4 Alternative Scenario 3: Economically Challenged Sites Scenario

Alternative Scenario 3 is based on the Reference Scenario with the additional assumption that five of the economically challenged reactors operated by First Energy and Exelon in Pennsylvania and Ohio's non-regulated utility markets are shutdown by 2021. These reactors are listed in Table 2-20.

Table 2-20. First Energy and Exelon Sites in Pennsylvania and Ohio

Reactor Site, Shutdown Date
Three Miles Island Unit 1, 2019
Davis Besse, 2020
Beaver Valley Unit 1 and 2, 2021
Perry, 2021

Table 2-21 provides the scenario inventory by reactor type as a function of the estimate phase. Actual quantities are used for discharges prior to 2013, forecast discharges are used for the individual reactors for later time periods.

Table 2-22 provides the scenario inventory detailed to provide actual discharges through December 31, 2012 from the GC-859 data set and the projected quantities between 1/1/2013 and 12/31/2018, and between 1/1/2019 and the end of the scenario, by major storage location category and by site Group.

The scenario totals nearly 463,000 assemblies containing approximately 134,200 MTU. The assumptions in this scenario are projected to result in a reduction of 6,500 SNF assemblies, totaling 2,000 MTU relative to the projections of the Reference Scenario.

Table 2-21. Projected SNF Inventory at NPR Sites and Morris for Alternative Scenario 3 by Reactor Type

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/13 to 12/31/18		Forecast Discharges 1/1/19 to 12/31/75		Total Projected Discharged Fuel	
Reactor Type	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**	**Assemblies**	**Initial Uranium (MT)**
PWR	103,605	44,894	19,407	8,513	77,931	34,296	200,943	87,702
BWR	136,533	24,293	26,411	4,658	99,057	17,496	262,001	46,448
Totals	**240,138**	**69,187**	**45,818**	**13,171**	**176,988**	**51,791**	**462,944**	**134,150**

Table 2-22. Projected SNF Inventory at NPR Sites and Morris for Alternative Scenario 3 by Site Group (Group Status as of 12/31/2018)

Description	Site Group	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Discharges 1/1/2019 to 12/31/2075		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 (87 Rx/51 Sites)*	C	186,593	53,901	39,666	11,507	167,683	49,031	393,942	114,439
Operating Reactors at Group C Sites with Announced Shutdown Date (5 Rx/4 Sites)	C	10,160	2,867	1,812	541	2,313	745	14,285	4.153
Operating Reactors at Group B Sites (6 Rx/3 Sites)	B	11,098	2,606	2,105	519	6,511	1,798	19,714	4,923
Operating Reactors at Group B Sites with Announced Shutdown Date (2 Rx/1 Site)	B	2,815	1,280	553	250	481	218	3,849	1,748
Shutdown Reactors at Group B Sites (3 Rx/3 Sites)	B	3,933	647	-	-	-	-	3,933	647
Reactors Shutdown Since 2000 (8 Rx/6 Sites)	A	14,436	4,327	1,682	355	0	0	16,118	4,681
Reactors Shutdown Prior to 2000 (10 Rx/9 Sites)	A	7,660	2,815	-	-	-	-	7,660	2,815
Away From Reactor Wet Storage	F	3,217	674	-	-	-	-	3,217	674
Totals		**239,912**	**69,117**	**45,818**	**13,171**	**176,988**	**51,791**	**462,718**	**134,079**

* Excludes reactors with announced early shutdowns.

2.3.5 Scenario Comparison Summary

The 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 report. A summary and comparison is provided in Table 2-23 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 over 15,000 assemblies (~4,600 MTU), in the case where all reactors shutdown after their current license period, to an increase of approximately 7,100 assemblies (~3,000 MTU), in the case where the two new reactors are added to the fleet and the operating reactors obtain their 20-years license extension.

Table 2-23. Summary Table of Projected SNF Inventory at NPR Sites and Morris for Reference and Alternative Scenarios

Scenario	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2082		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	240,138	69,187	45,818	13,171	183,545	53,803	469,501	136,161	-	-
Scenario 1 Addition of 4 New Builds	240,138	69,187	45,818	13,171	190,717	56,836	476,673	139,195	**7,172**	**3,034**
Scenario 2 Shutdown at end of Current License Period	240,138	69,187	45,818	13,171	168,398	49,209	454,354	131,568	**(15,147)**	**(4,593)**
Scenario 3 Economically Challenged Reactors Shutdown by 2021	240,138	69,187	45,818	13,171	176,988	51,791	462,944	134,150	**(6,557)**	**(2,011)**

2.4 Commercial SNF Dry Storage Systems

SNF 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 the SNF in their pools. At these facilities, dry storage systems are utilized to store the SNF. As more facilities run out of pool storage the amount of dry storage is increasing. As of December 31, 2018, 2,936 dry storage fuel casks have been loaded at commercial reactor sites containing 124,887 assemblies (~36,100 MT) of SNF (Table 2-6 and Appendix B).

Currently only four operating sites (South Texas Project, Three Mile Island, Harris, and Wolf Creek) do not have dry storage capabilities. Operations at the South Texas Project are expected to begin in early 2019. Three Mile Island and Wolf Creek have selected their storage technologies and initiated project activities.

In 2018, utilities loaded 261 dry storage systems containing 12,724 assemblies, and over 3,000 MT of fuel. This is the most dry storage systems loaded in a calendar year exceeding the prior high of 249 canisters (2017). The amount of commercial SNF loaded exceeds the amount discharged by about 900 MT. This is likely due to the activities at Vermont Yankee and San Onofre to accelerate the emptying of the spent pool fuel as part of decommissioning.

Table 2-24 to 2-26 provides the storage systems used at the Group A and Group B shutdown sites [Leduc, 2012 updated to reflect current knowledge]. These tables also provide the transportation cask status for the anticipated storage cask [Leduc, 2012 updated to reflect current knowledge]. Except for Millstone 1, all the reactor sites listed in these tables have implemented a dry storage system. All fuel from the shutdown Millstone 1 reactor is currently still in wet storage. Dry storage operations at Millstone have thus far been limited to discharges from the two operating PWRs at this site.

An additional six casks are currently stored on the cask pad and two casks containing SNF from West Valley stored on rail cars at CPP-2707 at INL. The TMI-2 core debris is currently stored in 29 casks at the TMI-2 ISFSI, also at INL. The Fort St. Vrain ISFSI stores 1,464 SNF elements in 244 canisters in a vault type storage system near Platteville, Colorado.

Table 2-24. Cask Systems Used at Group A Sites Shutdown Prior to 2000

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/CY-MPC (26 Assy) canister	NAC-STC (Docket No. 71-9235); Certificate expires 5/31/2019. 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 4/30/2019. Fuel in canisters in fabricated casks. No impact limiters.
La Crosse	BWR	07/2012-09/2012	NAC MPC/LACBWR canister	NAC-STC (Docket No. 71-9235); Certificate expires 5/31/2019. Foreign use versions fabricated.
Maine Yankee	PWR	08/2002-03/2004	NAC-UMS/UMS-24 canister	NAC-UMS Universal Transport Cask (Docket No. 71-9270); Certificate expires 10/31/2017. None fabricated
Rancho Seco	PWR	04/2001-08/2002	TN Standardized NUHOMS/FO-DSC, FC-DSC, and FF DSC canisters	NUHOMS MP187 (Docket No. 71-9255); Certificate expires 11/30/2018. 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 4/30/2019. Units fabricated but dedicated to storage at other sites. No impact limiters
Yankee Rowe	PWR	06/2002-06/2003	NAC-MPC/Yankee-MPC canister	NAC-STC (Docket No. 71-9235); Certificate expires 05/31/2019. Foreign use versions fabricated
Zion 1 & 2	PWR	2013-2016	NAC MAGNASTOR/TSC 37 canister	NAC MAGNATRAN (Docket No. 71-9356); License under review. None fabricated

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

Table 2-25. Cask Systems Used at Group A Sites Shutdown After 2000

Reactor [Unit]	Type	ISFSI Load Dates[a]	Storage System/Canisters	Transport Cask Status
Crystal River 3	PWR	2017-2018	TransNuclear, Standardized NUHOMS 32PTH1 storage canister, in a Horizontal Concrete Overpack	TN MP197HB (Docket No. 71-9302) Certificate expires 8/31/2022. One unit started fabrication which was subsequently halted.
Fort Calhoun	PWR	2006-??	TransNuclear, Standardized NUHOMS 32PT-S100 storage canister, in a Horizontal Concrete Overpack	TN MP197 (Docket No. 71-9302); Certificate expires 8/31/2022. None available. The TN MP197HB may be used if available.
Kewaunee	PWR	2009-2017	TransNuclear, Standardized NUHOMS 32PT-S100 storage canister, in a Horizontal Concrete Overpack Kewaunee also loaded the NAC MAGNASTOR 37 PWR assembly canister	TN MP197HB (Docket No. 71-9302); Certificate expires 8/31/2022. One unit started fabrication which was subsequently halted. NAC MAGNATRAN (Docket 71-9356) license under review
Oyster Creek	BWR	2002-??	TransNuclear, Standardized NUHOMS 61BT and 61BTH canisters	TN MP197HB (Docket No. 71-9302); Certificate expires 8/31/2022. One unit started fabrication which was subsequently halted.
San Onofre	PWR	2003-??	TransNuclear, Advanced NUHOMS 24PT1 and 24 PT4 storage canister, in a Horizontal Concrete Overpack SONGS is currently loading the Holtec UMAX MPC-37 canister	NUHOMS MP187 (Docket No. 71-9255); Certificate expires 11/30/2018. One cask fabricated. No impact limiters. TN MP197HB (Docket No. 71-9302); Certificate expires 8/31/2022. One unit started fabrication which was subsequently halted. HI-STAR 190 application under review.
Vermont Yankee	BWR	2008-2018	HI-STORM 100 Vertical Concrete Storage Cask containing MPC-68 and MPC-68M DSC canisters	HI-STAR 100 (Docket No. 71-9261) Certificate expires 4/30/2019. No impact limiters

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

Table 2-26. Cask Systems Used at Shutdown Reactors at 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 canisters. Four HI-STAR 100 casks are used to store some fuel from Dresden 1.	HI-STAR 100 (Docket No. 71-9261) Certificate expires 4/30/2019. No impact limiters fabricated
Indian Point 1	PWR	2008	HI-STORM Vertical Concrete Storage Cask containing MPC-32 canisters	HI-STAR 100 (Docket No. 71-9261) Certificate expires 4/30/2019. No impact limiters fabricated
Millstone 1	BWR	N/A	All BWR fuel at the Millstone is currently in pool storage. For planning purposes, we have assumed 61 assemblies per canister.	N/A

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

2.5 Commercial Spent Nuclear Fuel Characteristics

To date SNF has been discharged with burnup ranging from less than 20 gigawatt-days per metric ton (GWd/MT) and projected to approach 60 GWd/MT. Tables 2-27 through 2-30 and Figures 2-8 to 2-11 present the radionuclide decay heat for the 40 and 60 GWd/MT burnup 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 2-27. PWR 40 GWd/MT Spent 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**

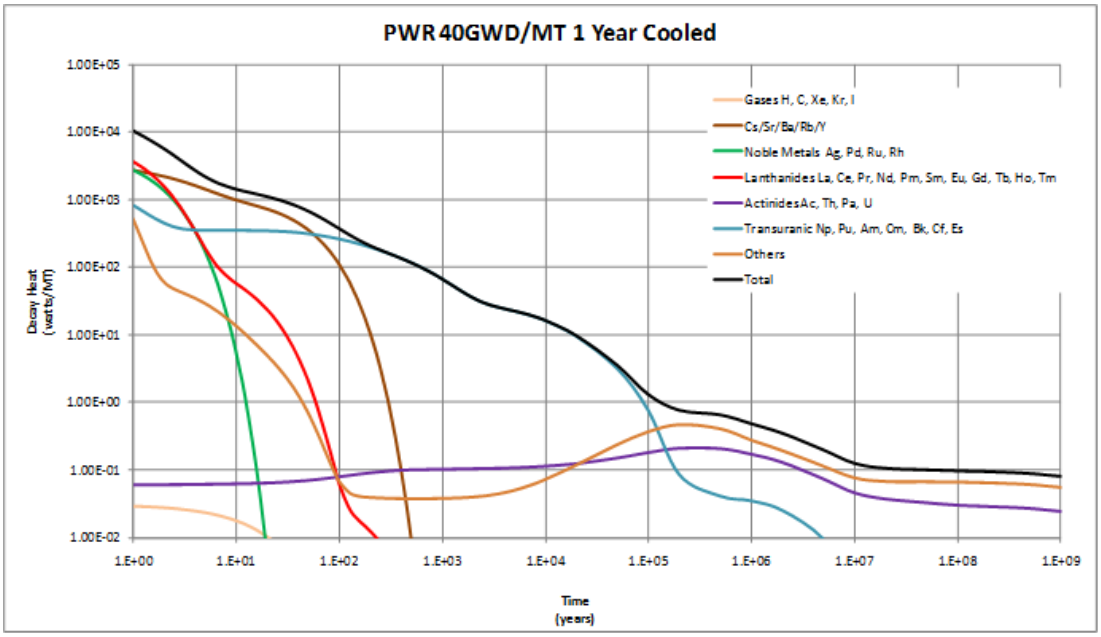


Figure 2-8. PWR 40 GWd/MT Spent Fuel Decay Heat.

Table 2-28. PWR 60 GWd/MT Spent 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**

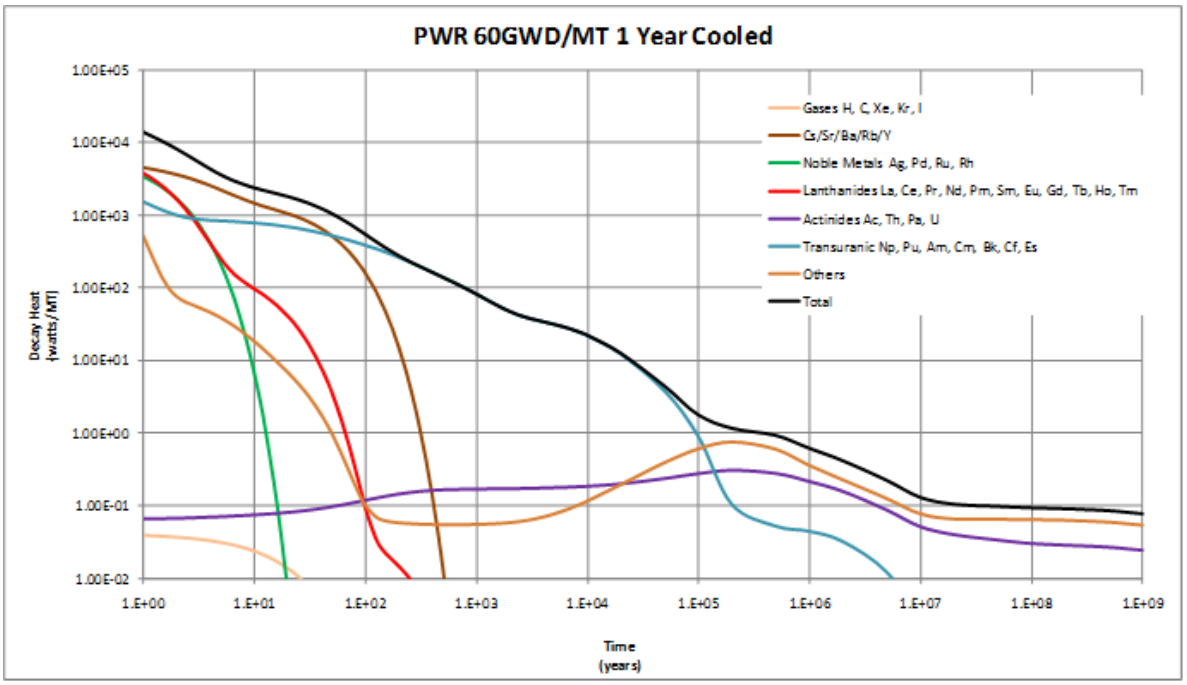


Figure 2-9. PWR 60 GWd/MT Spent Fuel Decay Heat.

Table 2-29. BWR 30 GWd/MT Spent 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**

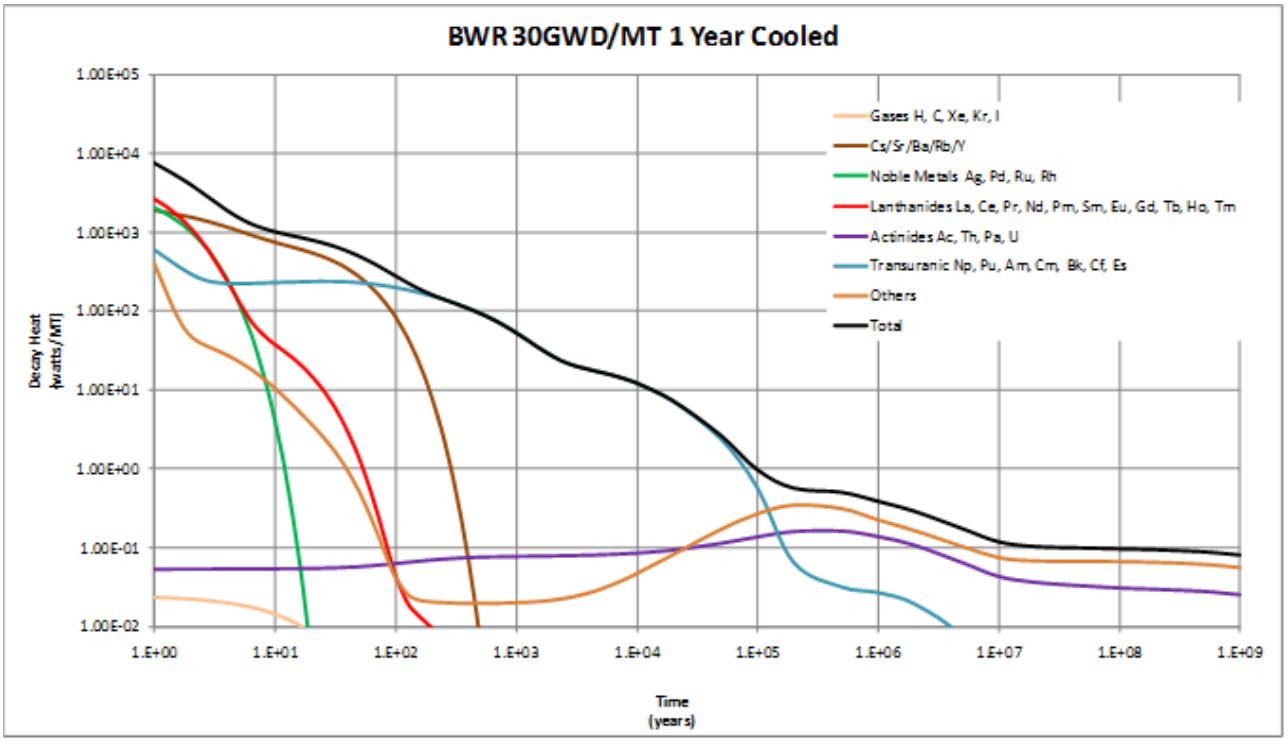


Figure 2-10. BWR 30 GWd/MT Spent Fuel Decay Heat.

Table 2-30. BWR 50 GWd/MT Spent 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**

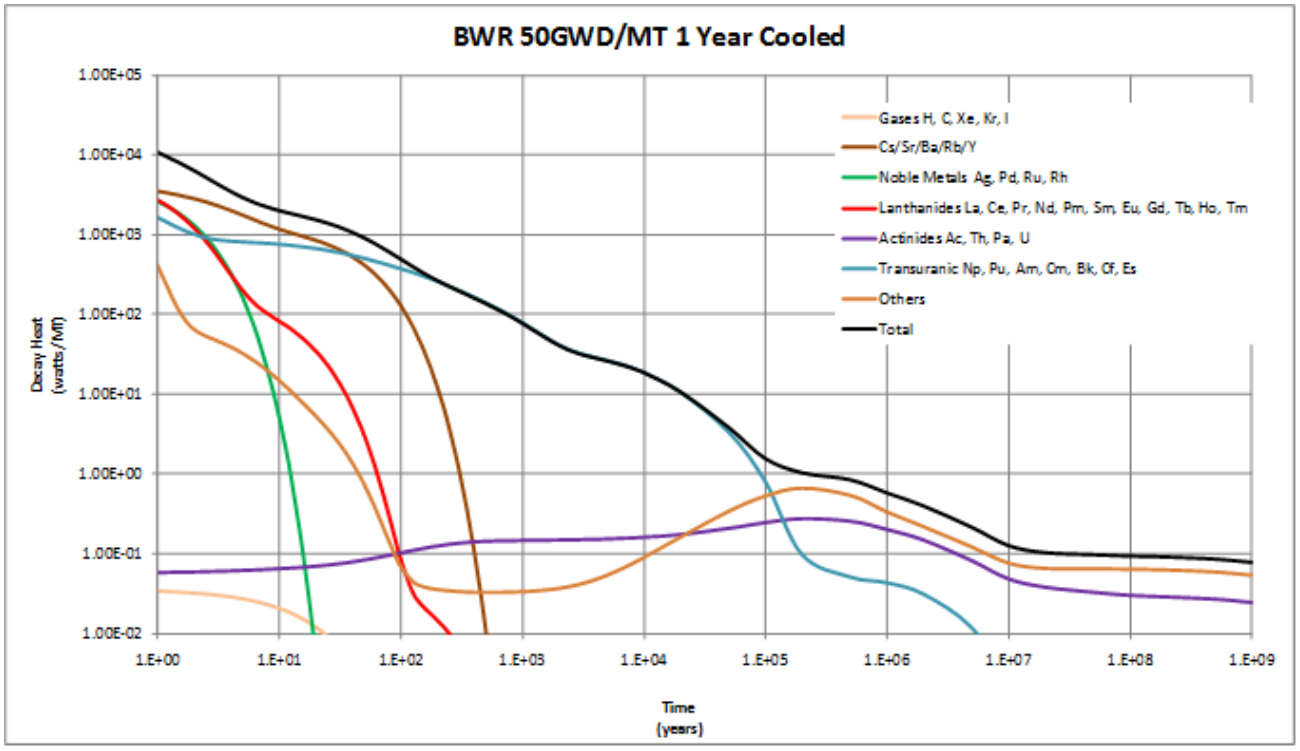


Figure 2-11. BWR 50 GWd/MT Spent Fuel Decay Heat.

3. Non-Commercial SNF and HLW

Since the inception of nuclear reactors, the DOE and its predecessor agencies operated or sponsored a variety of production, research, test, training, and other experimental reactors both domestically and overseas. The Naval Nuclear Propulsion Program (NNPP) has generated SNF 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 SNF has occurred at the Hanford Site, the INL, and the SRS. The INL is using electro-chemical processing to treat up to 60 MTHM of sodium bonded SNF.

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

- Non-Commercial SNF (aside from Naval SNF discussed in Section 3.2),
- Naval SNF,
- Defense HLW from fuel processing in liquid and dry waste forms, including glass logs in canisters.

3.1 Non-Commercial Spent 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. SNF generated in production reactors supported defense programs and other isotope production programs. An example of SNF existing today from production reactors is the N Reactor SNF 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 (See Section 4). SNF from research reactors is stored primarily at the INL and SRS. Examples of research reactor SNF being stored within the DOE complex include the High-Flux Beam Reactor SNF stored at the SRS; the Fast Flux Test Facility SNF stored at Hanford and the INL; training, research, and isotope reactors (built by General Atomics) SNF stored at Hanford and the INL; and the Advanced Test Reactor SNF stored at the Idaho National Laboratory. Additional research reactor SNF 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 Non-Commercial SNF Inventory

The source of current inventory data for this study is the Spent Fuel Database (SFD) maintained by the National Spent Nuclear Fuel Program at the INL [NSNFP, 2018]. The current total inventory of non-commercial SNF is approximately 2,285 MTHM. This quantity does not include any Naval spent nuclear fuel (see section 3.2) nor the 174 MTHM of spent fuel of commercial origin (See Section 2.1.2). DOE continues to operate several research reactors and will be receiving SNF from universities and the foreign research reactor return program. Projected material amounts (out to 2035) are relatively small (about 16 MTHM) and there is some uncertainty as to the total amount that will be generated or received.

Non-commercial SNF 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 230,000) 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 non-commercial SNF. This SNF inventory was reduced to 34 groups based on fuel matrix, cladding, cladding condition, and enrichment. These parameters were selected because of their potential relevance to supporting system-level evaluations.

A discussion of each of the 34 groupings is presented in Appendix D of UFDC 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 non-commercial SNF in the 34 groups.

3.1.2 Non-Commercial SNF Radionuclide Inventory

Process knowledge and the best available information regarding fuel fabrication, operations, and storage for DOE SNF are used to develop a conservative source-term estimate. The DOE SNF characterization process relies on pre-calculated results that provide radionuclide inventories for typical SNF 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 SNF 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. Pre-calculated 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 burnup. Appendix A of “DOE Managed Waste” [Wilson, 2016] lists the projected radionuclide inventory of non-commercial SNF for the nominal and bounding cases as of 2010. The nominal case is the expected or average inventory. The bounding case represents the highest burnup assembly or accounts for uncertainties if fuel burnup is not known.

From the SFD [NSNFP, 2018], the total estimated nominal radionuclide inventory is 130 million Ci for the year 2030. The estimated bounding radionuclide inventory is 250 million Ci for the year 2030. The nominal case is the expected or average inventory. The bounding case represents the highest burnup assembly or accounts for uncertainties if fuel burnup is not known.

3.1.3 Non-Commercial SNF Storage/Canisters

Although non-commercial SNF is stored throughout the U.S. at numerous facilities, a decision was made in 1995 to consolidate the material at three existing DOE sites; Hanford Site in Washington (2,129 MT), the INL in Idaho (124 MT), and the SRS in South Carolina (29 MT). The vast majority of non-commercial SNF 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 (~2,100 MT) of the SNF is contained in about 388 Multicanister Overpacks (MCO) at the Hanford site. The MCO is a sealed stainless steel canister which is about 24 inches in diameter and about 14 feet long.

For the remaining non-commercial SNF, a standardized disposal canister design was developed which included canisters of 18 and 24 inch diameters and 10 and 15 feet lengths. Because of uncertainty in disposal and packaging efficiencies, the total number of canisters to be generated ranged from about 50% to 160% of a point estimate of 2,624. Currently, no SNF has been packaged into the standardized disposal canister design.

The radionuclide inventory and resulting decay heat was calculated for the year 2030 based on the estimated radionuclide inventory as described in Section 3.1.2. The decay heat per canister is calculated as the estimated decay heat associated with each fuel record divided by the number of canisters (unrounded) required for the fuel (based on volume). These values are considered adequate for this scoping evaluation.

Table 3-1 provides the distribution of standardized canisters based on the 2030 nominal decay heat using the 2,624 nominal total canister count. Table 3-1 provides detail for the non-commercial SNF. The 2030 data indicate approximately 50% of the DOE SNF canisters will be generating decay heat of less than 100 watts. Nearly 95% of the DOE SNF canisters will be generating decay heat less than 300 watts. Nearly all the DOE SNF 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. Non-Commercial Spent Nuclear Fuel* Canister Decay Heat in 2030 [NSNFP, 2018]

	Non-Commercial SNF	
Decay heat per canister (watts)	**Number of canisters**	**Cumulative %**
<50	973.5	37.1%
50 - 100	306.5	48.8%
100 - 220	695.2	75.3%
220 - 300	509.3	94.7%
300 - 500	108.8	98.8%
500 - 1000	16.8	99.5%
1000 - 1500	2.6	99.8%
1500 - 2000	5.1	100.0%
>2000	6.6	100.0%
Total	**2,624**	

3.2 Naval SNF

The NNPP has generated SNF 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 SNF information for this report is the unclassified portion of the Yucca Mountain Repository License Application [DOE, 2008] and an evaluation report on options for permanent geologic disposal of spent nuclear fuel and HLW [SNL, 2014]. Since most details regarding naval SNF are classified, only limited information is presented herein.[b]

3.2.1 Naval SNF Inventory

Naval SNF 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 33 MTHM of Naval SNF currently exists with a projected inventory of less than 65 MTHM in 2035.

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 SNF.

3.2.1.1 *Naval SNF Radionuclide Inventory*

Each naval SNF canister is loaded such that thermal, shielding, criticality, and other characteristics of the received waste will be within the proposed repository waste acceptance requirement limits. As a result, a radionuclide inventory for a representative naval SNF canister, five years after reactor shutdown, was developed for use in the repository source term analyses (UFD Inventory Appendix E, Table E-1 [Carter, 2013]). Different packaging designs may be needed dependent upon the future disposal options.

3.2.1.2 *Naval SNF Storage/Canisters*

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

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

Approximately 400 naval SNF 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. The maximum heat load will be under the 11,800 watts/container limit established for Yucca Mountain. The NNPP is responsible for preparing and loading naval SNF canisters and began canister loading operations in 2002. As of December 31, 2018, 163 naval SNF canisters have been loaded and are being temporarily stored at INL. Table 3-2 provides the distribution of Naval SNF canisters based on nominal decay heat. [SNL, 2014]

[b] Before using the information in this section for studies involving naval SNF, contact the NNPP Program Manager, Navy Spent Nuclear Fuel at (202) 781-5903.

Table 3-2. Naval SNF Canister Decay Heat

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

3.3 Defense High-Level Radioactive Waste

High-level radioactive waste is the highly radioactive material resulting from the reprocessing of SNF including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation. 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.

In addition to aqueous reprocessing, the INL is using electro-chemical processing to treat up to 60 MTHM of sodium bonded SNF. The process converts the bond sodium into sodium chloride and separates the SNF 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 SNF to date.

3.3.1 Current Defense HLW Inventory

The source of inventory data for this study is information collected by the Department's OCRWM [DOE, 2008] as modified by recent site treatment plans. [DOE, 2017; Chew, 2016]

The INL reprocessed SNF 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 SNF and nuclear targets to recover valuable isotopes since 1954 producing more than 600,000 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, 2016] SRS began vitrifying liquid HLW in 1996 and through December 31, 2018 has produced 4,173 HLW canisters (2 feet × 10 feet).

The Hanford Site reprocessed defense reactor SNF 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. 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)
Hanford	N/A	220,000	N/A
INL	N/A	N/A	4,400
SRS	4,173[4]	136,000	N/A

1. Vitrified HLW in stainless steel canisters.
2. HLW stored in tanks.
3. Calcined HLW stored in bins.
4. Produced through December 31, 2018. Source: "DWPF Operations Summary Report" SRR-RP-2018-00004-246, December 27, 2018 05:00 hrs to December 28, 2018 05:00.

The Hanford Site encapsulated Cs and Sr separated from the liquid waste 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, which contained approximately 109 million curies at the time of production. Table 3-4 provides the capsule inventory broken down by decay heat load. Decay heat continues to decrease and as of 1/1/2019 the total radioactivity has been reduced to approximately 43M Ci with decay continuing to approximately 24 million curies by January 2043 [Covey, 2002].

The Hanford Tank Closure and Waste Management FEIS evaluated selected disposition pathways for the capsule contents. One alternative evaluated was conversion to glass. In this scenario, the capsule contents have potential to generate an additional 340 HLW glass canisters.

No decision has been made on the disposition of the Cs/Sr capsules. At present, DOE is working to construct a dry storage facility to replace wet storage in Waste Encapsulation and Storage Facility (WESF). After transferring the 1,936 capsules to dry storage, they would be safely stored until a future decision on disposition is made.

Table 3-4. Hanford Site Encapsulated Cs and Sr Inventory Distribution as of 1/1/2019

	Cs Capsules		Sr Capsules		Total Capsules	
Decay heat per canister (watts)	**Number of canisters**	**Cumulative %**	**Number of canisters**	**Cumulative %**	**Number of canisters**	**Cumulative %**
<50	3	0.2%	64	3.5%	67	3.5%
50 - 100	171	13.0%	123	18.6%	294	18.6%
100 - 200	1,161	100.0%	300	94.1%	1,461	94.1%
200 - 300	-	100.0%	105	99.5%	105	99.5%
300 - 500	-	100.0%	9	100.0%	9	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)	**147,935**		**85,547**		**233,482**	

3.3.2 Projected Defense HLW Inventory

SRS currently has the only operating reprocessing facility in the United States, H Canyon. It is estimated that an additional 8,000 m^3 of liquid HLW may be generated with continued canyon operations (approximately 2026, including H-Canyon shutdown flows).

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 4,173 canisters have been produced through December 31, 2018. 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 20 Case 2 which assumes a Salt Waste Processing Facility start-up date of January 2021.

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: 35% 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	2,908	35.6%
50 - 100	476	41.4%
100 - 200	3,878	88.8%
200 - 300	578	95.9%
300 - 500	330	100.0%
500 - 1000	0	100.0%
1000 - 1500	0	100.0%
1500 - 2000	0	100.0%
>2000	0	100.0%
Totals	**8,170**	
Total Decay Heat (watts)	**804,560**	

The Hanford Waste Treatment Project (WTP) is currently under construction and therefore the Hanford borosilicate glass canisters are based on a reference baseline inventory for their future production taken from *River Protection Project System Plan*, Revision 8 [DOE, 2017] as 7,800 canisters of glass and 8,400 TRU waste drums (to be disposed at WIPP). System Plan Revision 8 includes 11 different scenarios with glass canister production ranging from 7,200 (Scenario 4) to 63,600 (Scenario 3). Scenario 2 assumes DOE does not elect to pursue CH-TRU waste treatment which results in an estimated 11,400 canisters.

Scenario 2 is similar to 11,079 canisters estimated by the January 2011 Waste Treatment Plant document titled “2010 Tank Utilization Assessment”. This tank utilization assessment includes individual canister specific decay heat values which are summarized in Table 3-6 indicating 85% of the Hanford canisters will be generating less than 50 watts; and 100% of the Hanford canisters will be generating less than 300 watts. Since the Hanford system plan baseline (Scenario 1[c]) results in about 3,279 fewer canisters (29.6%) and the CH-TRU waste drums will not contain significant decay heat products, the decay heat values resulting from the current Hanford baseline will result in approximately 30% increase in each decay heat value group in Table 3-6.

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.

[c] Specific canister decay heat projections are not available for the current Hanford reference baseline scenario

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 calcine material (due to additives) followed by about 30% decrease in the volume as a result of the HIP process. The size of the final HIP container and final packaged canister remains under investigation. The current estimate is 3700 canisters.

Table 3-6 provides the projected distribution of DOE calcine canisters based on the nominal decay heat in the year 2017. 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%	3,700	100.0%
50 - 100	1,237	95.0%		
100 - 200	523	99.7%		
200 - 300	28	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**		**3,700**	
Total Decay Heat (watts)	**304,904**		**92,674**	

[a] Projected based on future waste vitrification operations.
[b] Projected by 2017.

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, DOE-2017] Table 1-1 and Appendix F provides the equivalent MTHM using the "Best Estimate" canisters count and using the historical factor of 0.5 MTHM per canister established in DOE/DP 0020/1 [DOE, 1985].

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

	HLW Canisters[1] Best Estimate	HLW Canister Range
Hanford	7,800	7,200-63,600
INL (Calcine)	3,700	1,190 - 11,200
INL (Electro-chemical processing)	102	82-135
SRS	8,170	8,000 - 8,300
Totals	**19,772**	**~16,500 - ~83,200[2]**

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

2. Rounded to nearest 100 canisters

3.3.3 Defense HLW Radionuclide Inventory

"DOE Managed Waste" [Wilson, 2016 Appendix B] 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 except by radioactive decay. The combined inventory from all three sites is aproximately1.3 million watts.

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 DOE Managed Waste [Wilson, 2016 Appendix B].

SRS is also the only DOE site continuing reprocessing, and the DOE-EM program periodically processes excess special isotopes via the reprocessing facility and the vitrification process. 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 SNF is shown in UFD Inventory Table F-3. [Carter, 2013]

3.3.4 Defense 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 GWSBs. The first GWSB is being modified such that canisters can be stacked two high, doubling the capacity of this building and delaying the need for a third GWSB.

4. Research Reactors

4.1 Non-DOE Research Reactors

Non-DOE research reactors operate at power levels that range from around 0.005 kW (AGN-201) up to 20 MW (NIST). Spent nuclear fuel from these reactors is generally sent to either SRS or INL, after discharge and the fuel is managed by DOE and included in the inventory discussed in Section 3.1. There are thirty-one non-DOE research reactors in operation at thirty sites (2 reactors collocated at Texas A&M University). Most of the non-DOE reactors are operating at universities and are used for research and for educational purposes. Additional information regarding research reactors at universities and other non-DOE sites is included in the listing by state and congressional district (Appendix F) and the state-by-state maps (Appendix G).

4.2 DOE Research Reactors

There are four DOE research reactors; the Advanced Test Reactor (ATR) and the Transient Reactor Test (TREAT) Facility at Idaho National Laboratory (INL), the Annular Core Research Reactor (SNL) and the High Flux Isotope Reactor (HFIR) at Oak Ridge National Laboratory (ORNL). Spent nuclear fuel from ATR is stored in the ATR canal prior to transfer to wet storage at INL's CPP-603 facility, while spent nuclear fuel from HFIR is stored in storage racks within the HFIR pool outside the core zone awaiting shipment to Savannah River Site. Additional information regarding DOE-Research Reactors can be found in Appendices F and H, the listing by state and congressional district and the state-by-state maps, respectively.

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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
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

Table A-1 (continued)

Assembly Class	Array Size	Manufacturer Code	Version	Assembly Code	Length (in.)	Width (in.)	Clad Material
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
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

Table A-1 (continued)

Assembly Class	Array Size	Manufacturer Code	Version	Assembly Code	Length (in.)	Width (in.)	Clad Material
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 SNF (post-2002) 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

Table A-2 (continued)

Assembly Class	Array Size	Manufacturer Code	Version	Assembly Code	Length (in.)	Width (in.)	Clad Material
	not available	AREVA	not available	ATRIUM10	176.2	5.44	Zircaloy-2
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
La Crosse	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 SNF (post-2002) 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 %)			Burnup (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
BWR	GE	G2307G3	187.419	189.105	1.96	2.41	2.60	25,420	38,861

Table A-3 (continued).

Reactor Type	Manufacturer Code	Assembly Code	Initial Uranium Loading (kg/assembly)		Enrichment (U^{235} wt %)			Burnup (MW/MTU)	
			Avg.	Max.	Min.	Avg.	Max.	Avg.	Max.
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
BWR	GE	G4609G13	171.417	172.912	3.24	3.85	4.17	42,045	53,636

Table A-3 (continued).

Reactor Type	Manufacturer Code	Assembly Code	Initial Uranium Loading (kg/assembly)		Enrichment (U^{235} wt %)			Burnup (MW/MTU)	
			Avg.	Max.	Min.	Avg.	Max.	Avg.	Max.
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
PWR	ANF	XFC14A	353.345	358.811	3.50	3.57	3.80	37,205	46,048

Table A-3 (continued).

Reactor Type	Manufacturer Code	Assembly Code	Initial Uranium Loading (kg/assembly)		Enrichment (U^{235} wt %)			Burnup (MW/MTU)	
			Avg.	Max.	Min.	Avg.	Max.	Avg.	Max.
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
PWR	CE	XPA15C	412.442	416.780	1.65	2.47	3.06	16,020	33,630

Table A-3 (continued).

Reactor Type	Manufacturer Code	Assembly Code	Initial Uranium Loading (kg/assembly)		Enrichment (U^{235} wt %)			Burnup (MW/MTU)	
			Avg.	Max.	Min.	Avg.	Max.	Avg.	Max.
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
PWR	WE	W1717WVJ	461.518	465.200	3.71	3.99	4.40	43,922	46,847

Table A-3 (continued).

Reactor Type	Manufacturer Code	Assembly Code	Initial Uranium Loading (kg/assembly)		Enrichment (U^{235} wt %)			Burnup (MW/MTU)	
			Avg.	Max.	Min.	Avg.	Max.	Avg.	Max.
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

Appendix B
December 2018 Projected Inventory by Reactor

Table B-1. Estimated Inventory at Operating Reactors by Storage Type and Site (Group B & C Sites)

Reactor	Dry Inventory 12/31/2018			Pool Inventory 12/31/2018		Site Inventory 12/31/2018	
	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Arkansas Nuclear One (2)	2,240	987	84	1,387	611	3,627	1,598
Beaver Valley Power Station (2)	370	171	10	2,454	1,133	2,824	1,304
Braidwood Station (2)	768	323	24	2,712	1,140	3,480	1,463
Browns Ferry Nuclear Plant (3)	5,997	1,082	78	7,178	1,295	13,175	2,377
Brunswick Steam Electric Plant (2)	2,196	434	36	2,283	452	4,479	886
Byron Station (2)	992	417	31	2,655	1,117	3,647	1,535
Callaway Plant (1)	666	282	18	1,342	568	2,008	850
Calvert Cliffs Nuclear Power Plant (2)	2,464	966	89	1,353	531	3,817	1,497
Catawba Nuclear Station (2)	1,131	506	39	2,309	1,033	3,440	1,539
Clinton Power Station (1)	979	177	11	2,869	518	3,848	694
Columbia Generating Station (1)	3,060	539	45	1,276	225	4,336	764
Comanche Peak Steam Electric Station (2)	1,152	484	36	2,034	855	3,186	1,339
Cooper Nuclear Station (1)	1,830	329	30	1,276	230	3,106	559
Davis-Besse Nuclear Station (1)	200	95	7	1,138	540	1,338	635
Diablo Canyon Nuclear Power Plant (2)	1,856	799	58	1,554	669	3,410	1,467
Donald C. Cook Nuclear Power Plant (2)	1,408	617	44	2,619	1,148	4,027	1,765
Dresden Nuclear Power Station (2)	5,032	885	74	5,550	931	10,582	1,816
Duane Arnold Energy Center (1)	1,220	221	20	2,060	372	3,280	593
Edwin I. Hatch Nuclear Plant (2)	5,576	1,003	82	3,858	694	9,434	1,696
Fermi (1)	816	143	12	2,900	510	3,716	653
Grand Gulf Nuclear Station (1)	2,312	409	34	3,532	624	5,844	1,033
H.B. Robinson Steam Electric Plant (1)	608	263	31	341	147	949	410
Hope Creek Generating Station (1)	1,972	354	29	2,744	492	4,716	845
Indian Point Nuclear Generating (2)	1,184	538	37	2,184	992	3,368	1,530
James A. FitzPatrick Nuclear Power Plant (1)	1,768	320	26	2,496	451	4,264	771
Joseph M. Farley Nuclear Plant (2)	1,632	716	51	1,782	781	3,414	1,497
LaSalle County Station (2)	2,244	402	33	6,800	1,218	9,044	1,619
Limerick Generating Station (2)	2,806	500	46	6,209	1,106	9,015	1,606
McGuire Nuclear Station (2)	1,732	781	58	2,192	989	3,924	1,770
Millstone Power Station (2)	1,088	461	34	2,150	911	3,238	1,372
Monticello Nuclear Generating Plant (1)	1,830	317	30	714	124	2,544	441
Nine Mile Point Nuclear Station (2)	2,135	377	35	5,929	1,047	8,064	1,424
North Anna Power Station (2)	2,048	950	64	1,190	552	3,238	1,501
Oconee Nuclear Station (3)	3,648	1,700	152	1,598	745	5,246	2,444
Palisades Nuclear Plant (1)	1,244	512	46	505	208	1,749	720
Palo Verde Nuclear Generating Station (3)	3,648	1,568	152	2,349	1,010	5,997	2,578
Peach Bottom Atomic Power Station (2)	6,052	1,087	89	5,260	944	11,312	2,031

Table B-1 (continued)

Reactor	Dry Inventory 12/31/2018			Pool Inventory 12/31/2018		Site Inventory 12/31/2018	
	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Perry Nuclear Power Plant (1)	1,360	245	20	2,990	539	4,350	784
Pilgrim Nuclear Power Station (1)	1,156	205	17	2,377	422	3,533	627
Point Beach Nuclear Plant (2)	1,472	565	50	1,074	412	2,546	977
Prairie Island Nuclear Generating Plant (2)	1,760	641	44	997	363	2,757	1,004
Quad Cities Nuclear Power Station (2)	3,740	664	55	6,268	1,113	10,008	1,776
River Bend Station (1)	2,108	373	31	2,052	364	4,160	737
R.E. Ginna Nuclear Power Plant (1)	320	118	10	1,149	423	1,469	540
St. Lucie Plant (2)	928	361	29	2,933	1,142	3,861	1,503
Salem Nuclear Generating Station (2)	864	396	27	2,546	1,168	3,410	1,565
Seabrook Station (1)	704	322	22	832	381	1,536	703
Sequoyah Nuclear Plant (2)	1,778	813	54	1,733	793	3,511	1,606
Shearon Harris Nuclear Power Plant (1)	-	-	-	6,227	1,607	6,227	1,607
South Texas Project (2)	-	-	-	2,864	1,535	2,864	1,535
Surry Nuclear Power Station (2)	2,558	1,174	89	782	359	3,340	1,533
Susquehanna Steam Electric Station (2)	5,796	1,024	99	4,556	805	10,352	1,828
Three Mile Island Nuclear Station (1)	-	-	-	1,492	703	1,492	703
Turkey Point Nuclear Generating (2)	896	409	28	2,199	1,003	3,095	1,411
Virgil C. Summer Nuclear Station (1)	148	63	4	1,428	610	1,576	673
Vogtle Electric Generating Plant (2)	1,088	469	34	2,421	1,044	3,509	1,513
Waterford Steam Electric Station (1)	736	310	23	1,321	557	2,057	867
Watts Bar Nuclear Plant (2)	370	170	10	947	436	1,317	606
Wolf Creek Generating Station (1)	-	-	-	1,763	810	1,763	810
Totals (98 reactors)	**105,686**	**30,036**	**2,421**	**149,733**	**43,497**	**255,419**	**73,534**

*Note: This Table does reflect fuel transfers.
Dresden quantities include 617 Dresden Unit 1 assemblies (~63.2MTU) which are co-mingled with unit 2 and 3 fuel and which are being moved to dry canister storage in a co-mingled fashion.

Table B-2. Estimated Inventory by Storage Type and Site (Group A Sites Shutdown before 2000)

	Dry Inventory 12/31/2018			Pool Inventory 12/31/2018		Site Inventory 12/31/2018	
Reactor	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Big Rock Point	441	57.92	7	-	-	441	57.92
Haddam Neck	1,019	413.53	40	-	-	1,019	413.53
Humboldt Bay	390	28.94	5	-	-	390	28.94
La Crosse	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	791	359.26	34	-	-	791	359.26
Yankee Rowe	533	127.13	15	-	-	533	127.13
Zion	2,226	1,019.41	61	-	-	2,226	1,019.41
Totals	**7,660**	**2,814.79**	**248**	**-**	**-**	**7,660**	**2,814.79**

*Note: This Table **does** reflect fuel transfers.

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

	Dry Inventory 12/31/2018			Pool Inventory 12/31/2018		Site Inventory 12/31/2018	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Dresden 1	272	27.72	4	Pool Empty	Remaining Inventory with Units 2 and 3**	272	27.71
Indian Point 1	160	30.58	5	-	-	160	30.58
Millstone 1	-	-	-	2,884	525.62	2,884	525.62
Totals	**432**	**58.30**	**9**	**2,884**	**525.62**	**3,316**	**583.93**

*Note: This Table **does** reflect fuel transfers.

** 617 Dresden 1 assemblies (~63.2MTU) are co-mingled with unit 2 and 3 fuel. This SNF is being moved to dry canister storage in a co-mingled fashion.

Table B-4. Estimated Inventory by Storage Type and Site (Group A Sites Shutdown after 2000)

	Dry Inventory 12/31/2018			Pool Inventory 12/31/2018		Site Inventory 12/31/2018	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Crystal River 3	1,243	582	39	-	-	1,243	582
Fort Calhoun	320	118	10	946	348	1,266	465
Kewaunee	1,335	519	38	-	-	1,335	519
Oyster Creek Nuclear Generating Station	2,074	367	34	2,468	436	4,542	803
San Onofre	2,260	935	79	1,595	674	3,855	1,609
Vermont Yankee	3,877	704	58	-	-	3,877	704
Totals	**11,109**	**3,223**	**258**	**5,009**	**1,458**	**16,118**	**4,681**

*Note: This Table **does** reflect fuel transfers.

Table B-5. Estimated Inventory Totals

	Dry Inventory 12/31/18			Pool Inventory 12/31/2018		Site Inventory 12/31/2018	
Reactor Group	**Assy.**	**Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Operating Sites	105,686	30,036	2,421	149,733	43,497	255,419	73,534
Group A Pre-2000 All Dry Storage	7,660	2,815	248	-	-	7,660	2,815
Group A Post-2000 All Dry Storage	6,455	1,805	135	-	-	6,455	1,805
Group A Post 2000 Pool and Dry Storage	4,654	1,419	123	5,009	1,458	9,663	2,877
Shutdown Group B	432	58	9	2,884	525	3,316	584
Grand Total	**124,887**	**36,133**	**2,936**	**157,626**	**45,481**	**282,513**	**81,614**

*Note: This Table **does** reflect fuel transfers.

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

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

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Arkansas Nuclear One, Unit 1	1,397	649	240	114	777	367	2,414	1,130
Arkansas Nuclear One, Unit 2	1,634	684	356	150	1,245	526	3,235	1,361
Beaver Valley Power Station, Unit 1	1,310	605	256	118	861	396	2,427	1,119
Beaver Valley Power Station, Unit 2	1,010	467	248	115	1,273	588	2,531	1,169
Braidwood Station, Unit 1	1,334	563	356	149	1,795	751	3,485	1,462
Braidwood Station, Unit 2	1,402	590	388	162	2,036	848	3,826	1,600
Browns Ferry Nuclear Plant, Unit 1	2,444	449	876	158	2,808	508	6,128	1,116
Browns Ferry Nuclear Plant, Unit 2	4,441	802	899	160	3,092	551	8,432	1,513
Browns Ferry Nuclear Plant, Unit 3	3,630	652	885	155	3,124	547	7,639	1,354
Brunswick Steam Electric Plant, Unit 1	3,580	644	735	130	2,520	445	6,835	1,218
Brunswick Steam Electric Plant, Unit 2	3,552	640	699	125	2,448	436	6,699	1,200
Byron Station, Unit 1	1,546	652	356	148	1,706	710	3,608	1,510
Byron Station, Unit 2	1,387	585	358	150	1,903	798	3,648	1,533

Table C-1 (continued)

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Callaway Plant	1,648	700	360	150	1,706	712	3,714	1,562
Calvert Cliffs Nuclear Power Plant, Unit 1	1,707	666	276	112	861	350	2,844	1,129
Calvert Cliffs Nuclear Power Plant, Unit 2	1,545	601	289	117	1,081	439	2,915	1,157
Catawba Nuclear Station, Unit 1	1,456	650	308	140	1,425	647	3,189	1,437
Catawba Nuclear Station, Unit 2	1,364	607	312	142	1,441	657	3,117	1,406
Clinton Power Station, Unit 1	2,996	542	852	152	4,600	822	8,448	1,517
Columbia Generating Station, Unit 2	3,584	631	752	133	3,836	679	8,172	1,443
Comanche Peak Steam Electric Station, Unit 1	1,285	545	372	156	2,146	896	3,803	1,597
Comanche Peak Steam Electric Station, Unit 2	1,165	485	364	153	2,195	920	3,724	1,558
Cooper Nuclear Station	3,604	658	556	99	1,799	322	5,959	1,079
Davis-Besse Nuclear Power Station, Unit 1	1,116	528	222	107	843	405	2,181	1,040
Diablo Canyon Nuclear Power Plant, Unit 1	1,412	610	376	159	569	241	2,357	1,010
Diablo Canyon Nuclear Power Plant, Unit 2	1,346	582	276	117	472	200	2,094	898

Table C-1 (continued)

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Donald C. Cook Nuclear Power Plant, Unit 1	1,734	781	361	163	1,205	544	3,300	1,488
Donald C. Cook Nuclear Power Plant, Unit 2	1,584	674	348	146	1,237	519	3,169	1,339
Dresden Nuclear Power Station, Unit 2	5,001	895	756	130	1,984	340	7,741	1,366
Dresden Nuclear Power Station, Unit 3	4,220	746	741	127	1,959	336	6,920	1,209
Duane Arnold Energy Center	2,824	511	456	82	368	66	3,648	659
Edwin I. Hatch Nuclear Plant, Unit 1	4,197	758	672	118	2,128	373	6,997	1,249
Edwin I. Hatch Nuclear Plant, Unit 2	3,892	700	673	120	2,800	500	7,365	1,321
Fermi, Unit 2	3,004	528	712	125	3,790	665	7,506	1,319
Grand Gulf Nuclear Station, Unit 1	4,788	846	1,056	187	5,288	937	11,132	1,969
H. B. Robinson Steam Electric Plant, Unit 2	1,506	653	252	109	661	287	2,419	1,049
Hope Creek Generating Station, Unit 1	3,832	689	884	156	4,742	837	9,458	1,683
Indian Point Nuclear Generating, Unit 2	1,517	688	270	122	193	87	1,980	897
Indian Point Nuclear Generating, Unit 3	1,298	592	283	128	288	131	1,869	851

Table C-1 (continued)

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
James A. FitzPatrick Nuclear Power Plant	3,664	663	600	108	1,960	352	6,224	1,123
Joseph M. Farley Nuclear Plant, Unit 1	1,517	671	268	113	961	407	2,746	1,191
Joseph M. Farley Nuclear Plant, Unit 2	1,360	599	269	114	1,162	491	2,791	1,204
LaSalle County Station, Unit 1	3,703	665	906	161	4,086	724	8,695	1,550
LaSalle County Station, Unit 2	3,515	630	920	163	4,755	844	9,190	1,638
Limerick Generating Station, Unit 1	3,970	707	840	149	4,404	779	9,214	1,635
Limerick Generating Station, Unit 2	3,385	603	820	147	4,874	871	9,079	1,620
McGuire Nuclear Station, Unit 1	1,517	680	295	135	1,303	595	3,115	1,409
McGuire Nuclear Station, Unit 2	1,528	685	284	130	1,258	576	3,070	1,392
Millstone Power Station, Unit 2	1,506	595	280	112	917	367	2,703	1,075
Millstone Power Station, Unit 3	1,124	515	328	150	1,651	754	3,103	1,418
Monticello Nuclear Generating Plant, Unit 1	3,148	561	454	78	1,390	237	4,992	876
Nine Mile Point Nuclear Station, Unit 1	3,340	597	464	79	1,332	227	5,136	903

Table C-1 (continued)

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Nine Mile Point Nuclear Station, Unit 2	3,396	598	864	149	4,508	778	8,768	1,526
North Anna Power Station, Unit 1	1,367	633	264	123	1,015	473	2,646	1,229
North Anna Power Station, Unit 2	1,351	626	256	119	1,053	489	2,660	1,234
Oconee Nuclear Station, Unit 1	1,628	758	268	123	780	359	2,676	1,241
Oconee Nuclear Station, Unit 2	1,540	718	284	133	887	416	2,711	1,267
Oconee Nuclear Station, Unit 3	1,554	725	272	127	857	399	2,683	1,250
Palisades Nuclear Plant	1,509	617	240	104	324	140	2,073	860
Palo Verde Nuclear Generating Station, Unit 1	1,539	658	399	174	2,005	874	3,943	1,707
Palo Verde Nuclear Generating Station, Unit 2	1,660	711	408	178	2,077	906	4,145	1,795
Palo Verde Nuclear Generating Station, Unit 3	1,575	676	416	181	2,217	967	4,208	1,824
Peach Bottom Atomic Power Station, Unit 2	4,968	893	819	146	2,675	477	8,462	1,516
Peach Bottom Atomic Power Station, Unit 3	4,708	848	819	145	2,948	522	8,475	1,515
Perry Nuclear Power Plant, Unit 1	3,502	632	848	152	4,710	843	9,060	1,626

Table C-1 (continued)

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Pilgrim Nuclear Power Station	3,069	547	464	80	580	99	4,113	726
Point Beach Nuclear Plant, Unit 1	1,142	437	173	69	441	176	1,756	681
Point Beach Nuclear Plant, Unit 2	1,081	413	156	62	472	187	1,709	661
Prairie Island Nuclear Generating Plant, Unit 1	1,200	439	153	54	478	168	1,831	661
Prairie Island Nuclear Generating Plant, Unit 2	1,204	441	200	70	671	236	2,075	747
Quad Cities Nuclear Power Station, Unit 1	4,337	773	746	130	2,439	425	7,522	1,327
Quad Cities Nuclear Power Station, Unit 2	4,184	747	741	127	2,453	420	7,378	1,294
River Bend Station, Unit 1	3,460	612	700	125	3,536	629	7,696	1,366
R.E. Ginna Nuclear Power Plant	1,325	488	184	67	397	145	1,906	701
St. Lucie Plant, Unit 1	1,813	701	328	131	1,119	445	3,260	1,277
St. Lucie Plant, Unit 2	1,420	550	300	121	1,417	569	3,137	1,240
Salem Nuclear Generating Station, Unit 1	1,444	664	308	141	1,117	510	2,869	1,315
Salem Nuclear Generating Station, Unit 2	1,350	620	308	140	1,271	577	2,929	1,337

Table C-1 (continued)

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Seabrook Station, Unit 1	1,204	552	332	151	1,853	845	3,389	1,548
Sequoyah Nuclear Plant, Unit 1	1,378	631	328	148	1,341	606	3,047	1,386
Sequoyah Nuclear Plant, Unit 2	1,461	670	344	157	1,397	638	3,202	1,465
Shearon Harris Nuclear Power Plant, Unit 1	1,052	476	280	127	1,417	644	2,749	1,247
South Texas Project, Unit 1	1,172	630	308	164	1,579	841	3,059	1,635
South Texas Project, Unit 2	1,076	578	308	164	1,733	923	3,117	1,665
Surry Nuclear Power Station, Unit 1	1,444	662	252	117	724	335	2,420	1,114
Surry Nuclear Power Station, Unit 2	1,453	667	260	119	742	340	2,455	1,126
Susquehanna Steam Electric Station, Unit 1	4,463	787	909	161	4,097	726	9,469	1,675
Susquehanna Steam Electric Station, Unit 2	4,073	718	907	161	4,703	835	9,683	1,714
Three Mile Island Nuclear Station, Unit 1	1,270	596	222	108	695	338	2,187	1,041
Turkey Point Nuclear Generating, Unit 3	1,326	605	216	98	643	293	2,185	996
Turkey Point Nuclear Generating, Unit 4	1,343	612	228	104	670	305	2,241	1,022

Table C-1 (continued)

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Virgil C. Summer Nuclear Station, Unit 1	1,304	559	272	114	1,177	494	2,753	1,167
Vogtle Electric Generating Plant, Unit 1	1,519	659	364	155	1,831	777	3,714	1,591
Vogtle Electric Generating Plant, Unit 2	1,261	544	365	154	2,013	851	3,639	1,550
Waterford Steam Electric Station, Unit 3	1,661	697	396	170	1,900	815	3,957	1,682
Watts Bar Nuclear Plant, Unit 1	892	411	340	156	2,233	1,025	3,465	1,592
Wolf Creek Generating Station, Unit 1	1,420	653	343	157	1,669	762	3,432	1,572
Watts Bar Nuclear Plant, Unit 2	-	-	85	39	3,423	1,571	3,508	1,610
Totals	**213,667**	**61,254**	**44,136**	**12,816**	**183,545**	**53,803**	**441,348**	**127,873**

*Note: This table **does not** reflect fuel transfers.

Table C-2. No Replacement Nuclear Generation Fuel Discharges by Reactor (Group A Sites Shutdown before 2000)

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		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	69.40	-	-	-	-	526	69.40
Haddam Neck	1,102	448.42	-	-	-	-	1,102	448.42
Humboldt Bay	390	28.94	-	-	-	-	390	28.94
La Crosse	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	791	359.26	-	-	-	-	791	359.26
Yankee Rowe	533	127.13	-	-	-	-	533	127.13
Zion 1	1,143	523.94	-	-	-	-	1,143	523.94
Zion 2	1,083	495.47	-	-	-	-	1,083	495.47
Totals	**7,829**	**2,861.28**	**-**	**-**	**-**	**-**	**7,829**	**2,861.28**

*Note: This table **does not** reflect fuel transfers.

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

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		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	90.87	-	-	-	-	892	90.87
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**

*Note: This table **does not** reflect fuel transfers.

Table C-4. No Replacement Nuclear Generation Fuel Discharges by Reactor Site (Group A Sites Shutdown after 2000)

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Crystal River 3	1,243	582.23	-	-	-	-	1,243	582.23
Fort Calhoun	1,091	399.38	175	65.97	-	-	1,266	465.35
Kewaunee	1,214	470.97	121	47.73	-	-	1,335	518.70
Oyster Creek	3,644	649.27	898	153.38	-	-	4,542	802.64
San Onofre 1	665	244.61	-	-	-	-	665	244.61
San Onofre 2	1,726	730.00	-	-	-	-	1,726	730.00
San Onofre 3	1,734	732.61	-	-	-	-	1,734	732.61
Vermont Yankee	3,389	615.97	488	87.69	-	-	3,877	703.66
Totals	**14,706**	**4,425.04**	**1,682**	**354.77**	**-**	**-**	**16,388**	**4,779.81**

*Note: This table **does not** reflect fuel transfers.

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

	Fuel Discharges as of 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2017		Forecast Future Discharges 1/1/2018 to 12/31/2075		Total Projected Discharged Fuel	
Reactor [Unit]	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**	**Assy.**	**Initial Uranium (MT)**
Operating Reactors	213,667	61,254	44,136	12,816	183,545	53,803	441,348	127,873
Group A Pre-2000	7,829	2,861	-	-	-	-	7,829	2,861
Shutdown Group B	3,936	647	-	-	-	-	3,936	647
Group A Post-2000	14,706	4,425	1,682	354	-	-	16,388	4,779
Grand Total	**240,138**	**69,187**	**45,818**	**13,171**	**183,545**	**53,803**	**469,501**	**136,161**

*Note: This table **does not** reflect fuel transfers.

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

Table D-1. Estimated and Projected Inventory at NPR Sites and Morris by State

State	Fuel Discharged Prior to 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		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	13,392	3,174	3,197	701	11,147	2,503	27,736	6,378	-	-	27,736	6,378
Arizona	4,774	2,045	1,223	534	6,299	2,747	12,296	5,325	-	-	12,296	5,325
Arkansas	3,031	1,333	596	265	2,022	893	5,649	2,491	-	-	5,649	2,491
California	7,766	3,156	652	276	1,041	441	9,459	3,873	(270)	(98)	9,189	3,774
Connecticut	6,616	2,084	608	262	2,568	1,121	9,792	3,467	(83)	(35)	9,709	3,432
Florida	7,145	3,051	1,072	453	3,849	1,613	12,066	5,117	(18)	(8)	12,048	5,109
Georgia	10,869	2,662	2,074	547	8,772	2,502	21,715	5,711	-	-	21,715	5,711
Illinois	36,743	8,498	7,120	1,598	29,716	7,019	73,579	17,116	2,461	529	76,040	17,645
Iowa	2,824	511	456	82	368	66	3,648	659	-	-	3,648	659
Kansas	1,420	653	343	157	1,669	762	3,432	1,572	-	-	3,432	1,572
Louisiana	5,121	1,309	1,096	295	5,436	1,445	11,653	3,049	-	-	11,653	3,049
Maine	1,434	542	-	-	-	-	1,434	542	-	-	1,434	542
Maryland	3,252	1,267	565	230	1,942	789	5,759	2,286	-	-	5,759	2,286
Massachusetts	3,602	675	464	80	580	99	4,646	853	-	-	4,646	853
Michigan	8,357	2,670	1,661	537	6,556	1,868	16,574	5,075	(85)	(11)	16,489	5,064
Minnesota	5,552	1,442	807	202	2,539	641	8,898	2,284	(1,058)	(198)	7,840	2,086
Mississippi	4,788	846	1,056	187	5,288	937	11,132	1,969	-	-	11,132	1,969
Missouri	1,648	700	360	150	1,706	712	3,714	1,562	-	-	3,714	1,562
Nebraska	4,695	1,057	731	165	1,799	322	7,225	1,544	(1,054)	(198)	6,171	1,346
New Hampshire	1,204	552	332	151	1,853	845	3,389	1,548	-	-	3,389	1,548
New Jersey	10,270	2,623	2,398	590	7,130	1,925	19,798	5,137	-	-	19,798	5,137

Table D-1 (continued)

State	Fuel Discharged Prior to 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		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)
New York	14,700	3,657	2,665	653	8,678	1,720	26,043	6,031	(40)	(15)	26,003	6,016
North Carolina	11,229	3,125	2,293	646	8,946	2,696	22,468	6,467	1,108	491	23,576	6,958
Ohio	4,618	1,160	1,070	258	5,553	1,248	11,241	2,667	-	-	11,241	2,667
Oregon	791	359	-	-	-	-	791	359	-	-	791	359
Pennsylvania	29,157	6,224	5,840	1,249	26,530	5,532	61,527	13,005	(2)	(0)	61,525	13,005
South Carolina	10,352	4,670	1,968	889	7,228	3,259	19,548	8,817	(1,109)	(492)	18,440	8,326
Tennessee	3,731	1,712	1,097	500	8,394	3,841	13,222	6,053	-	-	13,222	6,053
Texas	4,698	2,238	1,352	637	7,653	3,581	13,703	6,455	-	-	13,703	6,455
Vermont	3,389	616	488	88	-	-	3,877	704	-	-	3,877	704
Virginia	5,615	2,588	1,032	478	3,534	1,637	10,181	4,702	(69)	(31)	10,112	4,671
Washington	3,584	631	752	133	3,836	679	8,172	1,443	-	-	8,172	1,443
Wisconsin	3,771	1,358	450	178	913	362	5,134	1,899	(7)	(2)	5,127	1,896
Totals	**240,138**	**69,187**	**45,818**	**13,171**	**183,545**	**53,803**	**469,501**	**136,161**	**-226***	**-70***	**469,276**	**136,091**

***** Total Interstate Transfer reflects the amount of SNF reported in GC-859 as being transferred to DOE, this is not the total quantity of Commercial SNF in DOE possession, see Section 2.1.2.

Table D-2. Estimated Inventory by State and by Storage Configuration at the end of 2018

State	Dry Inventory			Pool Inventory		Site Inventory	
	Assy.	Estimated Initial Uranium (MT)	Fuel Casks	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Alabama	7,629	1,798	129	8,960	2,077	16,589	3,874
Arizona	3,648	1,568	152	2,349	1,010	5,997	2,578
Arkansas	2,240	987	84	1,387	611	3,627	1,598
California	4,999	1,991	163	3,149	1,343	8,148	3,334
Connecticut	2,107	875	74	5,034	1,437	7,141	2,311
Florida	3,067	1,352	96	5,132	2,144	8,199	3,496
Georgia	6,664	1,472	116	6,279	1,737	12,943	3,209
Illinois	16,253	3,915	293	30,071	6,711	46,324	10,626
Iowa	1,220	221	20	2,060	372	3,280	593
Kansas	-	-	-	1,763	810	1,763	810
Louisiana	2,844	684	54	3,373	920	6,217	1,604
Maine	1,434	542	60	-	-	1,434	542
Maryland	2,464	966	89	1,353	531	3,817	1,497
Massachusetts	1,689	332	32	2,377	422	4,066	754
Michigan	3,909	1,331	109	6,024	1,865	9,933	3,196
Minnesota	3,590	958	74	1,711	487	5,301	1,445
Mississippi	2,312	409	34	3,532	624	5,844	1,033
Missouri	666	282	18	1,342	568	2,008	850
Nebraska	2,150	447	40	2,222	577	4,372	1,024
New Hampshire	704	322	22	832	381	1,536	703
New Jersey	4,910	1,116	90	7,758	2,096	12,668	3,213
New York	5,567	1,383	113	11,758	2,913	17,325	4,296
North Carolina	3,928	1,215	94	10,702	3,047	14,630	4,262
Ohio	1,560	340	27	4,128	1,079	5,688	1,419
Oregon	791	359	34	-	-	791	359
Pennsylvania	15,024	2,781	244	19,971	4,692	34,995	7,472
South Carolina	5,535	2,532	226	5,676	2,535	11,211	5,067
Tennessee	2,148	984	64	2,680	1,228	4,828	2,212
Texas	1,152	484	36	4,898	2,390	6,050	2,874
Vermont	3,877	704	58	-	-	3,877	704
Virginia	4,606	2,123	153	1,972	911	6,578	3,034
Washington	3,060	539	45	1,276	225	4,336	764
Wisconsin	3,140	1,122	93	1,074	412	4,214	1,534
Totals	**124,887**	**36,133**	**2,936**	**160,843**	**46,155**	**285,730**	**82,288**

Excludes SNF from TMI Unit 2 (in ID) and Fort St. Vrain (in ID and CO).

Table D-3. Estimated Pool Inventory by Current Group and by State at the end of 2018

State	A		B		C		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)
Alabama	-	-	-	-	8,960	2,077	-	-	8,960	2,077
Arizona	-	-	-	-	2,349	1,010	-	-	2,349	1,010
Arkansas	-	-	-	-	1,387	611	-	-	1,387	611
California	1,595	674	-	-	1,554	669	-	-	3,149	1,343
Connecticut	-	-	5,034	1,437	-	-	-	-	5,034	1,437
Florida	-	-	-	-	5,132	2,144	-	-	5,132	2,144
Georgia	-	-	-	-	6,279	1,737	-	-	6,279	1,737
Illinois	-	-	5,550	931	21,304	5,106	3,217	674	30,071	6,711
Iowa	-	-	-	-	2,060	372	-	-	2,060	372
Kansas	-	-	-	-	1,763	810	-	-	1,763	810
Louisiana	-	-	-	-	3,373	920	-	-	3,373	920
Maryland	-	-	-	-	1,353	531	-	-	1,353	531
Massachusetts	-	-	-	-	2,377	422	-	-	2,377	422
Michigan	-	-	-	-	6,024	1,865	-	-	6,024	1,865
Minnesota	-	-	-	-	1,711	487	-	-	1,711	487
Mississippi	-	-	-	-	3,532	624	-	-	3,532	624
Missouri	-	-	-	-	1,342	568	-	-	1,342	568
Nebraska	946	348	-	-	1,276	230	-	-	2,222	577
New Hampshire	-	-	-	-	832	381	-	-	832	381
New Jersey	2,468	436	-	-	5,290	1,660	-	-	7,758	2,096
New York	-	-	2,184	992	9,574	1,921	-	-	11,758	2,913
North Carolina	-	-	-	-	10,702	3,047	-	-	10,702	3,047
Ohio	-	-	-	-	4,128	1,079	-	-	4,128	1,079

Table D-3 (continued)

State	A		B		C		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)
Pennsylvania	-	-	-	-	19,971	4,692	-	-	19,971	4,692
South Carolina	-	-	-	-	5,676	2,535	-	-	5,676	2,535
Tennessee	-	-	-	-	2,680	1,228	-	-	2,680	1,228
Texas	-	-	-	-	4,898	2,390	-	-	4,898	2,390
Vermont	-	-	-	-	1,972	911	-	-	1,972	911
Virginia	-	-	-	-	1,276	225	-	-	1,276	225
Washington	-	-	-	-	1,074	412	-	-	1,074	412
Wisconsin	-	-	-	-	8,960	2,077	-	-	8,960	2,077
Totals	**5,009**	**1,458**	**12,768**	**3,360**	**139,849**	**40,663**	**3,217**	**674**	**160,843**	**46,155**

Table D-4. Estimated Dry Inventory by Current Group and by State at the end of 2018

State	A			B			C			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)	Fuel Casks
Alabama	-	-	-	-	-	-	7,629	1,798	129	7,629	1,798	129
Arizona	-	-	-	-	-	-	3,648	1,568	152	3,648	1,568	152
Arkansas	-	-	-	-	-	-	2,240	987	84	2,240	987	84
California	3,143	1,192	105	-	-	-	1,856	799	58	4,999	1,991	163
Connecticut	1,019	414	40	1,088	461	34	-	-	-	2,107	875	74
Florida	1,243	582	39	-	-	-	1,824	770	57	3,067	1,352	96
Georgia	-	-	-	-	-	-	6,664	1,472	116	6,664	1,472	116
Illinois	2,226	1,019	61	5,304	913	78	8,723	1,983	154	16,253	3,915	293
Iowa	-	-	-	-	-	-	1,220	221	20	1,220	221	20
Louisiana	-	-	-	-	-	-	2,844	684	54	2,844	684	54
Maine	1,434	542	60	-	-	-	-	-	-	1,434	542	60
Maryland	-	-	-	-	-	-	2,464	966	89	2,464	966	89
Massachusetts	533	127	15	-	-	-	1,156	205	17	1,689	332	32
Michigan	441	58	7	-	-	-	3,468	1,273	102	3,909	1,331	109
Minnesota	-	-	-	-	-	-	3,590	958	74	3,590	958	74
Mississippi	-	-	-	-	-	-	2,312	409	34	2,312	409	34
Missouri	-	-	-	-	-	-	666	282	18	666	282	18
Nebraska	320	118	10	-	-	-	1,830	329	30	2,150	447	40
New Hampshire	-	-	-	-	-	-	704	322	22	704	322	22
New Jersey	2,074	367	34	-	-	-	2,836	750	56	4,910	1,116	90
New York	-	-	-	1,344	569	42	4,223	814	71	5,567	1,383	113
North Carolina	-	-	-	-	-	-	3,928	1,215	94	3,928	1,215	94
Ohio	-	-	-	-	-	-	1,560	340	27	1,560	340	27

Table D-4 (continued)

State	A			B			C			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)	Fuel Casks
Oregon	791	359	34	-	-	-	-	-	-	791	359	34
Pennsylvania	-	-	-	-	-	-	15,024	2,781	244	15,024	2,781	244
South Carolina	-	-	-	-	-	-	5,535	2,532	226	5,535	2,532	226
Tennessee	-	-	-	-	-	-	2,148	984	64	2,148	984	64
Texas	-	-	-	-	-	-	1,152	484	36	1,152	484	36
Vermont	3,877	704	58	-	-	-	-	-	-	3,877	704	58
Virginia	-	-	-	-	-	-	4,606	2,123	153	4,606	2,123	153
Washington	-	-	-	-	-	-	3,060	539	45	3,060	539	45
Wisconsin	1,668	557	43	-	-	-	1,472	565	50	3,140	1,122	93
Totals	**18,769**	**6,038**	**506**	**7,736**	**1,942**	**154**	**98,382**	**28,152**	**2,276**	**125,112**	**36,203**	**2,965**

Excludes SNF from TMI Unit 2 (in ID) and Fort St. Vrain (in ID and CO).

Table D-5. Estimated Total Inventory of Group A Sites by State at the end of 2018

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	257.32	3,855	1,608.82	-	-	4,738	1,866.14
Connecticut	1,019	413.53	-	-	-	-	1,019	413.53
Florida	1,243	582.23	-	-	-	-	1,243	582.23
Illinois	2,226	1,019.41	-	-	-	-	2,226	1,019.41
Maine	1,434	542.26	-	-	-	-	1,434	542.26
Massachusetts	533	127.13	-	-	-	-	533	127.13
Michigan	441	57.92	-	-	-	-	441	57.92
Nebraska	-	0.00	1,266	465.35	-	-	1,266	465.35
New Jersey	-	0.00	4,542	802.64	-	-	4,542	802.64
Oregon	791	359.26	-	-	-	-	791	359.26
Vermont	3,877	703.66	-	-	-	-	3,877	703.66
Wisconsin	1,668	556.66	-	-	-	-	1,668	556.66
Totals	**14,115**	**4,619**	**9,663**	**2,877**	**-**	**-**	**23,778**	**7,496**

Excludes SNF from Fort St. Vrain at DOE-Managed ISFSI in Colorado.

Table D-6. Estimated Total Inventory of Group B Sites by State at the end of 2018

State	B2		B3		B	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Connecticut	6,122	1,897.82	0	0.00	6,122	1,897.82
Illinois	10,854	1,843.47	0	0.00	10,854	1,843.47
New York	3,528	1,560.81	0	0.00	3,528	1,560.81
Totals	**20,504**	**5,302**	**0**	**0**	**20,504**	**5,302**

Table D-7. Estimated Total Inventory of Group C Sites by State at the end of 2018

State	C2		C3		C	
	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)	Assy.	Estimated Initial Uranium (MT)
Alabama	16,589	3,874.48	0	0.00	16,589	3,874.48
Arizona	5,997	2,578.11	0	0.00	5,997	2,578.11
Arkansas	3,627	1,597.65	0	0.00	3,627	1,597.65
California	3,410	1,467.41	0	0.00	3,410	1,467.41
Florida	6,956	2,913.98	0	0.00	6,956	2,913.98
Georgia	12,943	3,209.01	0	0.00	12,943	3,209.01
Illinois	30,027	7,088.38	0	0.00	30,027	7,088.38
Iowa	3,280	592.97	0	0.00	3,280	592.97
Kansas	0	0.00	1,763	809.71	1,763	809.71
Louisiana	6,217	1,604.10	0	0.00	6,217	1,604.10
Maryland	3,817	1,496.65	0	0.00	3,817	1,496.65
Massachusetts	3,533	627.10	0	0.00	3,533	627.10
Michigan	9,492	3,138.23	0	0.00	9,492	3,138.23
Minnesota	5,301	1,445.44	0	0.00	5,301	1,445.44
Mississippi	5,844	1,032.57	0	0.00	5,844	1,032.57
Missouri	2,008	850.50	0	0.00	2,008	850.50
Nebraska	3,106	559.14	0	0.00	3,106	559.14
New Hampshire	1,536	703.18	0	0.00	1,536	703.18
New Jersey	8,126	2,410.12	0	0.00	8,126	2,410.12
New York	13,797	2,734.78	0	0.00	13,797	2,734.78
North Carolina	8,403	2,655.66	6,227	1,606.68	14,630	4,262.34
Ohio	5,688	1,418.82	0	0.00	5,688	1,418.82
Pennsylvania	33,503	6,769.11	1,492	703.35	34,995	7,472.46
South Carolina	11,211	5,066.55	0	0.00	11,211	5,066.55
Tennessee	4,828	2,212.05	0	0.00	4,828	2,212.05
Texas	3,186	1,338.80	2,864	1,535.34	6,050	2,874.15
Virginia	6,578	3,033.89	0	0.00	6,578	3,033.89
Washington	4,336	764.24	0	0.00	4,336	764.24
Wisconsin	2,546	977.40	0	0.00	2,546	977.40
Totals	**225,885**	**64,160.32**	**12,346**	**4,655.09**	**238,231**	**68,815.41**

Table D-8. Estimated Total Inventory of Group F Site by State at the end of 2018

State	F	
	Assy.	Estimated Initial Uranium (MT)
Illinois	3,217	674
Totals	**3,217**	**674**

Table D-9. Estimated Total Inventory by Current Group and by State at the end of 2018

State	A		B		C		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)
Alabama	-	-	-	-	16,589	3,874	-	-	16,589	3,874
Arizona	-	-	-	-	5,997	2,578	-	-	5,997	2,578
Arkansas	-	-	-	-	3,627	1,598	-	-	3,627	1,598
California	4,738	1,866	-	-	3,410	1,467	-	-	8,148	3,334
Connecticut	1,019	414	6,122	1,898	-	-	-	-	7,141	2,311
Florida	1,243	582	-	-	6,956	2,914	-	-	8,199	3,496
Georgia	-	-	-	-	12,943	3,209	-	-	12,943	3,209
Illinois	2,226	1,019	10,854	1,843	30,027	7,088	3,217	674	46,324	10,626
Iowa	-	-	-	-	3,280	593	-	-	3,280	593
Kansas	-	-	-	-	1,763	810	-	-	1,763	810
Louisiana	-	-	-	-	6,217	1,604	-	-	6,217	1,604
Maine	1,434	542	-	-	-	-	-	-	1,434	542
Maryland	-	-	-	-	3,817	1,497	-	-	3,817	1,497
Massachusetts	533	127	-	-	3,533	627	-	-	4,066	754

Table D-9 (continued)

State	A		B		C		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)
Michigan	441	58	-	-	9,492	3,138	-	-	9,933	3,196
Minnesota	-	-	-	-	5,301	1,445	-	-	5,301	1,445
Mississippi	-	-	-	-	5,844	1,033	-	-	5,844	1,033
Missouri	-	-	-	-	2,008	850	-	-	2,008	850
Nebraska	1,266	465	-	-	3,106	559	-	-	4,372	1,024
New Hampshire	-	-	-	-	1,536	703	-	-	1,536	703
New Jersey	4,542	803	-	-	8,126	2,410	-	-	12,668	3,213
New York	-	-	3,528	1,561	13,797	2,735	-	-	17,325	4,296
North Carolina	-	-	-	-	14,630	4,262	-	-	14,630	4,262
Ohio	-	-	-	-	5,688	1,419	-	-	5,688	1,419
Oregon	791	359	-	-	-	-	-	-	791	359
Pennsylvania	-	-	-	-	34,995	7,472	-	-	34,995	7,472
South Carolina	-	-	-	-	11,211	5,067	-	-	11,211	5,067
Tennessee	-	-	-	-	4,828	2,212	-	-	4,828	2,212
Texas	-	-	-	-	6,050	2,874	-	-	6,050	2,874
Vermont	3,877	704	-	-	-	-	-	-	3,877	704
Virginia	-	-	-	-	6,578	3,034	-	-	6,578	3,034
Washington	-	-	-	-	4,336	764	-	-	4,336	764
Wisconsin	1,668	557	-	-	2,546	977	-	-	4,214	1,534
Totals	**23,778**	**7,496**	**20,504**	**5,302**	**238,231**	**68,815**	**3,217**	**674**	**285,730**	**82,288**

Excludes SNF from TMI Unit 2 (in ID) and Fort St. Vrain (in ID and CO).

Table D-10. Projected Inventory by Current Group and by State through 2075

State	A		B		C		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)
Alabama	-	-	-	-	27,736	6,378	-	-	27,736	6,378
Arizona	-	-	-	-	12,296	5,325	-	-	12,296	5,325
Arkansas	-	-	-	-	5,649	2,491	-	-	5,649	2,491
California	4,738	1,866	-	-	4,451	1,908	-	-	9,189	3,774
Connecticut	1,019	414	8,690	3,019	-	-	-	-	9,709	3,432
Florida	1,243	582	-	-	10,805	4,527	-	-	12,048	5,109
Georgia	-	-	-	-	21,715	5,711	-	-	21,715	5,711
Illinois	2,226	1,019	14,797	2,520	55,800	13,431	3,217	674	76,040	17,645
Iowa	-	-	-	-	3,648	659	-	-	3,648	659
Kansas	-	-	-	-	3,432	1,572	-	-	3,432	1,572
Louisiana	-	-	-	-	11,653	3,049	-	-	11,653	3,049
Maine	1,434	542	-	-	-	-	-	-	1,434	542
Maryland	-	-	-	-	5,759	2,286	-	-	5,759	2,286
Massachusetts	533	127	-	-	4,113	726	-	-	4,646	853
Michigan	441	58	-	-	16,048	5,006	-	-	16,489	5,064
Minnesota	-	-	-	-	7,840	2,086	-	-	7,840	2,086
Mississippi	-	-	-	-	11,132	1,969	-	-	11,132	1,969
Missouri	-	-	-	-	3,714	1,562	-	-	3,714	1,562
Nebraska	1,266	465	-	-	4,905	881	-	-	6,171	1,346
New Hampshire	-	-	-	-	3,389	1,548	-	-	3,389	1,548
New Jersey	4,542	803	-	-	15,256	4,335	-	-	19,798	5,137
New York	-	-	4,009	1,778	21,994	4,237	-	-	26,003	6,016
North Carolina	-	-	-	-	23,576	6,958	-	-	23,576	6,958

Table D-10 (continued)

State	A		B		C		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)
Ohio	-	-	-	-	11,241	2,667	-	-	11,241	2,667
Oregon	791	359	-	-	-	-	-	-	791	359
Pennsylvania	-	-	-	-	61,525	13,005	-	-	61,525	13,005
South Carolina	-	-	-	-	18,439	8,325	-	-	18,439	8,326
Tennessee	-	-	-	-	13,222	6,053	-	-	13,222	6,053
Texas	-	-	-	-	13,703	6,455	-	-	13,703	6,455
Vermont	3,877	704	-	-	-	-	-	-	3,877	704
Virginia	-	-	-	-	10,112	4,671	-	-	10,112	4,671
Washington	-	-	-	-	8,172	1,443	-	-	8,172	1,443
Wisconsin	1,668	557	-	-	3,459	1,340	-	-	5,127	1,896
Totals	**23,778**	**7,496**	**27,496**	**7,317**	**414,784**	**120,603**	**3,217**	**674**	**469,275**	**136,091**

Excludes SNF from TMI Unit 2 (in ID) and Fort St. Vrain (in ID and CO).

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 12/31/2012		Forecast Discharges 1/1/2013 to 12/31/2018		Forecast Future Discharges 1/1/2019 to 12/31/2075		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	73,624	18,240	13,360	3,303	49,281	12,031	136,265	33,574	(125)	(51)	136,140	33,523
2	65,329	21,523	13,585	4,367	56,470	18,872	135,384	44,761	(88)	(40)	135,296	44,721
3	58,869	15,098	10,712	2,704	41,045	10,381	110,626	28,183	1,311	317	111,937	28,500
4	42,316	14,327	8,161	2,798	36,749	12,518	87,226	29,643	(1,324)	(296)	85,902	29,346
Totals	**240,138**	**69,187**	**45,818**	**13,171**	**183,545**	**53,803**	**469,501**	**136,161**	**(226)**	**(70)**	**469,275**	**136,090**

Table E-2. Estimated Inventory by NRC Region and by Storage Configuration at the end of 2018

	Dry Inventory			Pool Inventory		Site Inventory	
NRC Region	**Assy.**	**Estimated Initial Uranium (MT)**	**Fuel Casks**	**Assy.**	**Estimated Initial Uranium (MT)**	**Assy.**	**Estimated Initial Uranium (MT)**
1	37,776	9,021	782	49,083	12,471	86,859	21,492
2	34,556	11,652	889	44,270	14,197	78,826	25,849
3	28,693	7,710	605	42,199	10,409	70,892	18,119
4	23,862	7,750	660	25,291	9,079	49,153	16,828
Totals	**124,887**	**36,133**	**2,936**	**160,843**	**46,155**	**285,730**	**82,288**

Table E-3. Estimated Pool Inventory by Current Group and by NRC Region at the end of 2018

NRC Region	A		B		C		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)
1	2,468	436	7,218	2,429	39,397	9,606	-	-	49,083	12,471
2	-	-	-	-	44,270	14,197	-	-	44,270	14,197
3	-	-	5,550	931	33,432	8,804	3,217	674	42,199	10,409
4	2,541	1,022	-	-	22,750	8,057	-	-	25,291	9,079
Totals	**5,009**	**1,458**	**12,768**	**3,360**	**139,849**	**40,663**	**3,217**	**674**	**160,843**	**46,155**

Table E-4. Estimated Dry Inventory by Current Group and by NRC Region at the end of 2018

NRC Region	A			B			C			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)	Fuel Casks
1	8,937	2,153	207	2,432	1,030	76	26,407	5,839	499	37,776	9,021	782
2	1,243	582	39	-	-	-	33,313	11,070	850	34,556	11,652	889
3	4,335	1,634	111	5,304	913	78	19,054	5,163	416	28,693	7,710	605
4	4,254	1,669	149	-	-	-	19,608	6,081	511	23,862	7,750	660
Totals	**18,769**	**6,038**	**506**	**7,736**	**1,942**	**154**	**98,382**	**28,152**	**2,276**	**124,887**	**36,133**	**2,936**

Table E-5. Estimated Total Inventory by Current Group and by NRC Region at the end of 2018

	A		B		C		F		Totals	
NRC Region	**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	11,405	2,589	9,650	3,459	65,804	15,444	-	-	86,859	21,492
2	1,243	582	-	-	77,583	25,267	-	-	78,826	25,849
3	4,335	1,634	10,854	1,843	52,486	13,967	3,217	674	70,892	18,119
4	6,795	2,691	-	-	42,358	14,138	-	-	49,153	16,828
Totals	**23,778**	**7,496**	**20,504**	**5,302**	**238,231**	**68,815**	**3,217**	**674**	**285,730**	**82,288**

Table E-6. Projected Inventory by Current Group and by NRC Region through 2075

	A		B		C		F		Totals	
NRC Region	**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	11,405	2,589	12,699	4,797	112,036	26,137	-	-	136,140	33,523
2	1,243	582	-	-	134,053	44,139	-	-	135,296	44,721
3	4,335	1,634	14,797	2,520	89,588	23,672	3,217	674	111,937	28,500
4	6,795	2,691	-	-	79,107	26,655	-	-	85,902	29,346
Totals	**23,778**	**7,496**	**27,496**	**7,317**	**414,784**	**120,603**	**3,217**	**674**	**469,275**	**136,090**

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Appendix F
Reference Scenario: No Replacement Nuclear Generation Forecast – Inventory by Congressional District

Table F-1. Estimated and Projected Inventory by State and Congressional District

State	Cong District	Representative	Senators	Facility Name (Bold = Shutdown)	Type of Facility	Commercial Spent Fuel (MTHM)	DOE/Navy* SNF (MTHM)	HLW (Equivalent MTHM)**	Commercial+ DOE/Navy SNF+ HLW TOTAL (MTHM)
Alabama (AL)	2	Martha Roby (R)	Doug Jones (D), Richard C. Shelby (R)	Farley	Comm Reactor	1,497	-	-	1,497
Alabama (AL)	5	Mo Brooks (R)		Browns Ferry	Comm Reactor	2,377	-	-	2,377
Arizona (AZ)	3	Raúl Grijalva (D)	Martha McSally (R) Kyrsten Sinema (D)	Palo Verde	Comm Reactor	2,578	-	-	2,578
Arkansas (AR)	3	Steve Womack (R)	Jon Boozman (R), Tom Cotton (R)	Arkansas Nuclear	Comm Reactor	1,598	-	-	1,598
California (CA)	2	Jared Huffman (D)	Dianne Feinstein (D), Kamala D. Harris (D)	**Humboldt Bay**	Comm Reactor	29	-	-	29
California (CA)	6	Doris Matsui (D)		UC Davis/McClellan N. Research Center	Non DOE Res Reactor	-	-	-	-
California (CA)	7	Ami Bara (D)		**Rancho Seco**	Comm Reactor	228	-	-	228
California (CA)	13	Barbara Lee (D)		Lawrence Berkeley National Laboratory	DOE National Lab	-	-	-	-
California (CA)	15	Eric Swalwell (D)		Aerotest Research ARRR	Non DOE Res Reactor	-	-	-	-
California (CA)	15	Eric Swalwell (D)		General Electric NTR	Non DOE Res Reactor	-	-	-	-
California (CA)	15	Eric Swalwell (D)		Lawrence Livermore National Laboratory	DOE National Lab	-	-	-	-
California (CA)	18	Anna Eshoo (D)		SLAC National Accelerator Laboratory	DOE National Lab	-	-	-	-
California (CA)	24	Salud Carbajal (D)		Diablo Canyon	Comm Reactor	1,467	-	-	1,467
California (CA)	45	Katie Porter (D)		University of California Irvine	Non DOE Res Reactor	-	-	-	-
California (CA)	49	Mike Levin (D)		**San Onofre**	Comm Reactor	1,609	-	-	1,609
Colorado (CO)	4	Ken Buck (R)	Michael F. Bennet (D), Cory Gardner (R)	Fort St. Vrain	DOE National Lab	15	-	-	15
Colorado (CO)	7	Ed Perlmutter (D)		National Renewable Energy Laboratory	DOE National Lab	-	-	-	-
Colorado (CO)	7	Ed Perlmutter (D)		U.S. Geological Survey GSTR	Non DOE Res Reactor	-	-	-	-
Connecticut (CT)	2	Joe Courtney (D)	Richard Blumenthal (D), Christopher Murphy (D)	**Haddam Neck/Connecticut Yankee**	Comm Reactor	414	-	-	414
Connecticut (CT)	2	Joe Courtney (D)		Millstone	Comm Reactor	1,898	-	-	1,898
Florida (FL)	3	Ted Yoho (R)	Rick Scott (R), Marco Rubio (R)	University of Florida UFTR	Non DOE Res Reactor	-	-	-	-
Florida (FL)	11	Daniel Webster (R)		**Crystal River**	Comm Reactor	582	-	-	582
Florida (FL)	18	Brian Mast (R)		St. Lucie	Comm Reactor	1,503	-	-	1,503
Florida (FL)	27	Donna Shalala (D)		Turkey Point	Comm Reactor	1,411	-	-	1,411
Georgia (GA)	1	Buddy Carter (R)		Hatch	Comm Reactor	1,696	-	-	1,696

Table F-1 (continued)

State	Cong District	Representative	Senators	Facility Name (Bold = Shutdown)	Type of Facility	Commercial Spent Fuel (MTHM)	DOE/Navy* SNF (MTHM)	HLW (Equivalent MTHM)**	Commercial+ DOE/Navy SNF+ HLW TOTAL (MTHM)
Georgia (GA)	12	Rick Allen (R)	Johnny Isakson (R), David Perdue (R)	Vogtle	Comm Reactor	1,513	-	-	1,513
Idaho (ID)	2	Mike Simpson (R)	Mike Crapo (R), James E. Risch (R)	Idaho National Laboratory	DOE National Lab	90	190	1,901	2,181
Idaho (ID)	2	Mike Simpson (R)		Idaho State University AGN-201	Non DOE Res Reactor	-	-	-	-
Idaho (ID)	2	Mike Simpson (R)		Naval Reactors Storage Facility	DOE National Lab	-	33	-	33
Illinois (IL)	3	Dan Lipinski (D)	Tammy Duckworth (D), Richard J. Durbin (D)	Argonne National Laboratory	DOE National Lab	-	-	-	-
Illinois (IL)	10	Bradley Schneider (D)		**Zion**	Zion	1,019	-	-	1,019
Illinois (IL)	13	Rodney Davis (R)		Clinton	Comm Reactor	694	-	-	694
Illinois (IL)	14	Randy Hultgren (R)		Fermi National Accelerator National Laboratory	DOE National Lab	-	-	-	-
Illinois (IL)	16	Adam Kinzinger (R)		Braidwood	Comm Reactor	1,463	-	-	1,463
Illinois (IL)	16	Adam Kinzinger (R)		Byron	Comm Reactor	1,535	-	-	1,535
Illinois (IL)	16	Adam Kinzinger (R)		Dresden	Comm Reactor	1,843	-	-	1,843
Illinois (IL)	16	Adam Kinzinger (R)		GE Morris Storage Facility	Comm Reactor	675	-	-	675
Illinois (IL)	16	Adam Kinzinger (R)		LaSalle County	Comm Reactor	1,619	-	-	1,619
Illinois (IL)	17	Cheri Bustos (D)		Quad Cities	Comm Reactor	1,776	-	-	1,776
Indiana (IN)	4	James Baird (R)	Todd Young (R), Mike Braun (R)	Purdue University PUR-1	Non DOE Res Reactor	-	-	-	-
Iowa (IA)	1	Abby Finkenauer (D)	Joni Ernst (R), Charles Grassley (R)	Duane Arnold	Comm Reactor	593	-	-	593
Iowa (IA)	4	Steve King (R)		Ames Laboratory (DOE Site)	DOE National Lab	-	-	-	-
Kansas (KS)	1	Roger Marshall (R)	Jerry Moran (R), Pat Roberts (R)	Kansas State University TRIGA II	Non DOE Res Reactor	-	-	-	-
Kansas (KS)	2	Steven Watkins (R)		Wolf Creek	Comm Reactor	810	-	-	810
Louisiana (LA)	2	Cedric Richmond (D)	Bill Cassidy (R), John Kennedy (R)	Waterford	Comm Reactor	867	-	-	867
Louisiana (LA)	5	Ralph Abraham (R)		River Bend	Comm Reactor	737	-	-	737
Maine (ME)	1	Chellie Pingree (D)	Susan M. Collins (R), Angus S. King, Jr (I)	**Maine Yankee**	Comm Reactor	542	-	-	542
Maryland (MA)	5	Steny H. Hoyer (D)	Benjamin L. Cardin (D), Chris Van Hollen (D)	Calvert Cliffs	Comm Reactor	1,497	-	-	1,497
Maryland (MA)	5	Steny H. Hoyer (D)		University of Maryland MUTR	Non DOE Res Reactor	-	-	-	-
Maryland (MA)	6	David Trone (D)		National Institute of Standards and Technology	Non DOE Res Reactor	-	-	-	-

Table F-1 (continued)

State	Cong District	Representative	Senators	Facility Name (Bold = Shutdown)	Type of Facility	Commercial Spent Fuel (MTHM)	DOE/Navy* SNF (MTHM)	HLW (Equivalent MTHM)**	Commercial+ DOE/Navy SNF+ HLW TOTAL (MTHM)
Maryland (MA)	8	Jamie Raskin (D)		Armed Forces Radiobiology Research Institute TRIGA	Non DOE Res Reactor	-	-	-	-
Massachusetts (MA)	1	Richard E. Neal (D)	Edward J. Markey (D), Elizabeth Warren (D)	**Yankee Rowe**	Comm Reactor	127	-	-	127
Massachusetts (MA)	3	Lori Trahan (D)		University of Lowell UMLRR	Non DOE Res Reactor	-	-	-	-
Massachusetts (MA)	7	Ayanna Pressley (D)		Massachusetts Institute of Technology MITR-II	Non DOE Res Reactor	-	-	-	-
Massachusetts (MA)	9	William Keating (D)		Pilgrim	Comm Reactor	627	-	-	627
Michigan (MI)	1	Jack Bergman (R)	Gary C. Peters (D), Debbie Stabenow (D)	**Big Rock Point**	Comm Reactor	58	-	-	58
Michigan (MI)	4	John Moolenaar (R)		DOW Chemical TRIGA	Non DOE Res Reactor	-	-	-	-
Michigan (MI)	6	Fred Upton (R)		Cook	Comm Reactor	1,765	-	-	1,765
Michigan (MI)	6	Fred Upton (R)		Palisades	Comm Reactor	720	-	-	720
Michigan (MI)	12	Debbie Dingell (D)		Enrico Fermi	Comm Reactor	653	-	-	653
Minnesota (MN)	2	Angie Craig (D)	Tina Smith (D), Amy Klobuchar (D)	Prairie Island	Comm Reactor	1,004	-	-	1,004
Minnesota (MN)	6	Tom Emmer (R)		Monticello	Comm Reactor	441	-	-	441
Mississippi (MS)	2	Bennie Thompson (D)	Thad Cochran (R), Cindy Hyde-Smith (R)	Grand Gulf	Comm Reactor	1,033	-	-	1,033
Missouri (MO)	3	Blaine Luetkemeyer (R)	Roy Blunt (R), Joshua Hawley (R)	Callaway	Comm Reactor	850	-	-	850
Missouri (MO)	4	Vicky Hartzler (R)		University of Missouri at Columbia	Non DOE Res Reactor	-	-	-	-
Missouri (MO)	8	Jason T. Smith (R)		Missouri University of Science and Technology	Non DOE Res Reactor	-	-	-	-
Nebraska (NE)	1	Jeff Fortenberry (R)	Deb Fischer (R), Ben Sasse (R)	**Fort Calhoun**	Comm Reactor	465	-	-	465
Nebraska (NE)	3	Adrian Smith (R)		Cooper Station	Comm Reactor	559	-	-	559
Nevada (NV)	4	Steven Horsford (D)	Jacky Rosen (D), Catherine Cortez-Masto (D)	Nevada National Security Site	DOE	-	-	-	-
Nevada (NV)	4	Steven Horsford (D)		Yucca Mountain	Potential DOE SNF/ HLW Repository	-	-	-	-
New Hampshire (NH)	1	Chris Pappas (D)	Margaret Wood Hassan (D), Jeanne Shaheen(D)	Seabrook	Comm Reactor	703	-	-	703
New Jersey (NJ)	2	Jefferson Van Drew (D)	Cory A Booker (D), Robert Menendez (R)	Hope Creek	Comm Reactor	845	-	-	845
New Jersey (NJ)	2	Jefferson Van Drew (D)		Salem	Comm Reactor	1,565	-	-	1,565
New Jersey (NJ)	3	Andy Kim (D)		Oyster Creek	Comm Reactor	803	-	-	803
New Jersey (NJ)	12	Bonnie Watson Coleman (D)		Princeton Plasma Physics Laboratory	DOE National Lab	-	-	-	-

Table F-1 (continued)

State	Cong District	Representative	Senators	Facility Name (Bold = Shutdown)	Type of Facility	Commercial Spent Fuel (MTHM)	DOE/Navy* SNF (MTHM)	HLW (Equivalent MTHM)**	Commercial+ DOE/Navy SNF+ HLW TOTAL (MTHM)
New Mexico (NM)	1	Debra Haaland (D)	Martin Heinrich (D), Tom Udall (D)	University of New Mexico AGN-201	Non DOE Res Reactor	-	-	-	-
New Mexico (NM)	2	Xochitl Torres Small (D)		Eddy-Lea Energy Alliance LLC	Potential SNF Storage Site				
New Mexico (NM)	2	Xochitl Torres Small (D)		Sandia National Laboratory	DOE National Lab	-	-	-	-
New Mexico (NM)	2	Xochitl Torres Small (D)		White Sands Missile Range	U.S. Army	-	-	-	-
New Mexico (NM)	3	Ben Ray Lujan (D)		Los Alamos National Laboratory	DOE National Lab	-	-	-	-
New York (NY)	1	Lee M. Zeldin (R)	Chuck Schumer (D), Kristen Gillibrand (D)	Brookhaven National Laboratory	DOE National Lab	-	-	-	-
New York (NY)	17	Nita Lowey (D)		Indian Point	Comm Reactor	1,561	-	-	1,561
New York (NY)	20	Paul Tonko (D)		Rensselaer Polytechnic Institute	Non DOE Res Reactor	-	-	-	-
New York (NY)	21	Elise Stefanik (R)		MARF	Naval Training Reactor	-	-	-	-
New York (NY)	21	Elise Stefanik (R)		S8G Submarine Prototype	Naval Training Reactor	-	-	-	-
New York (NY)	23	Tom Reed II (R)		West Valley Site	DOE National Lab	-	-	640	640
New York (NY)	24	John Katko (R)		Fitzpatrick	Comm Reactor	771	-	-	771
New York (NY)	24	John Katko (R)		Nine Mile Point	Comm Reactor	1,424	-	-	1,424
New York (NY)	24	John Katko (R)		R. E. Ginna	Comm Reactor	540	-	-	540
North Carolina (NC)	4	David Price (D)	Richard Burr (R), Thom Tillis (R)	Harris	Comm Reactor	1,607	-	-	1,607
North Carolina (NC)	4	David Price (D)		North Carolina State University PULSTAR	Non DOE Res Reactor	-	-	-	-
North Carolina (NC)	7	David Rouzer (D)		Brunswick	Comm Reactor	886	-	-	886
North Carolina (NC)	9	Vacant		McGuire	Comm Reactor	1,770	-	-	1,770
Ohio (OH)	3	Joyce Beatty (D)	Sherrod Brown (D), Robert Portman (R)	Ohio State University OSURR	Non DOE Res Reactor	-	-	-	-
Ohio (OH)	9	Marcy Kaptur (D)		Davis-Besse	Comm Reactor	635	-	-	635
Ohio (OH)	14	David Joyce (R)		Perry 1	Comm Reactor	784	-	-	784
Oregon (OR)	1	Suzanne Bonamici (D	Jeff Merkley (D), Ron Wyden (D)	**Trojan**	Comm Reactor	359	-	-	359
Oregon (OR)	3	Earl Blumenauer (D)		Reed College RRR	Non DOE Res Reactor	-	-	-	-
Oregon (OR)	4	Peter DeFazio (D)		Oregon State University OSTR	Non DOE Res Reactor	-	-	-	-
Pennsylvania (PA)	4	Madeleine Dean (D)	Robert P. Casey, Jr (D), Patrick Toomey (R)	Peach Bottom	Comm Reactor	2,031	-	-	2,031
Pennsylvania (PA)	5	Mary Scanlon (D)		Pennsylvania State University	Non DOE Res Reactor	-	-	-	-

Table F-1 (continued)

State	Cong District	Representative	Senators	Facility Name (Bold = Shutdown)	Type of Facility	Commercial Spent Fuel (MTHM)	DOE/Navy* SNF (MTHM)	HLW (Equivalent MTHM)**	Commercial+ DOE/Navy SNF+ HLW TOTAL (MTHM)
Pennsylvania (PA)	6	Chrissy Houlahan (D)		Limerick	Comm Reactor	1,606	-	-	1,606
Pennsylvania (PA)	11	Lloyd Smucker (R)		Susquehanna	Comm Reactor	1,828	-	-	1,828
Pennsylvania (PA)	12	Tom Marino (R))		Beaver Valley	Comm Reactor	1,304	-	-	1,304
Pennsylvania (PA)	14	Guy Reschenthaler (R)		National Energy Technology Laboratory	DOE National Lab	-	-	-	-
Pennsylvania (PA)	15	Glenn Thompson (R)		Three Mile Island	Comm Reactor	703	-	-	703
Rhode Island (RI)	2	James Langevin (D)	John Reed (D), Sheldon Whitehouse (D)	Rhode Island Atomic Energy Commission Nuclear Science Center	Non DOE Res Reactor	-	-	-	-
South Carolina (SC)	1	Joe Cunningham (D)		Moored Training Ship - Unit #1	Naval Training Reactor	-	-	-	-
South Carolina (SC)	1	Joe Cunningham (D)		Moored Training Ship - Unit #2	Naval Training Reactor	-	-	-	-
South Carolina (SC)	2	Joe Wilson (R)		Savannah River National Laboratory	DOE National Lab	-	29	4,085	4,114
South Carolina (SC)	3	Jeff Duncan (R)	Lindsey Graham (R), Tim Scott (R)	Oconee	Comm Reactor	2,444	-	-	2,444
South Carolina (SC)	5	Ralph Norman (R)		Catawba	Comm Reactor	1,539	-	-	1,539
South Carolina (SC)	5	Ralph Norman (R)		Summer	Comm Reactor	673	-	-	673
South Carolina (SC)	7	Tom Rice (R)		HB Robinson	Comm Reactor	410	-	-	410
Tennessee (TN)	3	Chuck Fleischmann (R)		Oak Ridge National Laboratory	DOE National Lab	-	-	-	-
Tennessee (TN)	3	Chuck Fleischmann (R)	Lamar Alexander (R), Marsha Blackburn (R)	Sequoyah	Comm Reactor	1,606	-	-	1,606
Tennessee (TN)	4	Scott DesJarlais (R)		Watts Bar	Comm Reactor	606	-	-	606
Texas (TX)	10	Michael McCaul (R)		University of Texas TRIGA II	Non DOE Res Reactor	-	-	-	-
Texas (TX)	11	K. Micheal Conoway (R)		Interim Storage Partners	Potential SNF Storage Site				
Texas (TX)	17	Bill Flores (R)	John Cornyn (R), Ted Cruz (R)	Texas A&M University AGN-201	Non DOE Res Reactor	-	-	-	-
Texas (TX)	17	Bill Flores (R)		Texas A&M University NSCR	Non DOE Res Reactor	-	-	-	-
Texas (TX)	25	Roger Williams (R)		Comanche Peak	Comm Reactor	1,339	-	-	1,339
Texas (TX)	27	Michael Cloud (R)		South Texas	Comm Reactor	1,535	-	-	1,535
Utah (UT)	2	Chris Stewart (R)	Mitch Romney (R), Mike Lee (R)	University of Utah TRIGA	Non DOE Res Reactor	-	-	-	-
Vermont (VT)	1	Peter Welch (D)	Patrick J. Leahy (D), Bernard Sanders (I)	**Vermont Yankee**	Comm Reactor	704	-	-	704
Virginia (VA)	3	Robert C. Scott (D)		Surry	Comm Reactor	1,533	-	-	1,533

Table F-1 (continued)

State	Cong District	Representative	Senators	Facility Name (Bold = Shutdown)	Type of Facility	Commercial Spent Fuel (MTHM)	DOE/Navy* SNF (MTHM)	HLW (Equivalent MTHM)**	Commercial+ DOE/Navy SNF+ HLW TOTAL (MTHM)
Virginia (VA)	3	Robert C. Scott (D)	Timothy Kaine (D), Mark R. Warner (D)	Thomas Jefferson National Accelerator Facility	DOE National Lab	-	-	-	-
Virginia (VA)	7	Abigail Spanberger (R)		North Anna	Comm Reactor	1,501	-	-	1,501
Washington (WA)	4	Dan Newhouse (R)	Patty Murray (D), Maria Cantwell (D),	Columbia	Comm Reactor	764	-	-	764
Washington (WA)	4	Dan Newhouse (R)		Hanford Site (DOE Site)	DOE	-	2,129	3,900	6,029
Washington (WA)	4	Dan Newhouse (R)		Pacific Northwest Laboratory	DOE National Lab	-	-	-	-
Washington (WA)	5	Cathy McMorris Rodgers (R)		Washington State University WSUR	Non DOE Res Reactor	-	-	-	-
Wisconsin (WI)	2	Mark Pocan (D)	Tammy Baldwin (D), Ron Johnson (R)	University of Wisconsin UWNR	Non DOE Res Reactor	-	-	-	-
Wisconsin (WI)	3	Ron Kind (D)		**La Crosse**	Comm Reactor	38	-	-	38
Wisconsin (WI)	6	Glenn Grothman (R)		Point Beach	Comm Reactor	977	-	-	977
Wisconsin (WI)	8	Mike Gallagher (R)		**Kewaunee**	Comm Reactor	519	-	-	519
Total						**82,403**	**2,371**	**10,526**	**95,300**

* SNF includes some from commercial sources Navy spent fuel is only stored at the Idaho storage facility

** Equivalent MTHM determined by using the nominal HLW canister counts in Tables 2-8 and 3-7 and applying the historical factors of 2.3 and 0.5 MTU per canister for commercial and defense HLW respectively from DOE/DP 0020/1 "An Evaluation of Commercial Repository Capacity for the Disposal of Defense High-Level Waste" (DOE 1985). Applying the total radioactivity method for determining equivalent MTHM in HLW would result in much lower quantities (INEEL 1999)."

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Appendix G
Revision History

A general description of the changes made to this document with each revision is provided in this appendix. Some of these revisions were only issued as drafts.

Revision 0 contains a single projection for commercial SNF 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 SNF. 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, Revision 1 includes an update to current storage locations for SNF through 2013.

Revision 2 contains some corrections and updates to inventory data with regard to current storage locations for SNF discharged through 2013. The updated inventory is primarily due to the commencement of dry storage operations at Fermi 2, as well ongoing transitions at multiple reactor sites of fuel from wet storage to dry storage. The dry storage inventory data are current as of September 1, 2014.

Revision 3 contains some corrections and updates to inventory data with regard to current storage locations for SNF discharged through 2015. The updated inventory is primarily due to implementation the new spent fuel projection tool [Vinson, 2015]. Also, the current revision reflects commencement of dry storage operations at Pilgrim and Beaver Valley, as well as ongoing transitions at multiple reactor sites of fuel from wet storage to dry storage. The dry storage inventory data are current as of May 5, 2015.

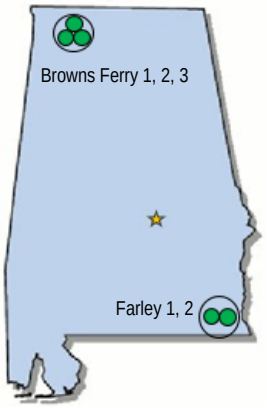
Revision 4 updates the inventory data with regard to current storage locations for SNF discharged through 2016. Revision 4 reflects nine reactors which have had shutdown dates announced by their utilities since the issuance of Revision 3. The updated inventory reflects the new GC-859 utility provided historical inventory thru June 2013 and the new spent fuel projection tool [Vinson, 2015]. Also, commencement of dry storage operations at Calloway, in Missouri, and V.C. Summer, in South Carolina, is reflected in the current revision. The dry storage inventory data are current as of May 3, 2016.

Revision 5 updates the inventory data with regard to current storage locations for SNF discharged through 2017. This revision reflects commencement of commercial operation of Watts Bar, Unit 2. Revision 5 reflects six reactors which have had shutdown dates announced by their utilities since the issuance of Revision 4. The updated inventory reflects the new GC-859 utility provided historical inventory thru June 2013 and the new spent fuel projection tool [Vinson, 2015]. Also, commencement of dry storage operations at Clinton, in Illinois, and Watts Bar, in Tennessee, is reflected in the current revision. The dry storage inventory data are current as of May 2, 2017.

Revision 6 updates the inventory data with regard to current storage locations for SNF discharged through 2018. This revision reflects Oyster Creek moving to a shutdown status. Revision 6 reflects seven reactors which have had shutdown dates announced by their utilities. The updated inventory reflects the GC-859 utility provided historical inventory thru June 2013 and the spent fuel projection tool [Vinson, 2015].

Appendix H
Reference Scenario: No Replacement
Nuclear Generation Forecast – State Inventory Data

ALABAMA



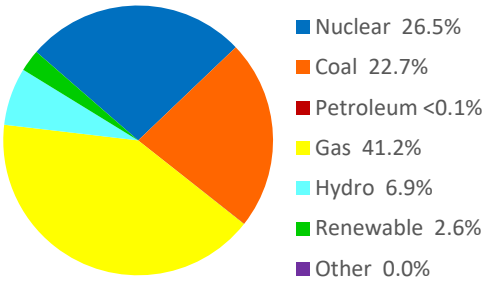
Elected Officials as of January 2019[1,2]

Governor:	Kay Ivey (R)
Senators:	Richard Shelby (R)
	Doug Jones (D)
Representatives:	
District 2:	Martha Roby (R)
District 5:	Mo Brooks (R)

Operating Reactors (5 at 2 sites)
Commercial Dry Storage Sites (2 sites)

Alabama: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

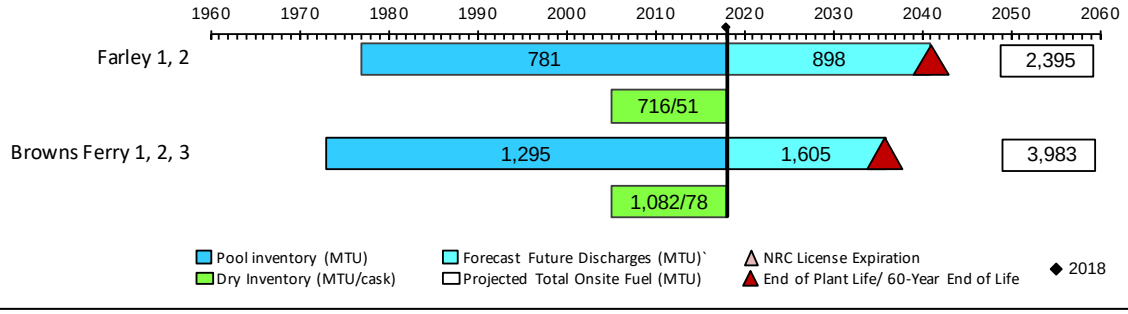


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
2	Farley 1	Southern Nuclear Operating Co.	Martha Roby (R)	1977-2037	PWR/Operating	2005/GL	1,191
	Farley 2			1981-2041	PWR/Operating		1,204
5	Browns Ferry 1	Tennessee Valley Authority	Mo Brooks (R)	1973-2033	BWR/Operating	2005/GL	1,116
	Browns Ferry 2			1974-2034	BWR/Operating		1,513
	Browns Ferry 3			1976-2036	BWR/Operating		1,354

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 1,798 MTU in 129 casks **Pool: 2,077 MTU** **Total: 3,874 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[5]

$948.9 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

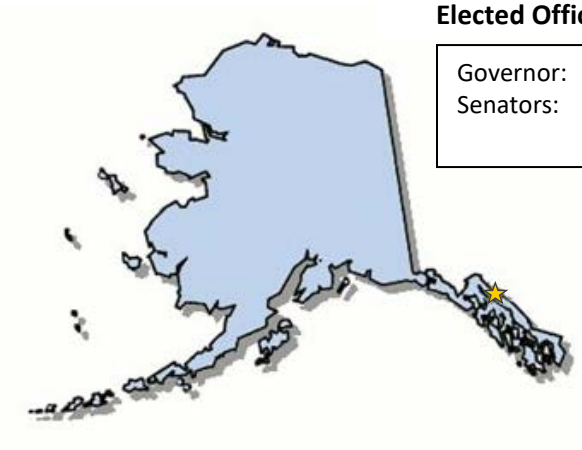
2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

ALASKA

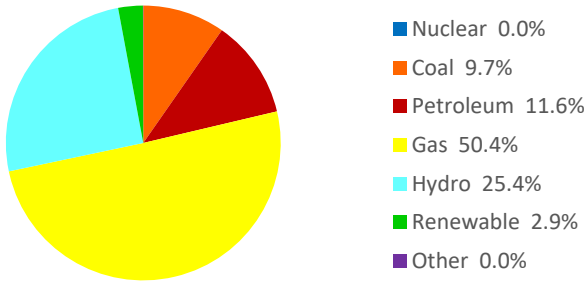


Elected Officials as of January 2019[1,2]

Governor:	Mike Dunleavy (R)
Senators:	Lisa Murkowski (R)
	Dan Sullivan (R)

Alaska: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)



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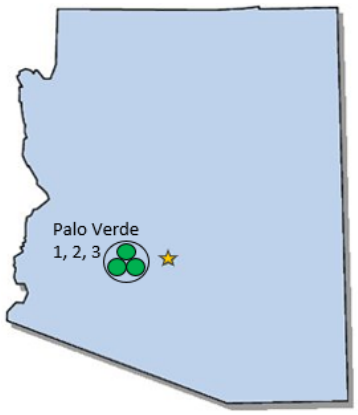
1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

ARIZONA



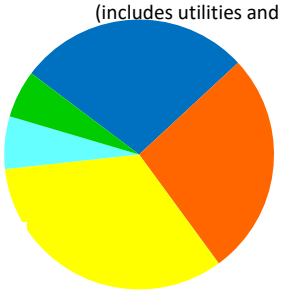
Elected Officials as of January 2019[1,2]

Governor:	Doug Ducey (R)
Senators:	Martha McSally (R)
	Kyrsten Sinema (D)
Representative:	
District 3:	Raúl Grijalva (D)

Operating Reactors (3 at 1 site)
Commercial Dry Storage Site (1 site)

Arizona: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

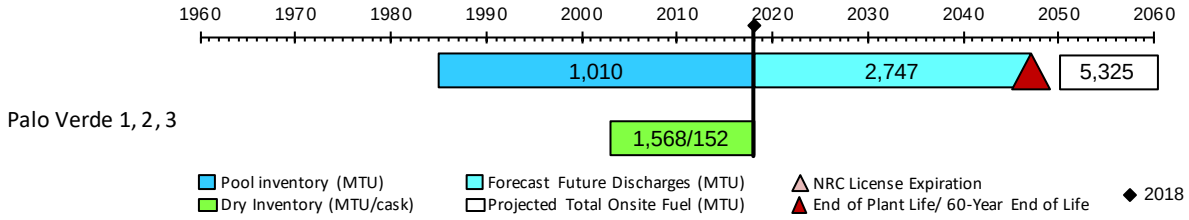


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
3	Palo Verde 1	Arizona Public Service Co.[5]	Raúl Grijalva (D)	1985-2045	PWR/Operating	2003/GL	1,707
	Palo Verde 2			1986-2046	PWR/Operating		1,795
	Palo Verde 3			1987-2047	PWR/Operating		1,824

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 1,568 MTU in 152 casks **Pool: 1,010 MTU** **Total: 2,578 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[6]	
$686.6 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019

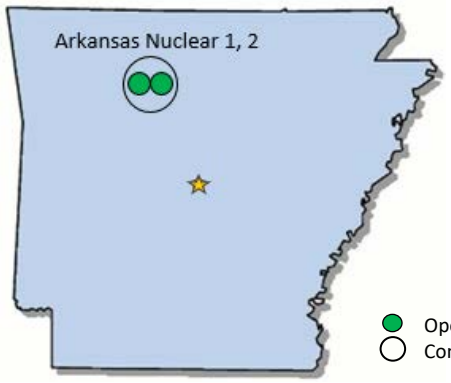
3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 Subsidiary of Pinnacle West Capital Corp.

6 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

ARKANSAS

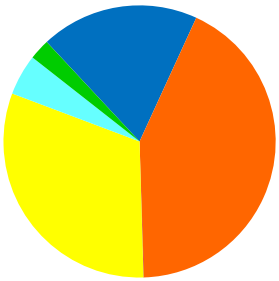


Elected Officials as of January 2019[1,2]

Governor:	Asa Hutchinson (R)
Senators:	John Boozman (R)
	Tom Cotton (R)
Representative:	
District 3:	Steve Womack (R)

Arkansas: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)



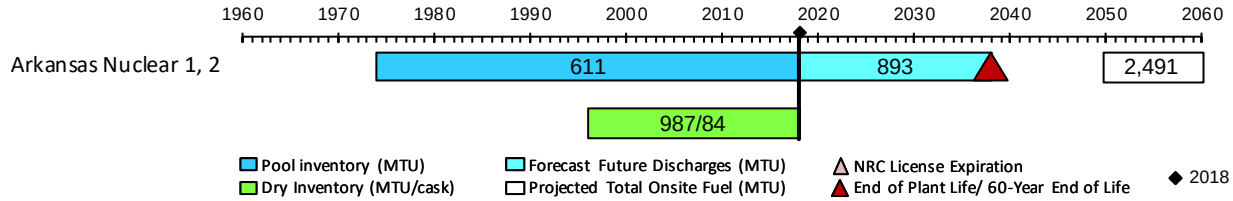
- Nuclear 18.8%
- Coal 42.6%
- Petroleum 0.1%
- Gas 31.2%
- Hydro 4.9%
- Renewable 2.5%
- Other 0.0%

Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
3	Arkansas Nuclear 1	Entergy Nuclear Operations, Inc.	Steve Womack (R)	1974-2034	PWR/Operating	1996/GL	1,130
	Arkansas Nuclear 2			1978-2038	PWR/Operating		1,361

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 987 MTU in 84 casks **Pool: 611 MTU** **Total: 1,598 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[5]	
$367.1 million paid	**$186.9 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

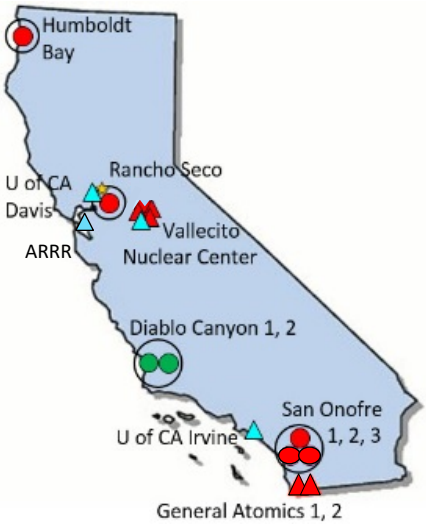
2 Governor from https://www.nga.org/governors, Accessed January 9, 2019

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

CALIFORNIA



Elected Officials as of January 2019[1,2]

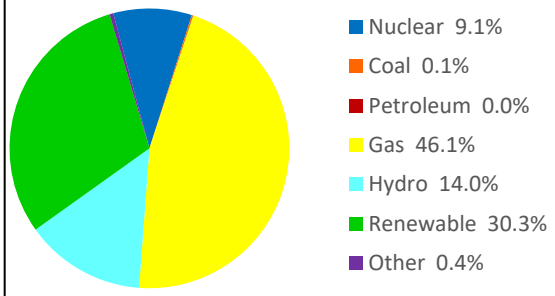
Governor:	Gavin Newsom (D)
Senators:	Dianne Feinstein (D)
	Kamala Harris (D)
Representatives:	
District 2:	Jared Huffman (D)
District 6:	Doris Matsui (D)
District 7:	Ami Bera (D)
District 15:	Eric Swalwell (D)
District 24:	Salud Carbajal (D)
District 45:	Katie Porter (D)
District 49:	Mike Levin (D)
District 52:	Scott Peters (D)

- Shutdown Reactors (5 at 3 sites)
- Operating Reactors (2 at 1 site)
- Commercial Dry Storage Site (4 sites)
- Operating Research Reactors (4 at 4 sites)
- Shutdown Research Reactors (5 at 2 sites)

*no fuel on-site at General Atomics facilities

California: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)



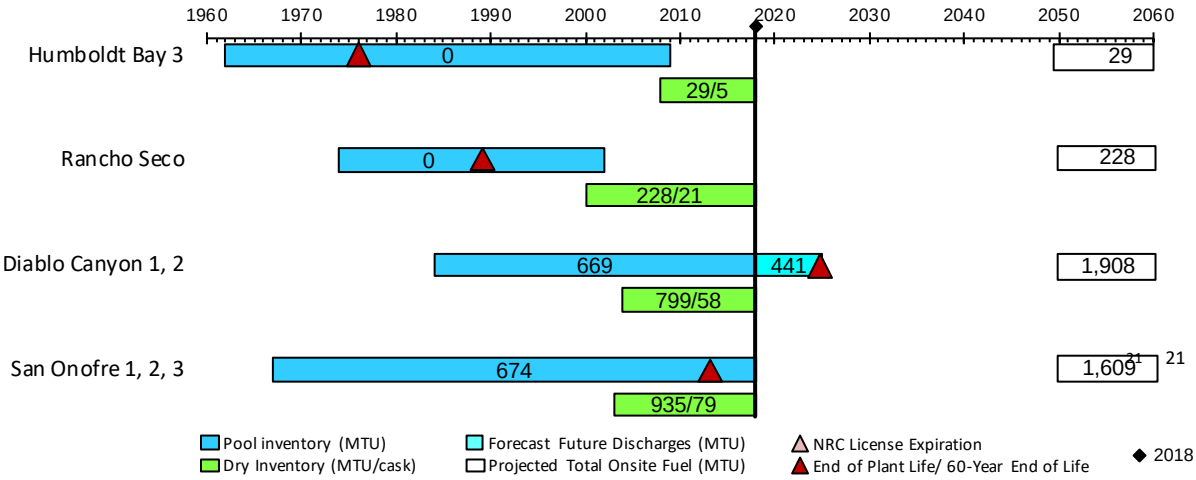
Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
2	Humboldt Bay 3[5]	Pacific Gas & Electric Company	Jared Huffman (D)	1963-1976/ DECON in progress[6]	BWR/ Shutdown	2005/SL Stranded[7]	29
6	University of California - Davis	University of California	Doris Matsui (D)	1998-	R&TRF TRIGA/ Operating		
7	Rancho Seco	Sacramento Municipal Utility District	Ami Bera (D)	1974-1989/ DECON completed	PWR/ Shutdown	2000/SL Stranded[7]	228
15	Aerotest Radiography and Research Reactor (ARRR)	Nuclear Labrinith Aerotest[8]	Eric Swalwell (D)	1965-	R&TRF TRIGA (Indus)/ Shutdown[8]		
	Vallecitos Boiling Water Reactor (VBWR)	GE Hitachi Nuclear Energy/ Vallecitos Nuclear Center		1957-1963/ SAFSTOR[9] possession only	BWR/ Shutdown		
	General Electric Test Reactor (GETR)			1986-2016/ SAFSTOR[10] possession only	R&TRF/ Shutdown[11]		
	Vallecitos Experimental Superheat Reactor (VESR)			1970-2016/ SAFSTOR[10] possession only	R&TRF/ Shutdown[11]		
	Nuclear Test Reactor (NTR)			1957-2021	R&TRF Nuclear Test/ Operating[12]		
24	Diablo Canyon 1	Pacific Gas & Electric Company	Salud Carbajal (D)	1984-2024[13]	PWR/ Operating	2004/SL	1010
	Diablo Canyon 2			1985-2025[13]	PWR/ Operating		898
45	University of California - Irvine	University of California	Katie Porter (D)	1969-[14]	R&TRF TRIGA Mark 1/ Operating		

Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
49	San Onofre 1	Southern California Edison Co.	Mike Levin (D)	1968-1992/ DECON[15,16]	PWR/ Shutdown	2003/GL	245[17]
	San Onofre 2			1982-2013/ DECON[16]	PWR/ Early Shutdown[18,19]		730
	San Onofre 3			1983-2013/ DECON[17]	PWR/ Early Shutdown[18,19]		733
52	General Atomics	General Atomics	Scott Peters (D)	1957-1997/ SAFSTOR[20]	R&TRF TRIGA Mark I/ Shutdown		
	General Atomics			1960-1995/ DECON[20]	R&TRF TRIGA Mark F/ Shutdown		

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 1,991 MTU in 163 casks **Pool: 1,343 MTU** **Total: 3,334 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[22]	
$953.0 million paid[23]	**$0.8 million one-time fee owed[24]**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 Humboldt Bay Units 1 and 2 were non-nuclear.

6 Humboldt Bay Unit 3's estimated date for closure is December 31, 2017. Transfer of SNF from fuel storage pool to ISFSI completed December 2008.

7 A stranded ISFSI does not have an active nuclear reactor on site.

8 Ownership issues have been resolved and Nuclear Labyrinth is now the parent company of ARRR, the license renewal is under NRC review Source: ADAMS ML17277B261.

9 No fuel on site. The licensee plans to maintain the facility in SAFSTOR until ongoing site nuclear activities are terminated and the entire site can be decommissioned in an integrated fashion. Estimated date of closure is 2025.

[10] NRC issued a possession-only license for GETR and VESR on February 5, 1986. The license was renewed on September 30, 1992; licensee requested continuation of their current license 12/15/15.

[11] Expected closure in 2025.

[12] There are also hot cells that are used for power reactor fuel post irradiation examination.

[13] Shutdown announced for the end of initial license period.

[14] Being evaluated by NRC for license renewal.

[15] Estimated date of closure is December 30, 2030.

[16] The fuel from Unit 1 was transferred to Phase 1 of the ISFSI. The ISFSI will be expanded onto the area previously occupied by Unit 1 as needed in order to store all Unit 2 and Unit 3 spent fuel. In late 2008, license completed Phase 2 of planned ISFSI.

[17] Includes 98 MTU transferred to Morris, Illinois.

[18] Power operations ceased permanently on June 12, 2013.

[19] Company submitted decommissioning plans in September 2014, estimating completion in about 20 years (2032).

[20] Consistent with the NRC Order dated November 4, 2008, this SNF was shipped to and is in storage at INL; however, General Atomics continues to have title to the SNF. Estimated date of closure is 2019.

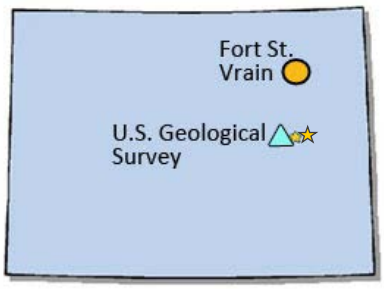
[21] Does not include 98 MTU from San Onofre 1 transferred to Morris, Illinois.

[22] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees. Includes one time fee paid by Vallecitos.

[23] Includes one-time fee paid by GE for Vallecitos.

[24] Includes one-time fee owed by Aerotest.

COLORADO



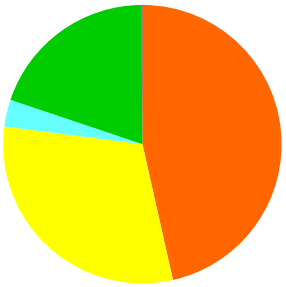
Operating Research Reactor (1 at 1 site)
DOE owned SNF (1 site)

Elected Officials as of January 2019[1,2]

Governor:	Jared Polis(D)
Senators:	Michael Bennet (D)
	Cory Gardner (R)
Representatives:	
District 4:	Ken Buck (R)
District 7:	Ed Perlmutter (D)

Colorado: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

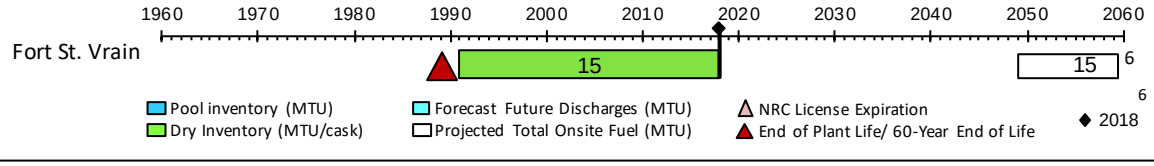


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected
4	Fort St. Vrain	DOE	Ken Buck (R)	1973-1989/ DECON completed	HTGR/ Shutdown	1991-2031/ SL	23[4]
7	US Geological Survey (USGS)	USGS	Ed Perlmutter (D)	1969- [5]	R&TRF TRIGA Mark I/ Operating		

COMMERCIAL SPENT FUEL ONSITE INVENTORY[6]

Dry: 15 MTU in 244 canisters (vault) Pool: 0 MTU Total: 15 MTU

SPENT NUCLEAR FUEL STORAGE STATUS



NUCLEAR WASTE FUND[7]	
$0.2 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

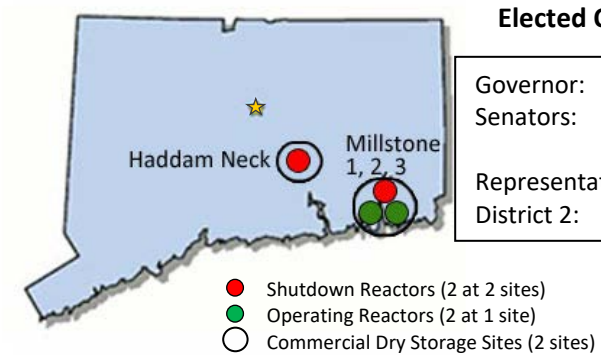
4 Includes 8.6 MTU transferred to INL.

5 Being evaluated by NRC for license renewal.

6 Excludes 8.6 MTU transferred to INL.

7 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

CONNECTICUT

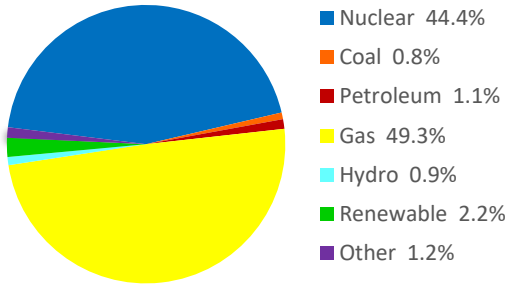


Elected Officials as of January 2019[1,2]

Governor:	Ned Lamont (D)
Senators:	Richard Blumenthal (D)
	Christopher Murphy (D)
Representative:	
District 2:	Joe Courtney (D)

Connecticut: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

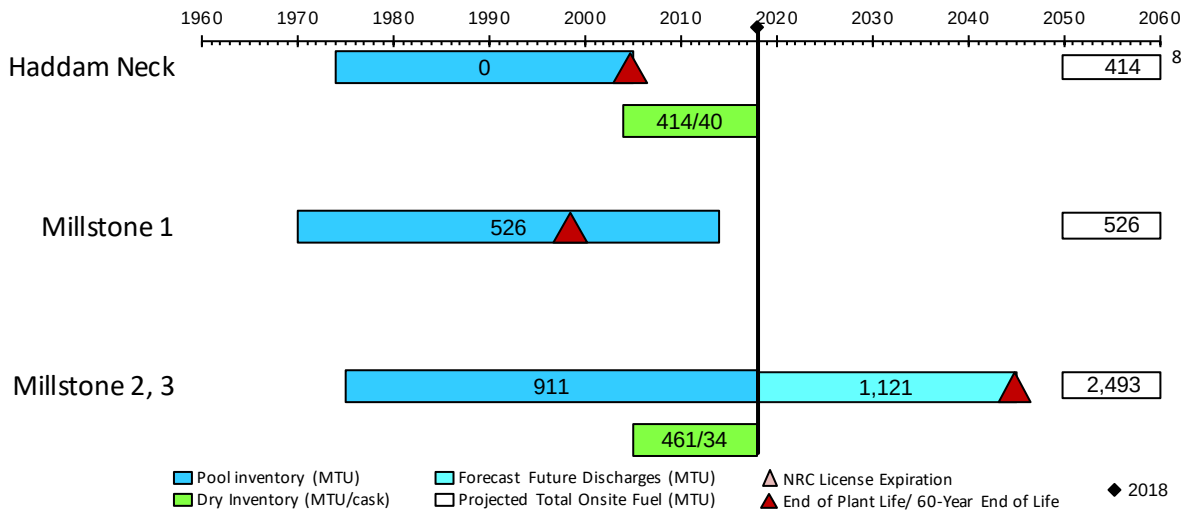


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
2	Haddam Neck	Connecticut Yankee Atomic Power	Joe Courtney (D)	1967-1996 DECON completed	PWR/Shutdown	2004/GL Stranded	448[5-6]
	Millstone 1	Dominion Nuclear Conneticut, Inc		1970-1998 SAFSTOR[7]	BWR/Shutdown		526
	Millstone 2			1975-2035	PWR/Operating	2005/GL	1,075
	Millstone 3			1986-2045	PWR/Operating		1,418

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 875 MTU in 74 casks **Pool: 1,437 MTU** **Total: 2,311 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[9]	
$894.9 million paid	**$39.8 million one-time fee owed**

[1] Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

[2] Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] Includes 34 MTU transferred to Morris, Illinois.

[6] Includes 0.41 MTU transferred to Idaho National Laboratory.

[7] Estimated date for closure is December 31, 2056.

[8] Does not include 34 MTU transferred to Morris, Illinois.

[9] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

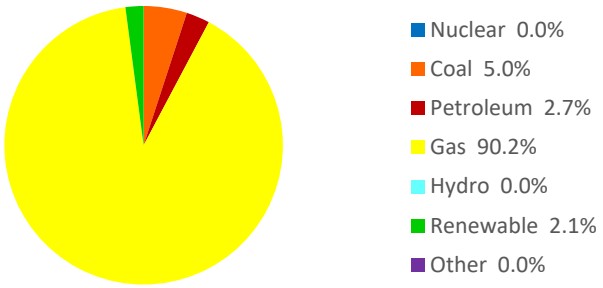
DELAWARE

Elected Officials as of January 2019[1,2]

Governor:	John Carney (D)
Senators:	Tom Carper (D)
	Chris Coons (D)

Delaware:2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

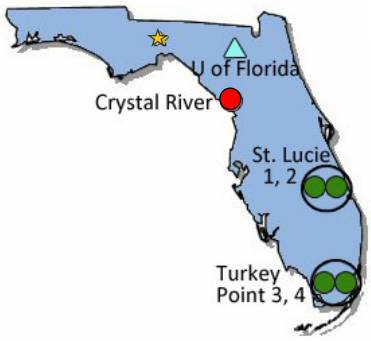


[1] Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

[2] Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

FLORIDA

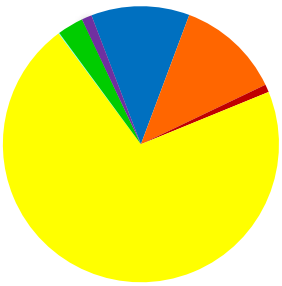


Shutdown Reactor (1 at 1 site)
Operating Reactors (4 at 2 sites)
Commercial Dry Storage Sites (2 sites)
Operating Research Reactor (1 at 1 site)

Elected Officials as of January 2019[1,2]

Governor:	Ron Desantis (R)
Senators:	Rick Scott (R)
	Marco Rubio (R)
Representatives:	
District 3:	Ted Yoho (R)
District 11:	Dan Webster (R)
District 18:	Brian Mast (R)
District 27:	Donna Shalala (D)

Florida: 2018 Electricity Generation Mix[3]
(includes utilities and independent power producers)



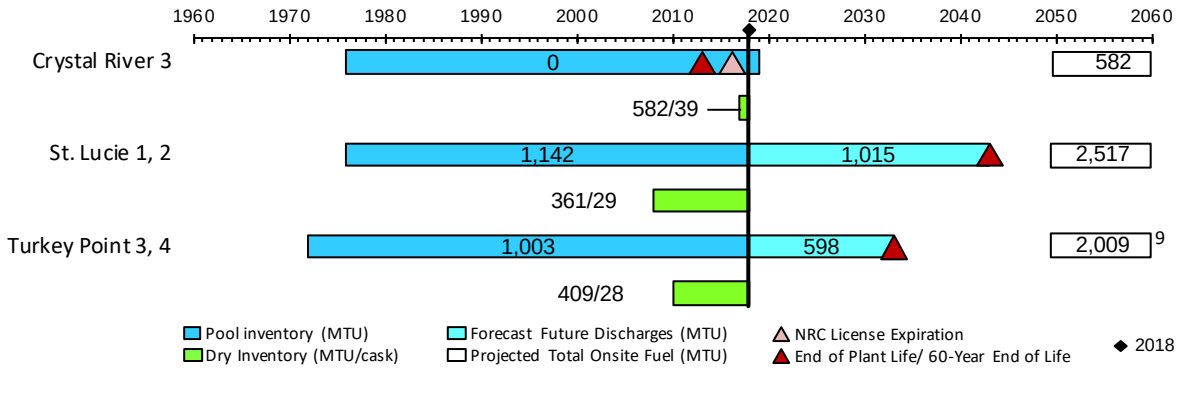
- Nuclear 11.5%
- Coal 12.2%
- Petroleum 0.9%
- Gas 71.0%
- Hydro 0.1%
- Renewable 3.1%
- Other 1.2%

Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
3	University of Florida	University of Florida	Ted Yoho (R)	1959- [5]	R&TRF Argonaut/ Operating		
11	Crystal River 3[6]	Duke Energy Florida, Inc.	Dan Webster (R)	1977-2016[7] SAFSTOR in progress	PWR/ Early shutdown		582
18	St. Lucie 1	Florida Power & Light Co.	Brian Mast (R)	1976-2036	PWR/Operating	2008/GL	1,277
	St. Lucie 2			1983-2043	PWR/Operating		1,240
27	Turkey Point 3		Donna Shalala (D)	1972-2032	PWR/Operating	2010/GL	996[8]
	Turkey Point 4			1973-2033	PWR/Operating		1,022

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 1,352 MTU in 96 casks **Pool: 2,144 MTU** **Total: 3,496 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[10]	
$887.0 million paid	**$0.0 million one-time fee owed**

[1] Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

[2] Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] Being evaluated by NRC for license renewal.

[6] This was the third plant built as part of the 4,700-acrew Crystal River Energy Complex. There are also four fossil fuel power plants on the site.

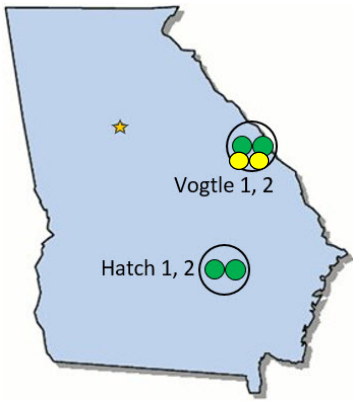
[7] Crystal River has been offline since 2009 and was permanently shutdown February 20, 2013. Its NRC operating license was to have expired in 2016. Estimated date for closure is 2074, at which time the site will be available for unrestricted use.

[8] Includes 8 MTU transferred to Idaho National Lab.

[9] Does not include 8 MTU transferred to Idaho National Lab.

[10] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

GEORGIA



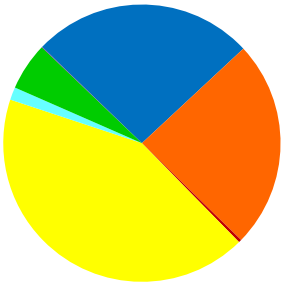
Reactors Under Construction (2 at 1 site)
Operating Reactors (4 at 2 sites)
Commercial Dry Storage Site (2 sites)

Elected Officials as of January 2019[1,2]

Governor:	Nathan Deal (R)
Senators:	John Isakson (R)
	David Perdue (R)
Representatives:	
District 1:	Buddy Carter (R)
District 12:	Rick Allen (R)

Georgia: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

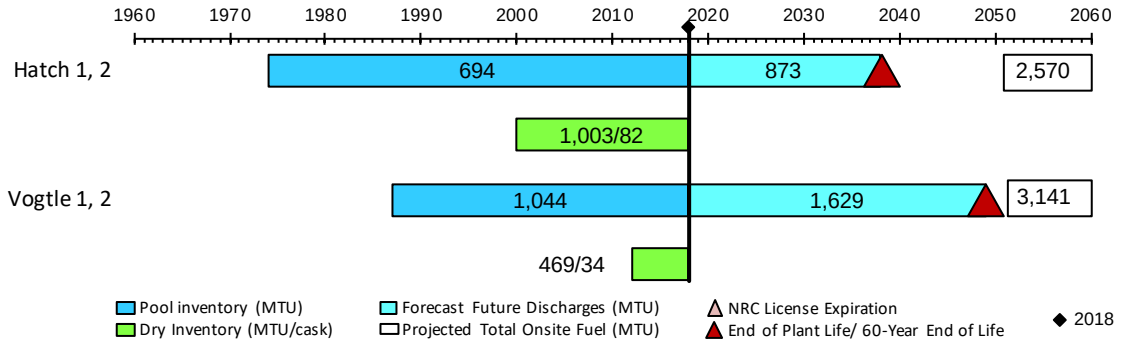


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
1	Hatch 1	Southern Nuclear Operating Co.	Buddy Carter (R)	1974-2034	BWR/Operating	2000/GL	1,249
	Hatch 2			1978-2038	BWR/Operating		1,321
12	Vogtle 1		Rick Allen (R)	1987-2047	PWR/Operating	2012/GL	1,591
	Vogtle 2			1989-2049	PWR/Operating		1,550
	Vogtle 3			2019/Planned	PWR/Under Construction		
	Vogtle 4			2020/Planned	PWR/Under Construction		

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 1,472 MTU in 116 casks **Pool: 1,8737 MTU** **Total: 3,209 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[5]	
$846.1 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

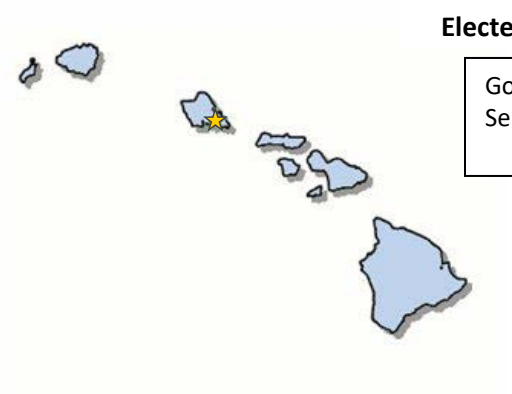
2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

HAWAII

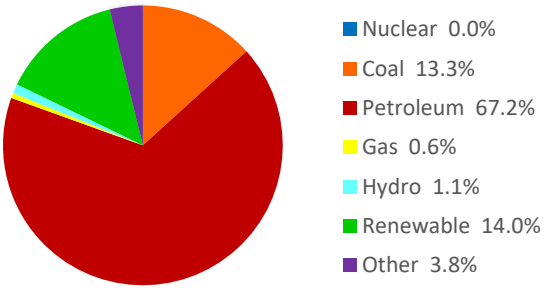


Elected Officials as of January 2019[1,2]

Governor:	David Ige (D)
Senators:	Brian Schatz (D)
	Mazie Hirono (D)

Hawaii: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)



1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

IDAHO

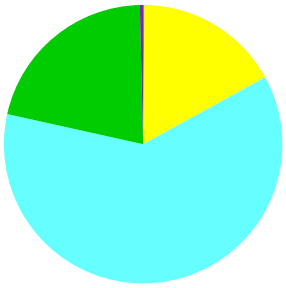
Elected Officials as of January 2019[1,2]

Governor:	Brad Little (R)
Senators:	Mike Crapo (R)
	Jim Risch (R)
Representative:	
District 2:	Mike Simpson (R)

- Operating Reactor (1 at 1 site)
- DOE owned ISFSI at INL, licensed but not constructed
- DOE owned TMI-2 ISFSI at INL
- DOE owned SNF and HLW at INL
- Surplus Plutonium at INL
- Navy owned SNF at INL

Idaho: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)



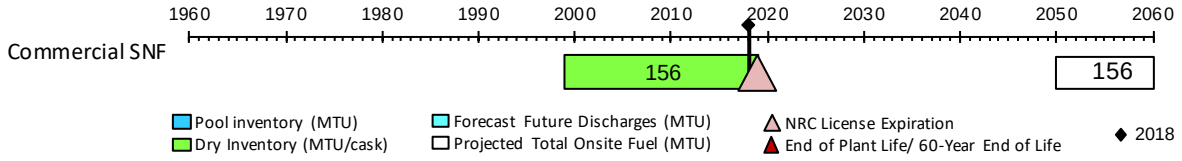
- Nuclear 0.0%
- Coal 0.1%
- Petroleum 0.0%
- Gas 16.9%
- Hydro 61.5%
- Renewable 21.2%
- Other 0.4%

Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/ Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
2	Idaho State Univ.	Idaho State Univ.	Mike Simpson (R)	1967-	AGN-201 #103		
	Idaho National Laboratory (INL)[5-7]	DOE[17]		1948-	National Laboratory		
	Advanced Test Reactor Critical Facility			1964-	Test reactor		
	Neutron Radiography Facility			mid-1970s	R&TRF TRIGA		
	INL: Advanced Test Reactor (ATR)[8]			1967-	Test reactor		
	INL: Materials and Fuels Complex[9]					See Note [11]	See Note [10]
	INL: CPP-603, Irradiated Fuel Storage Basins			1974-2035[11]	Dry storage	See Note [11]	See Note[12]
	INL: CPP-666 Fuel Storage Basins			1984-2035[11]	Pool storage	See Note [11]	See Note [8]
	INL: CPP-749, Underground Storage Vaults			1971-2035[11]	Dry storage	See Note [11]	
	INL: CPP-2707, Cask Pad and Rail Car			2003-2035[11]	Dry storage	See Note [11]	See note[13]
	INL TMI-2	DOE		1999-2019[13]	Dry storage	1999/SL[14]	See Note[15]
	INL Idaho Spent Fuel Facility (ISFF)			Licensed, but not yet constructed[16]	Dry storage	2004/SL	0
	Naval Reactors Facility	NNSA[17]			Various		

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 156 MTU **Pool: 0 MTU** **Total: 156 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[18]	
$0.0 million paid	**$0.0 million one-time fee owed**

[1] Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

[2] Governor from https://www.nga.org/governors, Accessed January 9, 2019

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] Values are for commercial SNF as identified in Section 2.1.2 of this report. Commercial SNF at INL includes 81.6 MTHM from TMI-2 core debris, 8.6 MTHM transferred from Ft. St. Vrain, and the balance from various R&D programs. INL also has approximately 123 MTHM of SNF from DOE and other sources for a total of 280 MTHM of DOE-Managed SNF, excluding Navy SNF.

[5] Since 1951, 52 reactors have been built on the grounds of what was originally the Atomic Energy Commission's National Reactor Testing Station, currently the location of Idaho National Laboratory. Only 3 reactors continue to operate. The 49 other experimental test reactors have been decommissioned.

[6] The INL received SNF and debris from Three Mile Island 2 (Pennsylvania).

[7] The INL receives SNF from foreign research reactors (FRR) and domestic research reactors (DRR).

[8] SNF removed from ATR is temporarily maintained in the reactor canal before it is transferred to CPP-666 (basins) for storage.

[9] Materials and Fuels Complex, formerly Argonne West, was part of Argonne National Laboratory (Illinois) until 2004 when it was incorporated into the INL.

[10] SNF from Experimental Breeder Reactor-II (EBR-2) is stored in cylinders in the Radioactive Scrap and Waste Facility. SNF from the Hanford Fast Flux Test Facility (HFFTF) is stored in the Hot Fuel Examination Facility.

[11] DOE regulated facility. The DOE Authorization Basis for all DOE-regulated SNF facilities assumes operations through 2035.

[12] Receipt of approximately 16 MTU of Foreign Research Reactor (FRR) and Domestic Research Reactor (DRR) SNF is expected through 2035.

[13] Includes 6 casks containing fuel from the Test Area North Fuel Examination Facility plus a rail car holding 2 casks from West Valley (New York) containing SNF of commercial origin.

[14] DOE submitted an application for license renewal March 2017.

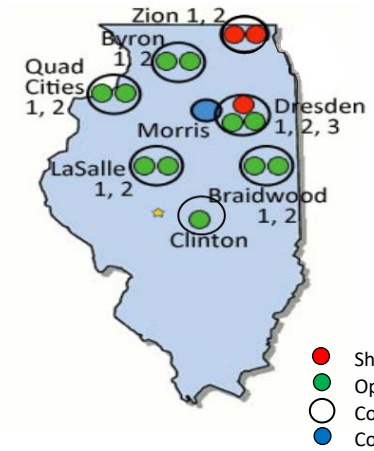
[15] Contains Three Mile Island 2 fuel debris.

[16] Not yet constructed. Purpose is to receive INL SNF.

[17] DOE Regulated Facilities.

[18] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

ILLINOIS



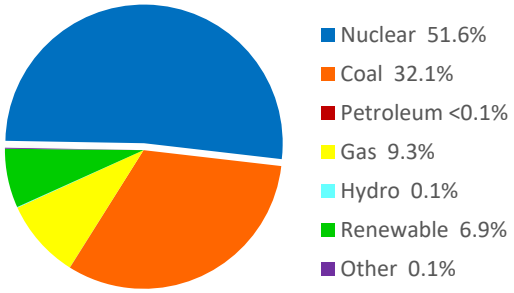
Shutdown Reactors (3 at 2 sites)
Operating Reactors (11 at 6 sites)
Commercial Dry Storage Sites (7 sites)
Commercial Pool Storage Site (1 site)

Elected Officials as of January 2019[1,2]

Governor:	Bruce Rauner (R)
Senators:	Richard Durbin (D)
	Tammy Duckworth (D)
Representatives:	
District 10:	Bradley Schneider (D)
District 13:	Rodney Davis (R)
District 16:	Adam Kinzinger (R)
District 17:	Cheri Bustos (D)

Illinois: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

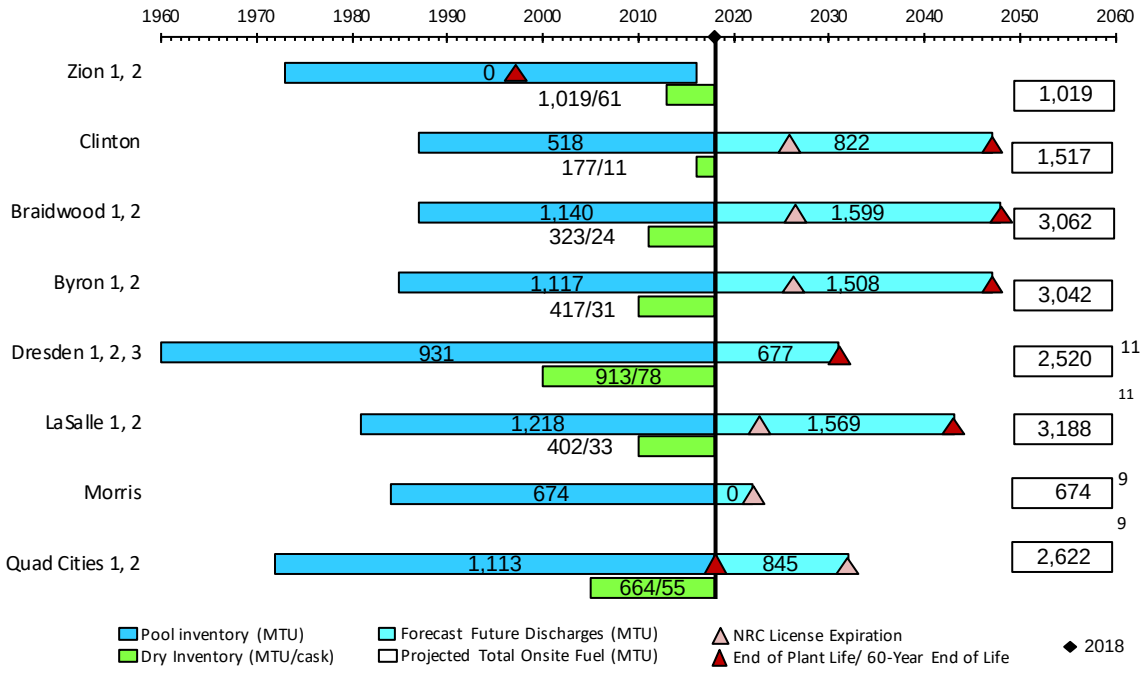


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
10	Zion 1	Zion Solutions	Bradley Schneider (D)	1973-1997/ DECON in progress	PWR/Shutdown[5]	2014/GL Stranded	524
	Zion 2			1973-1996/ DECON in progress	PWR/Shutdown[5]		495
13	Clinton	Exelon Generation Co., LLC	Rodney Davis (R)	1987-2026	BWR/Operating	2016/GL[6]	1,517
16	Braidwood 1		Adam Kinzinger (R)	1987-2046	PWR/Operating	2011/GL	1,462
	Braidwood 2			1988-2047	PWR/Operating		1,600
	Byron 1			1985-2044	PWR/Operating	2010/GL	1,510
	Byron 2			1987-2046	PWR/Operating		1,533
	Dresden 1			1959-1978 SAFSTOR, DECON in progress	BWR/Shutdown	2000/GL	91[7]
	Dresden 2			1991-2029	BWR/Operating		1,366[8]
	Dresden 3			1971-2031	BWR/Operating		1,209
	LaSalle 1			1982-2042	BWR/Operating	2010/GL	1,550
	LaSalle 2			1983-2043	BWR/Operating		1,638
	Morris	GE-Hitachi Nuclear Energy Americas LLC		1984-2022	SNF Storage		674[9-10]
17	Quad Cities 1	Exelon Generation Co., LLC	Cheri Bustos (D)	1972-2032	BWR/Operating	2005/GL	1,327
	Quad Cities 2			1972-2032	BWR/Operating		1,294

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 3,915 MTU in 293 casks **Pool: 6,711 MTU** **Total: 10,626 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[12]	
$2,261.2 million paid[13]	**$1,051.9million one-time fee owed**

[1] Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

[2] Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] Permanently shutdown February 13, 1998. Estimated date for closure 2020.

[6] The Clinton IFSI began operating after the Commercial Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 5, DRAFT (2017/06/30)] was issued.

[7] Includes 0.26 MTU transferred to Idaho National Laboratory.

[8] Includes 145 MTU transferred to Morris.

[9] Morris received SNF from the following facilities.

State	Facility	MTU to Morris
California	San Onofre 1	98.41
Connecticut	Haddam Neck	34.48
Illinois	Dresden 2	145.19
Minnesota	Monticello	198.19
Nebraska	Cooper	198.02
	Total	**674.29**

[10] On this table, the Total Projected SNF at Morris includes all SNF transferred from other facilities to Morris, including 145 MTU transferred from Dresden 2 to Morris. The Total Projected SNF from Dresden 2 also includes this 145 MTU which is consistent with how quantities are reported in this column. The result is that 145 MTU from Dresden 2 shows up twice on this Table, whereas on the Commercial Nuclear Fuel Onsite Inventory Figure, it shows up only once – in the Morris onsite inventory.

[11] Does not include 145 MTU transferred to Morris or 0.26 MTU transferred to Idaho National Laboratory.

[12] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and

HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

[13] Includes one-time fee paid by GE for Morris.

INDIANA

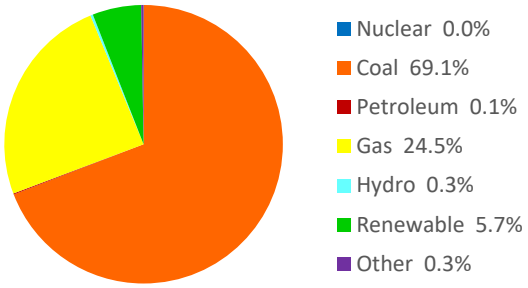
△ Operating Research Reactor (1 at 1 site)

Elected Officials as of January 2019[1,2]

Governor:	Eric Holcomb (R)
Senators:	Todd Young (R)
	Mike Braun (R)
Representative:	
District 4:	James Baird (R)

Indiana: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)



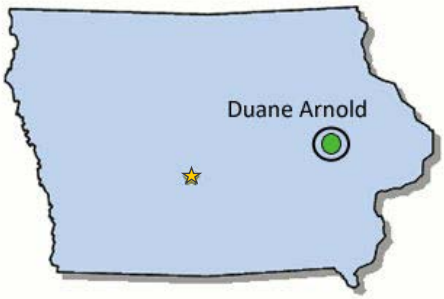
Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected
4	Purdue University	Purdue University	James Baird (R)	1962-	R&TRF Lockheed/ Operating		

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

IOWA



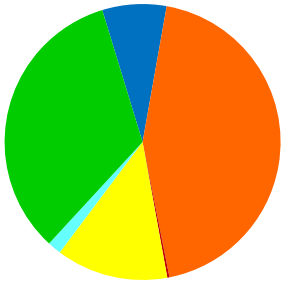
Operating Reactor (1 at 1 site)
Commercial Dry Storage Site (1 site)

Elected Officials as of January 2019[1,2]

Governor:	Kim Reynolds (R)
Senators:	Charles Grassley (R)
	Joni Ernst (D)
Representative:	
District 1:	Abby Finkenauer (D)

Iowa: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

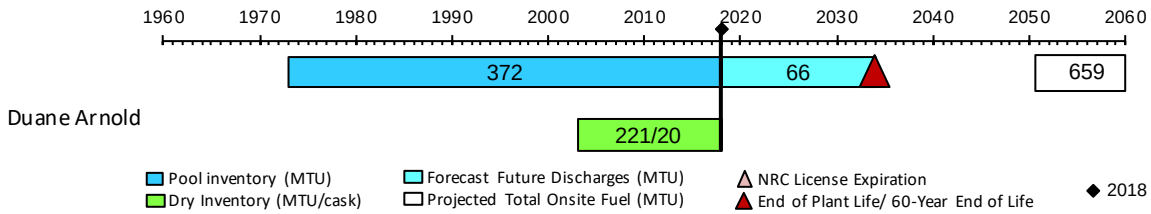


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
1	Duane Arnold	NextEra Energy Duane Arnold, LLC	Abby Finkenauer (D)	1974-2034	BWR/Operating	2003/GL	850

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 221 MTU in 20 casks **Pool: 372 MTU** **Total: 593 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[5]	
$137.1 million paid	**$0.0 million one-time fee owed**

[1] Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

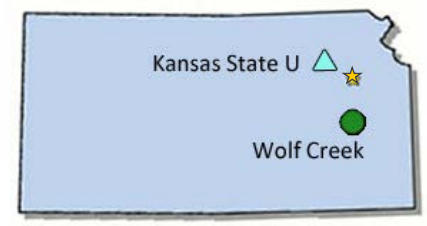
[2] Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

KANSAS



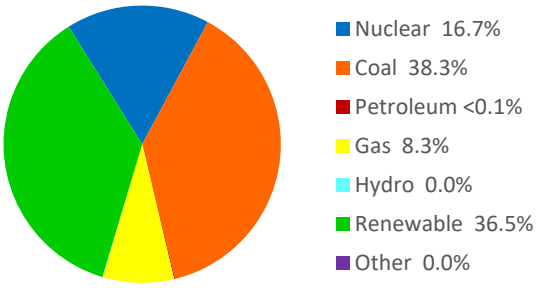
Operating Reactor (1 at 1 site)
Operating Research Reactor (1 at 1 site)

Elected Officials as of January 2019[1,2]

Governor:	Jeff Colyer (R)
Senators:	Pat Roberts (R)
	Jerry Moran (R)
Representatives:	
District 1:	Roger Marshall (R)
District 2:	Steven Watkins (R)

Kansas: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

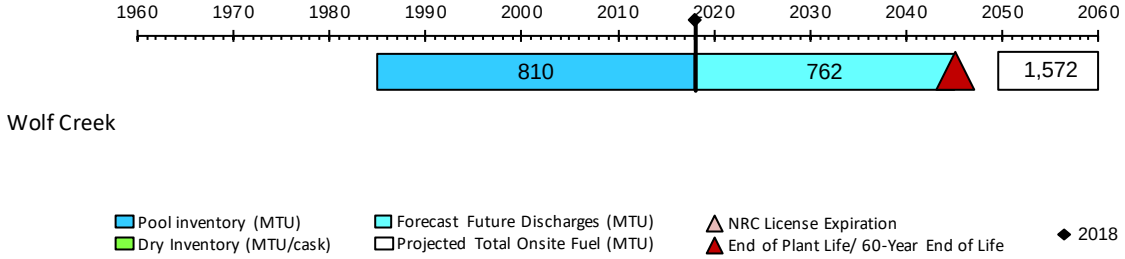


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
1	Kansas State University	Kansas State University	Roger Marshall (R)	1962-	R&TRF TRIGA/Operating		
2	Wolf Creek	Wolf Creek Nuclear Operating Co.	Steven Watkins (R)	1985-2045	PWR/Operating		1,572

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 0 MTU **Pool: 810 MTU** **Total: 810 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[5]	
$225.3 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

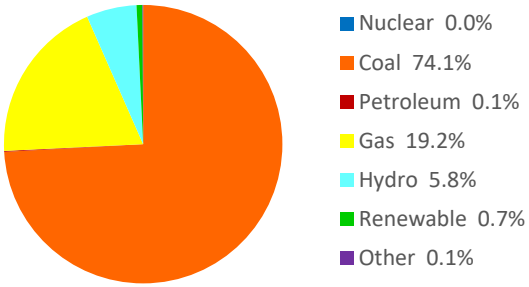
KENTUCKY

Elected Officials as of January 2019[1,2]

Governor:	Matt Bevin (R)
Senators:	Mitch McConnell (R)
	Rand Paul (R)

Kentucky: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

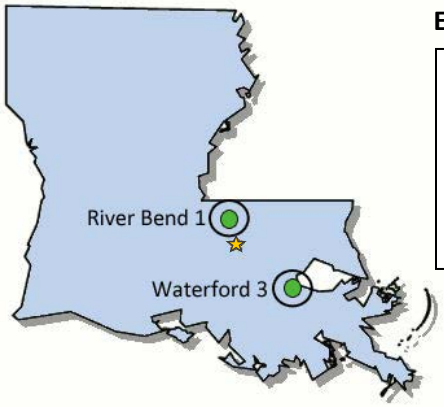


1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

LOUISIANA

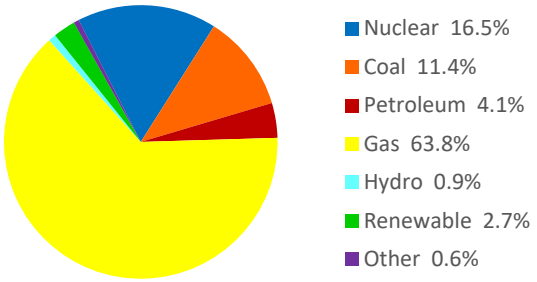


Elected Officials as of January 2019[1,2]

Governor:	John Edwards (D)
Senators:	John N. Kennedy (R)
	Bill Cassidy (R)
Representatives:	
District 2:	Cedric Richmond (D)
District 5:	Ralph Abraham (R)

Operating Reactors (2 at 2 sites)
Commercial Dry Storage Sites (2 sites)

Louisiana: 2018 Electricity Generation Mix[3]
(includes utilities and independent power producers)

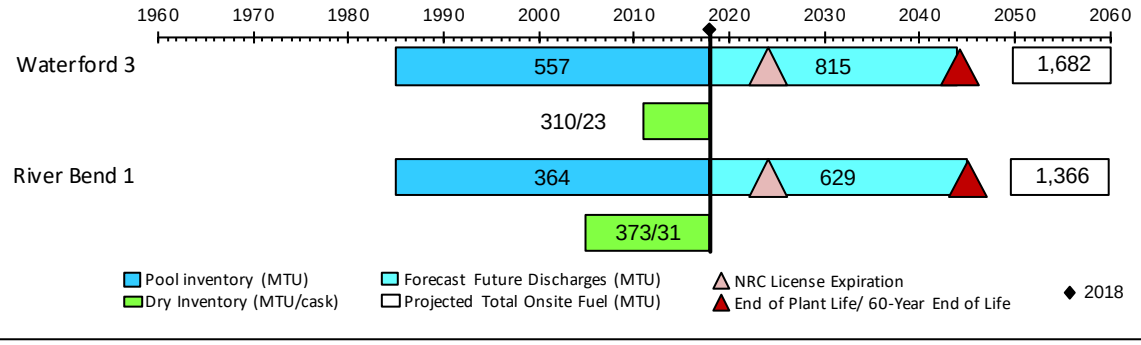


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
2	Waterford 3	Entergy Nuclear Operations, Inc.	Cedric Richmond (D)	1985-2024	PWR/Operating	2011/GL	1,682
5	River Bend 1		Ralph Abraham (R)	1985-2025	BWR/Operating	2005/GL	1,366

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 684 MTU in 54 casks **Pool: 920 MTU** **Total: 1,604 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[5]

$407.4 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

MAINE

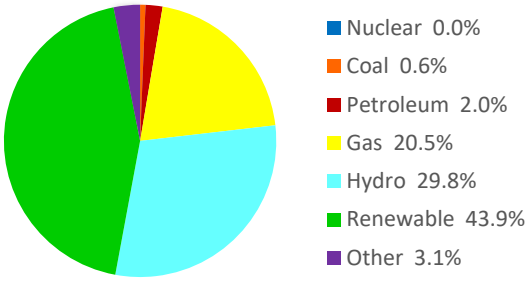
Shutdown Reactor (1 at 1 site)
Commercial Dry Storage Site (1 site)

Elected Officials as of January 2019[1,2]

Governor:	Janet Mills (D)
Senators:	Susan Collins (R)
	Angus King (I)
Representative:	
District 1:	Chellie Pingree (D)

Maine: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

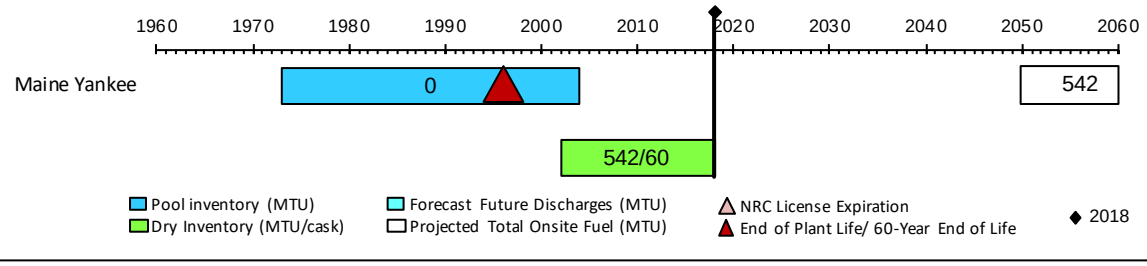


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
1	Maine Yankee	Maine Yankee Atomic Power Co.	Chellie Pingree (D)	1973-1996/ DECON completed	PWR/Shutdown	2002/GL Stranded[5]	542

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 542 MTU in 60 casks **Pool: 0 MTU** **Total: 542 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[6]	
$251.9 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

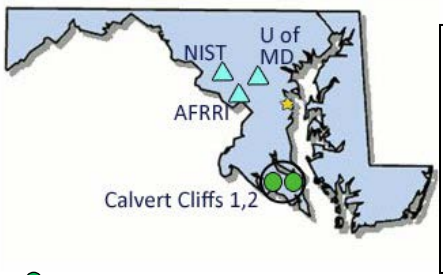
3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 A stranded ISFSI does not have an active reactor on site.

6 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

MARYLAND

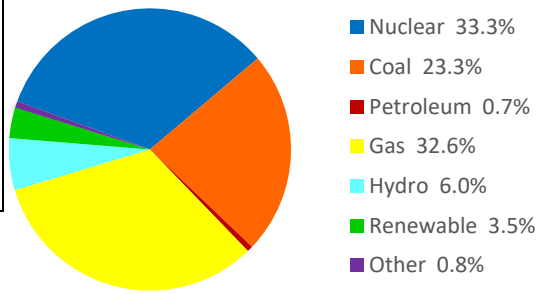


Operating Reactors (2 at 1 site)
Commercial Dry Storage Site (1 site)
Operating Research Reactors (3 at 3 sites)

Elected Officials as of January 2019[1,2]

Governor:	Larry Hogan (R)
Senators:	Chris Van Hollen Jr. (D)
	Benjamin Cardin (D)
Representatives:	
District 5:	Steny H. Hoyer (D)
District 6:	David Trone (D)
District 8:	Jamie Raskin (D)

Maryland: 2018 Electricity Generation Mix[3]
(includes utilities and independent power producers)

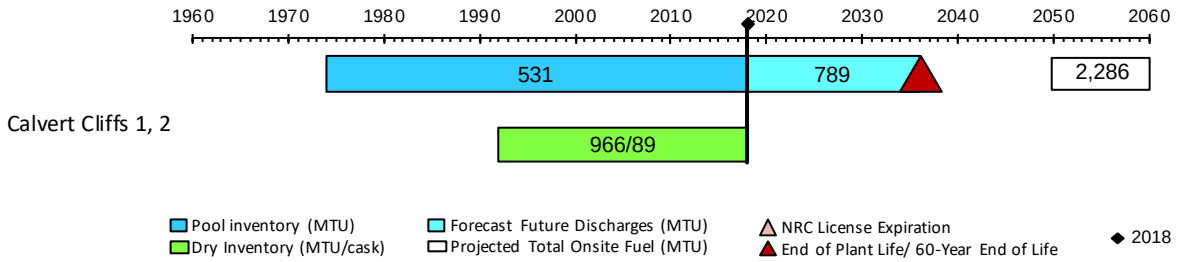


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
5	Calvert Cliffs 1	Calvert Cliffs Nuclear Power Plant inc.	Steny H. Hoyer (D)	1974-2034	PWR/Operating	1992/SL	1,129
	Calvert Cliffs 2			1976-2036	PWR/Operating		1,157
	University of Maryland	University of Maryland		1960- [5]	R&TRF TRIGA/Operating		
6	National Institute of Standards and Technology (NIST)	Commerce Department	David Trone (D)	1970-	R&TRF Nuclear Test/ Operating		
8	Armed Forces Radiobiology Research Institute (AFRRI)	DOD	Jamie Raskin (D)	1962- [5]	R&TRF TRIGA/Operating		

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 966 MTU in 89 casks **Pool: 531 MTU** **Total: 1,497 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[6]	
$426.4 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

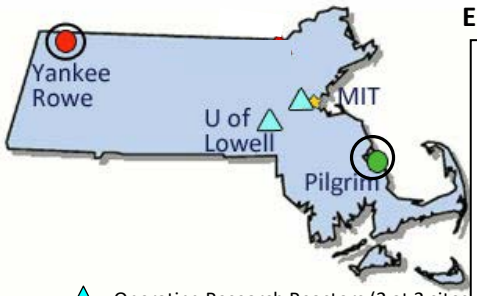
4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 Additional 20 year license renewal issued on January 4, 2017 and July 23, 2018.

6 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and

HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

MASSACHUSETTS



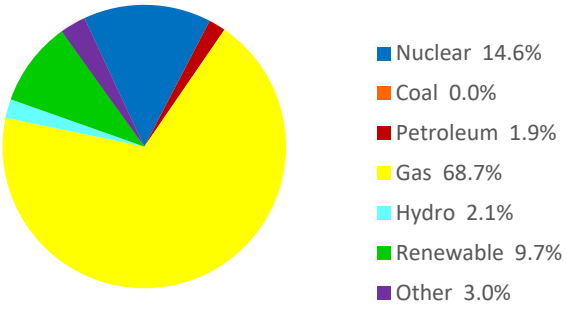
Operating Research Reactors (2 at 2 sites)
Shutdown Reactor (1 at 1 site)
Commercial Dry Storage Site (2 sites)
Operating Reactor (1 at 1 site)

Elected Officials as of January 2019[1,2]

Governor:	Charlie Baker (R)
Senators:	Elizabeth Warren (D)
	Edward Markey (D)
Representatives:	
District 1:	Richard E. Neal (D)
District 3:	Lori Trahan (D)
District 7:	Ayanna Pressley (D)
District 9:	William Keating (D)

Massachusetts: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

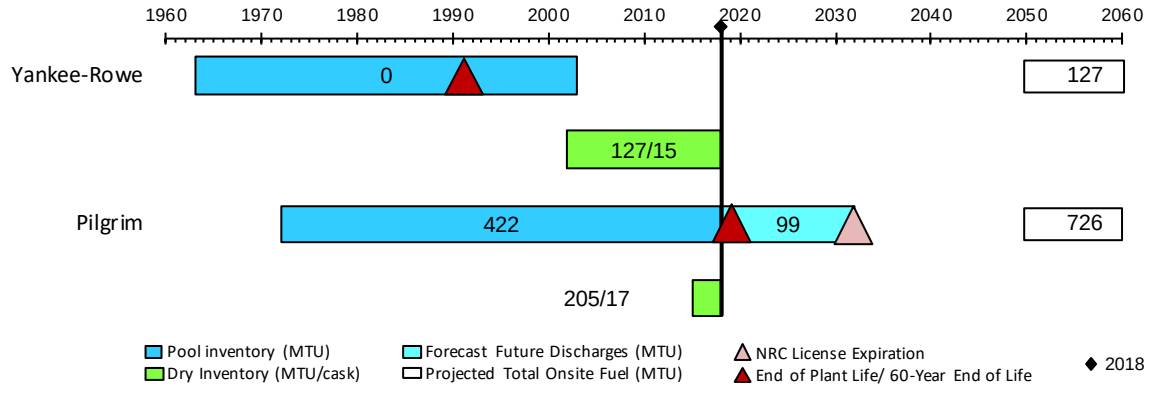


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
1	Yankee-Rowe	Yankee Atomic Electric Co.	Richard E. Neal (D)	1960-1991/ DECON completed	PWR/Shutdown	2002/GL Stranded[5]	127
3	Univ. of Mass.-Lowell	Univ. of Mass.-Lowell	Lori Trahan (D)	1974-[6]	R&TRF GE Pool/ Operating		
7	Massachusetts Institute of Technology	Massachusetts Institute of Technology	Ayanna Pressley (D)	1958-	R&TRF HWR Reflected/ Operating		
9	Pilgrim	Entergy Nuclear Operations, Inc.	William Keating (D)	1972-2032[7]	BWR/Operating, Planned early shutdown	2015/GL	726

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 332 MTU in 32 casks **Pool: 422 MTU** **Total: 754 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[8]	
$188.4 million paid	**$0.0 million one-time fee owed**

[1] Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

[2] Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

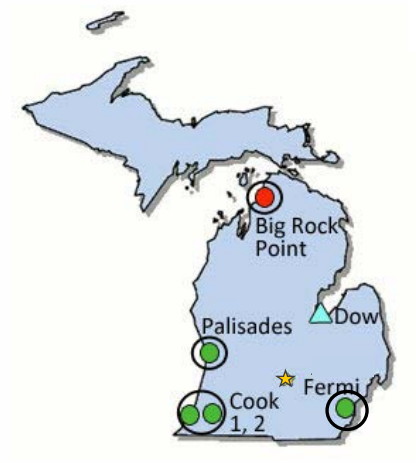
[5] A stranded ISFSI does not have an active reactor on site.

[6] Being evaluated by NRC for license renewal.

[7] Entergy announced on October 13, 2015 that Pilgrim will close no later than June 2019.

[8] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

MICHIGAN



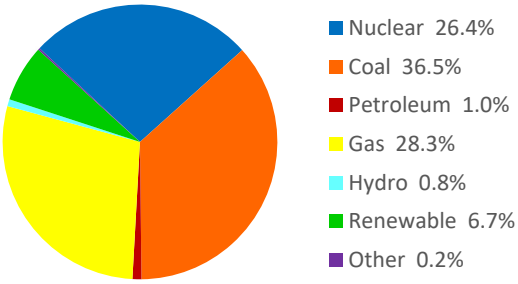
Shutdown Reactor (1 at 1 site)
Operating Reactors (4 at 3 sites)
Commercial Dry Storage Sites (4 sites)
Operating Research Reactor (1 at 1 site)

Elected Officials as of January 2019[1,2]

Governor:	Gretchen Whitmer (D)
Senators:	Debbie Stabenow (D)
	Gary Peters (D)
Representatives:	
District 1:	Jack Bergman(R)
District 4:	John Moolenaar (R)
District 6:	Fred Upton (R)
District 12:	Debbie Dingell (D)

Michigan: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

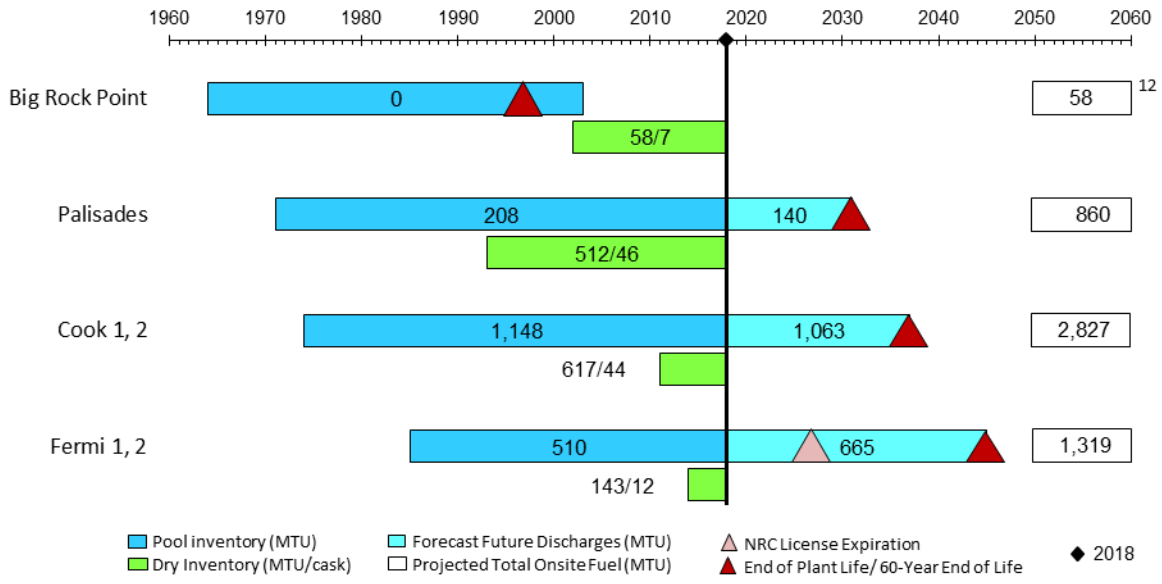


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
1	Big Rock Point	Entergy Nuclear Operations, Inc.	Jack Bergman (R)	1962-1997/ DECON completed	BWR/Shutdown	2002/GL Stranded[5]	69[6]
4	Dow Chemical Co.	Dow Chemical Co.	John Moolenaar (R)	1967- [7]	R&TRF TRIGA Mark 1/ Operating		
6	Palisades	Entergy Nuclear Operations, Inc.	Fred Upton (R)	1971-2031	PWR/Operating	1993/GL	1,016
	Cook 1	Indiana Michigan Power Co.[8]		1974-2034	PWR/Operating	2011/GL	1,488
	Cook 2			1977-2037	PWR/Operating		1,339
12	Fermi 1	DTE Electric Co.[9]	Debbie Dingell (D)	1963-1972	SAFSTOR		0
	Fermi 2			1985-2045	BWR/ Operating	2016/GL	1,319

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 1,331 MTU in 93 casks **Pool: 1,865 MTU** **Total: 3,196 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[11]	
$829.0 million paid	**$273.6 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 A stranded ISFSI does not have an active reactor on site.

6 Includes 11 MTU transferred to Idaho National Laboratory.

7 Reactor ceased operations on July 3, 2003 and fuel was removed in December 2003. Decommissioning plan was approved on June 26, 2006. Decommissioning activities took place 2006-2012.

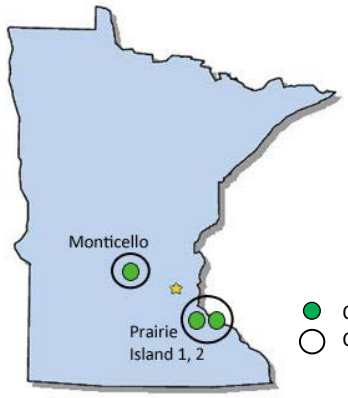
8 Subsidiary of AEP.

9 Formerly Detroit Edison Company.

10 Does not include 11 MTU transferred to Idaho National Laboratory.

11 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

MINNESOTA



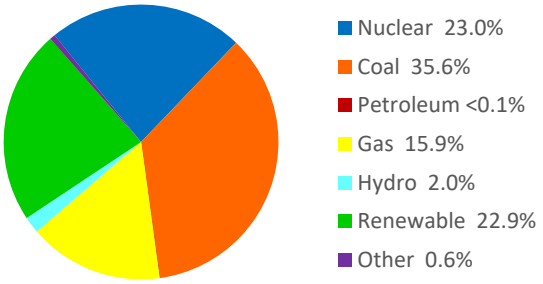
Operating Reactors (3 at 2 sites)
Commercial Dry Storage Sites (2 at 2 sites)

Elected Officials as of January 2019[1,2]

Governor:	Tim Walz (D)
Senators:	Amy Klobuchar (D)
	Tina Smith (D)
Representatives:	
District 2:	Angie Craig (D)
District 6:	Tom Emmer (R)

Minnesota: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

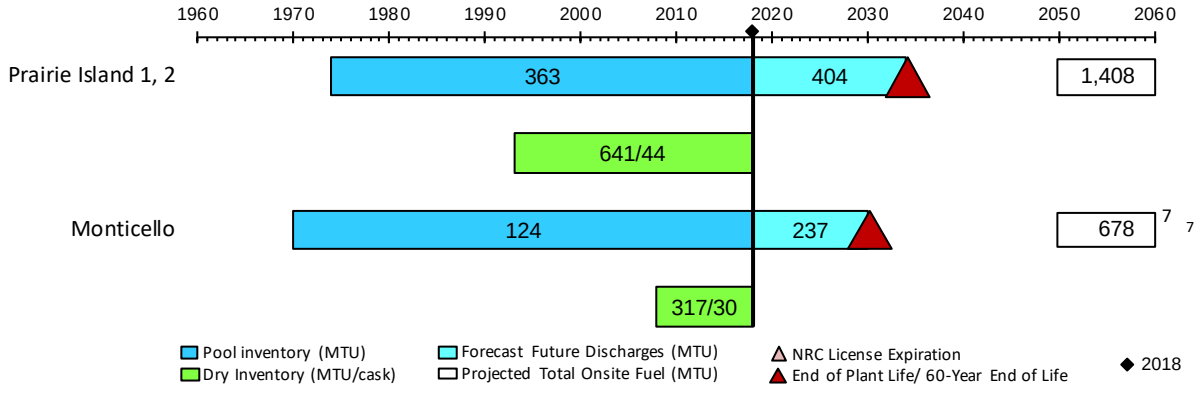


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
2	Prairie Island 1	Northern States Power Co. Minnesota	Angie Craig (D)	1974-2033	PWR/Operating	1993/SL[5]	661
	Prairie Island 2			1974-2034	PWR/Operating		747
6	Monticello		Tom Emmer (R)	1970-2030	BWR/Operating	2008/GL	876[6]

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 958 MTU in 74 casks **Pool: 487 MTU** **Total: 1,445 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[8]	
$449.2 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] Northern States Power Company, a Minnesota Corporation, (NSPM), doing business as Xcel Energy, submitted an application to the NRC requesting renewal of Special Nuclear Materials (SNM) license number SNM-2506 for the Prairie Island Nuclear Generating Plant (PINGP) site-specific Independent Spent Fuel Storage Installation (ISFSI) located in Red Wing, Goodhue County.

[6] Includes 198 MTU transferred to Morris (Illinois).

[7] Does not include 198 MTU transferred to Morris (Illinois).

[8] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

MISSISSIPPI

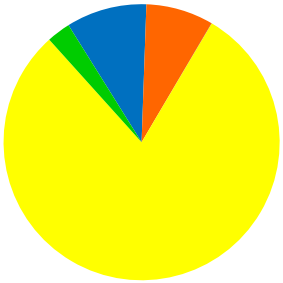
Elected Officials as of January 2019[1,2]

Governor:	Phil Bryant (R)
Senators:	Cindy Hyde-Smith (R)
	Roger Wicker (R)
Representative:	
District 2:	Bennie Thompson (D)

Operating Reactor (1 at 1 site)
Commercial Dry Storage Site (1 site)

Mississippi: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)



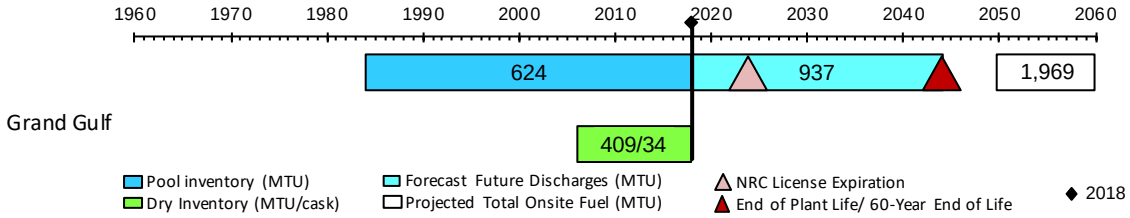
Nuclear 9.4%
Coal 7.9%
Petroleum <0.1%
Gas 79.9%
Hydro 0.0%
Renewable 2.8%
Other <0.1%

Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
2	Grand Gulf	Entergy Operations, Inc.	Bennie Thompson (D)	1984-2044	BWR/Operating	2006/GL	1,969

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 409 MTU in 34 casks **Pool: 624 MTU** **Total: 1,033 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[5]	
$250.4 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

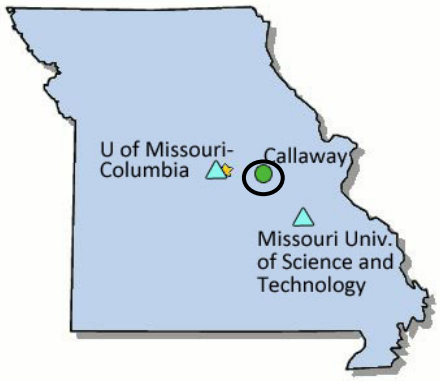
2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

MISSOURI



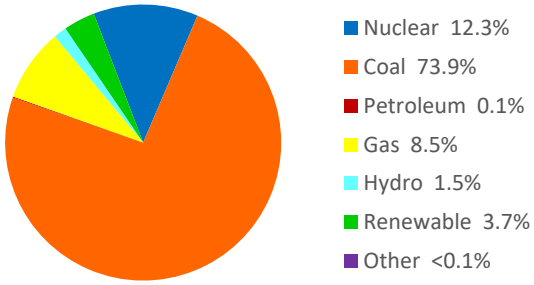
Elected Officials as of January 2019[1,2]

Governor:	Mike Parson (R)
Senators:	Joshua Hawley (R)
	Roy Blunt (R)
Representatives:	
District 3:	Blaine Luetkemeyer (R)
District 4:	Vicky Hartzler (R)
District 8:	Jason Smith (R)

Commercial Dry Storage Site (1 at 1 site)
Operating Reactor (1 at 1 site)
Operating Research Reactors (2 at 2 sites)

Missouri: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

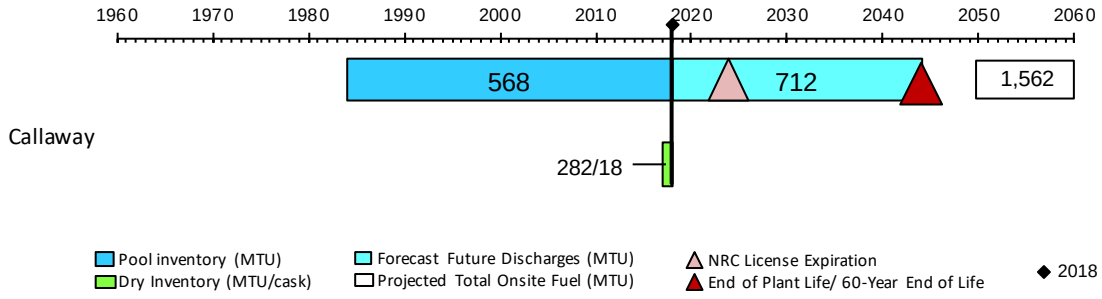


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
3	Callaway	Union Electric Co.	Blaine Luetkemeyer (R)	1984-2044	PWR/Operating	2015/GL	1,562
4	University of Missouri - Columbia	University of Missouri System	Vicky Hartzler (R)	1966-[5]	R&TRF Tank/ Operating		
8	Missouri University of Science and Technology	University of Missouri	Jason Smith (R)	1961-	R&TRF Pool/Operating		

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 282 MTU in 18 casks **Pool: 568 MTU** **Total: 850 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[6]	
$243.1 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

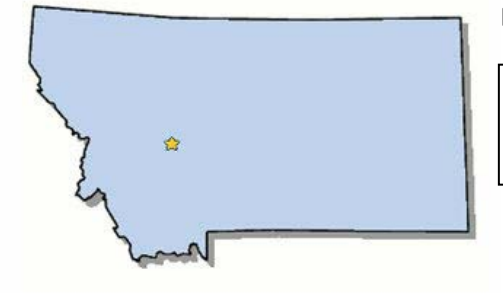
3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] In 2006 applied for license extension to 2026. As of January 5, 2016, being evaluated by NRC for license renewal.

[6] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

MONTANA

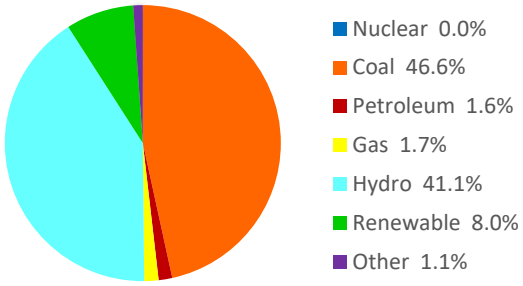


Elected Officials as of January 2019[1,2]

Governor:	Steve Bullock (D)
Senators:	Jon Tester (D)
	Steve Daines (R)

Montana: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

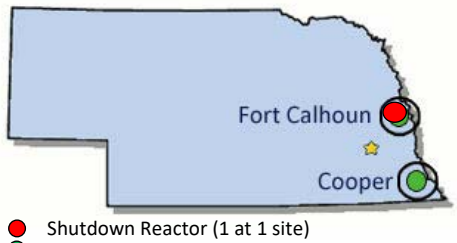


1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

NEBRASKA



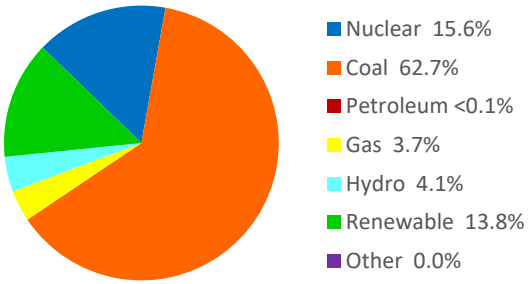
Shutdown Reactor (1 at 1 site)
Operating Reactors (1 at 1 site)
Commercial Dry Storage Sites (2 sites)

Elected Officials as of January 2019[1,2]

Governor:	Pete Ricketts (R)
Senators:	Deb Fischer (R)
	Benjamin Sasse (R)
Representatives:	
District 1:	Jeff Fortenberry (R)
District 3:	Adrian Smith (R)

Nebraska: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

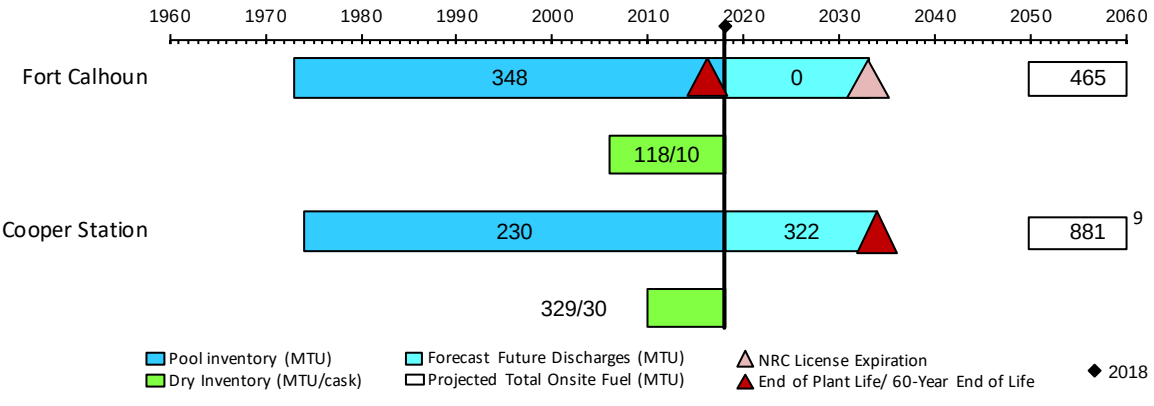


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
1	Fort Calhoun	Omaha Public Power District[5]	Jeff Fortenberry (R)	1973-2016[6] Shutdown	SAFSTORE	2006/GL	465
3	Cooper Station	Nebraska Public Power District[7]	Adrian Smith (R)	1974-2034	BWR/Operating	2010/GL	1,079[8]

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 447 MTU in 40 casks **Pool: 577 MTU** **Total: 1,024 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[10]	
$300.2 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 Operated by Exelon Nuclear Partners.

6 On November 13, 2016 Omaha Public Power district provided the NRC with a Certification of Permanent Removal of Fuel from the Reactor Vessel.

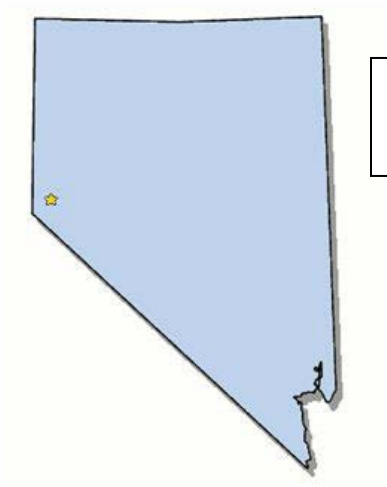
[7] Support services provided by Entergy Nuclear Nebraska through 2029.

[8] Includes 198 MTU transferred to Morris (Illinois).

[9] Does not include 198 MTU transferred to Morris (Illinois).

[10] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

NEVADA

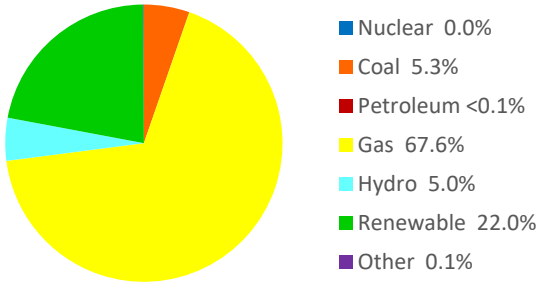


Elected Officials as of January 2019[1,2]

Governor:	Steve Sisolak (R)
Senators:	Catherine Cortez Masto (D)
	Jacky Rosen (D)

Nevada: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

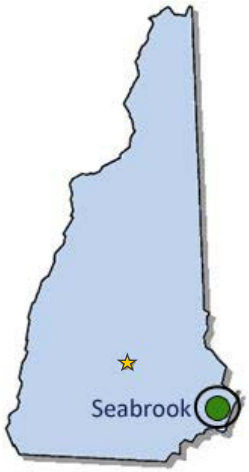


1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

NEW HAMPSHIRE



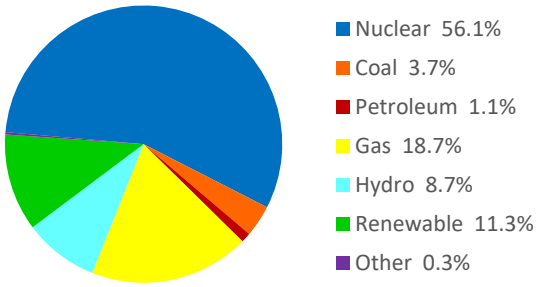
Elected Officials as of January 2019[1,2]

Governor:	Chris Sununu (R)
Senators:	Jeanne Shaheen (D)
	Margaret Hassan (D)
Representative:	
District 1:	Chris Pappas (D)

Operating Reactor (1 at 1 site)
Commercial Dry Storage Site (1 site)

New Hampshire: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

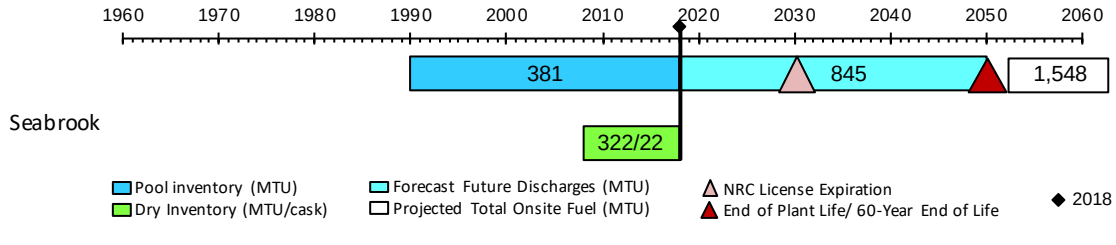


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
1	Seabrook	NextEra Energy Seabrook, LLC	Chris Pappas (D)	1990-2030	PWR/Operating	2008/GL	1,548

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 322 MTU in 22 casks **Pool: 381 MTU** **Total: 703 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[5]	
$201.2 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

NEW JERSEY

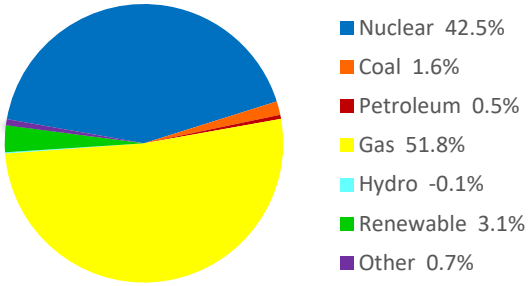
Shutdown Reactor (1 at 1 site)
Operating Reactors (3 at 1 site)
Commercial Dry Storage Sites (2 sites)

Elected Officials as of January 2019[1,2]

Governor:	Phil Murphy (D)
Senators:	Robert Menendez (D)
	Cory Booker (D)
Representatives:	
District 2:	Jefferson Van Drew (D)
District 3:	Andy Kim (D)

New Jersey: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

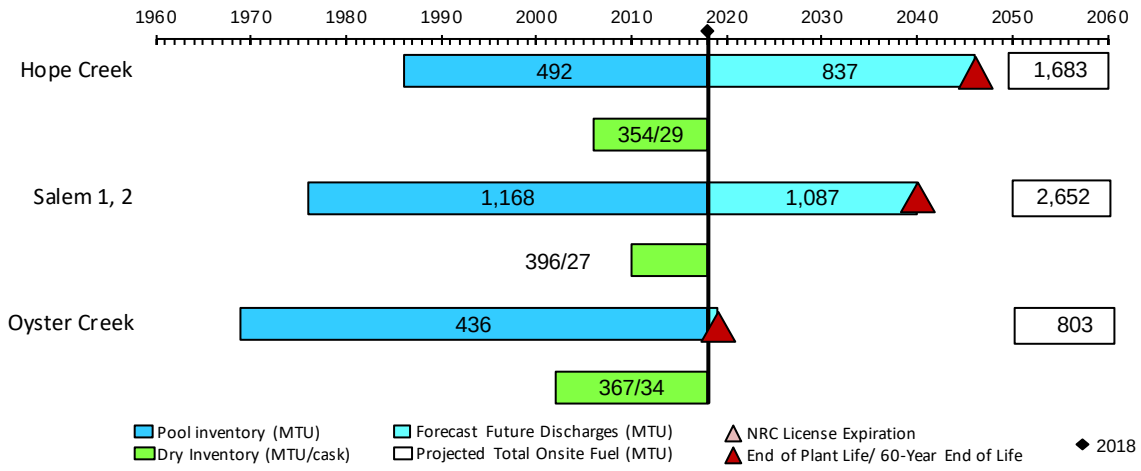


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
2	Hope Creek	PSEG Nuclear LLC	Jefferson Van Drew (D)	1986-2046	BWR/Operating	2006/GL	1,683
	Salem 1			1976-2036	PWR/Operating	2010/GL	1,315
	Salem 2			1981-2040	PWR/Operating		1,337
3	Oyster Creek	Exelon Generation Co.	Andy Kim (D)	1991-2018[5] Shutdown	BWR/shutdown[5]	2002/GL	832

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 1,116 MTU in 90 casks **Pool: 2,096 MTU** **Total: 3,213 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[6]	
$769.6 million paid	**$180.3 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] Shutdown in 2018.

[6] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

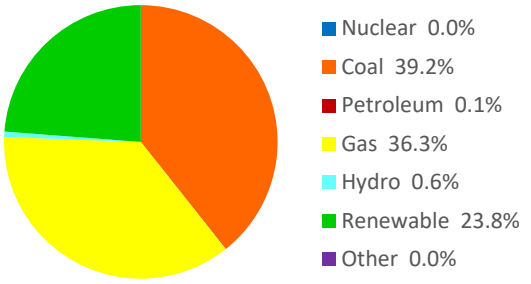
NEW MEXICO

Elected Officials as of January 2019[1,2]

Governor:	Michelle lujan Grisham (D)
Senators:	Tom Udall (D)
	Martin Heinrich (D)
Representatives:	
District 1:	Debra Haaland (D)
District 2:	Xochitl Torres Small (D)
District 3:	Ben R. Luján (D)

New Mexico: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)



△ Operating Research Reactors (2 at 2 sites)
▽ Sandia National Laboratory
▽ Surplus Plutonium at Los Alamos National Laboratory

Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected
1	University of New Mexico	Univ. of New Mexico	Debra Haaland (D)	1966-	R&TRF AGN-201M #112/ Operating		
	Sandia National Lab	DOE[4]		None	Various		
	SNL: Annular Core Research Reactor (ACRR)			1979-	Test reactor		
2	White Sands Missile Range	U.S. Air Force[4]	Xochitl Torres Small (D)	None	R&TRF FBR/ Operating		
3	Los Alamos National Lab	DOE[4]	Ben R. Luján (D)	None	Various		

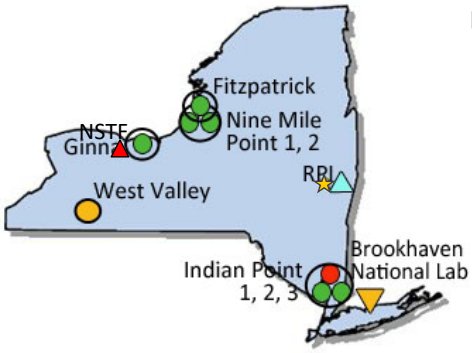
[1] Data for Elected Officials from https://www.govtrack.us/congress, January 9, 2019.

[2] Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] DOE Regulated Facilities.

NEW YORK



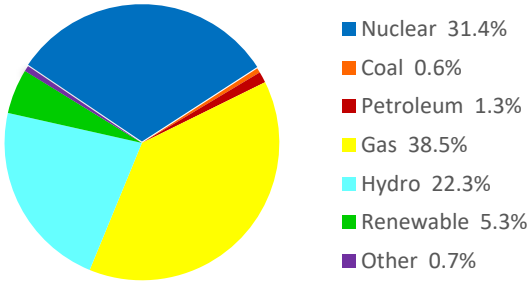
- Shutdown Reactor (1 at 1 site)
- Operating Reactors (6 at 4 sites)
- Commercial Dry Storage Sites (4 sites)
- Operating Research Reactor (1 at 1 site)
- Commercial HLW at West Valley
- Brookhaven National Laboratory
- Shutdown Research Reactor (1 at 1 site)

Elected Officials as of January 2019[1,2]

Governor:	Andrew Cuomo (D)
Senators:	Chuck Schumer (D)
	Kirsten Gillibrand (D)
Representatives:	
District 1:	Lee Zeldin (R)
District 17:	Nita Lowey (D)
District 20:	Paul D. Tonko (D)
District 23:	Tom Reed (R)
District 24:	John Katko (R)
District 26:	Brian Higgins (D)

New York: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

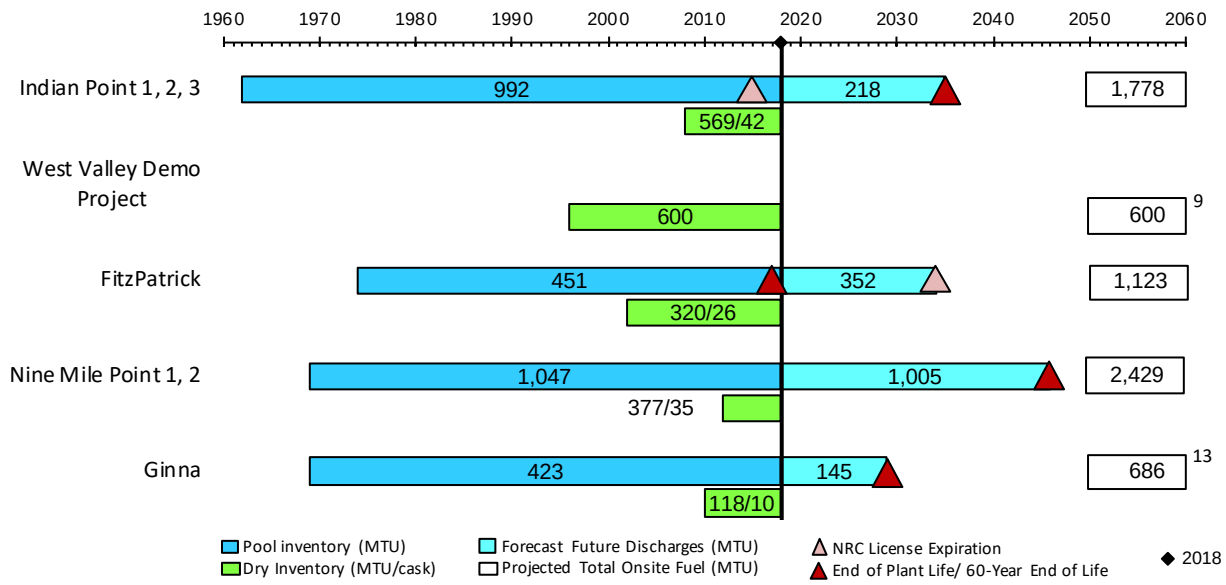


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
1	Brookhaven National Lab	DOE[5]	Lee Zeldin (R)	None	Various		
17	Indian Point 1	Entergy Nuclear Operations, Inc.	Nita Lowey (D)	1962-1974/ SAFSTOR[6]	PWR/Shutdown	2008/GL	31
	Indian Point 2			1973-2013[7-8]	PWR/Operating		897
	Indian Point 3			1975-2015[7-8]	PWR/Operating		851
20	Rensselaer Polytechnic Institute (RPI)	Rensselaer Polytechnic Institute	Paul D. Tonko (D)	1964-	R&TRF Critical Assembly/ Operating		
23	West Valley Demonstration Project	New York State Energy Research and Development Authority (NYSERDA)	Tom Reed II (R)	1966-1972/ DECON	Reprocessing Plant/Shutdown		See[9]
24	Fitzpatrick	Exelon Generation Company, LLC [10]	John Katko (R)	1974-2034	BWR/Operating	2002/GL	1,123
	Nine Mile Point 1	Execelon Corp., LLC		1974-2029	BWR/Operating	2012/GL	903
	Nine Mile Point 2			1987-2046	BWR/Operating		1,526
	Ginna	R. E. Ginna Nuclear Power plant., LLC		1969-2029	PWR/Operating	2010/GL	701[11]
26	Nuclear Science and Technology Facility (NSTF)	State Univ. of NY/SUNY-Buffalo Medical Research Center	Brian Higgins (D)	1964-1994 Possession only[12]	R&TRF/ PULSTAR/ Shutdown		

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 1,383 MTU in 113 casks **Pool: 2,913MTU** **Total: 4,296 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[14]	
$1,011.8 million paid[15]	**$522.2 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 201918.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 DOE Regulated Facility.

6 Estimated date for closure is 2026.

7 License renewal application submitted 2007.

8 In his January 9, 2017 State of the State Address in NYC, NY Governor Cuomo announced that the state had reached an agreement with Entergy to close the operating reactors at Indian Point in four years.

9 About 600 MTU were reprocessed producing about 2,500 m^3 of liquid high-level waste (HLW). The liquid was vitrified between 1996 and 2001 producing 278 HLW canisters. According to the DOE Environmental Management, http://www.wv.doe.gov/website in 2015, the first 20 canisters of HLW were placed in vertical storage canisters and 4 of these were then moved to the outdoor onsite storage pad. The transfer process for the remaining canisters of HLW is ongoing.

10 On March 31, 2017, the NRC amended the license to reflect Exelon's new plant ownership.

11 Includes 15 MTU transferred to the Idaho National Lab.

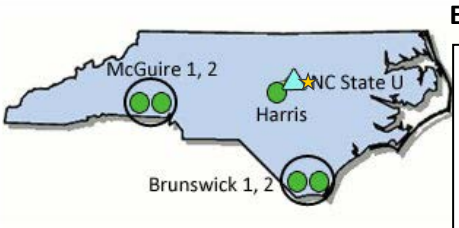
12 Fuel was removed in 2005; closure expected in 2017.

13 Does not include 15 MTU transferred to the Idaho National Lab.

14 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

15 Includes One-Time fee paid by Nuclear Fuel Services (NFS) for West Valley.

NORTH CAROLINA

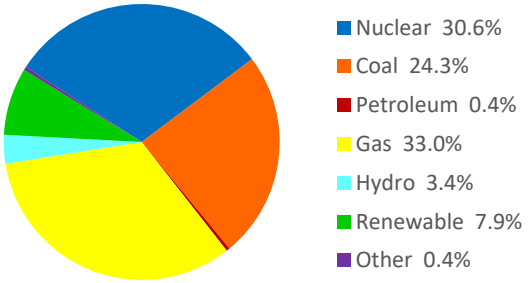


Operating Reactors (5 at 3 sites)
Commercial Dry Storage Sites (2 sites)
Operating Research Reactor (1 at 1 site)

Elected Officials as of January 2019[1,2]

Governor:	Roy Cooper (D)
Senators:	Richard Burr (R)
	Thom Tillis (R)
Representatives:	
District 4:	David Price (D)
District 7:	David Rouzer (R)
District 9:	Vacant

North Carolina: 2018 Electricity Generation Mix[3]
(includes utilities and independent power producers)

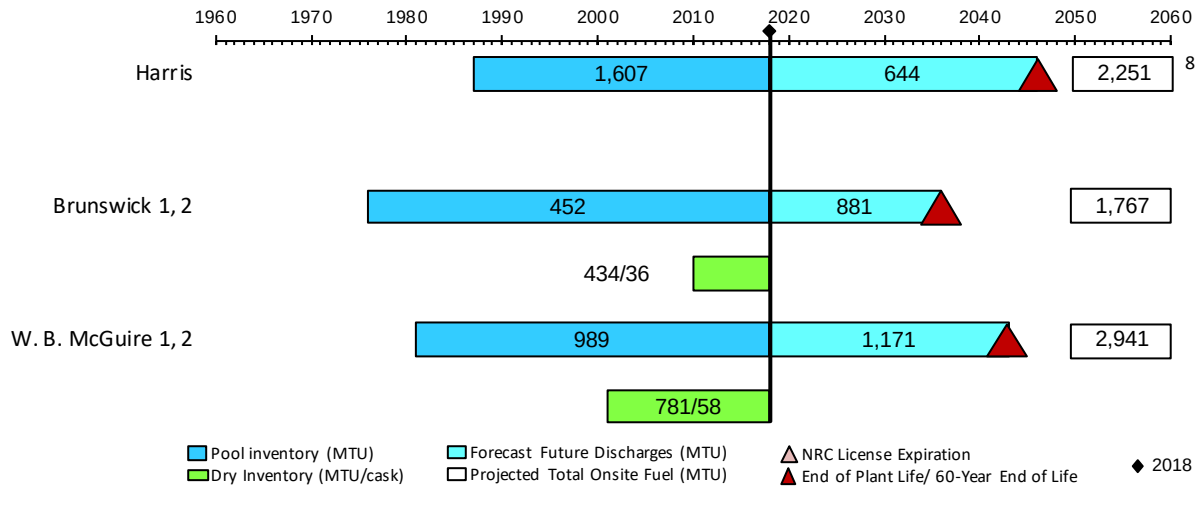


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
4	Harris	Duke Energy Progress, LLC[5]	David Price (D)	1987-2046	PWR/Operating		1,247
7	Brunswick 1		David Rouzer (R)	1976-2036	BWR/Operating	2010/GL	1,218[6]
	Brunswick 2			1974-2034	BWR/Operating		1,200[6]
4	North Carolina State University	North Carolina State University	David Price (R)	1972-	R&TRF Pulstar/ Operating		
9	W. B. McGuire 1	Duke Energy Carolinas, LLC[5]	Vacant	1981-2041	PWR/ Operating	2001/GL	1,409[7]
	W. B. McGuire 2			1983-2043	PWR/Operating		1,392[7]

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 1,215 MTU in 94 casks **Pool: 3,047 MTU** **Total: 4,262 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[13]	
$1,034.6 million paid	**$0.0 million one-time fee owed**

[1] Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

[2] Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] Subsidiary of Duke Energy Corp.

[6] Total Brunswick 1 and 2 total projected discharged fuel includes 784 MTU that was transferred from Brunswick to Harris and is no longer at the site.

[7] Total McGuire 1 and 2 total projected discharged fuel includes 140 MTU that was transferred to Oconee and is no longer at the site.

[8] Reflects the transfer of 784 MTU in from Brunswick and 219 MTU in from Robinson 2 (South Carolina).

[9] SNF was transferred between Harris, Brunswick, and Robinson 2 (South Carolina). The following table provides the forecasted SNF inventories at Harris and Brunswick, including transfers. Forecasted future discharges are not included. Transfer data is from Table 2-5, Source: Commercial Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 5, DRAFT (2017/06/30)].

Onsite SNF at Harris (MTU) as of 12/31/2017		Onsite SNF at Brunswick (MTU) as of 12/31/2017	
Fuel discharges onsite as of 12/31/2012	476	Fuel discharges onsite as of 12/31/2012	1284
Forecast fuel discharges, 1/1/2013 to 12/31/2017	95	Forecast fuel discharges, 1/1/2013 to 12/31/2017	212
SNF transferred in from Robinson 2	219	SNF transferred in from Robinson 2	132
SNF transferred in from Brunswick	784	SNF transferred out to Harris	-784
Total Forecasted SNF Onsite	**1,575**	**Total Forecasted SNF Onsite**	**843**

[10] Reflects the transfer of 784 MTU out to Harris (South Carolina) and 132 MTU in from Robinson 2 (South Carolina).

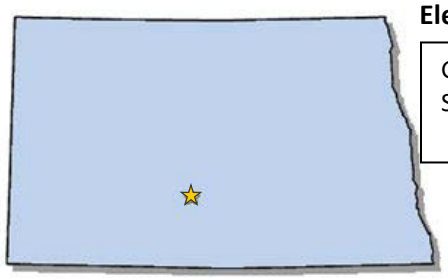
[11] Reflects the transfer of 140 MTU in from Oconee (South Carolina).

[12] SNF was transferred between W. B. McGuire (North Carolina) and Oconee (South Carolina). The following table provides the forecasted SNF inventories at Harris and Brunswick, including transfers. Forecasted future discharges are not included. Transfer data is from Table 2-5, Source: Commercial Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 5, DRAFT (2017/06/30)].

Onsite SNF at McGuire as of 12/31/2017	
Fuel discharges onsite as of 12/31/2012	1365
Forecast fuel discharges, 1/1/2013 to 12/31/2017	233
SNF transferred in from Oconee	140
Total Forecasted SNF Onsite	**1,737**

[13] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

NORTH DAKOTA

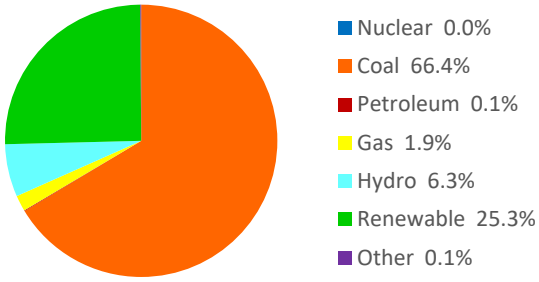


Elected Officials as of January 2019[1,2]

Governor:	Doug Burgum (R)
Senators:	John Hoeven (R)
	Kevin Cramer (R)

North Dakota: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

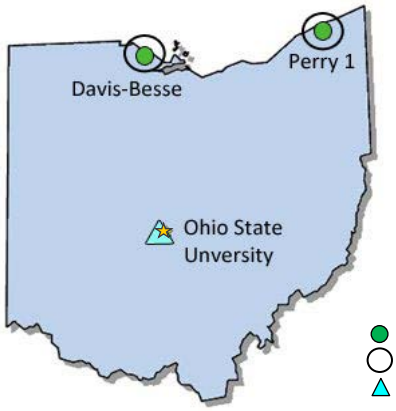


1 Data for Elected Officials from https://www.govtrack.us/congress, January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

OHIO

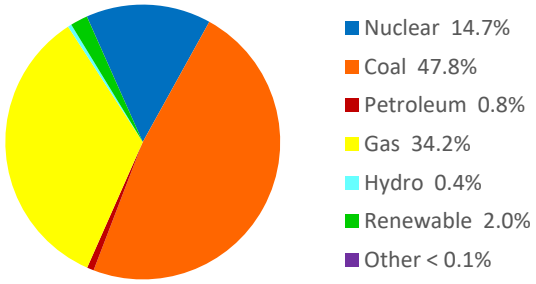


Elected Officials as of January 2019[1,2]

Governor:	John Kasich (R)
Senators:	Sherrod Brown (D)
	Robert Portman (R)
Representatives:	
District 3:	Joyce Beatty (D)
District 9:	Marcy Kaptur (D)
District 14:	David Joyce (R)

Ohio: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)



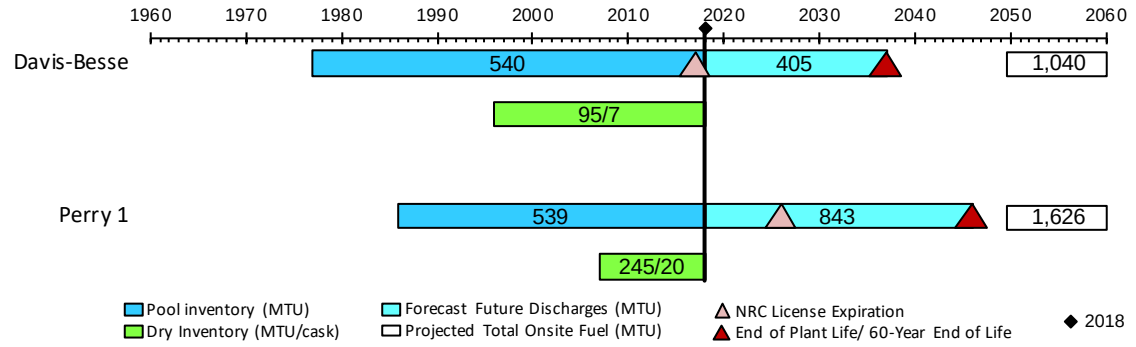
Operating Reactors (2 at 2 sites)
Commercial Dry Storage Sites (2 sites)
Operating Research Reactor (1 at 1 site)

Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
3	Ohio State University	Ohio State University	Joyce Beatty (D)	1961-	R&TRF Pool/Operating		
9	Davis-Besse	First Energy Nuclear Operating Co.	Marcy Kaptur (D)	1977-2037[5]	PWR/Operating	1996/GL	1,040
14	Perry 1		David Joyce (R)	1986-2026	BWR/Operating	2007/GL	1,626

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 340 MTU in 27 casks **Pool: 1,079 MTU** **Total: 1,419 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[6]	
$381.5 million paid	**$33.7 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] Twenty-year license extension approved 12/08/2015.

[6] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

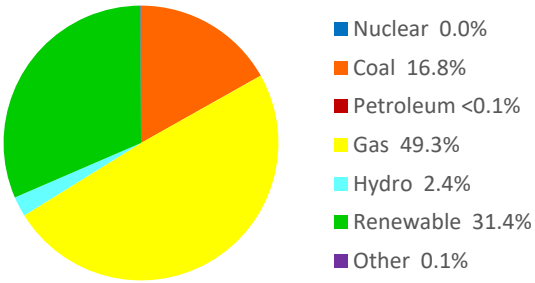
OKLAHOMA

Elected Officials as of January 2019[1,2]

Governor:	Mary Fallin (R)
Senators:	James Inhofe (R)
	James Lankford (R)

Oklahoma: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

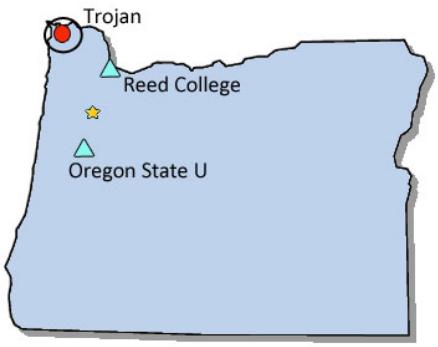


1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

OREGON



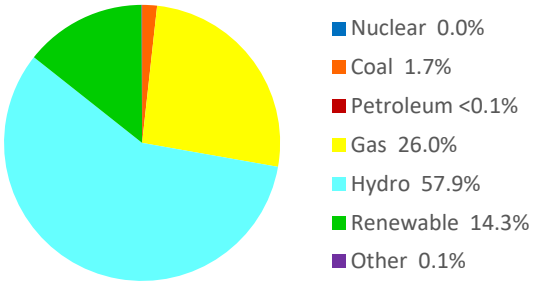
Elected Officials as of January 2019[1,2]

Governor:	Kate Brown (D)
Senators:	Ron Wyden (D)
	Jeff Merkley (D)
Representatives:	
District 1:	Suzanne Bonamici (D)
District 3:	Earl Blumenauer (D)
District 4:	Peter DeFazio (D)

Shutdown Reactor (1 at 1 site)
Commercial Dry Storage Site (1 site)
Operating Research Reactors (2 at 2 sites)

Oregon: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

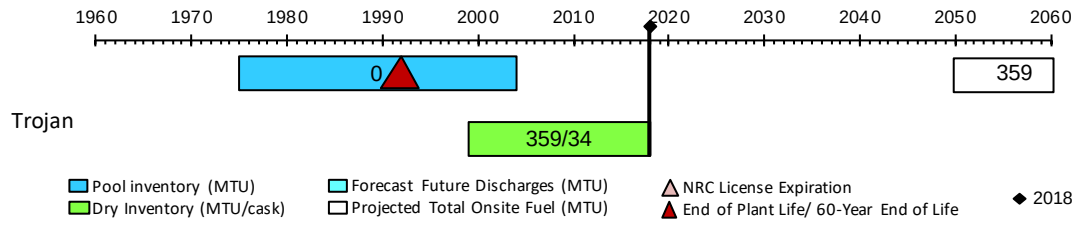


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
1	Trojan	Portland General Electric Corp.	Suzanne Bonamici (D)	1975-1992 Terminated[5]	PWR/ DECON Completed	1999/SL Stranded[6]	359
3	Reed College	Reed College	Earl Blumenauer (D)	1968-	R&TRF TRIGA Mark I/ Operating		
4	Oregon State University	Oregon State University	Peter DeFazio (D)	1967-	R&TRF TRIGA Mark II/ Operating		

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 359 MTU in 34 casks **Pool: 0 MTU** **Total: 359 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[7]	
$75.5 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

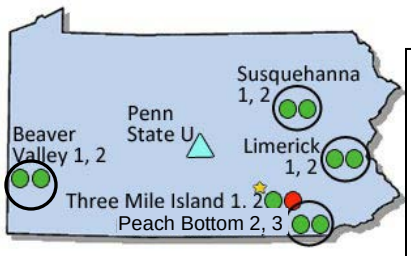
4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 NRC license is terminated when all decommissioning activities have been completed and the site is released for unrestricted use.

[6] A stranded ISFSI does not have an active reactor on site.

[7] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

PENNSYLVANIA



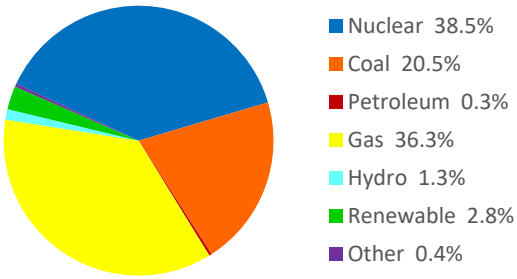
- Shutdown Reactor (1 at 1 site)
- Operating Reactors (9 at 5 sites)
- Commercial Dry Storage Sites (4 sites)
- Operating Research Reactor (1 at 1 site)

Elected Officials as of January 2019[1,2]

Governor:	Tom Wolf (D)
Senators:	Robert Casey, Jr. (D)
	Patrick Toomey (R)
Representatives:	
District 4:	Madeleine Dean (D)
District 5:	Mary Scanlon (D)
District 6:	Chrissy Houlahan (D)
District 11:	Lloyd Smucker (R)
District 12:	Tom Marino (R)
District 15:	Glenn Thompson (R)

Pennsylvania: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

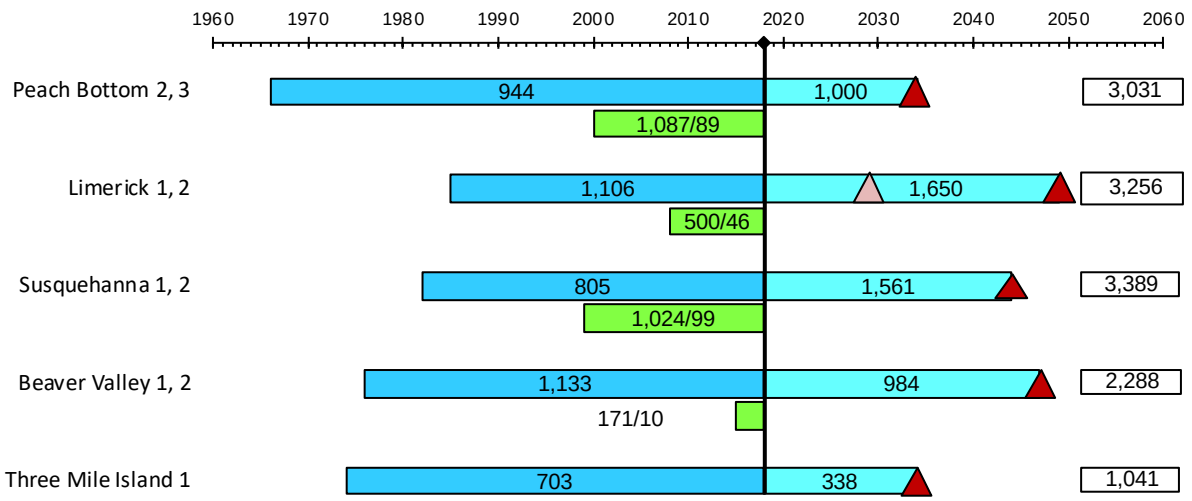


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
4	Peach Bottom 1	Exelon Generation Co., LLC	Madeleine Dean (D)	1967-1974/ SAFSTOR	BWR/Shutdown		
	Peach Bottom 2			1973-2033	BWR/Operating	2000/GL	1,516[5]
	Peach Bottom 3			1974-2034	BWR/Operating		1,515
5	Pennsylvania State University	Pennsylvania State University	Mary Scanlon (D)	1955-	R&TRF TRIGA/ Operating		
6	Limerick 1	Exelon Generation Co., LLC	Chrissy Houlahan (D)	1985-2044	BWR/Operating	2008/GL	1,635
	Limerick 2			1989-2049	BWR/Operating		1,620
11	Susquehanna 1	Susquehanna Nuclear, LLC	Lloyd Smucker (R)	1982-2042	BWR/Operating	1999/GL	1,675
	Susquehanna 2			1984-2044	BWR/Operating		1,714
12	Beaver Valley 1	First Energy Nuclear Operating Co.	Tom Marino (R)	1976-2036	PWR/Operating	2015/GL	1,119
	Beaver Valley 2			1987-2047	PWR/Operating		1,169
15	Three Mile Island 1	Exelon Generation Co., LLC	Glenn Thompson (R)	1974-2034	PWR/Operating		1,041
	Three Mile Island 2			1978-1979[6] SAFSTORE	PWR//Shutdown		See Note[7]

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 2,781 MTU in 244 casks **Pool: 4,692 MTU** **Total: 7,472 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[8]	
$1,946.9 million paid	**$91.8 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

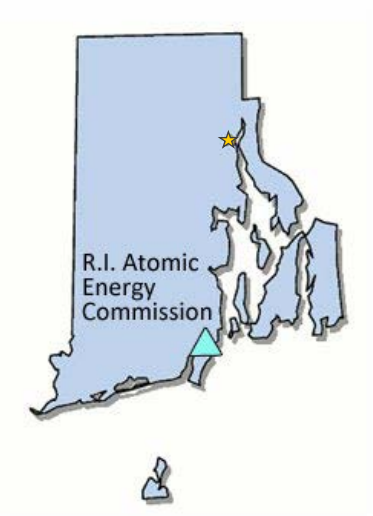
5 Includes 0.38 MTU transferred to Idaho National Laboratory.

6 Unit 2 in post-defueling monitored storage mode until both units are ready for decommissioning.

7 Three Mile Island Unit 2 fuel shipped to Idaho National Laboratory.

8 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

RHODE ISLAND



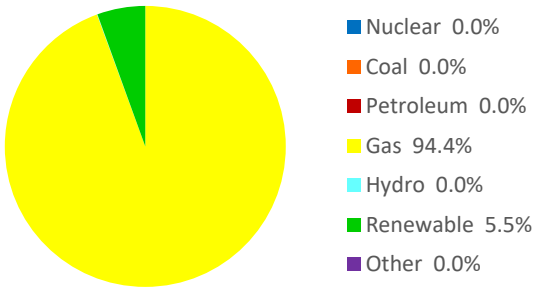
△ Operating Research Reactor (1 at 1 site)

Elected Officials as of January 2019[1,2]

Governor:	Gina Raimondo (R)
Senators:	John Reed (D)
	Sheldon Whitehouse (D)
Representative:	
District 2:	James Langevin (D)

Rhode Island: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)



Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected
2	RI Atomic Energy Commission	RI Atomic Energy Commission	James Langevin (D)	1964-[4]	R&TRF GE Pool/ Operating		

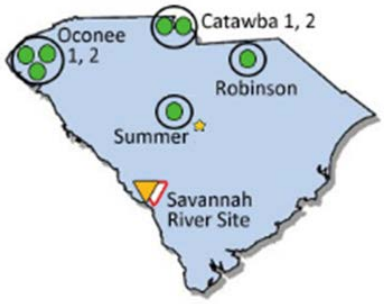
1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 Being evaluated by NRC for license renewal.

SOUTH CAROLINA

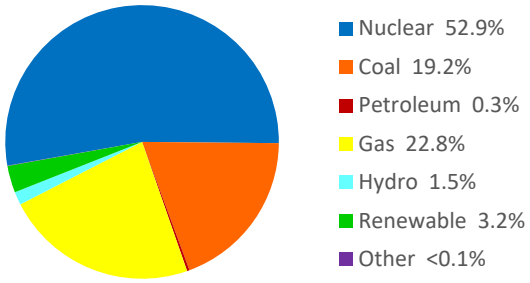


Elected Officials as of January 2019[1,2]

Governor:	Henry McMaster (R)
Senators:	Lindsey Graham (R)
	Tim Scott (R)
Representatives:	
District 2:	Joe Wilson (R)
District 3:	Jeff Duncan (R)
District 5:	Ralph Norman (R)
District 7:	Tom Rice (R)

South Carolina: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)



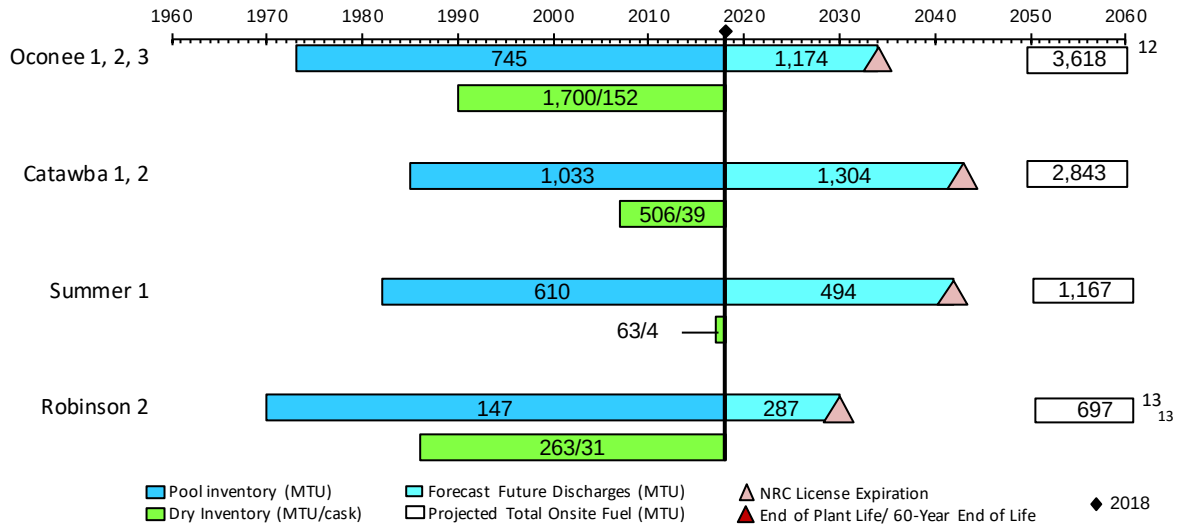
- Operating Reactors (7 at 4 sites)
- Commercial Dry Storage Sites (4 sites)
- DOE owned SNF and HLW at Savannah River Site
- Surplus Plutonium at Savannah River Site

Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
2	Savannah River Site	DOE[5]	Joe Wilson (R)		Various		See Note [15]
3	Oconee 1	Duke Energy Carolinas[6]	Jeff Duncan (R)	1973-2033	PWR/Operating	1990/SL 1999/GL	1,241[7]
	Oconee 2			1973-2033	PWR/Operating		1,267[7]
	Oconee 3			1974-2034	PWR/Operating		1,250[7]
5	Catawba 1		Ralph Norman (R)	1985-2043	PWR/Operating	2007/GL	1,437
	Catawba 2			1986-2043	PWR/Operating		1,406
	Summer 1	South Carolina Electric & Gas[8]		1982-2042	PWR/Operating	2016/GL	1,167
7	Robinson 2	Duke Energy Progress, LLC[6]	Tom Rice (R)	1970-2030	PWR/Operating	1986/SL 2005/GL	1,049[9-11]

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 2,532 MTU in 226 casks **Pool: 2,535 MTU** **Total: 5,067 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[14]	
$1,498.7 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 20192018.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 DOE Regulated Facility.

6 Subsidiary of Duke Energy Corp.

7 Total Oconee 1,2, and 3 total projected discharged fuel includes 140 MT transferred to McGuire and is no longer at the site.

8 Subsidiary of SCANA Corp. Acquisition by Domenion Energy is in progress as of 1/1/2019.

9 Includes 0.44 MTU transferred to Idaho National Laboratory.

10 Includes 132 MTU transferred to Brunswick (North Carolina).

11 Includes 219 MTU transferred to Harris (North Carolina).

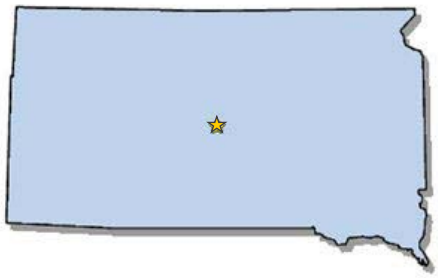
12 Reflects the transfer of 140 MTU to McGuire (North Carolina).

13 Reflects the transfer of 132 MTU to Brunswick (North Carolina) and 219 MTU to Harris (North Carolina).

14 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

15 SRS has approximately 29 MT from DOE sources.

SOUTH DAKOTA

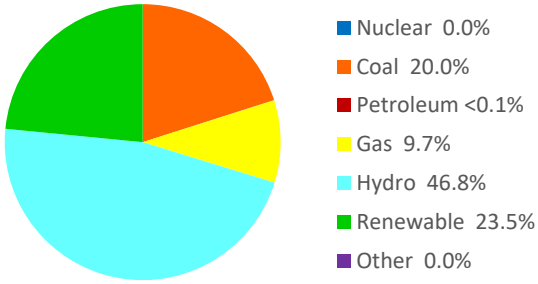


Elected Officials as of January 2019[1,2]

Governor:	Kristi Noem (R)
Senators:	Mike Rounds (R)
	John Thune (R)

South Dakota:2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

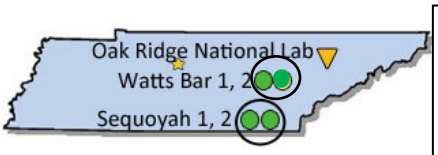


1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

TENNESSEE

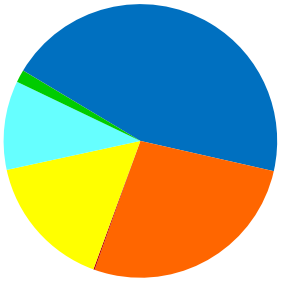


Operating Reactors (4 at 2 sites)
Commercial Dry Storage Site (1 site)
DOE owned SNF at Oak Ridge

Elected Officials as of January 2019[1,2]

Governor:	Bill Lee (R)
Senators:	Lamar Alexander (R)
	Marsha Blackburn (R)
Representatives:	
District 3:	Chuck Fleischmann (R)
District 4:	Scott DesJarlais (R)

Tennessee: 2018 Electricity Generation Mix[3]
(includes utilities and independent power producers)



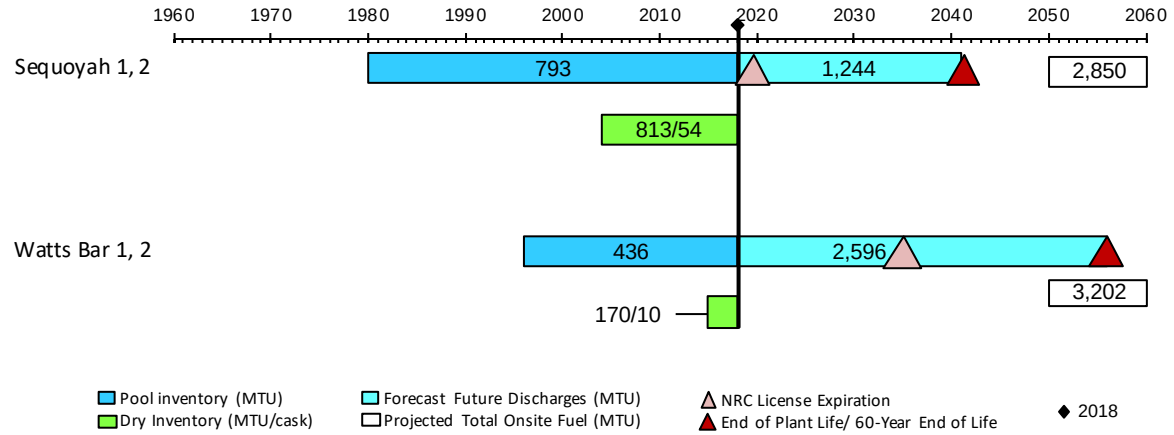
- Nuclear 44.9%
- Coal 26.9%
- Petroleum 0.2%
- Gas 16.0%
- Hydro 10.5%
- Renewable 1.5%
- Other <0.1%

Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
3	Sequoyah 1	Tennessee Valley Authority	Chuck Fleischmann (R)	1980-2040	PWR/Operating	2004/GL	1,386
	Sequoyah 2			1981-2041	PWR/Operating		1,465
	Oak Ridge National Lab	DOE[5]		None	Various		
	ORNL: High Flux Isotope Reactor (HFIR)			mid-1960s	Test reactor		See Note [8]
4	Watts Bar 1	Tennessee Valley Authority	Scott DesJarlais (R)	1996-2035	PWR/Operating	2016/GL[6]	1,592
	Watts Bar 2			2015-2055	PWR/Operating		1,506

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 984 MTU in 64 casks **Pool: 1,228 MTU** **Total: 2,212 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[7]	
$596.9 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

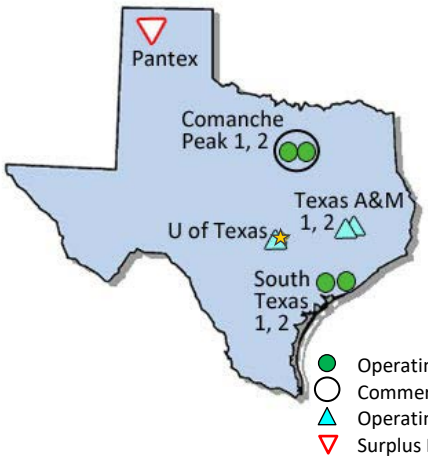
5 DOE Regulated Facility.

6 ISFSI opened after Commercial Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2016-000263, Rev 4, DRAFT (2016/06/30) was submitted.

7 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

8 DOE Operates the High-Flux Isotope Reactor (HFIR) at ORNL, some of the SNF is storred on-site awaiting transfer to SRS in South Carolina.

TEXAS

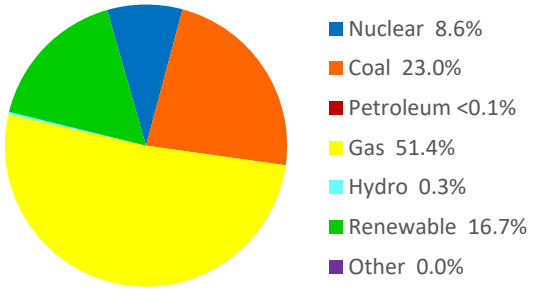


Elected Officials as of January 2019[1,2]

Governor:	Greg Abbott (R)
Senators:	John Cornyn (R)
	Ted Cruz (R)
Representatives:	
District 10:	Michael McCaul (R)
District 13:	Mac Thornberry (R)
District 17:	Bill Flores (R)
District 25:	Roger Williams (R)
District 27:	Michael Cloud (R)

Texas: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

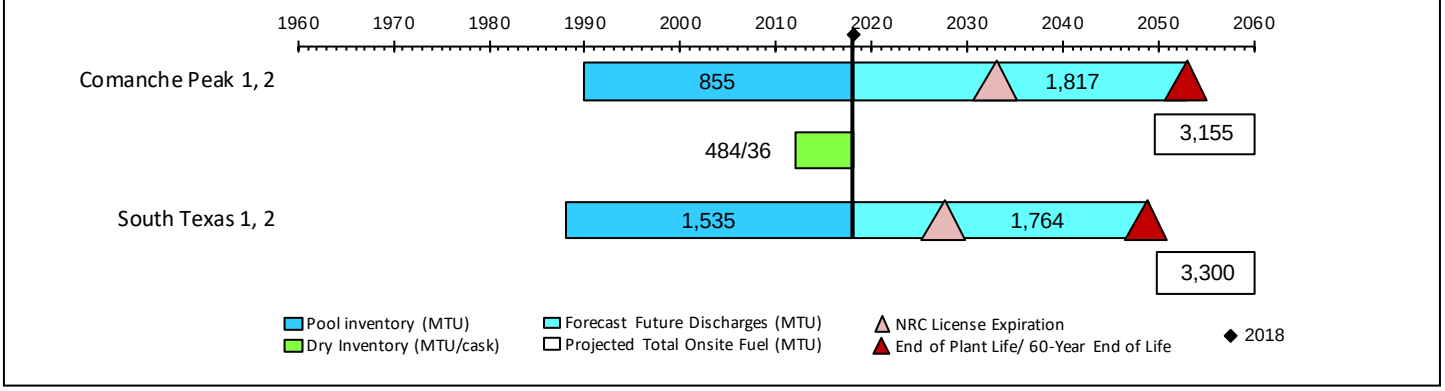


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
10	University of Texas	University of Texas	Michael McCaul (R)	1992-[6]	R&TRF TRIGA Mark II/ Operating		
13	Pantex Plant	DOE-NNSA[5]	Mac Thornberry (R)		Operating		
17	Texas A&M 1	Texas A&M	Bill Flores (R)	1957-[6]	R&TRF AGN-201M #106/ Operating		
	Texas A&M 2			1961-[6]	R&TRF TRIGA/Operating		
25	Comanche Peak 1	Comanche Peak Power Company, LLC	Roger Williams (R)	1990-2030	PWR/Operating	2012/GL	1,597
	Comanche Peak 2			1993-2033	PWR/Operating		1,558
27	South Texas 1	STP Nuclear Operating Co.	Michael Cloud (R)	1988-2047	PWR/Operating		1,635
	South Texas 2			1989-2048	PWR/Operating		1,665

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 484 MTU in 36 casks **Pool: 2,390 MTU** **Total: 2,874 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[7]	
$812.3 million paid	**$0.0 million one-time fee owed**

[1] Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

[2] Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

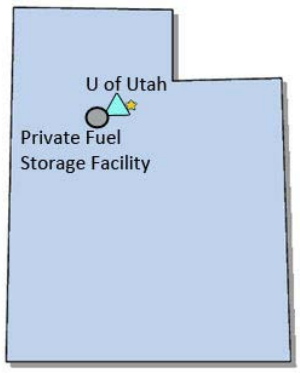
[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] DOE regulated facility.

[6] Being evaluated by NRC for license renewal.

[7] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

UTAH

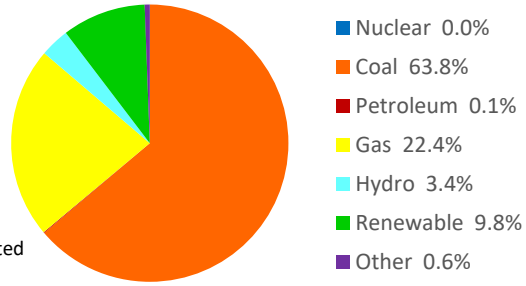


Elected Officials as of January 2019[1,2]

Governor:	Gary Herbert (R)
Senators:	Mitt Romney (R)
	Mike Lee (R)
Representative:	
District 2:	Chris Stewart (R)

△ Operating Research Reactor (1 at 1 site)
● Commercial Dry Storage Site, permitted but not constructed

Utah: 2018 Electricity Generation Mix[3]
(includes utilities and independent power producers)



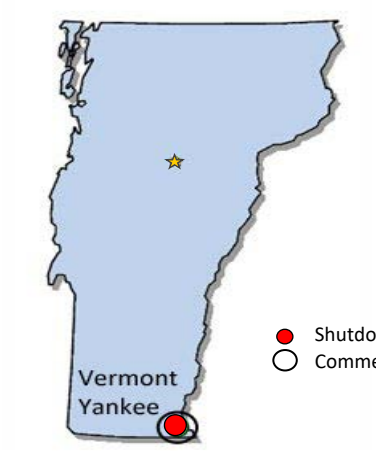
Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected
2	University of Utah	University of Utah	Chris Stewart (R)	1975-	R&TRF TRIGA Mark I/ Operating		

[1] Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

[2] Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

VERMONT



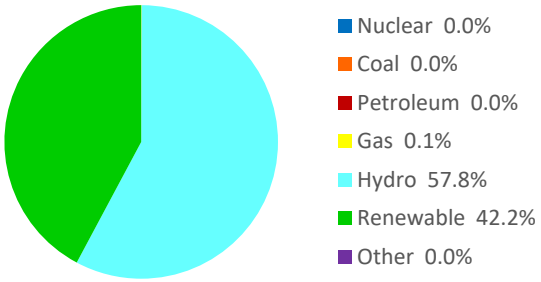
Shutdown Reactor (1 at 1 site)
Commercial Dry Storage Site (1 site)

Elected Officials as of January 2019[1,2]

Governor:	Phil Scott (R)
Senators:	Patrick Leahy (D)
	Bernie Sanders (I)
Representatives:	
District At-Large:	Peter Welch (D)

Vermont: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

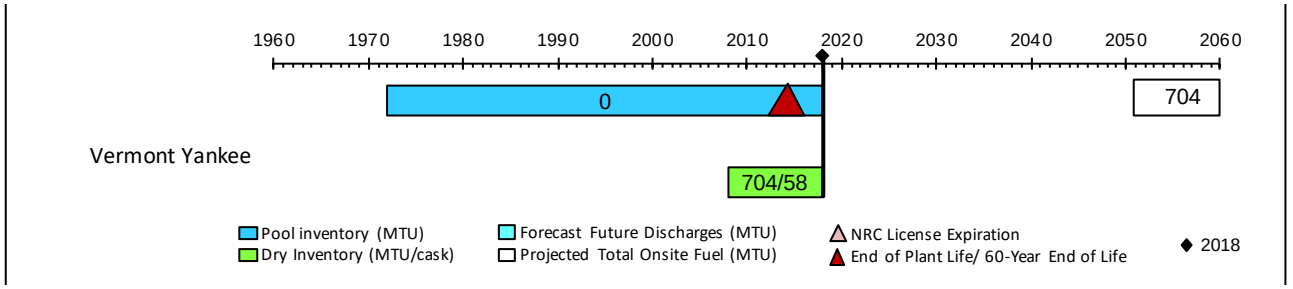


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
1	Vermont Yankee	Entergy Nuclear Operations, Inc.	Peter Welch (D)	1973-2014[5] SAFSTORE	BWR/ Early Shutdown	2008/GL	704

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 704 MTU in 58 casks **Pool: 0 MTU** **Total: 704 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[6]	
$118.9 million paid	**$149.4 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

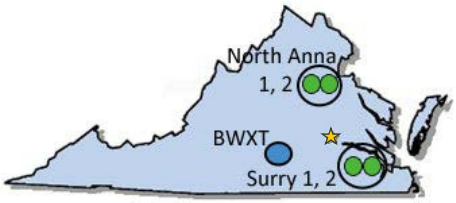
3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

5 On August 27, 2013, Entergy Corporation announced that it planned to shutdown Vermont Yankee. The plant went offline on December 29, 2014.

6 The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

VIRGINIA



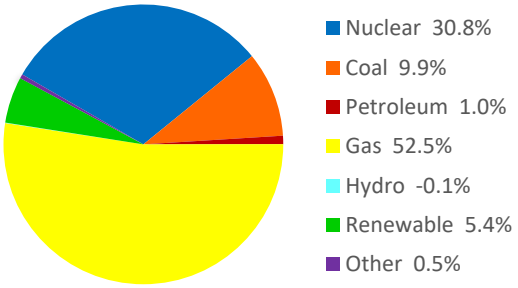
- Operating Reactors (4 at 2 sites)
- Commercial Dry Storage Sites (2 sites)
- Commercial Pool Storage Site (1 site)

Elected Officials as of January 2019[1,2]

Governor:	Ralph Northam (D)
Senators:	Mark Warner (D)
	Timothy Kaine (D)
Representatives:	
District 3:	Robert C. Scott (D)
District 6:	Ben Cline (R)
District 7:	Abigail Spanberger (D)

Virginia: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

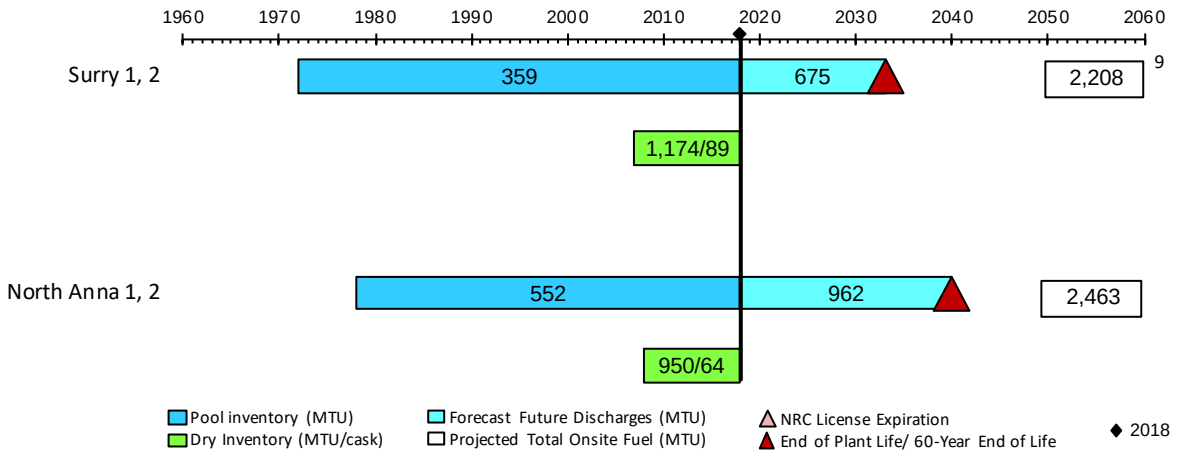


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
3	Surry 1	Virginia Electric & power Co.[5]	Robert C. Scott (D)	1972-2032	PWR/Operating	1986/SL 2007/GL	1,114[6]
	Surry 2			1973-2033	PWR/Operating		1,126[6]
6	BWX Technologies	BWX Technologies	Ben Cline (R)	SNM-42[7]	Dry and pool storage/ Operating[8]	See Note[7]	
7	North Anna 1	Dominion Generation [5]	Abigail Spanberger (D)	1978-2038	PWR/Operating	1998/SL 2008/GL	1,229
	North Anna 2			1980-2040	PWR/Operating		1,234

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 2,123 MTU in 153 casks **Pool: 911 MTU** **Total: 3,034 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[10]	
$837.0 million paid[11]	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] Subsidiary of Dominion Resources Co.

[6] Total of Surry 1 and Surry 2 includes 31 MTU transferred to Idaho National Laboratory for examination and testing.

[7] [Federal Register Volume 72, Number 235 [Notices] Pages 69234-69236] Renewed license for Mt. Athos facility in Lynchburg, Virginia was issued on March 29, 2007.

[8] Facility manufactures nuclear fuel elements. Dry and wet storage of SNF is included in the operating license.

[9] Total does not include 31 MTU transferred to Idaho National Laboratory.

[10] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

[11] Includes one-time fee paid by B&W.

WASHINGTON

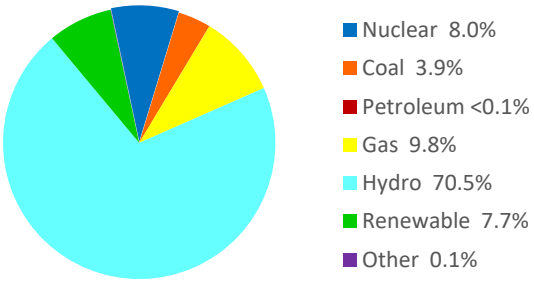
- Operating Reactors (1 at 1 site)
- Commercial Dry Storage Site (1 site)
- Operating Research Reactor (1 at 1 site)
- DOE owned SNF and HLW at Hanford
- Surplus Plutonium at Hanford

Elected Officials as of January 2019[1,2]

Governor:	Jay Inslee (D)
Senators:	Patty Murray (D)
	Maria Cantwell (D)
Representatives:	
District 4:	Dan Newhouse (R)
District 5:	Cathy McMorris Rodgers (R)

Washington: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

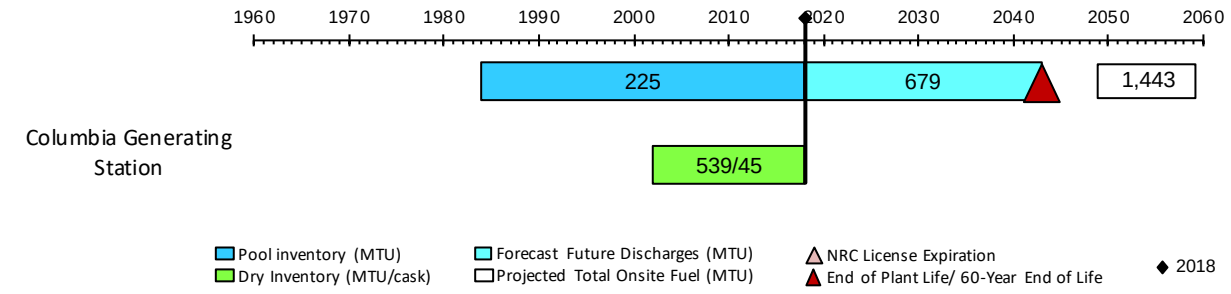


Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
4	Columbia Generating Station	Energy Northwest	Dan Newhouse (R)	1984-2043	BWR/ Operating	2002/GL	1,443
	Hanford Reservation	DOE[5]		None	Various/ Shutdown		
5	Washington State University	Washington State University	Cathy McMorris Rodgers (R)	1961-	R&TRF TRIGA/ Operating		

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 539 MTU in 45 casks **Pool: 225 MTU** **Total: 764 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[6]	
$198.9 million paid	**$0.0 million one-time fee owed**

1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

4 SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] DOE Regulated Facility

[6] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A "one-time fee" was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

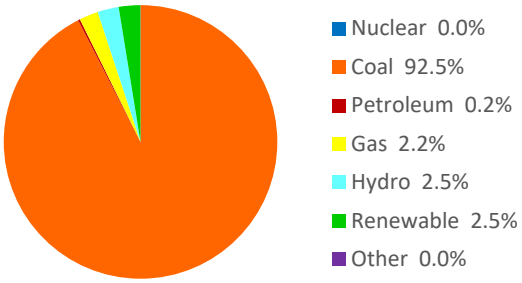
WEST VIRGINIA

Elected Officials as of January 2019[1,2]

Governor	: Jim Justice (D)
Senators:	Shelley Capito (R)
	Joe Manchin (D)

West Virginia: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)

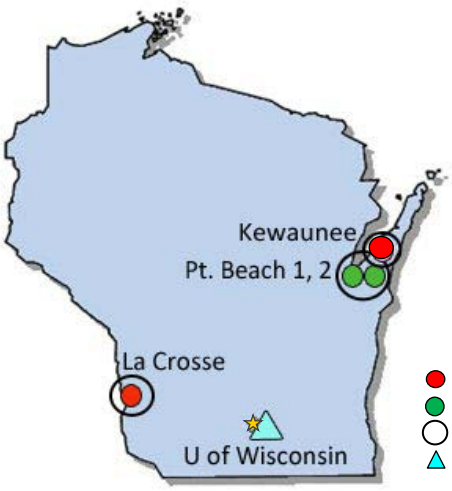


1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

WISCONSIN



Shutdown Reactor (2 at 2 sites)
Operating Reactors (2 at 1 site)
Commercial Dry Storage Sites (3 sites)
Operating Research Reactor (1 at 1 site)

Elected Officials as of January 2019[1,2]

Governor:	Tony Evers (D)
Senators:	Ron Johnson (R)
	Tammy Baldwin (D)
Representatives:	
District 2:	Marc Pocan (D)
District 3:	Ron Kind (D)
District 6:	Glenn Grothman (R)
District 8:	Mike Gallagher (R)

Wisconsin 2018 Electricity Generation Mix[3]

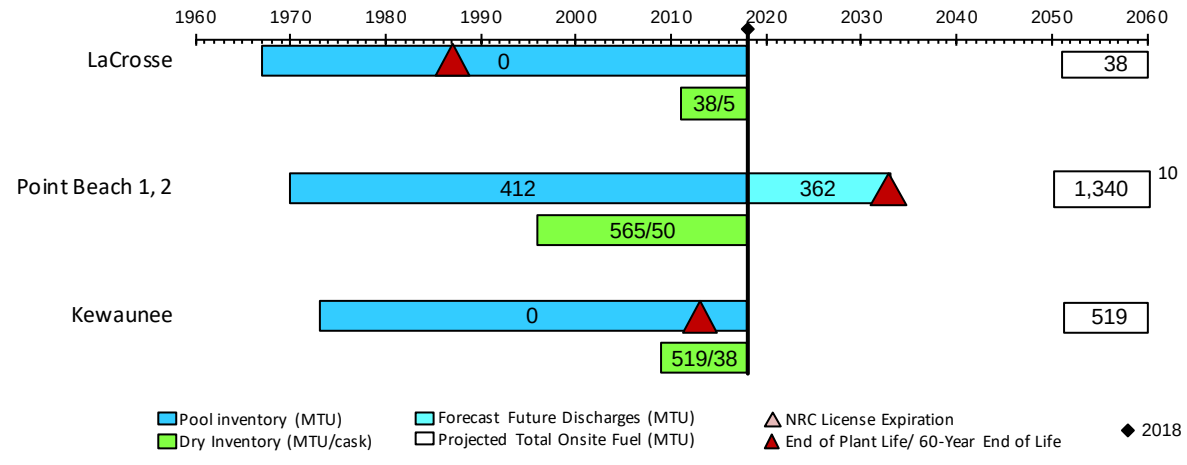
(includes utilities and independent power producers)

Cong. Dist.	Facility	NRC Licensee	Representative	Operating License Period/Status	Facility Type/Status	ISFSI License Year/Type	SNF (MTU) Total Projected[4]
2	University. of Wisconsin	University of Wisconsin	Marc Pocan (D)	1960-	R&TRF TRIGA/ Operating		
3	LaCrosse	Dairyland Power Cooperative	Ron Kind (D)	1967-1987/ DECON in progress[5]	BWR/Shutdown	2011/GL Stranded[6]	38[7]
6	Point Beach 1	NextEra Energy Point Beach LLC	Glenn Grothman (R)	1970-2030	PWR/Operating	1996/GL	681[8]
	Point Beach 2			1973-2033	PWR/Operating		661
8	Kewaunee	Dominion Generation	Mike Gallagher (R)	1973-2013[9] SAFSTOR	PWR/ Early Shutdown	2009/GL	519

COMMERCIAL SPENT FUEL ONSITE INVENTORY[4]

Dry: 1,122 MTU in 93 casks **Pool: 412 MTU** **Total: 1,534 MTU**

SPENT NUCLEAR FUEL STORAGE STATUS[4]



NUCLEAR WASTE FUND[11]	
$416.4 million paid	**$0.0 million one-time fee owed**

[1] Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

[2] Governor from https://www.nga.org/governors, Accessed January 9, 2019.

[3] Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases..

[4] SNF Data estimated as of December 31, 2018 from Table C-1, D-1, Source: Spent Nuclear Fuel and High-Level Radioactive Waste Inventory Report [FCRD-NFST-2013-000263, Rev 6]. Total Projected Discharges and Forecast Future Discharges based on 60-Year End-of-Plant Life. Totals may vary slightly due to rounding. NRC License Expiration shown only when different from End-of-Plant Life/60-Year End of Life.

[5] Estimated date of closure is 2019.

[6] A stranded ISFSI does not have an active reactor on site.

[7] Includes 0.12 MTU transferred to Savannah River Site.

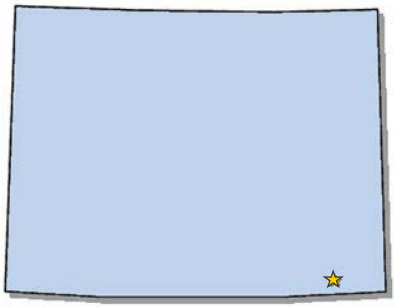
[8] Includes 2 MTU transferred to Idaho National Laboratory.

[9] Operating license previously extended until 2033. On October 22, 2012, Dominion Resources announced early shutdown. The plant came offline on May 7, 2013.

[10] Does not include 2 MTU transferred to Idaho National Laboratory.

[11] The Nuclear Waste Policy Act established the Federal Government's responsibility to provide permanent disposal of commercial spent nuclear fuel (SNF) and high-level radioactive waste (HLW), and the Nuclear Waste Fund, composed of payments made by the generators and owners of SNF (primarily nuclear utilities) and HLW, to ensure that the costs of carrying out activities relating to the disposal be borne by the generators and owners of the SNF and HLW. A “one-time fee” was established for SNF created before April 7, 1983, and an ongoing quarterly fee based on electricity generated and sold from April 7, 1983 forward. Payments and amounts owed are as of December 31, 2018 using the Department of Energy Consolidated Accounting & Investment System (CAIS) data. Paid amounts are net of fee and interest credits/refunds. One-time fee owed includes both fees and interest on fees.

WYOMING

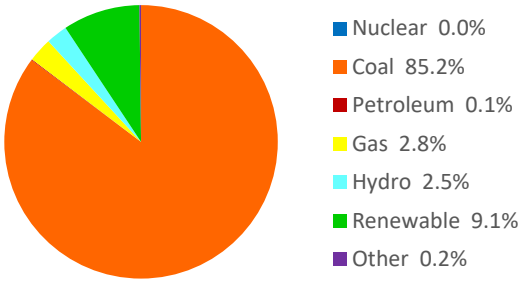


Elected Officials as of January 2019[1,2]

Governor:	Mark Gordon (R)
Senators:	Mike Enzi (R)
	John Barrasso (R)

Wyoming: 2018 Electricity Generation Mix[3]

(includes utilities and independent power producers)



1 Data for Elected Officials from https://www.govtrack.us/congress, Accessed January 9, 2019.

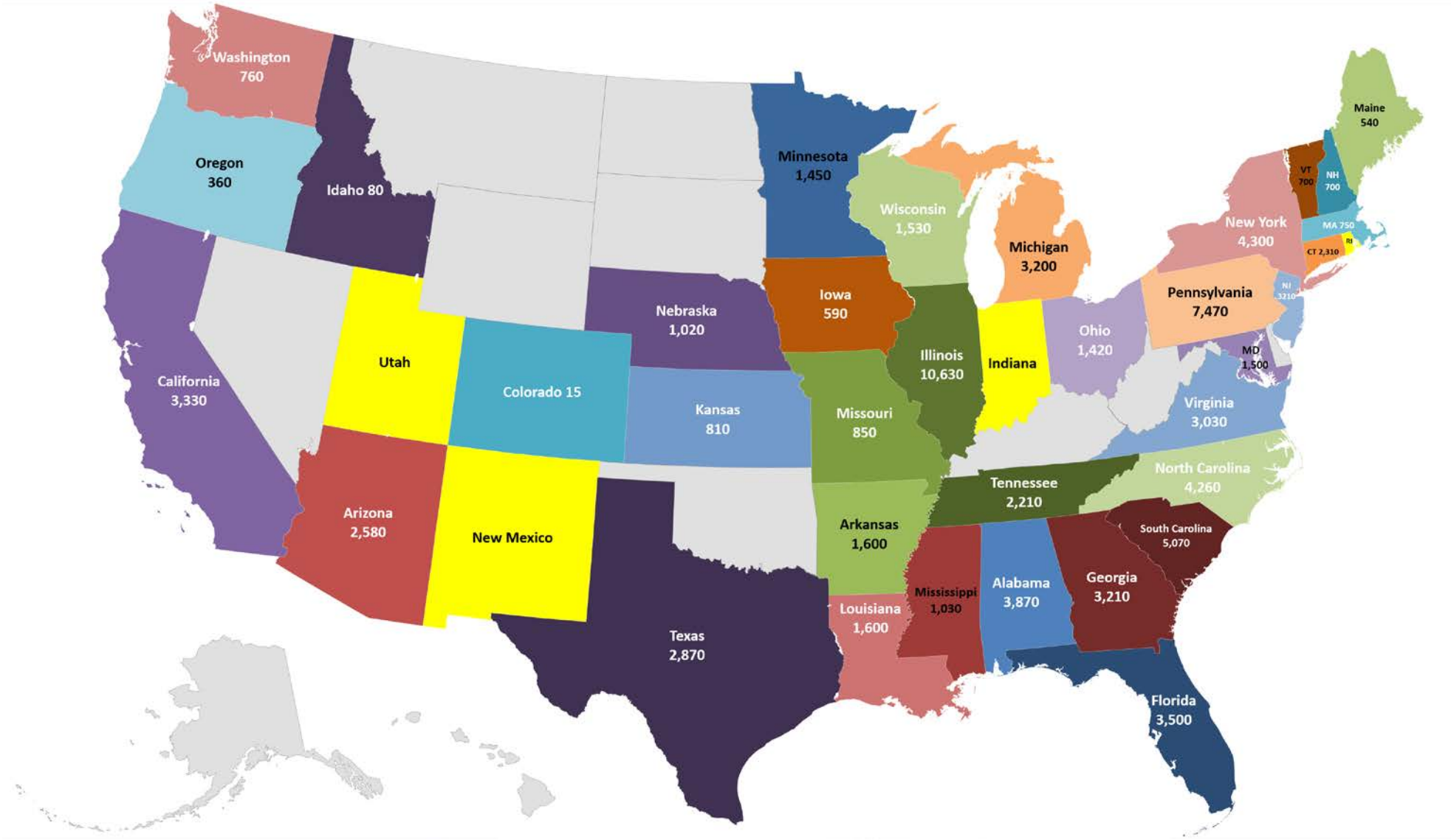
2 Governor from https://www.nga.org/governors, Accessed January 9, 2019.

3 Data for Electricity Generation Mix from Tables 1.4.B-1.13.B, Electric Power Monthly - December 2018. Year-to-Date Data through October 2018. Petroleum includes both liquid and coke. Gas includes both natural gas and other gases. Hydro includes both conventional and pumped storage. Renewable includes wind, biomass, geothermal, and solar. Other includes manufactured, supplemental gaseous fuel, propane, and waste gases.

35 States with Commercial SNF from Nuclear Power Reactors

4 States with Research Reactors Only

Approximate Amounts in Metric Tons Heavy Metal (Estimated 12/31/18)



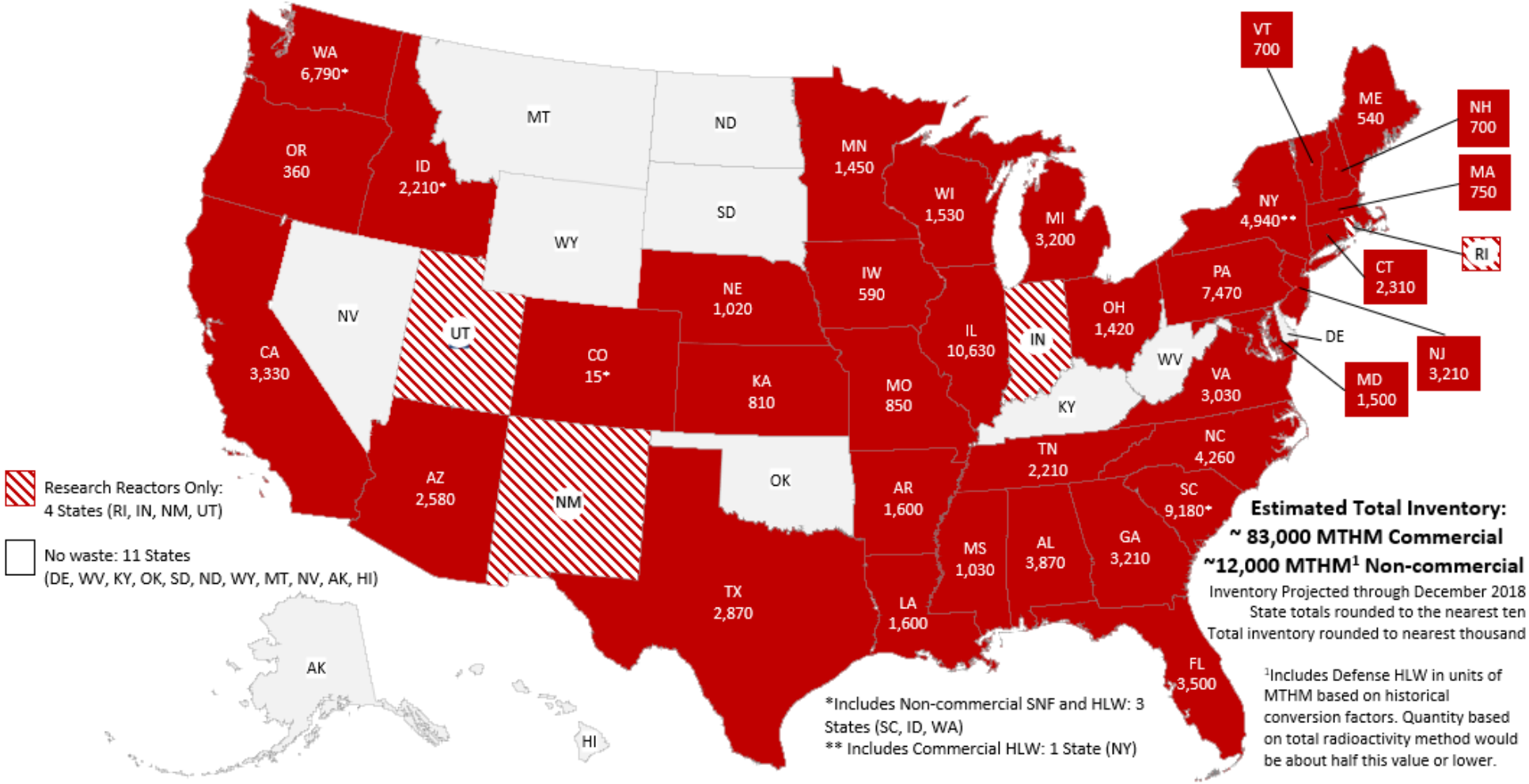
SNF at DOE-Managed, NRC Regulated Facilities (CO, ID)

Research reactors only (IN, NM, RI, UT)

Note: Quantities of SNF from research and defense programs and additional commercial-origin SNF stored under DOE authority are not included.

39 States with SNF/HLW

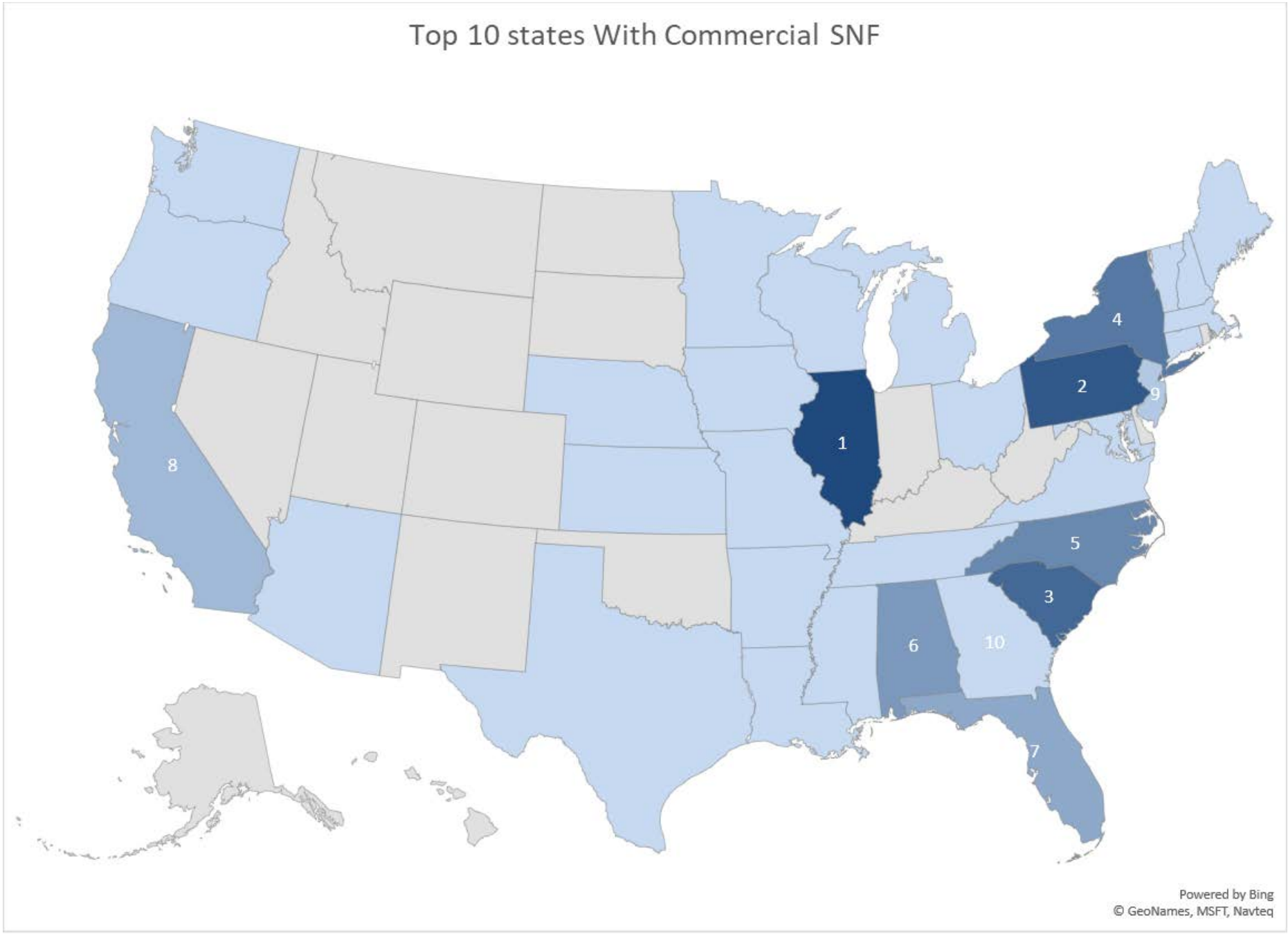
Approximate amounts shown in Metric Tons Heavy Metal (MTHM)



Estimated Total Inventory:
~ 83,000 MTHM Commercial
~12,000 MTHM[1] Non-commercial

Inventory Projected through December 2018
State totals rounded to the nearest ten
Total inventory rounded to nearest thousand

[1]Includes Defense HLW in units of MTHM based on historical conversion factors. Quantity based on total radioactivity method would be about half this value or lower.


Top 10 states With Commercial SNF
1
2
3
4
5
6
7
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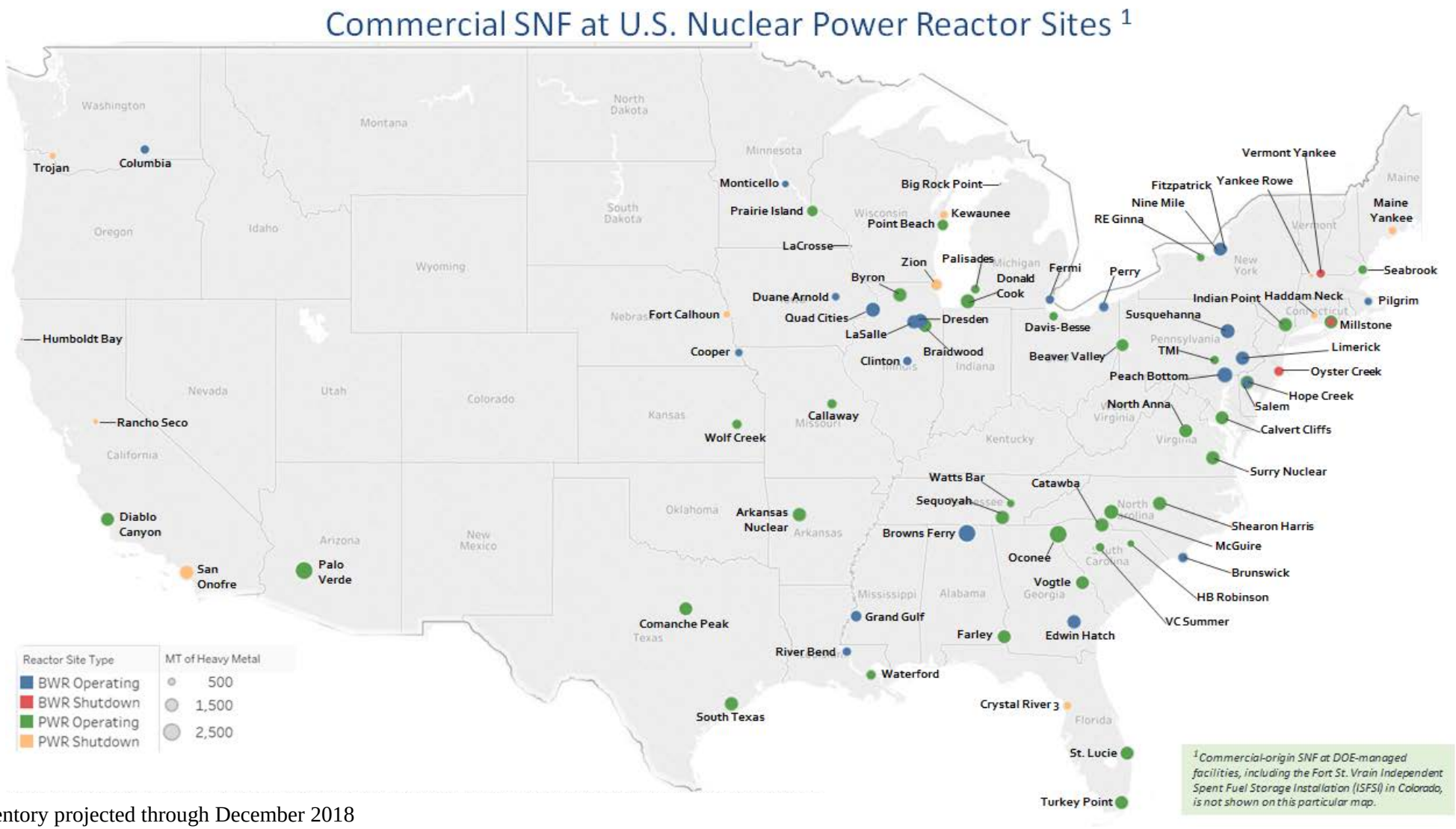
9
10
Powered by Bing
© GeoNames, MSFT, Navteq



Inventory projected through December 2018