

Table 4.1. Data Sources for NEEDS 2006

Data Source¹	Data Source Documentation
DOE's Form EIA-860 (2003)	DOE's Form EIA-860 is an annual survey of utility power plants at the generator level. It contains data such as summer, winter and nameplate capacity, location (state and county), status, prime mover, primary energy source, in-service year, and a plant-level cogenerator flag.
DOE's Form EIA-767 (2003)	DOE's Form EIA-767 is an annual survey, "Steam-Electric Plant Operation and Design Report", that contains data for utility nuclear and fossil fuel steam boilers such as fuel quantity and quality; boiler identification, location, status, and design information; and post-combustion NO _x control, FGD scrubber and particulate collector device information. Note that boilers in plants with less than 10 MW do not report all data elements. The relationship between boilers and generators is also provided, along with generator-level generation and nameplate capacity. Note that boilers and generators are not necessarily in a one-to-one correspondence.
NERC Electricity Supply and Demand (ES&D) database (2004)	The NERC ES&D is released annually. It contains generator-level information such as summer, winter and nameplate capacity, state, NERC region and sub-region, status, primary fuel and on-line year.
EIA's Annual Energy Outlook (AEO 2006)	The Energy Information Administration (EIA) Annual Energy Outlook presents annually updated forecasts of energy supply, demand and prices covering a 20-25 year time horizon. The projections are based on results from EIA's National Energy Modeling System (NEMS). Information from AEO 2006, such as heat rates and renewable builds in response to state renewable portfolio standards (RPS) were used in NEEDS 2006.
Global Energy Decisions New Entrants database (June 2006)	Global Energy's New Entrants database has information on new power plant builds, rerates and retirements. This was the primary source used in NEEDS 2006 for information on planned-committed units.
EPA's Emission Tracking System (ETS 2005)	The Emission Tracking System (ETS) database is updated quarterly and certified annually. It contains boiler-level information such as primary fuel, heat input, SO ₂ and NO _x controls, and SO ₂ , NO _x and CO ₂ emissions. NEEDS2006 used ETS data for developing emission rate and post-combustion control information.
Utility and RPO (Regional Planning Organizations) Comments	Comments from selected U.S. utilities and RPOs regarding the population in NEEDS as well as unit characteristics were used in the Base Case 2006.

¹Indicated under "Data Source" are the primary issue dates of the indicated data sources that were used. Other vintages of these data sources were also used in instances where data were not available for the indicated issue date or where there were methodological reasons for using other vintages of the data.

Table 4.2. Rules Used in Populating NEEDS 2006

Scope

Geographic		Excluded units in Alaska or Hawaii
Capacity	–	Excluded units with reported nameplate, summer and winter capacity of zero
Status	–	Excluded units on long-term scheduled maintenance or units with forced outages for greater than three months or retired (i.e. units with status codes “OS” or “RE” in EIA Forms)
	–	Status of boiler(s) and associated generator(s) were taken into account for determining operation status
Planned or Future Units	–	Included planned units that had broken ground or secured financing and were expected to be online by the end of 2009
Firm/Non-firm Electric Sales		Excluded non-utility onsite generators that do not produce electricity for sale to the grid.
	–	Excluded all mobile and distributed generators

Table 4.3. Summary Population (through 2004) in NEEDS 2006

Plant Type	Number of Units	Capacity (MW)
Biomass	130	2,142
Coal Steam	1,292	309,309
Combined Cycle	1,467	162,784
Combustion Turbine	5,400	131,369
Fossil Waste	29	502
Geothermal	204	2,103
Hydro	3,686	78,107
IGCC	4	515
Landfill Gas	609	950
Municipal Solid Waste	173	2,116
Non-Fossil Waste	74	521
Nuclear	104	100,824
O/G Steam	743	119,454
Pumped Storage	146	20,493
Solar	39	406
Tires	4	99
Wind	261	6,420
Total	14,365	938,114

Table 4.4. Hierarchy of Data Sources for Capacity in NEEDS 2006

Sources Shown in Hierarchical Order

Capacity from Utility Comments

2003 EIA 860 Summer Capacity

NERC ES&D 2004 Summer Capacity

2003 EIA 860 Winter Capacity

NERC ES&D 2004 Winter Capacity

2003 EIA 860 Nameplate Capacity

Note: If a unit's capacity was shown as zero, it was not included in NEEDS 2006.

Table 4.5. Capacity-Parsing Algorithm for Steam Units in NEEDS 2006

Type of Boiler-Generator Link				
For Boiler B ₁ to B _N linked to Generators G ₁ to G _N	One-to-One	One-to-Many	Many-to-One	Many-to-Many
		$MW_{Bi} = MW_{Gi}$	$MW_{Bi} = \hat{a}_i MW_{Gi}$	$MW_{Bi} = (MF_{Bi} / \hat{a}_i MF_{Bi}) * MW_{Gi}$

Notes

MF_{Bi} = maximum steam flow of boiler *i*

MW_{Gi} = electric generation capacity of generator *j*

Table 4.6. Data Sources for Unit Configuration in NEEDS 2006.

Unit Component	Primary Data Source	Secondary Data Source	Tertiary Data Source	Other Sources	Default
Firing Type	Utility/RPO Comments	2003 EIA 767	-	-	-
Bottom Type	Utility/RPO Comments	2003 EIA 767	-	-	Dry
SO ₂ Pollution Control	NSR Settlement or Utility/RPO Comments	EPA's Emission Tracking System (ETS) - 2005	2003 EIA 767	See Note ¹	No Control
NO _x Pollution Control	NSR Settlement or Utility/RPO Comments	EPA's Emission Tracking System (ETS) - 2005	2003 EIA 767	See Note ¹	No Control
Particulate Matter Control	NSR Settlement or Utility/RPO Comments	EPA's Emission Tracking System (ETS) - 2005	2003 EIA 767	1999 Hg ICR ²	-

Notes

¹In addition to the primary, secondary and tertiary data sources listed here, the following sources were consulted and emission controls were updated when corroborating information could be found: McIlvaine Utility Upgrade Database, ICAC (Institute of Clean Air Companies), and web sites of generating unit owners and operators

²Hg ICR refers to EPA's "Information Collection Request for Electric Utility Steam Generating Unit Mercury Emissions Information Collection Effort (ICR)." See www.epa.gov/ttn/atw/combust/utiltox/mercury.html.

Table 4.7. Aggregation Profile of Model Plants as Provided at Set Up of EPA Base Case 2006

Existing and Planned/Committed Units			Retrofits		
Plant Type	Number of Units	Number of IPM model Plants		Number of Units	Number of IPM model Plants
Biomass	139	51	Retrofit Coal to Scrubber	---	504
Coal Steam	1,316	870	Retrofit Coal to ACI + SCR	---	500
Combined Cycle	1,507	343	Retrofit Coal to ACI + Scrubber	---	1,135
Combustion Turbine	5,445	1,018	Retrofit Coal to ACI + Scrubber + SCR	---	1,620
Fossil_Other	29	12	Retrofit Coal to ACI + Scrubber + SNCR	---	609
Fuel Cell	2	2	Retrofit Coal to ACI +SNCR	---	452
Geothermal	222	7	Retrofit Coal to Activated Carbon Injection (ACI)	---	609
Hydro	3,704	73	Retrofit Coal to Scrubber + SCR	---	1,882
Integrated Gas Combined Cycle	5	4	Retrofit Coal to Scrubber + SNCR	---	717
Landfill Gas	643	55	Retrofit Coal to Selective Catalytic Reduction (SCR)	---	278
Non Fossil_Other	251	69	Retrofit Coal to Selective Noncatalytic Reduction (SNCR)	---	257
Nuclear	104	104	Retrofit Oil and Gas to SCR	---	249
Oil/Gas Steam	745	389	Retrofit Oil and Gas to SNCR	---	249
Pumped Storage	146	22	Total	---	9,061
Solar	240	12			
Wind	352	38			
Total	14,850	3,069			
New Units			Repowerings		
Conventional Pulverized Coal - Dry	---	120	Coal to Combined Cycle repowering	---	870
Conventional Pulverized Coal - Wet	---	120	Coal to IGCC repowering	---	870
Advanced Combined Cycle	---	128	Oil and Gas to Combined Cycle repowering	---	382
Advanced Combustion Turbine	---	128	Total	---	2,122
Nuclear	---	64			
Nuclear with Investment Credits	---	64			
Biomass	---	32			
Fuel Cell	---	32			
Geothermal	---	39			
IGCC	---	128			
IGCC with Investment Credits	---	128			
Landfill Gas	---	96			
Solar	---	43			
Wind	---	435			
Total	---	1,557			
			Early Retirements		
			Coal Early Retirement	---	874
			Oil and Gas Early Retirement	---	385
			Combined Cycle Early Retirement	---	343
			Combustion Turbine Early Retirement	---	1,018
			Nuclear Early Retirement	---	104
			Total	---	2,724
Grand Total (Existing and Planned/Committed + New + Retrofits + Repowerings + Early Retirements)					18,533

Table 4.8. VOM Assumptions (2004\$) in EPA Base Case 2006

Capacity Type	NO_x Control	Variable O&M Range (mills/kWh)
Unscrubbed Coal	No NO _x	0.82 - 2.10
	SCR	1.44 - 2.72
	SNCR	1.80 - 3.08
Scrubbed Coal - Dry	No NO _x	3.34 - 4.62
	SCR	3.96 - 5.24
	SNCR	4.32 - 5.60
Scrubbed Coal - Wet	No NO _x	2.26 - 3.54
	SCR	2.88 - 4.16
	SNCR	3.24 - 4.52
Oil/Gas Steam	No NO _x	0.86 - 4.63
	SCR	0.97 - 4.74
	SNCR	1.36 - 5.13
Combined-Cycle	—	2.41 - 7.01
Combustion Turbines	—	2.38 - 8.76
IGCC	—	1.59 - 4.31

Table 4.9. FOM Assumptions Used in EPA Base Case 2006

Prime Mover Type	Primary Fuel	NO_x Control	Age of Unit	FOM (2004\$/kW-Yr)
Combined Cycle	Oil & Gas Unscrubbed	No NO _x	All Years	11.51
Conventional Hydroelectric	Water	No NO _x	All Years	14.30
Fuel Cell	Natural Gas	No NO _x	All Years	18.30
Gas Turbine	Oil & Gas Unscrubbed	No NO _x	>30 years	8.32
			0-20 years	3.40
			20-30 years	7.91
Geothermal	Earth	No NO _x	All Years	18.30
IGCC	Coal Unscrubbed	No NO _x	All Years	108.20
MSW/Landfill Gas	Landfill Gas	No NO _x	All Years	21.50
Pumped Storage	Water	No NO _x	All Years	18.30
Solar Photovoltaic	Sun	No NO _x	All Years	17.20
Solar Thermal	Sun	No NO _x	All Years	18.30
Steam Turbine	Coal Scrubbed - Dry	No NO _x	0 to 20 Years	37.75
			20 to 30 Years	40.38
			30 to 40 Years	49.62
			Greater than 40 Years	55.36
		SCR	0 to 20 Years	38.35
			20 to 30 Years	40.98
			30 to 40 Years	50.22
			Greater than 40 Years	55.96
		SNCR	0 to 20 Years	38.00
			20 to 30 Years	40.63
			30 to 40 Years	49.87
			Greater than 40 Years	55.61
	Coal Scrubbed - Wet	No NO _x	0 to 20 Years	38.64
			20 to 30 Years	41.27
			30 to 40 Years	50.51
			Greater than 40 Years	56.25
		SCR	0 to 20 Years	39.24
			20 to 30 Years	41.87
			30 to 40 Years	51.11
			Greater than 40 Years	56.85
		SNCR	0 to 20 Years	38.89
			20 to 30 Years	41.52
			30 to 40 Years	50.76
			Greater than 40 Years	56.50
Coal Unscrubbed	No NO _x	0 to 20 Years	29.27	
		20 to 30 Years	31.90	
		30 to 40 Years	41.14	
		Greater than 40 Years	46.88	
	SCR	0 to 20 Years	29.87	
		20 to 30 Years	32.50	
		30 to 40 Years	41.74	
		Greater than 40 Years	47.48	
	SNCR	0 to 20 Years	29.52	
		20 to 30 Years	32.15	
		30 to 40 Years	41.39	
		Greater than 40 Years	47.13	
Oil & Gas Unscrubbed	No NO _x	0 to 20 Years	15.94	
		20 to 30 Years	19.26	
		30 to 40 Years	20.36	
		Greater than 40 Years	26.57	
	SCR	0 to 20 Years	16.76	
		20 to 30 Years	20.08	
		30 to 40 Years	21.18	
		Greater than 40 Years	27.39	
	SNCR	0 to 20 Years	16.12	
		20 to 30 Years	19.44	
		30 to 40 Years	20.54	
		Greater than 40 Years	26.75	
Wind	Wind	No NO _x	All Years	19.70
Wood/Biomass	Biomass	No NO _x	All Years	16.70

Table 4.10. Summary of Planned-Committed Units in EPA Base Case 2006

Type	Capacity (MW)	Year Range Described	Data Source
Renewables/Non Conventional			
Biomass	168	2005-2007	AEO 2006 Planned Renewables
Geothermal	269	2005-2015	AEO 2006 Planned Renewables
Hydro	156	2005-2013	AEO 2006 Planned Renewables
Landfill Gas	134	2005-2015	AEO 2006 Planned Renewables
Solar	526	2005-2030	AEO 2006 Planned Renewables
Wind	10,628	2005-2015	AEO 2006 Planned Renewables
Fossil/Conventional			
Coal Steam	11,272	2005-2010	Global Energy Decisions New Entrants Database (June 2006)
Oil/Gas Steam	12	2009	Global Energy Decisions New Entrants Database (June 2006)
Combined Cycle	24,763	2005-2009	Global Energy Decisions New Entrants Database (June 2006)
Combustion Turbine	5,959	2005-2009	Global Energy Decisions New Entrants Database (June 2006)
IGCC	600	2009	Global Energy Decisions New Entrants Database (June 2006)
Total	54,485		

Table 4.11. Planned-Committed Units by Model Region in EPA Base Case 2006

IPM Region	Unit Type	Number of Units	Capacity (MW)
AZNM	Biomass	1	3
AZNM	Coal Steam	1	400
AZNM	Combined Cycle	4	1,447
AZNM	Combustion Turbine	1	25
AZNM	Geothermal	1	10
AZNM	Hydro	1	3
AZNM	Landfill Gas	1	2
AZNM	Solar	55	91
AZNM	Wind	1	120
CA-N	Combined Cycle	2	2,373
CA-N	Combustion Turbine	2	235
CA-N	Geothermal	1	10
CA-N	Hydro	1	22
CA-N	Solar	24	114
CA-N	Wind	9	3,139
CA-S	Biomass	1	8
CA-S	Combined Cycle	2	4,227
CA-S	Combustion Turbine	2	138
CA-S	Hydro	1	1
CA-S	Solar	24	33
CA-S	Wind	1	50
COMD	Combustion Turbine	1	35
DSNY	Combined Cycle	1	750
ECAK	Coal Steam	2	536
ECAK	Combustion Turbine	1	160
ECAK	Landfill Gas	1	2
ECAM	Combustion Turbine	2	271
ECAM	IGCC	1	600
ECAM	Landfill Gas	1	2
ECAM	Wind	2	23
ENTG	Coal Steam	1	665
ENTG	Combined Cycle	2	523
ENTG	Combustion Turbine	4	720
ERCT	Coal Steam	4	2,950
ERCT	Combined Cycle	2	618
ERCT	Combustion Turbine	1	80
ERCT	Landfill Gas	10	50
ERCT	Solar	24	36
ERCT	Wind	16	3,615
FRCC	Biomass	1	25
FRCC	Combined Cycle	3	4,614
FRCC	Combustion Turbine	2	136
FRCC	Landfill Gas	1	19
LILC	Combined Cycle	1	116

Table 4.11. Planned-Committed Units by Model Region in EPA Base Case 2006

IPM Region	Unit Type	Number of Units	Capacity (MW)
LILC	Combustion Turbine	1	136
MACE	Combined Cycle	1	1,186
MACE	Landfill Gas	1	2
MACE	Wind	1	8
MACW	Landfill Gas	7	30
MACW	Wind	1	24
MANO	Coal Steam	1	200
MANO	Combustion Turbine	3	489
MANO	Wind	4	61
MECS	Hydro	1	0
MRO	Biomass	2	56
MRO	Coal Steam	2	1,453
MRO	Combined Cycle	6	1,545
MRO	Combustion Turbine	8	796
MRO	Hydro	1	9
ORO	Wind	20	884
NENG	Biomass	4	76
NENG	Combustion Turbine	1	0
NENG	Landfill Gas	3	9
NENG	Oil/Gas Steam	2	12
NENG	Solar	1	1
NENG	Wind	4	664
NWPE	Coal Steam	5	697
NWPE	Combined Cycle	1	779
NWPE	Combustion Turbine	3	385
NWPE	Geothermal	16	250
NWPE	Hydro	2	1
NWPE	Landfill Gas	1	1
NWPE	Wind	3	200
NYC	Combined Cycle	2	980
PNW	Combined Cycle	2	1,365
PNW	Combustion Turbine	1	160
PNW	Hydro	8	109
PNW	Wind	3	236
RMPA	Coal Steam	1	750
RMPA	Wind	6	64
SNV	Combined Cycle	1	1,200
SNV	Combustion Turbine	1	77
SNV	Solar	49	201
SNV	Wind	10	508
SOU	Combined Cycle	6	1,260
SOU	Combustion Turbine	1	69
SOU	Hydro	3	11
SOU	Landfill Gas	2	7
SPPN	Coal Steam	1	22
SPPN	Combustion Turbine	2	461

Table 4.11. Planned-Committed Units by Model Region in EPA Base Case 2006

IPM Region	Unit Type	Number of Units	Capacity (MW)
SPPN	Wind	2	153
SPPS	Coal Steam	1	660
SPPS	Combined Cycle	1	540
SPPS	Combustion Turbine	3	652
SPPS	Solar	24	51
SPPS	Wind	4	318
TVA	Wind	2	166
UPNY	Wind	1	198
VACA	Coal Steam	1	1,160
VACA	Combustion Turbine	1	84
VACA	Landfill Gas	4	8
WUMS	Coal Steam	4	1,779
WUMS	Combined Cycle	3	1,240
WUMS	Combustion Turbine	4	850
WUMS	Landfill Gas	2	4
WUMS	Wind	1	200
Total			54,485

Table 4.12. Regional Cost Adjustment Factors for Conventional and Renewable Generating Technologies

Model Region Name	Region Code	Regional Factor
Commonwealth Edison	COMD	1.004
East Central Area Reliability Coordination Agreement - MISO-KY	ECAK	1.004
East Central Area Reliability Coordination Agreement - MISO	ECAM	1.004
East Central Area Reliability Coordination Agreement - PJM	ECAP	1.004
Entergy	ENTG	0.96
Electric Reliability Council of Texas	ERCT	0.986
Florida Reliability Coordinating Council	FRCC	0.961
Long Island Lighting Company	LILC	1.879
Downstate New York	DSNY	1.043
New York City	NYC	1.989
Upstate New York	UPNY	1.043
Mid-Atlantic Area Council - East	MACE	0.996
Mid-Atlantic Area Council - South	MACS	0.996
Mid-Atlantic Area Council - West	MACW	0.996
Mid-America Interconnected Network - South	MANO	1.004
Michigan Electric Coordination System	MECS	1.004
Midwest Regional Planning Organization	MRO	1.004
New England Power Pool	NENG	1.145
Southern Company	SOU	0.96
Southwest Power Pool - North	SPPN	0.997
Southwest Power Pool - South	SPPS	0.997
Tennessee Valley Authority	TVA	0.96
Virginia-Carolinas	VACA	0.96
Dominion Virginia Power	VAPW	0.96
Wisconsin-Upper Michigan	WUMS	1.004
Western Electricity Coordinating Council - AZNMSNV	AZNM	1.003
Western Electricity Coordinating Council - California North	CA-N	1.058
Western Electricity Coordinating Council - California South	CA-S	1.058
Western Electricity Coordinating Council-Northwest Power Pool East	NWPE	1.026
Western Electricity Coordinating Council - Pacific Northwest	PNW	1.026
Western Electricity Coordinating Council - Rocky Mountain Power Area	RMPA	1.003
Western Electricity Coordinating Council - Southern Nevada	SNV	1.003

Table 4.13. Performance and Unit Cost Assumptions for Potential (New) Capacity from Conventional Fossil Technologies in EPA Base Case 2006

	Conventional Pulverized Coal - Wet Bituminous	Conventional Pulverized Coal - Dry	Integrated Gasification Combined Cycle	Advanced Combined Cycle	Advanced Combustion Turbine
Size (MW)	600	600	550	400	230
First Year Available	2010	2010	2010	2010	2010
Lead Time(years)	4	4	4	3	2
Vintage #1 (years covered)	2010-2014	2010-2014	2010-2014	2010-2014	2010-2014
Vintage #2 (years covered)	2015-2019	2015-2019	2015-2019	2015-2019	2015-2019
Vintage #3 (years covered)	2020-2024	2020-2024	2020-2024	2020-2024	2020-2024
Vintage #4 (years covered)	2025-2035	2025-2035	2025-2035	2025-2035	2025-2035
Availability	85%	85%	85%	87%	92%
Vintage #1					
Heat Rate (Btu/kWh)	8,763	8,763	7,939	6,577	8,920
Capital (2004\$/kW)	1,233	1,316	1,415	565	378
Fixed O&M (2004\$/kW/yr)	37.56	43.96	53.78	15.84	6.51
Variable O&M(2004\$/MWh) (2004\$/Mwh)	2.87 - 4.14	3.23 - 4.50	1.70 - 4.43	2.41 - 7.01	2.38 - 8.76
Vintage #2					
Heat Rate (Btu/kWh)	8,661	8,661	7,477	6,403	8,612
Capital (2004\$/kW)	1,217	1,300	1,386	555	369
Fixed O&M (2004\$/kW/yr)	37.56	43.96	53.78	15.84	6.51
Variable O&M(2004\$/MWh)	2.87 - 4.14	3.23 - 4.50	1.70 - 4.43	2.41 - 7.01	2.38 - 8.76
Vintage #3					
Heat Rate (Btu/kWh)	8,600	8,600	7,200	6,333	8,550
Capital (2004\$/kW)	1,199	1,281	1,340	532	347
Fixed O&M (2004\$/kW/yr)	37.56	43.96	53.78	15.84	6.51
Variable O&M(2004\$/MWh)	2.87 - 4.14	3.23 - 4.50	1.70 - 4.43	2.41 - 7.01	2.38 - 8.76
Vintage #4					
Heat Rate (Btu/kWh)	8,600	8,600	7,200	6,333	8,550
Capital Cost (2004\$/kW)	1,184	1,266	1,265	517	333
Fixed O&M (2004\$/kW/yr)	37.56	43.96	53.78	15.84	6.51
Variable O&M(2004\$/MWh)	2.87 - 4.14	3.23 - 4.50	1.70 - 4.43	2.41 - 7.01	2.38 - 8.76

Note: Since the Variable Operating and Maintenance costs of fossil-fired plants in EPA Base Case 2006 change according to the segment(s) of a load duration curve in which a plant operates; VOM is expressed as a range of values.

Table 4.14. Performance and Unit Cost Assumptions for Potential (New) Renewable and Non-Conventional Technology Capacity

	Biomass Gasification Combined Cycle	Wind	Fuel Cells	Solar Photovoltaic	Solar Thermal	Geothermal	Landfill Gas		
Size (MW)	80	50	10	5	100	50	30		
First Year Available	2010	2010	2010	2010	2010	2010	2010		
Lead Time (years)	4	3	3	2	3	4	3		
Vintage #1 (years covered)	2010 - 2035	2010 - 2035	2010 - 2035	2010 - 2035	2010 - 2035	2010 - 2035	2010 - 2035		
Availability	83%	95%	87%	90%	90%	87%	90%		
Generation capability	Economic Dispatch	Generation Profile	Economic Dispatch	Generation Profile	Generation Profile	Economic Dispatch	Economic Dispatch		
Vintage #1							Hi	Lo	VLo
Heat Rate (Btu/kWh)	8,911	--	7,930	--	--	29,261 - 397,035	13,648	13,648	13,648
Capital (2004\$/kW)	1,763	1,142 - 3,437	4,374	3,931	2,605	2024 - 96,566	1,495	1,883	2,899
Fixed O&M (200\$/kW/yr) ⁴	48.56	27.59	5.15	10.64	51.70	74 - 2,472	104.03	104.03	104.03
Variable O&M (2004\$/MWh)	3.13	0.00	43.64	0.00	0.00	0.00	0.01	0.01	0.01

Table 4.15. Terrain Cost Adjustment Factors for New Wind Plants

	Cost Class				
	1	2	3	4	5
Terrain Cost Adjustment Factor	1.0	1.2	1.5	2.0	3.0

Table 4.16. Regional Interconnection Costs for New Wind Plants

Region Code	Interconnection Cost (2004 \$/kW)
ECAM	7.3
ECAP	7.3
ECAK	7.3
MECS	7.3
ERCOT	7.9
MACE	8.8
MACW	8.8
MACS	8.8
WUMS	7.1
MANO	7.1
COMD	7.1
MRO	6.9
DSNY	7.4
UPNY	7.4
NENG	8.3
SOU	9.2
TVA	9.2
VACA	9.2
VAPW	9.2
ENTG	9.2
SPPN	8.7
SPPS	8.7
PNW	8.0
NWPE	8.0
AZNM	5.7
RMA	5.7
SNV	5.7
CA-N	8.6
CA-S	8.6

Table 4.17. Potential Geothermal Capacity and Cost Characteristics per Model Region

Model Region	Potential Capacity (MW)	Capital Cost (2004\$/kW)	FOM (2004\$/kW)
AZNM	807	2,793	116
AZNM	1,091	3,456	122
AZNM	813	3,603	172
AZNM	150	4,179	259
AZNM	200	4,771	259
AZNM	680	9,708	369
AZNM	120	14,263	437
AZNM	100	16,632	437
CA-N	750	2,470	125
CA-N	495	2,773	200
CA-N	400	6,083	237
CA-N	613	8,965	370
CA-N	635	20,277	819
CA-N	350	23,181	819
CA-S	200	3,520	148
CA-S	400	3,862	165
CA-S	330	11,274	418
CA-S	225	12,849	418
NWPE	837	4,396	154
NWPE	515	8,826	242
NWPE	85	13,219	364
NWPE	9	79,040	2,472
NWPE	20	96,566	2,472
NWPE	820	2,024	77
NWPE	334	2,955	115
NWPE	1,050	3,346	109
NWPE	654	3,787	127
NWPE	175	4,128	132
PNW	425	5,355	194
PNW	1,765	7,754	274
PNW	300	9,388	231
PNW	303	2,234	74
PNW	150	2,470	74
PNW	1,000	3,578	130
PNW	300	3,862	141
PNW	1,125	4,736	173
RMPA	200	2,324	99
RMPA	2,170	6,426	230
RMPA	200	7,297	254

Table 4.18. Regional Potential Wind Capacity (MW) by Wind and Cost Class in EPA Base Case 2006

NEMS Region	Wind Class	Cost Class 1	Cost Class 2	Cost Class 3	Cost Class 4	Cost Class 5
CNV	4	2,020	539	539	539	9,832
	5	872	232	232	232	4,241
	6	797	212	212	212	3,876
ECAR	4	322	322	322	322	1,934
	5	107	107	107	107	643
	6	47	47	47	47	281
ERCOT	4	11	8	18	11	4
	5	1,792	1,222	2,850	1,710	570
	6	26	18	41	25	8
MAAC	4	60	60	60	60	358
	5	18	18	18	18	105
	6	6	6	6	6	35
MAIN	4	1,604	401	401	401	1,203
	5	26	7	7	7	20
	6	0	0	0	0	0
MAPP	4	6,944	13,888	41,665	41,665	1,284,671
	5	1,467	2,933	8,800	8,800	271,337
	6	61	122	367	367	11,322
NE	4	449	449	898	898	1,797
	5	241	241	482	482	964
	6	279	279	559	559	1,118
NWP	4	8,380	14,414	9,386	1,676	301,354
	5	3,591	6,176	4,022	718	129,129
	6	2,084	3,585	2,334	417	74,948
NY	4	125	125	251	251	501
	5	31	31	61	61	122
	6	0	0	0	0	0
RA	4	3,839	3,839	7,679	19,197	157,415
	5	243	243	486	1,216	9,967
	6	62	62	124	309	2,536
SPP	4	3,085	6,170	18,511	18,511	570,760
	5	2	3	9	9	288
	6	0	0	1	1	35
STV	4	156	156	312	312	624
	5	60	60	119	119	239
	6	75	75	149	149	299
Total Potential Capacity		38,881	56,051	101,076	99,414	2,842,534

Table 4.19. Regional Assumptions on Potential Geothermal Electric Capacity

Region	Capacity (MW)
AZNM	3,961
CA-N	3,243
CA-S	1,155
NWPE	4,499
PNW	5,368
RMPA	2,570
Grand Total	20,796

Table 4.20. Regional Assumptions on Potential Electric Capacity from New Landfill Gas Units (MW)

NEMS Region	IPM Region	Class - LGHI	Class - LGLo	Class - LGVLo
ECAR	MECS, ECAP, ECAM, ECAK	72	30	539
ERCOT	ERCT	12	26	316
MAAC	MACE, MACW, MACS	93	22	311
MAIN	COMD, MANO, WUMS	83	92	495
MAPP	MRO	43	22	150
NY	DSNY, UPNY, LILC, NYC	54	27	142
NE	NENG	62	6	51
FL	FRCC	14	26	158
STV	SOU, TVA, VACA, VAPW, ENTG	68	22	447
SPP	SPPS, SPPN	5	0	185
NWP	PNW, NWPE	17	58	185
RA	AZNM, SNV, RMPA	0	0	91
CNV	CA-S, CA-N	131	250	749
US		654	581	3,819

Note: The potential electric capacity from new landfill gas units is based on AEO 2006, which applies the listed limits to the indicated NEMS (National Energy Modeling System) regions. In EPA Base Case 2006 the sum of the new landfill gas electric capacity in the IPM regions shown in a specific row cannot exceed the limits listed in that row. Capacity limits for three categories of potential landfill gas units are distinguished in this table based on the rate of methane production at sites: LGHI = high rate of landfill gas production, LGLo = low rate of landfill gas production, and LGVLo = very low rate of landfill gas production.

Table 4.21. Reserve Margin Contribution and Average Capacity Factor by Wind Class and Model Region

Model Region	Wind Class 6	Wind Class 5	Wind Class 4
AZNM	36%	33%	29%
CA-N	41%	38%	33%
CA-S	41%	38%	33%
COMD		40%	34%
DSNY		45%	39%
ECAK	48%	44%	38%
ECAM	49%	45%	39%
ECAP	48%	44%	38%
ENTG	45%	42%	36%
ERCT	43%	40%	35%
FRCC	39%	36%	31%
LILC	45%	41%	36%
MACE	43%	40%	34%
MACS	43%	40%	34%
MACW	43%	40%	34%
MANO		40%	35%
MECS	49%	46%	39%
MRO	39%	36%	31%
NENG	44%	40%	35%
NWPE	46%	43%	37%
NYC	45%	41%	36%
PNW	52%	48%	41%
RMPA	39%	36%	31%
SNV	35%	32%	28%
SOU	47%	43%	37%
SPPN	43%	40%	34%
SPPS	42%	39%	34%
TVA	48%	45%	39%
UPNY		47%	41%
VACA	47%	44%	38%
VAPW	49%	45%	39%
WUMS		44%	38%
Average Summer CF	36%	33%	28%
Average Winter CF	47%	44%	38%

Table 4.22. Reserve Margin Contribution and Average Capacity Factor by Model Region

Model Region	Solar Thermal			Solar Photovoltaic		
	Summer Average CF	Winter Average CF	Reserve Margin Contribution	Summer Average CF	Winter Average CF	Reserve Margin Contribution
AZNM	42%	33%	54%	28%	31%	39%
CA-N	51%	36%	61%	28%	27%	40%
CA-S	51%	36%	59%	28%	27%	38%
COMD				23%	23%	32%
DSNY				22%	20%	35%
ECAK				23%	21%	29%
ECAM				23%	21%	31%
ECAP				23%	21%	31%
ENTG				24%	25%	31%
ERCT	36%	30%	47%	25%	26%	35%
FRCC				24%	27%	35%
LILC				22%	20%	33%
MACE				22%	22%	31%
MACS				22%	22%	31%
MACW				22%	22%	31%
MANO				23%	23%	32%
MECS				23%	21%	33%
MRO	34%	21%	40%	24%	25%	36%
NENG				22%	23%	35%
NWPE	41%	26%	46%	26%	22%	37%
NYC				22%	20%	33%
PNW	41%	26%	37%	26%	22%	33%
RMPA	42%	33%	50%	28%	31%	41%
SNV	42%	33%	53%	28%	31%	37%
SOU				24%	25%	34%
SPPN	35%	25%	44%	25%	27%	35%
SPPS	35%	25%	41%	25%	27%	32%
TVA				24%	25%	31%
UPNY				22%	20%	31%
VACA				24%	25%	31%
VAPW				24%	25%	32%
WUMS				23%	23%	36%
Average	41%	30%	49%	24%	24%	34%

Table 4.23. Average Regional Nuclear Capacity Factors in EPA Base Case 2006

IPM Region/Year	2010	2015	2020	2025
AZNM	91.3%	91.3%	91.3%	91.3%
CA-N	90.6%	90.6%	90.6%	90.6%
CA-S	91.2%	91.2%	91.2%	91.2%
COMD	93.2%	93.2%	93.2%	93.2%
DSNY	82.0%	82.0%	82.0%	82.0%
ECAK	N/A	N/A	N/A	N/A
ECAM	89.6%	89.7%	89.7%	89.7%
ECAP	82.0%	82.0%	82.0%	82.0%
ENTG	90.2%	90.2%	90.2%	90.2%
ERCT	89.3%	90.5%	90.5%	90.5%
FRCC	92.8%	92.8%	92.8%	92.8%
LILC	N/A	N/A	N/A	N/A
MACE	90.5%	90.8%	90.8%	90.8%
MACS	89.1%	89.1%	89.1%	89.1%
MACW	92.1%	92.1%	92.1%	92.1%
MANO	90.4%	90.4%	90.4%	90.4%
MECS	82.8%	82.8%	82.8%	82.8%
MRO	86.9%	86.9%	86.9%	86.9%
NENG	87.9%	88.6%	88.6%	88.6%
NWPE	N/A	N/A	N/A	N/A
NYC	N/A	N/A	N/A	N/A
PNW	90.0%	90.0%	90.0%	90.0%
RMPA	N/A	N/A	N/A	N/A
SNV	N/A	N/A	N/A	N/A
SOU	92.0%	92.0%	92.0%	92.0%
SPPN	90.2%	90.2%	90.2%	90.2%
SPPS	N/A	N/A	N/A	N/A
TVA	90.1%	90.1%	90.1%	90.1%
UPNY	87.8%	87.8%	87.8%	87.8%
VACA	92.4%	92.7%	92.7%	92.7%
VAPW	87.6%	87.6%	87.6%	87.6%
WUMS	88.0%	88.0%	88.0%	88.0%
National Weighted Average	89.2%	89.3%	89.3%	89.3%

Table 4.24. Cost and Performance Assumptions for Repowering Options in EPA Base Case 2006

Repower Coal to Coal IGCC				
Size (MW)	100	250	500	1000
First Year Available	2010	2010	2010	2010
Lead Time (years)	4	4	4	4
Vintage #1 (years covered)	2010 and after	2010 and after	2010 and after	2010 and after
Availability	85%	85%	85%	85%
Repowering Ratio	66%	83%	93%	86%
Heat Rate (Btu/kWh)	8,458	8,352	8,282	8,114
Capital (2004\$/kW)	2,020	1,691	1,527	1,432
Fixed O&M (2004\$/kW-yr)	37.6	37.6	37.6	37.6
Variable O&M (2004\$/MWh)	2.02	2.02	2.02	2.02

Repower Coal and Oil & Gas Steam to Combined Cycle				
Size (MW)	100	250	500	1000
First Year Available	2010	2010	2010	2010
Lead Time (years)	4	4	4	4
Vintage #1 (years covered)	2010 and after	2010 and after	2010 and after	2010 and after
Availability	87%	87%	87%	87%
Repowering Ratio - Coal	208%	196%	187%	185%
Repowering Ratio - Oil & Gas	198%	186%	178%	176%
Heat Rate (Btu/kWh)	8,566	7,490	6,494	6,521
Capital (2004\$/kW)	698	585	537	513
Fixed O&M (2004\$/kW-yr)	15	15	15	15
Variable O&M (2004\$/MWh)	1.52	1.52	1.52	1.52

Appendix 4-1. Representative Wind Generation Profiles in EPA Base Case 2006

Illustrative* Hourly Generation Profile from Wind
(kWh of Generation per MW of Electricity)

	Wind Class				Wind Class		
	6	5	4		6	5	4
Winter Hour 1	431	398	344	Summer Hour 1	225	207	179
Winter Hour 2	431	398	344	Summer Hour 2	225	207	179
Winter Hour 3	431	398	344	Summer Hour 3	225	207	179
Winter Hour 4	431	398	344	Summer Hour 4	225	207	179
Winter Hour 5	431	398	344	Summer Hour 5	225	207	179
Winter Hour 6	447	411	355	Summer Hour 6	280	258	223
Winter Hour 7	447	411	355	Summer Hour 7	280	258	223
Winter Hour 8	575	530	458	Summer Hour 8	444	409	353
Winter Hour 9	575	530	458	Summer Hour 9	444	409	353
Winter Hour 10	575	530	458	Summer Hour 10	444	409	353
Winter Hour 11	575	530	458	Summer Hour 11	444	409	353
Winter Hour 12	575	530	458	Summer Hour 12	444	409	353
Winter Hour 13	575	530	458	Summer Hour 13	444	409	353
Winter Hour 14	575	530	458	Summer Hour 14	444	409	353
Winter Hour 15	575	530	458	Summer Hour 15	444	409	353
Winter Hour 16	575	530	458	Summer Hour 16	444	409	353
Winter Hour 17	575	530	458	Summer Hour 17	444	409	353
Winter Hour 18	575	530	458	Summer Hour 18	444	409	353
Winter Hour 19	447	411	355	Summer Hour 19	280	258	223
Winter Hour 20	447	411	355	Summer Hour 20	280	258	223
Winter Hour 21	447	411	355	Summer Hour 21	280	258	223
Winter Hour 22	447	411	355	Summer Hour 22	280	258	223
Winter Hour 23	447	411	355	Summer Hour 23	280	258	223
Winter Hour 24	447	411	355	Summer Hour 24	280	258	223
Winter Average	502	463	400	Summer Average	344	317	274

* Based on model region NWPE

Appendix 4-2. Representative Solar Generation Profiles in EPA Base Case 2006

(kWh of Generation per MW of Electricity)

	Solar			Solar	
	Solar Thermal	Photovoltaic		Solar Thermal	Photovoltaic
Winter Hour 1	2	0	Summer Hour 1	18	0
Winter Hour 2	2	0	Summer Hour 2	18	0
Winter Hour 3	2	0	Summer Hour 3	18	0
Winter Hour 4	2	0	Summer Hour 4	18	0
Winter Hour 5	2	0	Summer Hour 5	18	0
Winter Hour 6	129	22	Summer Hour 6	318	19
Winter Hour 7	129	22	Summer Hour 7	318	19
Winter Hour 8	482	466	Summer Hour 8	662	550
Winter Hour 9	482	466	Summer Hour 9	662	550
Winter Hour 10	482	466	Summer Hour 10	662	550
Winter Hour 11	482	466	Summer Hour 11	662	550
Winter Hour 12	482	466	Summer Hour 12	662	550
Winter Hour 13	482	466	Summer Hour 13	662	550
Winter Hour 14	482	466	Summer Hour 14	662	550
Winter Hour 15	482	466	Summer Hour 15	662	550
Winter Hour 16	482	466	Summer Hour 16	662	550
Winter Hour 17	482	466	Summer Hour 17	662	550
Winter Hour 18	482	466	Summer Hour 18	662	550
Winter Hour 19	129	22	Summer Hour 19	318	19
Winter Hour 20	129	22	Summer Hour 20	318	19
Winter Hour 21	129	22	Summer Hour 21	318	19
Winter Hour 22	129	22	Summer Hour 22	318	19
Winter Hour 23	129	22	Summer Hour 23	318	19
Winter Hour 24	129	22	Summer Hour 24	318	19
Winter Average	264	221	Summer Average	413	258

Appendix 4-3. Existing Nuclear Units in NEEDS 2006

Plant Name	Oris Code	Unit ID	Region Name	State Name	On-Line Year	Capacity (MW)	Heat Rate (Btu/kWh)
Browns Ferry	46	1	TVA	Alabama	1974	1,244	10,550
Browns Ferry	46	2	TVA	Alabama	1975	1,239	10,215
Browns Ferry	46	3	TVA	Alabama	1977	1,239	10,215
Clinton Power Station	204	1	MANO	Illinois	1987	1,043	10,107
Wolf Creek Generating Station	210	1	SPPN	Kansas	1985	1,166	10,107
San Onofre	360	2	CA-S	California	1983	1,070	10,107
San Onofre	360	3	CA-S	California	1984	1,080	10,107
Columbia Generating Station	371	2	PNW	Washington	1984	1,108	10,107
Millstone	566	2	NENG	Connecticut	1975	882	10,107
Millstone	566	3	NENG	Connecticut	1986	1,155	10,107
Turkey Point	621	3	FRCC	Florida	1972	693	10,107
Turkey Point	621	4	FRCC	Florida	1973	693	10,107
Crystal River	628	3	FRCC	Florida	1977	838	10,107
Vogtle	649	1	SOU	Georgia	1987	1,152	10,107
Vogtle	649	2	SOU	Georgia	1989	1,149	10,107
Dresden Generating Station	869	2	COMD	Illinois	1970	867	10,107
Dresden Generating Station	869	3	COMD	Illinois	1971	867	10,107
Quad Cities Generating Station	880	1	COMD	Illinois	1972	867	10,107
Quad Cities Generating Station	880	2	COMD	Illinois	1972	867	10,107
Duane Arnold	1060	1	MRO	Iowa	1975	562	10,107
Pilgrim Nuclear Power Station	1590	1	NENG	Massachusetts	1972	685	10,107
Palisades	1715	1	MECS	Michigan	1972	767	10,107
Fermi	1729	2	MECS	Michigan	1988	1,111	10,107
Monticello	1922	1	MRO	Minnesota	1971	569	10,107
Prairie Island	1925	1	MRO	Minnesota	1974	522	10,107
Prairie Island	1925	2	MRO	Minnesota	1974	522	10,107
Fort Calhoun	2289	1	MRO	Nebraska	1973	483	10,107
Oyster Creek	2388	1	MACE	New Jersey	1969	619	10,107
PSEG Salem Generating Station	2410	1	MACE	New Jersey	1977	1,174	10,107
PSEG Salem Generating Station	2410	2	MACE	New Jersey	1981	1,130	10,107
Indian Point 2	2497	2	DSNY	New York	1973	979	10,107
Nine Mile Point Nuclear Power Station	2589	1	UPNY	New York	1969	621	10,107
Nine Mile Point Nuclear Power Station	2589	2	UPNY	New York	1969	1,135	10,107
Peach Bottom	3166	2	MACW	Pennsylvania	1974	1,112	10,107
Peach Bottom	3166	3	MACW	Pennsylvania	1974	1,112	10,107
H B Robinson	3251	2	VACA	South Carolina	1971	724	10,107
Oconee	3265	1	VACA	South Carolina	1973	846	10,107
Oconee	3265	2	VACA	South Carolina	1974	846	10,107
Oconee	3265	3	VACA	South Carolina	1974	846	10,107
Vermont Yankee	3751	1	NENG	Vermont	1972	506	10,107
Surry	3806	1	VAPW	Virginia	1972	810	10,107
Surry	3806	2	VAPW	Virginia	1973	815	10,107
Point Beach	4046	1	WUMS	Wisconsin	1970	512	10,107
Point Beach	4046	2	WUMS	Wisconsin	1972	514	10,107
Waterford 3	4270	3	ENTG	Louisiana	1985	1,089	10,107
Donald C Cook	6000	1	ECAP	Michigan	1975	1,016	10,942
Donald C Cook	6000	2	ECAP	Michigan	1978	1,077	10,848
Joseph M Farley	6001	1	SOU	Alabama	1977	851	10,107
Joseph M Farley	6001	2	SOU	Alabama	1981	860	10,107
Palo Verde	6008	1	AZNM	Arizona	1986	1,317	10,107
Palo Verde	6008	2	AZNM	Arizona	1986	1,352	10,107
Palo Verde	6008	3	AZNM	Arizona	1988	1,317	10,107
Calvert Cliffs Nuclear Power Plant	6011	1	MACS	Maryland	1975	884	10,107
Calvert Cliffs Nuclear Power Plant	6011	2	MACS	Maryland	1977	873	10,107
Brunswick	6014	1	VACA	North Carolina	1977	919	10,107
Brunswick	6014	2	VACA	North Carolina	1975	940	10,107
Harris	6015	1	VACA	North Carolina	1987	900	10,107
Perry	6020	1	ECAM	Ohio	1987	1,235	11,000
Braidwood Generation Station	6022	1	COMD	Illinois	1988	1,201	10,107
Braidwood Generation Station	6022	2	COMD	Illinois	1988	1,175	10,107
Byron Generating Station	6023	1	COMD	Illinois	1985	1,164	10,107
Byron Generating Station	6023	2	COMD	Illinois	1987	1,158	10,107
LaSalle Generating Station	6026	1	COMD	Illinois	1984	1,118	10,107
LaSalle Generating Station	6026	2	COMD	Illinois	1984	1,120	10,107
Catawba	6036	1	VACA	South Carolina	1985	1,129	10,107
Catawba	6036	2	VACA	South Carolina	1986	1,151	10,107
McGuire	6038	1	VACA	North Carolina	1981	1,100	10,107
McGuire	6038	2	VACA	North Carolina	1984	1,100	10,107
Beaver Valley	6040	1	ECAP	Pennsylvania	1976	893	10,962
Beaver Valley	6040	2	ECAP	Pennsylvania	1987	900	10,946
St Lucie	6045	1	FRCC	Florida	1976	839	10,107
St Lucie	6045	2	FRCC	Florida	1983	839	10,107

Plant Name	Oris Code	Unit ID	Region Name	State Name	On-Line Year	Capacity MW	Heat Rate Btu/kWh
Edwin I Hatch	6051	1	SOU	Georgia	1975	869	10,107
Edwin I Hatch	6051	2	SOU	Georgia	1979	883	10,107
Grand Gulf	6072	1	SOU	Mississippi	1985	1,270	10,107
Diablo Canyon	6099	1	CA-N	California	1985	1,087	10,107
Diablo Canyon	6099	2	CA-N	California	1986	1,087	10,107
PPL Susquehanna	6103	1	MACW	Pennsylvania	1983	1,135	10,107
PPL Susquehanna	6103	2	MACW	Pennsylvania	1985	1,140	10,107
Limerick	6105	1	MACE	Pennsylvania	1986	1,134	10,107
Limerick	6105	2	MACE	Pennsylvania	1990	1,134	10,107
James A FitzPatrick	6110	1	UPNY	New York	1976	844	10,107
Seabrook	6115	1	NENG	New Hampshire	1990	1,239	10,107
PSEG Hope Creek Generating Station	6118	1	MACE	New Jersey	1986	1,069	10,107
Ginna	6122	1	UPNY	New York	1970	498	10,107
V C Summer	6127	1	VACA	South Carolina	1984	966	10,107
Comanche Peak	6145	1	ERCT	Texas	1990	1,185	10,240
Comanche Peak	6145	2	ERCT	Texas	1993	1,185	10,317
Davis-Besse	6149	1	ECAM	Ohio	1977	885	11,000
Sequoyah	6152	1	TVA	Tennessee	1981	1,150	10,123
Sequoyah	6152	2	TVA	Tennessee	1982	1,140	10,202
Callaway	6153	1	MANO	Missouri	1984	1,137	10,107
North Anna	6168	1	VAPW	Virginia	1978	925	10,107
North Anna	6168	2	VAPW	Virginia	1980	917	10,107
South Texas Project	6251	1	ERCT	Texas	1988	1,280	10,107
South Texas Project	6251	2	ERCT	Texas	1989	1,280	10,107
River Bend	6462	1	ENTG	Louisiana	1986	990	10,107
Watts Bar Nuclear Plant	7722	1	TVA	Tennessee	1996	1,121	10,266
Three Mile Island	8011	1	MACW	Pennsylvania	1974	810	10,107
Kewaunee	8024	1	WUMS	Wisconsin	1974	560	10,107
Cooper	8036	1	MRO	Nebraska	1974	766	10,107
Arkansas Nuclear One	8055	1	ENTG	Arkansas	1974	890	10,107
Arkansas Nuclear One	8055	2	ENTG	Arkansas	1980	996	10,107
Indian Point 3	8907	3	DSNY	New York	1976	991	10,107

Appendix 4-4. VOM and FOM Cost Assumptions for Existing Nuclear Units

Plant Name	ORIS Code	Unit ID	FOM (2004 \$/kW-yr)	VOM (2004 mills/kWh)
Browns Ferry	46	1	91.2	0.37
Browns Ferry	46	2	91.2	0.39
Browns Ferry	46	3	91.2	0.37
Clinton Power Station	204	1	182.8	0.89
Wolf Creek Generating	210	1	125.8	0.65
San Onofre	360	2	190.6	0.92
San Onofre	360	3	190.6	0.96
Columbia Generating	371	2	138.9	0.66
Millstone	566	2	187.7	1.00
Millstone	566	3	175.6	0.93
Turkey Point	621	3	134.1	0.61
Turkey Point	621	4	134.1	0.60
Crystal River	628	3	165.8	0.74
Vogtle	649	1	133.0	0.60
Vogtle	649	2	133.0	0.59
Dresden Generating Station	869	2	186.0	0.81
Dresden Generating Station	869	3	186.0	0.87
Quad Cities Generating	880	1	162.0	0.76
Quad Cities Generating	880	2	162.0	0.76
Duane Arnold	1060	1	190.4	1.01
Pilgrim Nuclear Power	1590	1	220.7	0.97
Palisades	1715	1	180.2	1.04
Fermi	1729	2	142.5	0.73
Monticello	1922	1	171.6	0.94
Prairie Island	1925	1	148.3	0.75
Prairie Island	1925	2	148.3	0.76
Fort Calhoun	2289	1	200.4	1.09
Oyster Creek	2388	1	233.1	1.07
PSEG Salem Generating	2410	1	146.1	0.71
PSEG Salem Generating	2410	2	146.1	0.72
Indian Point 2	2497	2	207.7	1.28
Nine Mile Point Nuclear	2589	1	176.8	0.90
Nine Mile Point Nuclear	2589	2	172.6	0.88
Peach Bottom	3166	2	157.8	0.74
Peach Bottom	3166	3	157.8	0.73
H B Robinson	3251	2	109.5	0.54
Oconee	3265	1	127.5	0.67
Oconee	3265	2	127.5	0.59
Oconee	3265	3	127.5	0.66
Vermont Yankee	3751	1	186.2	0.97
Surry	3806	1	110.3	0.53
Surry	3806	2	110.3	0.52
Point Beach	4046	1	184.8	0.88
Point Beach	4046	2	184.8	0.92
Waterford 3	4270	3	148.6	0.56
Donald C Cook	6000	1	159.8	0.96
Donald C Cook	6000	2	159.8	0.98
Joseph M Farley	6001	1	126.5	0.65
Joseph M Farley	6001	2	126.5	0.62
Palo Verde	6008	1	107.1	0.46
Palo Verde	6008	2	107.1	0.50
Palo Verde	6008	3	107.1	0.47

Plant Name	ORIS Code	Unit ID	FOM (2004 \$/kW-yr)	VOM (2004 mills/kWh)
Calvert Cliffs Nuclear	6011	1	141.8	0.69
Calvert Cliffs Nuclear	6011	2	141.8	0.66
Brunswick	6014	1	101.0	0.42
Brunswick	6014	2	101.0	0.42
Harris	6015	1	120.0	0.55
Perry	6020	1	146.2	0.73
Braidwood Generation	6022	1	118.5	0.52
Braidwood Generation	6022	2	118.5	0.54
Byron Generating Station	6023	1	115.5	0.52
Byron Generating Station	6023	2	115.5	0.51
La Salle Generating Station	6026	1	144.3	0.68
La Salle Generating Station	6026	2	144.3	0.70
Catawba	6036	1	122.4	0.59
Catawba	6036	2	122.4	0.58
McGuire	6038	1	109.3	0.44
McGuire	6038	2	109.3	0.45
Beaver Valley	6040	1	173.8	0.87
Beaver Valley	6040	2	173.8	0.82
St Lucie	6045	1	130.0	0.58
St Lucie	6045	2	130.0	0.64
Edwin I Hatch	6051	1	134.2	0.70
Edwin I Hatch	6051	2	134.2	0.71
Grand Gulf	6072	1	123.2	0.50
Diablo Canyon	6099	1	120.6	0.65
Diablo Canyon	6099	2	120.6	0.64
PPL Susquehanna	6103	1	157.3	0.81
PPL Susquehanna	6103	2	157.3	0.81
Limerick	6105	1	116.6	0.50
Limerick	6105	2	116.6	0.50
James A Fitzpatrick	6110	1	185.5	0.82
Seabrook	6115	1	163.3	0.86
PSEG Hope Creek	6118	1	134.8	0.77
R.E. Ginna Nuclear	6122	1	188.0	0.84
V C Summer	6127	1	131.1	0.73
Comanche Peak	6145	1	109.7	0.56
Comanche Peak	6145	2	109.7	0.57
Davis-Besse	6149	1	144.4	0.82
Sequoyah	6152	1	105.4	0.44
Sequoyah	6152	2	105.4	0.41
Callaway	6153	1	127.6	0.68
North Anna	6168	1	90.2	0.43
North Anna	6168	2	90.2	0.46
South Texas Project	6251	1	111.1	0.54
South Texas Project	6251	2	111.1	0.53
River Bend	6462	1	177.0	0.94
Watts Bar Nuclear Plant	7722	1	127.1	0.58
Three Mile Island	8011	1	156.1	0.75
Kewaunee	8024	1	138.4	0.78
Cooper	8036	1	204.3	1.18
Arkansas Nuclear One	8055	1	139.4	0.58
Arkansas Nuclear One	8055	2	139.4	0.60
Indian Point 3	8907	3	182.0	0.87

**Appendix 4-5. Nuclear Upratings and Scheduled Retirements (MW)
as Incorporated in EPA Base Case 2006 from AEO 2006**

Plant Name	Unit	Year of Uprate	Increase in Capacity (MW)
Vermont Yankee	1	2011	101
Surry	1	2018	97
Surry	2	2018	98
Harris	1	2015	63
Byron Generating Station	1	2015	81
Catawba	1	2010	23
McGuire	1	2015	165
McGuire	2	2016	165
St. Lucie	1	2010	17
St. Lucie	2	2010	17
Grand Gulf	1	2012	89
Limerick	1	2019	136
Limerick	2	2019	136
R.E. Ginna Nuclear	1	2014	85
North Anna	1	2014	139
North Anna	2	2015	138
Turkey Point	3	2013	14
Turkey Point	4	2010	14
South Texas Project	1	2016	154
South Texas Project	2	2017	154
Vogtle	1	2010	23
Vogtle	2	2010	23