Chapter 5: Baseline Projections of New Facilities

Introduction

Facilities regulated under the final section 316(b) New Facility Rule are new greenfield and stand-alone electric generators and manufacturing facilities that operate a new cooling water intake structure (CWIS) or a CWIS whose design capacity is increased, require a National Pollutant Discharge Elimination System (NPDES) permit, have a design intake flow of equal to or greater than two million gallons per day (MGD), and use at least 25 percent of their intake water for cooling purposes. The overall costs and economic impacts of the final rule depend on the number of new facilities subject to the rule and on the planned characteristics (i.e., construction, design, location, and capacity) of their CWISs. The projection of the number and characteristics of new facilities represents baseline conditions in the absence of the rule and identifies the facilities that will be subject to the final section 316(b) New Facility Rule.

Chapter Contents

This chapter presents forecasts of the number of new electric generators and manufacturing facilities subject to the final section 316(b) New Facility Rule that will begin operating between 2001 and 2020. The chapter consists of three sections. Section 5.1 presents the methodology and results of estimating the number and characteristics of new electric generating facilities. Section 5.2 presents the methodology and results of estimating the number of new manufacturing facilities. Each section discusses uncertainties about the estimated number and type of facilities that will be constructed in the future. The final section summarizes the results of the new baseline projections of facilities.

5.1 New Electric Generators

EPA estimates that 83 new electric generators subject to the final section 316(b) New Facility Rule will begin operation between 2001 and 2020. Of these, 69 are new combined-cycle facilities and 14 are new coal facilities.[1] This projection is based on a combination of national forecasts of new steam electric capacity additions and information on the characteristics of specific facilities that are planned for construction in the near future or that have been constructed in the recent past. Using these two types of information, EPA developed model facilities that provide the basis for estimating costs and economic impacts for electric generators throughout the remainder of this document.

[1] Combined-cycle facilities use an electric generating technology in which electricity is produced from otherwise lost waste heat exiting from one or more gas (combustion) turbines. The exiting heat is routed to a conventional boiler or to a heat recovery steam generator for utilization by a steam turbine to produce electricity. This process increases the efficiency of the electric generating unit.

5.1.1 Projected Number of New Facilities

EPA used four main data sources to project the number and characteristics of new steam electric generators subject to the final rule: (1) the Energy Information Administration's (EIA) *Annual Energy Outlook 2001* (AEO2001); (2) Resource Data International's (RDI) *NEWGen Database*, (3) EPA's section 316(b) industry survey of existing facilities; and (4) EIA's Form EIA-860A and 860B databases. The diagram in Figure 5-1 below presents the steps and data inputs required for EPA's estimate of the number of new in-scope electric generators. Also included are the values and the data sources of each input.

Figure 5-1: Estimation of the Number of New Steam Electric Generators, 2001 - 2020

Variable	Value		Source	
	Combined Cycle	Coal	Combined Cycle	Coal
Total Capacity Additions	203,985 MW	21,813 MW	AEO2001	
×				
% of Capacity Additions from New Facilities	87.7%	76.1%	NEWGen Database	
=				
Capacity Additions from New Facilities	178,894 MW	16,599 MW	Calculation	
÷				
Avg. Capacity New Facilities	741 MW	475 MW	NEWGen Database	EIA-860A and EIA-860B Databases
=				
Total # of New Facilities	241	35	Calculation	
×				
In-Scope %	28.6%	40.5%	EPA Research of NEWGen Facilities	§ 316(b) Industry Survey
=				
# New In-Scope Facilities	69	14	Calculation	

Source: U.S. EPA analysis, 2001.

The following sections provide detail on each data source used in this analysis and the calculations necessary to derive the numbers presented in the diagram. The final subsection, 5.1.1.e, summarizes how EPA combined the information from the different data sources to calculate the number of new combined-cycle and coal facilities.

a. Annual Energy Outlook 2001

The Annual Energy Outlook (AEO) is published annually by the U.S. Department of Energy's Energy Information Administration (EIA) and presents forecasts of energy supply, demand, and prices. These forecasts are based on results generated from EIA's National Energy Modeling System (NEMS, U.S. DOE, 2000a). The NEMS system generates

projections based on known levels of technological capabilities, technological and demographic trends, and current laws and regulations. Other key projections are made regarding the pricing and availability of fossil fuels, levels of economic growth, and trends in energy consumption. The AEO projections are used by Federal, State, and local governments, trade associations, and other planners and decision-makers in both the public and private sectors. EPA used the most recent forecast of capacity additions between 2001 and 2020 (presented in the AEO2001) to estimate the number of new combined-cycle and coal-fired steam electric plants.

The AEO2001 presents forecasts of both planned and unplanned capacity additions between 2001 and 2020 for eight facility types (coal steam, other fossil steam, combined-cycle, combustion turbine/diesel, nuclear, pumped storage/other, fuel cells and renewables). EPA has determined that only facilities that employ a steam electric cycle require significant quantities of cooling water and are thus potentially affected by the final section 316(b) New Facility Rule. As a result, this analysis considers capacity additions associated with coal steam, other fossil steam, combined-cycle, and nuclear facilities only. In its Reference Case, the AEO2001 forecasts total capacity additions of 370 GW from all facility types between 2001 and 2020.[2] Coal steam facilities account for 22 GW, or 6 percent of the total forecast, and combined-cycle facilities account for 204 GW, or 55 percent. The remaining capacity additions, 39 percent of the total, come from non-steam facility types. Based on all available data in the rulemaking record, EPA projects no new additions for nuclear and other fossil steam capacity.

Table 5-1 below presents the forecasted capacity additions between 2001 and 2020 from the Reference Case of the AEO2001. Section 5.A.2 in the Appendix to this chapter contains additional information on the AEO forecast, including capacity additions by year; Section 5.A.5 contains information on the distribution of the forecasted combined-cycle capacity additions by North American Electric Reliability Council (NERC) region.

Table 5-1: AEO2001 Capacity Addition Forecasts by Facility Type (2001 - 2020)

Facility Type	Capacity Addition (MW)	Percent of Total Additions
Coal Steam	21,813	6%
Other Fossil Steam[a]	0	0%
Combined-Cycle	203,985	55%
Nuclear	0	0%
Total Steam Electric Capacity Additions	***225,798***	***61%***
Combustion Turbine/Diesel	136,085	37%
Pumped Storage/Other[b]	0	0%
Fuel Cells	289	< 1%
Renewable[c]	8,209	2%
Total Capacity Additions	**370,381**	**100%**

[a] Includes oil-, gas-, and dual-fired capability.
[b] Other includes methane, propane gas, and blast furnace gas for utilities; and hydrogen, sulfur, batteries, chemicals, fish oil, and spent sulfite liquor.
[c] Includes conventional hydroelectric, geothermal, wood, wood waste, municipal solid waste, other biomass, solar thermal, photovoltaics, and wind power.

Source: Adapted from U.S. DOE, 2001a (Supplement Table 72)

[2] Among other model parameters, the AEO2001 Reference Case assumes economic growth of 3 percent and electricity demand growth of 1.8 percent.

b. NEWGen database

The NEWGen database is created and regularly updated by Resource Data International's (RDI) Energy Industry Consulting Practice. The database provides detailed facility-level data on electric generation projects, including new (greenfield and stand-alone) facilities and additions and modifications to existing facilities, proposed over the next several years. Information in the NEWGen database includes: generating technology, fuel type, generation capacity, owner and holding company, electric interconnection, project status, on-line dates, and other operational details. The majority of the information contained in this database is obtained from trade journals, developers, local authorities, siting boards, and state environmental agencies.

EPA used the February 2001 version of the NEWGen database to develop model facilities for the economic analysis of electric generators. Specifically, the database was used to:

- calculate the percentage of total combined-cycle capacity additions and the percentage of total coal capacity additions derived from new (greenfield and stand-alone) facilities;
- estimate the in-scope percentage of new combined-cycle facilities; and
- determine the technical, operational, and ownership characteristics of new in-scope combined-cycle facilities.

The first step in the NEWGen database analysis was to identify the electric generation projects of interest to the final section 316(b) New Facility Rule. EPA screened the database by state, project status, and facility type to eliminate projects that are out of the scope of this rule. The next subsection presents EPA's screening analysis. The following subsections present a description of each of the three uses of the NEWGen database listed above.

❖ *NEWGen screening analysis*

The February 2001 version of the NEWGen database contains 941 electric generation projects. EPA screened each of these facilities with respect to the following criteria:

- ***State:*** Only facilities located within the United States are affected by the final section 316(b) New Facility Rule. EPA did not consider facilities located in Canada or Mexico in this analysis.

- ***Project status:*** EPA considered only those projects that are "Under Construction," "Operating," in "Early Development," or in "Advanced Development." The analysis did not consider projects that were "Canceled" or "Tabled" because those projects are unlikely to be completed.

- ***Facility type:*** Only facilities that employ a steam electric cycle use substantial amounts of cooling water and are therefore of interest to the analysis of the final section 316(b) New Facility Rule. Since the AEO2001, discussed in Section 5.1.1.a above, only predicts steam electric capacity additions at combined-cycle and coal steam facilities, EPA's analysis only considered these two types of projects listed in the NEWGen database.[3]

Of the 941 projects in the NEWGen database, 383 combined-cycle facilities and 26 coal facilities passed these three screening criteria. EPA furthermore differentiated between projects at "New Plants" (i.e., greenfield or stand-alone) and those at "Existing Facilities." Table 5-2 summarizes the results of the screening analysis.

[3] Facility types considered for the combined-cycle analysis include "Comb Cycle," "CC/Cogen," and "CT/Cogen." Facility types considered for the coal analysis include "Coal Boiler" and "Coal Boiler/Cogen."

Table 5-2: Number of New Projects Identified in the NEWGen Screening Analysis			
Facility Type	**New Plants [a]**	**Existing Facilities**	**Total**
Combined-Cycle	320	63	383
Coal	16	10	26
Total	336	73	409

[a] The number of new plants include facilities in scope and out of scope of the New Facility Rule.

Source: RDI, 2001.

❖ ***Percentage of capacity additions derived from new facilities***

The first step in estimating the capacity additions derived from new facilities is to determine their share of the projected total new capacity of both new facilities and existing facilities (see diagram in Figure 5-1 above). The NEWGen database provides this information for both combined-cycle and coal facilities. Together, new facilities and existing facilities with capacity additions constitute all of the proposed capacity additions associated with combined-cycle and coal facilities. Table 5-3 below presents the size of the new and existing facilities identified in the screening analysis as well as the percentage of total capacity associated with new and existing facilities of each type. The table shows that for both combined-cycle and coal facilities, the vast majority of capacity additions, 88 percent and 76 percent, respectively, come from new facilities.

Table 5-3: Share of Capacity Additions from New (Greenfield and Stand-alone) Facilities						
Facility Type	**Number of Facilities**		**Steam Capacity (MW)**		**Percent of Total Capacity**	
	New	**Existing**	**New**	**Existing**	**New**	**Existing**
Combined-Cycle	320	63	223,868	31,531	**87.7%**	12.3%
Coal	16	10	9,339	2,930	**76.1%**	23.9%

Source: RDI, 2001.

While information on both new and existing plants as well as both combined-cycle and coal plants was used to determine the percentage of capacity additions derived from new (greenfield and stand alone) facilities, all subsequent analyses of the NEWGen database only consider the **320 new combined-cycle plants**. Projects at "Existing Facilities," which may include capacity additions and modifications, will be addressed under the Phase II or Phase III section 316(b) rules for existing facilities (to be proposed in February of 2002 and June of 2003, respectively) and are therefore not of interest to the analysis of the final section 316(b) New Facility Rule. In addition, because the total number of new coal plants identified in the NEWGen database (16) is small, EPA found it more reliable to use the section 316(b) Industry Survey, described in Section 5.1.1.c below, to estimate the in-scope percentage, capacity, and technology characteristics for coal plants subject to the final section 316(b) New Facility Rule. The survey included far more facilities over a longer period of time, providing better information on the characteristics of coal plants.

❖ ***In-scope percentage of new combined-cycle facilities***

Identification of facilities within the scope of the final section 316(b) New Facility Rule requires information on the source and quantity of cooling water used by each of the 320 new combined-cycle facilities that passed the screening analysis. Only limited information on cooling water use was available in the NEWGen database. As a result, EPA obtained cooling water information through extensive research of public data sources such as state permitting authorities and public utility

departments. This research revealed information on cooling water use for 199 of the 320 new combined-cycle facilities.[4]

Each of the 199 greenfield or stand-alone combined-cycle facilities for which cooling water information was available was subsequently screened with respect to the following criteria to identify those facilities in scope of the final section 316(b) New Facility Rule:

- ***Cooling Water Source:*** The facility withdraws from a water of the United States;
- ***New or Modified CWIS:*** The facility uses a new or modified CWIS;[5]
- ***NPDES Permit:*** The facility holds or requires an NPDES permit; and
- ***Design Intake Capacity:*** The facility has a design intake capacity equal to or greater than two million gallons per day (MGD).

The analysis of the permit applications showed that 57 of the 199 facilities with cooling water information, or 28.6 percent, meet all four criteria, and thus fall within the scope of the final section 316(b) New Facility Rule. Table 5-4 presents the results of this analysis. The table also provides an indication of why each of the remaining 142 facilities was determined to be out of scope of the final rule. The table indicates that the vast majority (93 percent) of the 142 out of scope facilities do not withdraw from waters of the U.S. For more information on cooling water sources of the 199 facilities, see Section 5.A.3 in the Appendix to this chapter.

Table 5-4: In Scope Status of NEWGen Combined-Cycle Facilities

In Scope Status	Number of Facilities	Percent of Facilities
In Scope	57	28.6%
Out of Scope	142	71.4%
Does not withdraw from waters of the U.S.[a]	*132*	*93.0%*
Existing CWIS with no increase in design capacity	*7*	*4.9%*
No NPDES permit	*2*	*1.4%*
Design intake flow less than 2 MGD	*1*	*0.7%*

[a] Includes 22 facilities that employ a dry cooling technology.

Source: U.S. EPA analysis of information from state permitting authorities, 2001, and RDI, 2001.

Most of the remaining discussion of the NEWGen database analysis focuses on the 57 in-scope combined-cycle facilities. The average steam capacity (in MW) of the 199 facilities with cooling water information is required to estimate the total number of projected new combined-cycle facilities. Table 5-5 below summarizes the proposed average steam electric generating capacity of the 199 NEWGen facilities, by in-scope status. The table shows that the average capacity of all 199 facilities is 741 MW (the average capacity for in-scope facilities is 747 MW, while the average for out of scope facilities is 739 MW).

[4] Facilities for which cooling water information is not available are not disregarded when determining overall impacts from the final rule. The methodology of estimating the number of new combined-cycle facilities is based on the overall new capacity projected by the AEO2001, and the distribution of characteristics of facilities for which cooling water information was available (see Section 5.1.1.e below). EPA applied those percentages to an estimate of the number of new facilities based on energy demand to determine the number of in-scope facilities. The total number of facilities that may experience costs and an economic impact under the final section 316(b) New Facility Rule is therefore independent of the absolute number of NEWGen facilities for which cooling water information is available.

[5] A modified CWIS is an existing CWIS whose design intake capacity is increased to accommodate the additional cooling water needs of the new facility.

Table 5-5: Average Size of NEWGen Combined-Cycle Facilities			
In Scope Status	**Number of Facilities**	**Steam Capacity (MW)**	**Average Steam Capacity (MW)**
In Scope	57	42,563	747
Out of Scope	142	104,892	739
Total	199	147,455	**741**

Source: U.S. EPA analysis of information from state permitting authorities, 2001, and RDI, 2001.

❖ ***Characteristics of in-scope NEWGen facilities***

The final use of the NEWGen database in the analysis of new combined-cycle facilities was to characterize the facilities' cooling water use characteristics. The costing analysis for the final section 316(b) New Facility Rule depends in part on two factors: the facility's cooling water source (i.e., freshwater or marine water) and its baseline cooling system type (i.e., once-through or recirculating system).[6] Table 5-6 presents the distribution of the 57 in-scope facilities by these two characteristics. For more information on the types of water bodies from which the 57 NEWGen facilities propose to withdraw cooling water, see Section 5.A.4 in the Appendix to this chapter.

Table 5-6: In-Scope NEWGen Combined-Cycle Facilities by Water Body Type and Cooling System Type								
	Recirculating		**Once Through**		**Unknown**		**Total**	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Marine	3	5%	3	5%	3	5%	9	16%
Freshwater	33	58%	0	0%	15	26%	48	84%
Total	***36***	***63%***	***3***	***5%***	***18***	***32%***	***57***	***100%***

Source: U.S. EPA analysis of information from state permitting authorities, 2001, and RDI, 2001.

Table 5-6 shows that the majority of in-scope facilities, 36, or 63 percent, propose to use a recirculating cooling system in the baseline, while only three facilities, or five percent, plan to build a once-through system. For 18 facilities, or 32 percent, the cooling system type was unknown.[7] Forty-eight of the 57 in-scope facilities propose to withdraw from a freshwater source, while nine will withdraw from a marine source.

c. Section 316(b) Industry Survey of Existing Facilities

The NEWGen database discussed in the previous section contained information on only 16 new (greenfield and stand-alone) coal facilities. EPA believes that information from EPA's section 316(b) industry survey of existing facilities (U.S. EPA, 2000) was more reliable for estimating characteristics of new coal facilities projected over the 2001-2020 analysis period because it included far more plants over a longer time period.

- The **screener questionnaire** was sent to 1,050 nonutility plants and 1,550 manufacturing facilities in January 1999.
- The **detailed questionnaire** was sent to 280 utility electric generation plants, 52 nonutility electric generation plants, and 320 manufacturing plants in January 2000.

[6] Marine sources of cooling water include oceans, estuaries, and tidal rivers. Facilities using marine sources of cooling water may not always achieve the high recycle rates obtainable by using freshwater for cooling. Thus, facilities using marine waters may have higher costs associated with pumping greater volumes of make-up water.

[7] How these 18 facilities were integrated into the analysis is described in Section 5.1.2.a below.

- The **short technical questionnaire** was sent to 637 utility plants that did not receive a detailed questionnaire in January 2000.

All three survey instruments requested technical information, including the facility's in-scope status, cooling system type, intake flow, and source water body. In addition, the screener questionnaire and the detailed questionnaire also requested economic and financial information. For more information on the three survey instruments, see *Information Collection Request; Detailed Industry Questionnaires: Phase II Cooling Water Intake Structures* (U.S. EPA, 1999).

EPA used the following survey data on coal plants constructed during the past 20 years to project the number and characteristics of new (greenfield and stand-alone) coal facilities:[8]

- **In-scope status:** The three survey instruments identified 111 unique coal-fired facilities that began commercial operation between 1980 and 1999. Of the 111 facilities, 45, or 40.5 percent, would be in scope of the final section 316(b) New Facility Rule if they had been new facilities.[9]
- **Water body type:** Of the 45 in scope facilities, 42 withdraw cooling water from a freshwater body while three withdraw from a marine water body.
- **Cooling system type:** The 45 in scope facilities have the following cooling system types: 28 recirculating, nine once-through, four recirculating with a cooling lake or pond, and four with a combination system.

In developing model coal facilities, EPA only considered those existing survey plants that have a once-through system, a recirculating system, or a recirculating system with a cooling lake or pond. Table 5-7 below presents the distribution of the 41 in-scope facilities that meet these cooling system criteria by water body type and cooling system type.

Table 5-7: Survey Coal Facilities by Water Body Type and Cooling System Type

	Recirculating		Recirculating with Lake		Once-Through		Total	
	No.	%	No.	%	No.	%	No.	%
Marine	3	7%	0	0%	0	0%	3	7%
Freshwater	25	61%	4	10%	9	22%	38	93%
Total	***28***	***68%***	***4***	***10%***	***9***	***22%***	***41***	***100%***

Source: U.S. EPA analysis, 2001.

d. EIA databases

In addition to the section 316(b) industry survey of existing facilities, EPA used two of EIA's electricity databases in the analysis of projected new coal plants: Form EIA-860A, *Annual Electric Generator Report – Utility* and Form EIA-860B, *Annual Electric Generator Report – Nonutility* (U.S. DOE, 1998a; U.S. DOE, 1998b). EPA used these databases for three purposes:

- **Identify which of the surveyed electric generators are "coal" plants:** EPA used the prime mover and the primary energy source, reported in the EIA databases, to determine if a surveyed facility is a coal plant. Only plants that only have coal units were considered in this analysis.
- **Identify coal plants constructed during the past 20 years:** Both EIA databases request the in-service date of each unit. Of the surveyed facilities, 111 coal-fired plants began commercial operation between 1980 and 1999.

[8] Coal plants constructed during the past 20 years were identified from Forms EIA-860A and EIA-860B. See discussion in subsection 5.1.1.d below.

[9] For convenience, these 45 existing facilities that would be subject to the final section 316(b) New Facility Rule if they were *new* facilities, are referred to as the 45 "in-scope" facilities, although as existing facilities, they will not in fact be subject to the rule.

- **Determine the average size of new coal plants:** The 111 identified coal plants have an average nameplate rating of 475 MW.[10]

e. Summary of the number of new facilities

EPA estimated the number of projected new combined-cycle and coal plants using information from the four data sources described in subsections 5.1.1.a to 5.1.1.d above. EPA used the U.S. Department of Energy's estimate of new capacity additions (combined-cycle: 204 GW, coal: 22 GW) and multiplied it by the percentage of capacity additions that will be built at new facilities (combined-cycle: 88%, coal: 76%) to determine the new capacity that will be constructed at new facilities (combined-cycle: 179 GW, coal: 17 GW). EPA then divided this value by the average facility size (combined-cycle: 741 MW, coal: 475 MW) to determine the total number of potential new facilities (combined-cycle: 241, coal: 35; both in scope and out-of-scope of the section 316(b) New Facility Rule). Finally, based on EPA's estimate of the percentage of facilities that meet the two MGD flow threshold (combined-cycle: 28.6%, coal: 40.5%), EPA estimates there will be 69 new in-scope combined-cycle facilities and 14 new coal facilities over the 2001–2020 period. These calculations are summarized in Figure 5-1 at the beginning of Section 5.1.1.

5.1.2 Development of Model Facilities

The final step in the baseline projection of new electric generators was the development of model facilities for the costing and economic impact analyses. This step required translating characteristics of the analyzed combined-cycle and coal facilities into characteristics of the 83 projected new facilities. The characteristics of interest are: (1) the type of water body from which the intake structure withdraws (freshwater or marine water); (2) the facility's type of cooling system (once-through or recirculating system); and (3) the facility's steam electric generating capacity. The following two subsections discuss how EPA developed model facilities for combined-cycle and coal facilities, respectively.

a. Combined-cycle facilities

EPA's analysis projected 69 new in-scope combined-cycle facilities. Cooling water and economic characteristics of these 69 facilities were determined based on the characteristics of the 57 in-scope NEWGen facilities.[11] EPA developed six model facility types based on the 57 facilities' combinations of source water body and type of cooling system. Within each source water body/cooling system group, EPA created between one and three model facilities, depending on the number of facilities within that group and the range of their steam electric capacities. For example, there were 48 NEWGen facilities that plan to withdraw from a freshwater body and build a recirculating system. Their steam electric capacities ranged from 165 MW to 1,600 MW. EPA sorted the 48 facilities by their capacity and divided them into three groups of approximately equal size. For each group, the average facility size was calculated. The model facility based on the NEWGen facilities in the first group represents freshwater/recirculating facilities with a relatively small generating capacity (439 MW); the second model facility represents freshwater/recirculating facilities with a medium generating capacity (699 MW); and the third model facility represents freshwater/recirculating facilities with a relatively large generating capacity (1,061 MW). The same approach was taken to develop model facilities that withdraw from a marine water body and/or plan to install a once-through system.

Based on the distribution of the 57 NEWGen facilities by source water body group, cooling system type, and size group, EPA determined how many of the 69 projected new facilities are represented by each of the six model facility types. Table 5-9 below presents the six model facility types, their estimated steam electric capacity, the number of NEWGen facilities upon which each model facility type was based, and the number of projected new facilities that belong to each type. Section 5.A.6 in the Appendix to this chapter provides more detail on the 57 NEWGen facilities and the model facility assignment of the 69 projected new facilities.

[10] The average capacity for in-scope coal facilities is 763 MW, while the average for out-of-scope coal facilities is 278 MW.

[11] As shown in Table 5.6 above, EPA could determine the water body type for all 57 in-scope facilities but did not have information on the cooling system type for 18 facilities. Since all freshwater facilities with a known cooling system type propose to build a recirculating system, EPA assumed that the 15 freshwater facilities with an unknown cooling system type will also build a recirculating system. For marine facilities, EPA assumed that two of the three facilities with an unknown system type would build a recirculating system in the baseline while one would build a once-through system.

Table 5-9: Combined-Cycle Model Facilities

Model Facility Type	Cooling System Type	Source Water Body	Steam Electric Capacity (MW)	Number of NEWGen Facilities	Number of Projected New Facilities
CC OT/M-1	Once-Through	Marine	1,031	4	5
CC R/M-1	Recirculating	Marine	489	4	5
CC R/M-2	Recirculating	Marine	1,030	1	1
CC R/FW-1	Recirculating	Freshwater	439	15	18
CC R/FW-2	Recirculating	Freshwater	699	17	21
CC R/FW-3	Recirculating	Freshwater	1,061	16	19
Total				**57**	**69**

Source: U.S. EPA analysis, 2001.

b. Coal facilities

EPA's analysis projected 14 new in-scope coal facilities. The same approach was used to assign cooling water and economic characteristics to these 14 facilities as was used for combined-cycle facilities (see discussion in the previous section). EPA determined the characteristics of the 14 projected new coal facilities based on the characteristics of the 41 existing in-scope coal facilities presented in Table 5-7 above. EPA developed eight model facility types based on the 41 facilities' source water body and their type of cooling system. Within each source water body/cooling system group, EPA created between one and three model facilities, depending on the number of facilities within that group and the range of their steam electric capacities. Based on the distribution of the 41 survey facilities by source water body group, cooling system type, and size group, EPA determined how many of the 14 projected new coal facilities are represented by each of the eight model facility types. Table 5-10 below presents the eight model facility types, their estimated steam electric capacity, the number of survey facilities upon which each model facility type was based, and the number of projected new coal facilities that are represented by each type. Section 5.A.7 in the Appendix to this chapter provides more detail on the 14 survey facilities and the model facility assignment of the 14 projected new coal facilities.

Table 5-10: Coal Model Facilities

Model Facility Type	Cooling System Type	Source Water Body	Steam Electric Capacity (MW)	Number of Existing Survey Facilities	Number of Projected New Facilities
Coal R/M-1	Recirculating	Marine	812	3	1
Coal OT/FW-1	Once-Through	Freshwater	63	3	1
Coal OT/FW-2	Once-Through	Freshwater	515	5	1
Coal OT/FW-3	Once-Through	Freshwater	3,564	1	1
Coal R/FW-1	Recirculating	Freshwater	173	10	3
Coal R/FW-2	Recirculating	Freshwater	625	7	3
Coal R/FW-3	Recirculating	Freshwater	1,564	8	3
Coal RL/FW-1	Recirculating with Lake[a]	Freshwater	660	4	1
Total				**41**	**14**

[a] For this analysis, recirculating facilities with cooling lakes are assumed to exhibit characteristics like a once-through facility.

Source: U.S. EPA analysis, 2001.

5.1.3 Summary of Forecasts for New Electric Generators

EPA estimates that a total of 276 new steam electric generators will begin operation between 2001 and 2020. Of the total number of new plants, EPA projects that 83 will be in scope of the final section 316(b) New Facility Rule. Sixty-nine are expected to be combined-cycle facilities and 14 coal-fired facilities. Table 5-11 summarizes the results of the analysis.

Table 5-11: Number of Projected New Electric Generators (2001 to 2020)

Facility Type	Total Number of New Facilities	Facilities In Scope of the Final Rule						
		Recirculating		Recirc. with Lake		Once-Through		Total
		Freshwater	Marine	Freshwater	Marine	Freshwater	Marine	
Combined-Cycle	241	58	6	0	0	0	5	69
Coal	35	9	1	1	0	3	0	14
Total	276	67	7	1	0	3	5	83

Source: U.S. EPA analysis, 2001.

5.1.4 Uncertainties and Limitations

There are unavoidable uncertainties associated with EPA's estimation of the number of new electric generators that will be subject to the final section 316(b) New Facility Rule. While 20-year projections about economic and technological trends are always challenging, this is particularly the case for the electric generating industry which is in the middle of a major restructuring as the result of ongoing industry deregulation. In this analysis, EPA has used the best information available to reasonably estimate the costs and economic impacts of this rule. This analysis employs the following assumptions:

- **The AEO2001 accurately forecasts new capacity additions.** EPA believes that the AEO2001, developed using the Department of Energy's (DOE) National Energy Modeling System (NEMS), represents the best information on future capacity trends currently available. Its results are well reviewed and documented, publicly available, and widely accepted. However, new technology developments, changes in energy costs, or economic growth rates different from those projected in AEO2001 could result in different actual capacity trends.[12]

- **Future combined-cycle facilities will be the same size as NEWGen combined-cycle facilities planned for the near future.** The average size of the analyzed NEWGen combined-cycle facilities is 741 MW. EPA believes that this estimate is reasonable because it is consistent with DOE's forecast of the average size of a new combined-cycle unit of approximately 360 MW (U.S. DOE, 2000b, Table 43).[13] According to DOE, new combined-cycle facilities generally have more than one unit (Beamon, 2001a). If new facilities had two units on average, the average new combined-cycle facility would have a generating capacity of approximately 720 MW.

- **Future coal facilities will be the same size as coal facilities constructed during the past 20 years.** The average size of the analyzed coal facilities is 475 MW, which is somewhat smaller than DOE's forecast of the size of a new coal facility (U.S. DOE, 2000b, Table 43).[14] DOE estimates that a new coal unit would be 400 MW and that a coal facility would generally have more than one unit (Beamon, 2001b). However, using a smaller average size would result in an overestimate of the number of new coal facilities, not an underestimate. The results of EPA's analysis are therefore conservative.

- **Future facilities will have the same cooling water characteristics as the analyzed existing facilities.** EPA estimates that 28.6 percent of new combined-cycle facilities and 40.5 percent of new coal facilities will be subject to the final section 316(b) New Facility Rule as a result of their cooling water characteristics. In addition, EPA estimates that 93 percent of all new combined-cycle facilities and 71 percent of all new coal facilities will install a recirculating system in the baseline. EPA believes that the high projected use of recirculating systems reflects a trend towards increasing consciousness in many parts of the country of the value of aquatic resources and the need to conserve water. As a result, EPA expects that these characteristics are not short-term phenomena that are tied to economic conditions but represent developments that are likely to continue beyond the current business cycle. The Agency therefore believes that the projected number of new in-scope facilities and their projected cooling system types are realistic.

For the reasons listed above, EPA has a fairly high degree of confidence in its overall projection of the number of new electric generation facilities.

[12] The Department of Energy (DOE) believes that there has been a change in the forecast of new capacity additions since the publication of the AEO2001. In specific, DOE believes that 185 GW of new combined-cycle capacity (instead of 204 GW) and 30 GW of new coal capacity (instead of 22 GW) will begin operation between 2001 and 2020. EPA recalculated the projected number of new combined-cycle and coal facilities using these alternative projections. This re-analysis resulted in an decrease in the number of combined-cycle facilities from 241 to 219. The number of in-scope combined-cycle facilities decreased from 69 to 63. The total number of coal facilities increased from 35 to 48. The number of in-scope coal facilities increased from 14 to 19. The six in-scope combined-cycle facilities that are no longer projected are all estimated to employ recirculating systems in the baseline. Of the five additional coal facilities, four are estimated to operate a recirculating system and one a once-through system in the baseline. This change in capacity forecasts would further result in an increase in the total annualized cost for new coal facilities from $21.4 to $23.7 million and a decrease in the total annualized cost for new combined-cycle facilities from $13.3 to $12.8 million. Overall annualized costs for the final rule would increase from $47.7 to $49.5 million. See Chapter 6: Facility Compliance Costs for the calculation of annualized costs incurred under the final rule.

[13] DOE projects three types of new combined-cycle units: integrated coal-gasification combined-cycle (428 MW), conventional gas/oil combined-cycle (250 MW), and advanced oil/gas combined-cycle (400 MW). The average size of all three types is approximately 360 MW.

[14] DOE only projects one type of new coal unit: conventional pulverized coal (400 MW).

5.2 New Manufacturing Facilities

EPA estimates that 38 new manufacturing facilities subject to the final section 316(b) New Facility Rule will begin operation between 2001 and 2020. Of the 38 facilities, 22 are chemical facilities, ten are steel facilities, two are petroleum refineries, two are paper mills, and two are aluminum facilities.[15] The projection is based on a combination of industry-specific forecasts and information on the characteristics of existing manufacturing facilities.

As described in Chapter 4, the recent slowdown in the U.S. economy has not yet been fully reflected in published forecasts for various industries. The Congressional Budget Office is continuing to forecast modest GDP growth for 2002 and after, but acknowledges that there is substantial uncertainly in its forecasts. To the extent that overall economic growth is overstated by current forecasts, the industry-specific growth rates used in this chapter may also be overstated, which will result in an overstatement of the number of new facilities that will be subject to requirements of the final section 316(b) New Facility Rule.

5.2.1 Methodology

EPA used several steps to estimate the number of new manufacturing facilities subject to the final rule. For each industry sector, EPA:

- identified the SIC codes with potential new in-scope facilities;
- obtained industry growth forecasts;
- determined the share of growth from new (greenfield and stand-alone) facilities;
- projected the number of new facilities;
- determined cooling water characteristics of existing facilities; and
- developed model facilities.

The remainder of this section briefly outlines each of these six steps. Section 5.2.2 describes the baseline projections of new manufacturing facilities for each of the five industry sectors.[16]

a. SIC codes with potential new in-scope facilities

EPA used results from the section 316(b) *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* to identify the SIC codes within each of the five industry sectors that are likely to have one or more new (greenfield and stand-alone) facilities subject to the final section 316(b) New Facility Rule. SIC codes that were included in this analysis are those that, based on the Detailed Industry Questionnaire, have at least one existing facility that meets the in-scope criteria of the final rule. Facilities meet the in-scope criteria of the final rule if they:

- use a CWIS to withdraw from a water of the U.S.;
- hold an NPDES permit;
- withdraw at least two million gallons per day (MGD); and
- use 25 percent or more of their intake flow for cooling purposes.[17]

[15] Data on industrial water use, presented in Chapter 2, showed that the Paper and Allied Products (SIC 26), Chemicals and Allied Products (SIC 28), Petroleum and Coal Products (SIC 29), and Primary Metals (SIC 33) industry sectors account for more than 90 percent of the water used for cooling purposes in the manufacturing sector. Other industry sectors draw relatively small volumes of water for cooling purposes, and it is unlikely that significant numbers of facilities in these industries will exceed the two MGD threshold. This baseline projection of new manufacturing facilities and the subsequent economic analyses therefore focus on these four sectors.

[16] This analysis divides the Primary Metals sector (SIC 33) into two subsectors: steel (SIC 331) and aluminum (SIC 333/335). Section 5.2.2 therefore discusses five separate sectors, not four.

[17] For convenience, existing facilities that meet the criteria of the final section 316(b) New Facility Rule are referred to as "existing in-scope facilities" or "in-scope survey respondents." As existing facilities, they will not in fact be subject to the rule. However, they would be subject to the final section 316(b) New Facility Rule if they were *new* facilities.

For each SIC code with at least one in-scope survey respondent, EPA estimated the total number of facilities in the SIC code (based on the sample weighted estimate from EPA's section 316(b) industry survey of existing facilities), and the number and percentage of in-scope survey respondents.

b. Industry growth forecasts

Forecasts of the number of new (greenfield and stand-alone) facilities that will be built in the various industrial sectors are generally not available over the 20-year time period required for this analysis. Projected growth rates for value of shipments in each industry were used to project future growth in capacity. A number of sources provided forecasts, including the annual *U.S. Industry Trade & Industry Outlook (2000)*, the *Assumptions to the Annual Energy Outlook 2001*, and other sources specific to each industry.[18] EPA assumed that the growth in capacity will equal growth in the value of shipments, except where industry-specific information supported alternative assumptions.

c. Share of growth from new facilities

There are three possible sources of industry growth: (1) construction of new (greenfield and stand-alone) facilities; (2) higher or more efficient utilization of existing capacity; and (3) capacity expansions at existing facilities. Where available, information from industry sources provided the basis for estimating the potential for construction of new facilities. Where this information was not available, EPA assumed as a default that 50 percent of the projected growth in capacity will be attributed to new facilities. This assumption likely overstates the actual number of new (greenfield and stand-alone) facilities that will be constructed.

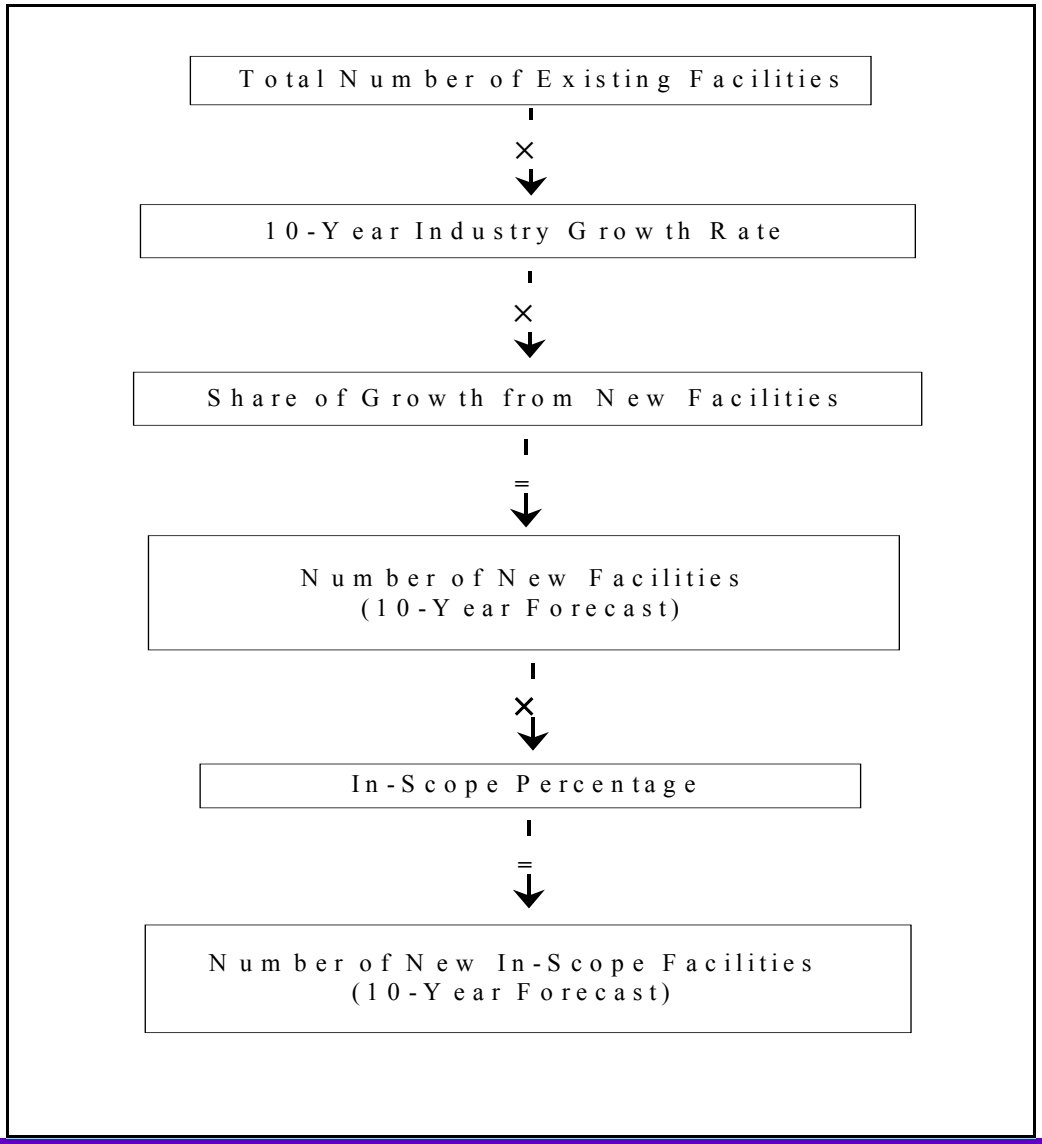
d. Projected number of new facilities

EPA projected the number of new facilities in each SIC code by multiplying the total number of existing facilities by the forecasted 10-year growth rate for that SIC code. The resulting value was then multiplied by the share of growth from new facilities to derive the total number of new facilities over ten years. However, not all of the projected new facilities will be subject to requirements of the final section 316(b) New Facility Rule. Information on the likely water use characteristics of new facilities that will determine their in-scope status under the final rule is generally not available for future manufacturing facilities. EPA assumed that the characteristics of new facilities will be similar to the characteristics of existing survey respondents (i.e., the percentage of new facilities subject to the final rule would be the same as the percentage of existing facilities that meet the rule's in-scope criteria). Using this assumption, EPA calculated the number of new in-scope facilities by multiplying the 10-year forecast of new facilities by the in-scope percentage of existing facilities. To derive the 20-year estimate, both the estimated total number of new facilities and the estimated number of new in-scope facilities were doubled. This approach most likely overstates the number of new facilities that will incur regulatory costs, because new facilities may be more likely than existing ones to recycle water and to use cooling water sources other than a water body of the U.S.

The diagram in Figure 5-2 below presents the steps and data inputs required for EPA's 10-year projection of the number of new manufacturing facilities in each SIC code.

[18] The Reference section at the end of this chapter presents a complete list of the data sources used in this baseline projection.

Figure 5-2: Estimation of the Number of New Manufacturing Facilities, 2001 - 2010



Source: U.S. EPA analysis, 2001.

e. Cooling water characteristics of existing in-scope facilities

EPA used information from EPA's section 316(b) *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* to determine the characteristics of the in-scope survey respondents. The survey requested technical information, including the facility's cooling system type, source water body, and intake flow in addition to economic and financial information.[19] Cooling water characteristics of interest to the analysis are the facility's baseline cooling system type (i.e., once-through or recirculating system) and its cooling water source (i.e., freshwater or marine water). In addition, the facility's design intake flow was used in the costing analysis.

[19] For more information on the survey instrument, see *Information Collection Request; Detailed Industry Questionnaires: Phase II Cooling Water Intake Structures* (U.S. EPA, 1999).

f. Development of model facilities

The final step in the baseline projection of new manufacturing facilities was the development of model facilities for the costing and economic impact analyses. This step required translating characteristics of the existing in-scope facilities into characteristics of the projected new facilities. Again, the characteristics of interest are: (1) the facility's type of cooling system in the baseline (once-through or recirculating system) and (2) the type of water body from which the intake structure withdraws (freshwater or marine water). EPA developed one model facility for each cooling system/water body combination within each 4-digit SIC code. Based on the distribution of the in-scope survey respondents by cooling system type and source water body, EPA assigned the projected new in-scope facilities to model facility types.

5.2.2 Projected Number of New Manufacturing Facilities

a. Paper and Allied Products (SIC 26)

❖ ***SIC codes with potential new in-scope facilities***

EPA's *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* identified five 4-digit SIC codes in the Paper and Allied Products industry (SIC code 26) with at least one existing facility that operates a CWIS, holds a NPDES permit, withdraws at least two million gallons per day (MGD) from a water of the U.S., and uses 25 percent or more of its intake flow for cooling purposes. Table 5-12 below presents the total number of existing facilities, the number of in-scope questionnaire respondents, and the in-scope percentage for each of the five SIC codes.

Table 5-12: Section 316(b) Facilities in the Paper and Allied Products Industry (SIC 26)

SIC Code	SIC Description	Total Number of Existing Facilities	In-Scope Survey Respondents	
			No.	%
2611	Pulp Mills	60	26	43.6%
2621	Paper Mills	290	74	25.4%
2631	Paperboard Mills	190	43	22.4%
2676	Sanitary Paper Products	4	2	50.0%
2679	Converted Paper and Paperboard Products, Not Elsewhere Classified	19	3	14.2%
	Total SIC 26	**562**	**147**	**26.1%**

Source: U.S. EPA, 2000; OMB, 1987.

EPA analyzed these industry segments to estimate the number of new in-scope facilities in the Paper and Allied Products Industry.

❖ ***Projected growth in shipments***

Shipments of pulp and paper products are closely tied to the overall state of the U.S. and world economies. The growth in sales will be linked to increased foreign demand as exports continue to be the major end use. Industry sources project the following growth rates for the different segments of the market (McGraw-Hill, 2000):

- Pulp mill shipments (SIC code 2611) are expected to increase by 1.75 percent annually over the 5-year period 2000 through 2004, with most of the growth representing increased exports.
- Shipments from the paper and paperboard mills sector (SIC codes 2621 and 2631) are expected to increase by about 1.8 percent annually from 2000 through 2004.
- No specific forecasts for sanitary paper products (SIC codes 2676 and 2679) are available. EPA therefore assumed that between 2001 and 2020, shipments from these facilities will grow at the same rate as the overall U.S. GDP, or 3.0 percent annually (U.S. DOE, 2000b).

❖ ***Share of growth from new facilities***

According to the S&P Paper and Forest Products Industry Survey (S&P, 2000), most sectors of the paper industry have been consolidating in an attempt to achieve profit growth in a mature industry. Many companies have shut down some older, less cost-efficient plants, but are reluctant to invest in major new capacity that would lead to oversupply in the market. Most companies that have increased operating capacity in recent years have taken over existing mills rather than construct new mills. Those firms that cannot find a merger partner or an acquirable mill are often modernizing existing facilities rather than constructing a major new facility.

According to the annual capacity survey released in late 2000 by the American Forest & Paper Association (AF&PA), U.S. capacity to produce paper and paperboard will increase by an annual average of 0.7 percent over the period 2001 to 2003 (S&P, 2000). This increase is well below the average annual rate of 2.1 percent during the previous 10 years. The AF&PA survey cites several factors to explain the slow growth in capacity, including a highly competitive trade environment for some grades, competing demands for the industry's capital, and mill and machine shutdowns. Although most conditions influencing the industry are conducive to some growth, certain grades are experiencing reduced demand. Standard and Poor's estimates that six percent of U.S. containerboard capacity was shut down between late 1998 and early 1999 (S&P, 2000). The recent decline in investment in new capacity is likely to continue. Any growth in production in the pulp, paper, and paperboard mill sectors (SIC codes 2611, 2621, and 2631) will likely result from increased efficiency at existing facilities, reopening of capacity that is currently idle, or perhaps rebuilding or expanding existing facilities (Stanley, 2000; Jensen, 2000). Therefore, EPA assumed that none of the projected growth in these industries would result from new (greenfield and stand-alone) facilities.

Substantial growth has occurred in the secondary fiber deink sector since 1990. The number of deink facilities has grown from 43 (1990) to about 77 over the past ten years. The sanitary paper products sector (SIC 2676) potentially includes deink facilities and may therefore experience construction of new greenfield and stand-alone facilities. EPA does not expect these new deink facilities to be in scope of the final section 316(b) New Facility Rule, however, because evidence suggests that cooling water intake flows of stand-alone deink facilities are well below the two MGD minimum flow threshold of the final section 316(b) New Facility Rule (Wisconsin Tissues, 1999) The existing facilities in SIC 2676 identified in the detailed questionnaire all have intake flows substantially above two MGD, and are therefore likely to be in the non-deink part of SIC 2676. No growth is projected for new non-deink facilities in SIC 2676.

❖ ***Projected number of new facilities***

Table 5-13 presents the number of existing facilities in the five analyzed SIC codes, the projected industry growth (annual growth rate and compounded growth rate over ten years), the share of growth from new facilities, and the number of projected new facilities (total and in-scope). To calculate the number of projected new facilities, EPA applied the industry-specific 10-year growth rate and the percentage of capacity growth from new facilities to the total number of existing facilities. Based on its research, EPA believes that none of the projected growth in these industries would result from new (greenfield and stand-alone) facilities. However, in comments on the proposed section 316(b) New Facility Rule, the American Forestry and Paper Association (AF&PA) stated that one or two new greenfield and stand-alone paper mills are expected to be built over the next decade. In response to this comment, EPA assumed that two new in-scope paper mills (SIC code 2621) would be subject to the final section 316(b) New Facility Rule.

Table 5-13: Projected Number of New Paper Facilities (SIC 26)

SIC Code	Total Number of Existing Facilities	Projected Industry Growth Rate			Estimated Number of New Facilities[b]				
					10-Year Forecast (2001-2010)			20-Year Forecast (2001-2020)[c]	
		Annual	Over 10 Years[a]	Share of Growth from New Facilities	Total	In-Scope Percentage	In-Scope	Total	In-Scope
2611	60	1.75%	18.94%	0.0%	0	43.6%	0	0	0
2621	290	1.80%	19.53%	0.0%	1	--	1	2	2
2631	190	1.80%	19.53%	0.0%	0	22.4%	0	0	0
2676[d]	4	3.00%	34.39%	0.0%	0	50.0%	0	0	0
2679	19	3.00%	34.39%	0.0%	0	14.2%	0	0	0
Total	**562**				**1**	**26.1%**	**1**	**2**	**2**

[a] Total percentage growth over 10 years, based on the forecasted annual growth rate [(1 + Annual Rate)^{10} - 1].
[b] EPA's forecast methodology does not project any new in-scope facilities for this SIC code. This projection is based on a comment submitted by the AF&PA.
[c] Equal to 2 * the 10-Year Forecast.
[d] Facilities in this SIC code are assumed to be facilities other than deink facilities.

Source: U.S. EPA analysis, 2001.

❖ *Characteristics of existing facilities*

EPA used information from EPA's section 316(b) *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* to estimate characteristics of the new in-scope manufacturing facilities projected over the 2001-2020 analysis period. The survey requested technical information, including the facility's cooling system type, source water body, and intake flow in addition to economic and financial information.

EPA used the following survey data on existing in-scope paper mills (SIC code 2621) to project characteristics of the two new (greenfield and stand-alone) facilities:[20]

- **Cooling system type:** There were 74 existing in-scope paper mills. These 74 facilities have the following cooling system types: 36 once-through, three recirculating, 13 combination system, and 21 other system types.
- **Water body type:** Of the 74 in-scope facilities, 71 withdraw cooling water from a freshwater body while two withdraw from a marine water body. One paper mill withdraws water from both a freshwater and marine water body.

In developing model manufacturing facilities, EPA only considered those existing survey plants that have a once-through system, a recirculating system, or a combination system. For this analysis, EPA classified facilities with a combination system as once-through and facilities withdrawing from both water body types as marine, providing for a conservative estimate. Table 5-14 below presents the distribution of the 53 in-scope facilities that meet these cooling system criteria by cooling system type and source water body.

[20] The numbers in this section may not add up to totals because the survey facilities are sample-weighted and rounded.

Table 5-14: Existing Paper Mill Facilities by Water Body Type and Cooling System Type (SIC 2621)

SIC	Recirculating				Once-Through				Total	
	Freshwater		Marine		Freshwater		Marine			
	No.	%	No.	%	No.	%	No.	%	No.	%
2621	3	6%	0	0%	47	88%	3	5%	53	100%

Source: U.S. EPA, 2000; U.S. EPA analysis, 2001.

❖ ***Development of model facilities***

This analysis assumes that two new in-scope paper mills (SIC code 2621) will begin operation during the next 20 years. The distribution of existing facilities across water body and cooling system types showed that 88 percent of all existing in-scope paper mills operate a once-through system and withdraw from a freshwater body. EPA therefore assumed that both projected new in-scope paper mills will be freshwater facilities with a once-through system. Table 5-15 below presents the model facility type, the number of in-scope survey facilities upon which the model facility type was based, and the number of projected new facilities that belong to that model type.

Table 5-15: SIC 26 Model Facilities

Model Facility Type	SIC Code	Cooling System Type	Source Water Body	Number of In-Scope Survey Respondents	Number of New In-Scope Facilities
MAN OT/F-2621	2621	Once-Through	Freshwater	47	2

Source: U.S. EPA analysis, 2001.

b. Chemicals and Allied Products Industry (SIC 28)

❖ ***SIC codes with potential new in-scope facilities***

EPA's *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* identified fifteen 4-digit SIC codes in the Chemicals and Allied Products Industry (SIC 28) with at least one existing facility that operates a CWIS, holds a NPDES permit, withdraws at least two million gallons per day (MGD) from a water of the U.S., and uses 25 percent or more of its intake flow for cooling purposes. Table 5-16 below presents the total number of existing facilities, the number of in-scope questionnaire respondents, and the in-scope percentage for each of the 15 SIC codes.

Table 5-16: Section 316(b) Facilities in the Chemicals and Allied Products Industry (SIC 28)

SIC Code	SIC Description	Total Number of Existing Facilities	In-Scope Survey Respondents	
			No.	%
2812	Alkalies and Chlorine	28	20	68.7%
2813	Industrial Gases	110	4	3.9%
2816	Inorganic Pigments	26	4	16.7%
2819	Industrial Inorganic Chemicals, Not Elsewhere Classified	271	33	12.2%
2821	Plastics Material and Synthetic Resins, and Nonvulcanizable Elastomers	305	15	4.8%
2823	Cellulosic Manmade Fibers	7	1	17.9%
2824	Manmade Organic Fibers, Except Cellulosic	36	9	24.1%
2833	Medicinal Chemicals and Botanical Products	33	3	9.9%
2834	Pharmaceutical Preparations	91	4	4.7%
2841	Soaps and Other Detergents, Except Speciality Cleaners	36	4	12.0%
2865	Cyclic Organic Crudes and Intermediates, and Organic Dyes and Pigments	59	4	7.3%
2869	Industrial Organic Chemicals, Not Elsewhere Classified	364	48	13.1%
2873	Nitrogenous Fertilizers	60	9	14.4%
2874	Phosphatic Fertilizers	41	1	2.9%
2899	Chemicals and Chemical Preparations, Not Elsewhere Classified	162	4	2.7%
	Total SIC 28	**1,629**	**164**	**10.0%**

Source: U.S. EPA, 2000; OMB, 1987.

EPA analyzed each of these 15 industry segments to estimate the number of new in-scope facilities in the Chemicals and Allied Products Industry.

❖ ***Projected growth in shipments***

The Kline *Guide to the U.S. Chemical Industry* projects that shipments of the products from the chemical industry will generally follow the pattern of overall industrial growth over the next decade (Kline, 1999). The American Chemistry Council (previously known as Chemical Manufacturers Association (CMA)) reported that most chemical companies have been experiencing tough competition, with strong downward pressure on pricing, the loss of some export markets, and growing over-capacity. In response to an uncertain outlook for global chemical demand, firms are accelerating the pace of restructuring, joint ventures and mergers. Industry consolidation, competition, and continuing globalization has led to excess capacity for many products and generally lower profitability than in the past (S&P, 2001b). Chemicals industry performance is cyclical, reflecting trends in domestic and foreign economies, input prices, and fluctuations in operating rates. The industry's performance was strong through most of 2000, but fell sharply at the end of 2000 and early 2001, due to rising

feedstock and energy prices, lower manufacturing demand, and lower operating rates. (S&P, 2001b). Forecasts of growth vary by sector, with lower growth forecast for commodity chemicals and higher growth expected for plastics. In particular, , industry sources project the following growth rates for value of shipments in different chemicals market segments:

- Shipments of industrial gases (SIC code 2813) are projected to grow at a rate of 2.8 percent annually through 2003, while the rest of the inorganic chemicals sector (SIC code 281) will grow at a rate of 1.9 percent annually (Kline, 1999).[21]

- Shipments in the plastics industry (SIC code 2821) are forecasted to grow by more than 4 percent annually through 2003 (McGraw-Hill, 2000; Kline, 1999).

- Research at proposal showed that man-made fibers production (SIC codes 2823 and 2824) is expected to grow by 1.9 percent annually through 2000 (McGraw-Hill, 1999). Since that forecast, growth in the man-made fiber industry has slowed down to no growth in the value of industry shipments between 1998 and 1999 (McGraw-Hill, 2000). In the absence of a newer growth projection, EPA continued to use the original annual growth estimate of 1.9 percent for the final rule analysis.

- Medicinal chemicals shipments (SIC code 2833) are expected to grow by 2.8 percent per year through 2003. The growth will be fueled by increased demand for new products (McGraw-Hill, 2000).

- Research at proposal showed that growth in shipments of U.S. pharmaceutical products (SIC 2834) are projected to average "in the mid-single digits" for five years (McGraw-Hill, 1999). A more current forecast predicts the industry to have a positive growth rate for the next five years (McGraw-Hill, 2000). Since no more specific information was available, EPA continued to use the original annual growth estimate of 5 percent for SIC 2834 for the final rule analysis.

- Shipments of soaps and detergents (SIC 2841) are projected to increase by 2.4 percent per year through 2003 (Kline, 1999).

- Basic petrochemical shipments (SIC 2865) are expected to grow by 3.3 annually through 2003 (Kline, 1999). S&P forecasts that long-term shipment growth for ethylene, the largest-volume organic chemical produced in the U.S., will grow 3 to 4 percent annually (S&P, 2001b). This is consistent with Kline's forecast that the entire industry will grow by 3.3 percent annually.

- Shipments of industrial organic chemicals not elsewhere classified (SIC 2869) are projected to increase by almost 3 percent annually through 2004 (McGraw-Hill, 2000).

- Shipments of fertilizers are projected to increase by 2.4 percent annually through 2003 (Kline, 1999). The fertilizer industry (SICs 2873 and 2874) reflects a modest projected growth in the underlying American farm economy (McGraw-Hill, 2000).

- Shipments of miscellaneous chemicals (SIC 2899) are expected to increase by 3 percent annually through 2003 (McGraw-Hill, 2000).

[21] SIC code 281 is officially titled "Industrial Inorganic Chemicals." However, to avoid confusion with SIC code 2819, "Industrial Inorganic Chemicals, Not Elsewhere Classified," this chapter will refer to SIC code 281 as the "Inorganic Chemicals sector."

❖ ***Share of growth from new facilities***

In their comments on the proposed section 316(b) New Facility Rule, the American Chemistry Council commented that EPA overestimated the number of new in-scope chemical facilities in the proposal analysis because the percent of growth that comes from new facilities (50 percent) was overstated. The comment did not provide an alternative estimate. For this analysis, EPA therefore reduced its estimate by half and assumed that the growth in capacity that will come from new chemical facilities will be 25 percent.[22]

❖ ***Projected number of new facilities***

Table 5-17 presents the number of existing facilities in the 15 analyzed SIC codes, the projected industry growth (annual growth rate and compounded growth rate over ten years), the share of growth from new facilities, and the number of projected new facilities (total and in-scope). To calculate the number of projected new facilities, EPA applied the industry-specific 10-year growth rate and the percentage of capacity growth from new facilities to the total number of existing facilities. EPA then applied the in-scope percentage (based on information from the section 316(b) *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures*) to the 10-year forecast of new facilities to derive the projected number of new in-scope facilities over 10 years. Both the number of new facilities and the number of new in-scope facilities were doubled to calculate the 20-year projection. EPA estimates that 282 new facilities will be constructed in the relevant SIC code 28 segments over the next 20 years. Of these, 22 are expected to be in scope of the final section 316(b) New Facility Rule. Eight of the in-scope facilities are expected to produce industrial organics (SIC code 2869), four are plastics manufacturing facilities (SIC code 2821), and four are industrial inorganic chemical facilities (SIC code 2819). In addition, two new in-scope facilities are projected in each of the following sectors: alkalies and chlorine (SIC code 2812), pharmaceutical preparations (SIC code 2834), and nitrogenous fertilizers (SIC code 2873).

[22] EPA also estimated the projected number of new chemical facilities if 37.5 percent (the midpoint between 25 percent used for the final rule analysis and 50 percent used for the proposal analysis) of growth was assumed to come from new facilities. Using this alternative assumption would increase the number of projected new chemical facilities from 22 to 40. Total annualized costs for chemical facilities would increase from $6.8 million to $11.1 million. Overall annualized costs for the final rule would increase from $47.7 million to 52.0 million. See *Chapter 6: Facility Compliance Costs* for the calculation of annualized costs incurred under the final rule.

Table 5-17: Projected Number of New Chemical Facilities (SIC 28)

SIC Code	Total Number of Existing Facilities	Projected Industry Growth Rate			Estimated Number of New Facilities				
					10-Year Forecast (2001-2010)			20-Year Forecast (2001-2020)[d]	
		Annual	Over 10 Years[a]	Share of Growth from New Facilities	Total[b]	In-Scope Percentage	In-Scope[c]	Total	In-Scope
2812	28	1.9%	20.7%	25.0%	1	68.7%	1	2	2
2813	110	2.8%	31.8%	25.0%	9	3.9%	0	18	0
2816	26	1.9%	20.7%	25.0%	1	16.7%	0	2	0
2819	271	1.9%	20.7%	25.0%	14	12.2%	2	28	4
2821	305	4.0%	48.0%	25.0%	37	4.8%	2	74	4
2823	7	1.9%	20.7%	25.0%	0	17.9%	0	0	0
2824	36	1.9%	20.7%	25.0%	2	24.1%	0	4	0
2833	33	2.8%	31.8%	25.0%	3	9.9%	0	6	0
2834	91	5.0%	62.9%	25.0%	14	4.7%	1	28	2
2841	36	2.4%	26.8%	25.0%	2	12.0%	0	4	0
2865	59	3.3%	38.4%	25.0%	6	7.3%	0	12	0
2869	364	3.0%	34.4%	25.0%	31	13.1%	4	62	8
2873	60	2.4%	26.8%	25.0%	4	14.4%	1	8	2
2874	41	2.4%	26.8%	25.0%	3	2.9%	0	6	0
2899	162	3.0%	34.4%	25.0%	14	2.7%	0	28	0
Total	**1,629**				**0**	**10.0%**	**11**	**282**	**22**

[a] Total percentage growth over 10 years, based on the forecasted annual growth rate [(1 + Annual Rate)^{10} - 1].
[b] Equal to Total Number of Existing Facilities * 10-Year Growth Rate * Share of Growth from New Facilities.
[c] Equal to Estimated Number of New Facilities * In-Scope Percentage.
[d] Equal to 2 * the 10-Year Forecast.

Source: U.S. EPA analysis, 2001.

❖ *Characteristics of existing facilities*

EPA used information from EPA's section 316(b) *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* to estimate characteristics of the new in-scope chemical facilities projected over the 2001-2020 analysis period. The survey requested technical information, including the facility's cooling system type, source water body, and intake flow in addition to economic and financial information.

EPA used the following survey data on existing chemical facilities to project characteristics of the 22 new (greenfield and stand-alone) facilities:[23]

- **Cooling system type:** There were 128 existing in-scope chemical facilities in the sectors with projected new in-scope facilities. These 128 facilities have the following cooling system types: 70 once-through, 23 combination system, 17 recirculating, 13 with other system types, and four that have unknown system types.
- **Water body type:** Of 128 in-scope chemical facilities, 109 withdraw cooling water from a freshwater body and 17

[23] The numbers in this section may not add up to totals because the survey facilities are sample-weighted and rounded.

withdraw from a marine water body. One facility withdraws from both a freshwater and marine water body.

In developing model manufacturing facilities, EPA only considered those existing survey plants that have a once-through system, a recirculating system, or a combination system. For this analysis, EPA classified facilities with a combination system as once-through and facilities withdrawing from both water body types as marine, providing a conservative estimate. Table 5-18 below presents the distribution of the 111 in-scope facilities that meet these cooling system criteria by water body type and cooling system type.

Table 5-18: Existing Chemical Facilities by Water Body Type and Cooling System Type (SIC 28)

SIC Code	Recirculating				Once-Through				Total	
	Freshwater		Marine		Freshwater		Marine			
	No.	%	No.	%	No.	%	No.	%	No.	%
2812	4	28%	0	0%	6	36%	6	36%	15	100%
2819	5	14%	0	0%	16	47%	13	39%	33	100%
2821	0	0%	0	0%	10	100%	0	0%	10	100%
2834	0	0%	0	0%	4	100%	0	0%	4	100%
2869	4	11%	0	0%	35	89%	0	0%	39	100%
2873	4	50%	0	0%	4	50%	0	0%	9	100%
Total	17	16%	0	0%	75	67%	19	17%	111	100%

Source: U.S. EPA, 2000; U.S. EPA analysis, 2001.

❖ *Development of model facilities*

EPA projected that 22 new in-scope chemical facilities will begin operation during the next 20 years. Based on the distribution of the in-scope survey respondents across water body and cooling system types, EPA assigned the 22 new facilities to 10 different model facility types, by SIC code:

- ***SIC code 2812:*** EPA projects that two new in-scope facilities will begin operation during the next 20 years. The distribution of existing in-scope facilities across water body and cooling system types showed that 36 percent of the existing facilities operate a once-through system and withdraw from a freshwater body and 36 percent operate a once-through system and withdraw from a marine body. EPA therefore projected one new once-through/freshwater facility and one new once-through system/marine facility.

- ***SIC code 2819:*** Four new industrial inorganic chemicals, not elsewhere classified facilities are projected to begin operation during the 20-year analysis period. The distribution of existing facilities across water body and cooling system types showed that 47 percent of the existing in-scope facilities operate a once-through system and withdraw from a freshwater body, 39 percent operate a once-through system and withdraw from a marine water body, and 14 percent operate a recirculating system and withdraw from a freshwater body. EPA therefore projected two new once-through/freshwater facilities and two new once-through/marine facilities.

- ***SIC code 2821:*** EPA projects that four new in-scope facilities will begin operation during the next 20 years. The distribution of existing facilities across water body and cooling system types showed that all existing in-scope plastics material and synthetic resins, and nonvulcanizable elastomer facilities operate a once-through system and withdraw from a freshwater body. EPA therefore assumed that all four projected new in-scope facilities will be freshwater facilities with a once-through system.

- ***SIC code 2834:*** EPA projects that two new in-scope facilities will begin operation during the next 20 years. The distribution of existing facilities across water body and cooling system types showed that all existing in-scope

pharmaceutical preparation facilities operate a once-through system and withdraw from a freshwater body. EPA therefore assumed that both projected new in-scope facilities will be freshwater facilities with a once-through system.

- ***SIC code 2869:*** Eight new facilities in the Industrial Organic Chemical, Not Elsewhere Classified sector are projected to begin operation during the 20-year analysis period. The distribution of existing facilities across water body and cooling system types showed that 89 percent of the existing facilities operate a once-through system and withdraw from a freshwater body and 11 percent operate a recirculating system and withdraw from a freshwater body. Therefore EPA projected seven new once-through/freshwater facilities and one new recirculating/freshwater facility.

- ***SIC code 2873:*** EPA projected that two new in-scope nitrogenous fertilizer facilities will begin operation in the next 20 years. The distribution of existing facilities across water body and cooling system types showed that 50 percent of the existing facilities operate a recirculating system and withdraw from a freshwater body and 50 percent operate once-through systems and withdraw from a freshwater body. EPA therefore projected one new recirculating/freshwater facility and one new once-through/freshwater facility.

Table 5-19 below presents the model facility type, the number of in-scope survey facilities upon which the model facility type was based, and the number of projected new facilities that belong to that model type.

Table 5-19: SIC 28 Model Facilities

Model Facility Type	SIC	Cooling System Type	Source Water Body	Number of Existing In-Scope Facilities	Number of Projected New Facilities
MAN OT/M-2812	2812	Once-Through	Marine	6	1
MAN OT/F-2812	2812	Once-Through	Freshwater	6	1
MAN OT/M-2819	2819	Once-Through	Marine	13	2
MAN OT/F-2819	2819	Once-Through	Freshwater	16	2
MAN OT/F-2821	2821	Once-Through	Freshwater	10	4
MAN OT/F-2834	2834	Once-Through	Freshwater	4	2
MAN OT/F-2869	2869	Once-Through	Freshwater	35	7
MAN RE/F-2869	2869	Recirculating	Freshwater	4	1
MAN OT/F-2873	2873	Once-Through	Freshwater	4	1
MAN RE/F-2873	2873	Recirculating	Freshwater	4	1
Total				**102**	**22**

Source: U.S. EPA analysis, 2001.

c. Petroleum and Coal Products (SIC 29)

❖ *SIC codes with potential new in-scope facilities*

EPA's *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* identified one 4-digit SIC code in the Petroleum and Coal Products Industry (SIC 29) with at least one existing facility that operates a CWIS, holds a NPDES permit, withdraws at least two million gallons per day (MGD) from a water of the U.S., and uses 25 percent or more of its intake flow for cooling purposes. Table 5-20 below presents the total number of existing facilities, the number of in-scope questionnaire respondents, and the in-scope percentage for SIC code 2911.

Table 5-20: Section 316(b) Facilities in the Petroleum and Coal Products Industry (SIC 29)

SIC Code	SIC Description	Total Number of Existing Facilities	In-Scope Survey Respondents	
			No.	%
2911	Petroleum Refining	163	31.3	19.2%

Source: U.S. EPA, 2000; OMB, 1987.

EPA analyzed the petroleum refining industry to estimate the number of new in-scope facilities.

❖ ***Projected growth in shipments***

The Energy Information Administration (EIA) forecasts that U.S. petroleum consumption will increase by 6.3 million barrels (bbl) a day between 1999 and 2020. Approximately 96 percent of the projected demand growth results from increased consumption of "light products," including gasoline, diesel, heating oil, jet fuel, and liquified petroleum gases. Additional petroleum imports are expected to fill the projected widening gap between supply and consumption. Petroleum imports are projected to be about 64 percent of total consumption in 2020 (U.S. DOE, 2000a).

No forecasts of shipments specific to petroleum refineries are available. Therefore, EPA assumed that shipments from this industry will grow at the same 3.0 percent annual rate as forecast for overall GDP (U.S. DOE, 2000b).

❖ ***Share of growth from new facilities***

EIA projects that domestic refinery capacity (SIC code 2911) will grow from 16.5 million bbl per day in 1999 to between 18.2 million bbl per day (low economic growth case) and 18.8 million bbl per day (high economic growth case) in 2020. This expansion will result from expanded capacity at existing refineries. No new refineries are likely to be constructed in the U.S. due to financial and legal constraints (U.S. DOE, 2000a).

❖ ***Projected number of new facilities***

Table 5-21 presents the number of existing facilities in the analyzed SIC code, the projected industry growth (annual growth rate and compounded growth rate over ten years), the share of growth from new facilities, and the estimated number of new facilities (total and in-scope). At proposal, EPA projected that there would be no new petroleum refineries constructed in the U.S. over the analysis period. The petroleum industry commented that the assumption of no new petroleum refineries over the next 20 years is invalid. Even though the *Annual Energy Outlook 2001* still projects no new refineries during the next 20 years, EPA nevertheless revised this estimate and made the conservative assumption that two new in-scope petroleum refineries will be subject to in the final section 316(b) New Facility Rule.

Table 5-21: Projected Number of New Petroleum Refinery Facilities (SIC 2911)

SIC Code	Total Number of Existing Facilities	Projected Industry Growth Rate			Estimated Number of New Facilities[b]				
					10-Year Forecast (2001-2010)			20-Year Forecast (2001-2020)[c]	
		Annual	Over 10 Years[a]	Share of Growth from New Facilities	Total	In-Scope Percentage	In-Scope	Total	In-Scope
2911	163	3.0%	34.4%	0.0%	1	--	1	2	2

[a] Total percentage growth over 10 years, based on the forecasted annual growth rate $[(1 + \text{Annual Rate})^{10} - 1]$.
[b] EPA's forecast methodology does not project any new in-scope facilities for this SIC. This projection is based on a comment submitted by the petroleum industry.
[c] Equal to 2 * the 10-Year Forecast.

Source: U.S. EPA analysis, 2001.

❖ *Characteristics of existing facilities*

EPA used information from EPA's section 316(b) *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* to estimate the characteristics of the new in-scope petroleum refineries assumed over the 2001-2020 analysis period. The survey requested technical information, including the facility's in-scope status, cooling system type, source water body, and intake flow in addition to economic and financial information.

EPA used the following survey data on existing petroleum facilities to project characteristics of the two new petroleum facilities:[24]

- **Cooling system type:** There were 31 existing in-scope petroleum refineries. These 31 facilities have the following cooling system types: 15 recirculating, 10 combination system, 5 once-through, and one other.
- **Water body type:** Of the 31 in-scope facilities, 26 withdraw cooling water from a freshwater body and five withdraw from a marine water body.

In developing model manufacturing facilities, EPA only considered those existing survey plants that have a once-through system, a recirculating system, or a combination system. For this analysis, EPA classified facilities with a combination system as once-through facilities, providing a conservative estimate. Table 5-22 below presents the distribution of the 30 in-scope facilities that meet these cooling system criteria by water body type and cooling system type.

Table 5-22: Existing Petroleum Facilities by Water Body Type and Cooling System Type (SIC 2911)

SIC Code	Recirculating				Once-Through				Total	
	Freshwater		Marine		Freshwater		Marine			
	No	%	No	%	No	%	No	%	No	%
2911	15	50%	0	0%	9	29%	6	21%	30	100%

Source: U.S. EPA, 2000; U.S. EPA analysis, 2001.

❖ *Development of model facilities*

EPA projected that two new in-scope petroleum refineries (SIC code 2911) will begin operation during the next 20 years. The distribution of existing facilities across water body and cooling system types showed that 50 percent of the existing petroleum refineries operate a recirculating system and withdraw from a freshwater body and 29 percent operate once-through systems and withdraw from a freshwater body. EPA therefore assumed that the two new projected facilities would have those characteristics. Table 5-23 below presents the model facility type, the number of in-scope survey facilities upon which the model facility type was based, and the number of projected new facilities that belong to that model type.

Table 5-23: SIC 29 Model Facilities

Model Facility Type	SIC Code	Cooling System Type	Source Water Body	Number of Existing In-Scope Facilities	Number of Projected New Facilities
MAN OT/F-2911	2911	Once-Through	Freshwater	9	1
MAN RE/F-2911	2911	Recirculating	Freshwater	15	1
Total				**24**	**2**

Source: U.S. EPA analysis, 2001.

[24] The numbers in this section may not add up to totals because the survey facilities are sample-weighted and rounded.

d. Steel (SIC 331)

❖ ***SIC codes with potential new in-scope facilities***

EPA's *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* identified five 4-digit SIC codes in the Steel Works, Blast Furnaces, and Rolling and Finishing Mills Industries (SIC 331) with at least one existing facility that operates a CWIS, holds a NPDES permit, withdraws at least two million gallons per day (MGD) from a water of the U.S., and uses 25 percent or more of its intake flow for cooling purposes. Table 5-24 below presents the total number of existing facilities, the number of in-scope questionnaire respondents, and the in-scope percentage for each of the five SIC codes.

Table 5-24: Section 316(b) Facilities in the Steel Industry (SIC 331)

SIC Code	SIC Description	Total Number of Existing Facilities	In-Scope Survey Respondents	
			No.	%
3312	Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills	161	40	24.9%
3313	Electrometallurgical Products, Except Steel	6	2	30.4%
3315	Steel Wiredrawing and Steel Nails and Spikes	122	3	2.5%
3316	Cold-Rolled Steel Sheet, Strip, and Bars	57	9	16.4%
3317	Steel Pipe and Tubes	130	7	5.7%
	Total SIC 331	**476**	**62**	**13.0%**

Source: U.S. EPA, 2000; OMB, 1987.

EPA analyzed each of these five industry segments to determine the number of new in-scope facilities in the Steel Industry.

❖ ***Projected growth in shipments***

Demand for North American steel is expected to increase over the long term. Steel shipments are expected to rise at a 1 to 2 percent annual rate through 2004, assuming continued moderate economic growth (McGraw-Hill, 2000).

❖ ***Share of growth from new facilities***

Industry-specific information on the potential for the construction of new facilities was not available. EPA therefore assumed that 50 percent of the projected growth in shipments in all potentially-affected steel industries will result from new facilities.

❖ ***Projected number of new facilities***

Table 5-25 presents the number of existing facilities in the analyzed SIC code, the projected industry growth (annual growth rate and compounded growth rate over ten years), the share of growth from new facilities, and the number of projected new facilities (total and in-scope). To calculate the number of projected new facilities, EPA applied the industry-specific 10-year growth rate and the percentage of capacity growth from new facilities to the total number of existing facilities. EPA then applied the in-scope percentage (based on information from the section 316(b) *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures*) to the 10-year forecast of new facilities to derive the projected number of new in-scope facilities over 10 years. Both the number of new facilities and the number of new in-scope facilities were doubled to calculate the 20-year projection. EPA estimates that 78 new facilities will be constructed over the next 20 years, of which 10 will be in scope of the final section 316(b) New Facility Rule.

Table 5-25: Projected Number of New Iron and Steel Facilities (SIC 331)

SIC Code	Total Number of Existing Facilities	Projected Industry Growth Rate			Estimated Number of New Facilities				
					Ten Year Forecast (2001-2010)			Twenty Year Forecast (2001-2020)[d]	
		Annual	Over 10 Years[a]	Share of Growth from New Facilities	Total[b]	In-Scope Percentage	In-Scope[c]	Total	In-Scope
3312[e]	161	1.5%	16.1%	50.0%	13	24.9%	3	26	6
3313	6	3.0%	34.4%	50.0%	1	30.4%	0	2	0
3315	122	1.5%	16.1%	50.0%	10	2.5%	0	20	0
3316	57	1.5%	16.1%	50.0%	5	16.4%	1	10	2
3317	130	1.5%	16.1%	50.0%	10	5.7%	1	20	2
Total	476				39	**13.0%**	5	78	10

[a] Total percentage growth over 10 years, based on the forecasted annual growth rate [(1 + Annual Rate)^{10} - 1].
[b] Equal to Total Number of Existing Facilities * 10-Year Growth Rate * Share of Growth from New Facilities.
[c] Equal to Estimated Number of New Facilities * In-Scope Percentage.
[d] Equal to 2 * the 10-Year Forecast.
[e] Recent growth in new steelmaking capacity has been in minimills. The success of the thin slab caster/flat rolling mill is expected to result in the addition of 8 million tons of new minimill steel capacity in the U.S. between 2001 and 2003 (S&P, 2001a). While new low-cost minimills have been starting up, some antiquated, less efficient integrated mills have been shut down and other integrated producers have increased output efficiencies at their existing blast furnaces during the late 1990's (McGraw-Hill, 1999). EPA therefore assumes that all new facilities in the basic steel sector will be new minimills rather than new integrated mills.

Source: U.S. EPA analysis, 2001.

❖ *Characteristics of existing facilities*

EPA used information from EPA's section 316(b) *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* to estimate characteristics of the new in-scope steel facilities projected over the 2001-2020 analysis period. The survey requested technical information, including the facility's cooling system type, source water body, and intake flow in addition to economic and financial information.

EPA used the following survey data on existing steel facilities to project characteristics of the 10 new steel facilities:[25]

- **Cooling system type:** There are 57 existing in-scope steel facilities. These 57 facilities have the following cooling system types: 21 combination systems, 20 once-through, 9 recirculating, and 7 other system types.
- **Water body type:** All 57 facilities withdraw cooling water from a freshwater body.

In developing model manufacturing facilities, EPA only considered those existing survey plants that have a once-through system, a recirculating system, or a combination system. For this analysis, EPA classified facilities with a combination system as once-through facilities, providing a conservative estimate. Table 5-26 below presents the distribution of the 50 in-scope facilities that meet these cooling system criteria by water body type and cooling system type.

[25] The numbers in this section may not add up to totals because the survey facilities are sample-weighted and rounded.

Table 5-26: Existing Steel Facilities by Water Body Type and Cooling System Type (SIC 331)

SIC	Recirculating				Once-Through				Total	
	Freshwater		Marine		Freshwater		Marine			
	No	%	No	%	No	%	No	%	No	%
3312	3	9%	0	0%	32	91%	0	0%	35	100%
3316	3	33%	0	0%	6	67%	0	0%	9	100%
3317	3	50%	0	0%	3	50%	0	0%	6	100%
Total	9	18%	0	0%	41	82%	0	0%	50	100%

Source: U.S. EPA, 2000; U.S. EPA analysis, 2001.

❖ *Development of model facilities*

EPA projected that 10 new in-scope steel facilities will begin operation during the next 20 years. Based on the distribution of the in-scope survey respondents across water body and cooling system types, EPA assigned the 10 new facilities to six different model facility types, by SIC code:

- ***SIC code 3312:*** Six steel mills are projected to begin operation during the 20-year analysis period. The distribution of existing facilities across water body and cooling system types showed that 91 percent of the existing facilities operate a once-through system and withdraw from a freshwater body and nine percent operate a recirculating system and withdraw from a freshwater body. Therefore EPA projected five new once-through/freshwater facilities and one recirculating/freshwater facility.

- ***SIC code 3316:*** EPA projected that two new in-scope cold-rolled steel sheet, strip, and bar facilities will begin operation in the next 20 years. The distribution of existing facilities across water body and cooling system types showed that 67 percent of the existing facilities operate a once-through system and withdraw from a freshwater body and 33 percent operate a recirculating system and withdraw from a freshwater body. EPA therefore projected one once-through/freshwater and one recirculating/freshwater facility.

- ***SIC code 3317:*** EPA projected that two new in-scope steel pipe and tube facilities will begin operation in the next 20 years. The distribution of existing facilities across water body and cooling system types showed that 50 percent of the existing facilities operate a recirculating system and withdraw from a freshwater body and 50 percent operate once-through systems and withdraw from a freshwater body. EPA therefore assumed that the two new projected facilities would have those characteristics.

Table 5-27 below presents the model facility type, the number of in-scope survey facilities upon which the model facility type was based, and the number of projected new facilities that belong to that model type.

Table 5-27: SIC 331 Model Facilities

Model Facility Type	SIC Code	Cooling System Type	Source Water Body	Number of Existing In-Scope Facilities	Number of Projected New Facilities
MAN OT/F-3312	3312	Once-Through	Freshwater	32	5
MAN RE/F-3312	3312	Recirculating	Freshwater	3	1
MAN OT/F-3316	3316	Once-Through	Freshwater	6	1
MAN RE/F-3316	3316	Recirculating	Freshwater	3	1
MAN OT/F-3317	3317	Once-Through	Freshwater	3	1
MAN RE/F-3317	3317	Recirculating	Freshwater	3	1
Total				**50**	**10**

Source: U.S. EPA analysis, 2001.

e. Aluminum (SIC 333/335)

❖ *SIC codes with potential new in-scope facilities*

EPA's *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* identified two 4-digit SIC codes in the nonferrous metals industries (SIC codes 333/335) with at least one existing facility that operates a CWIS, holds a NPDES permit, withdraws at least two million gallons per day (MGD) from a water of the U.S., and uses 25 percent or more of its intake flow for cooling purposes. Table 5-28 below presents the total number of existing facilities, the number of in-scope questionnaire respondents, and the in-scope percentage for the two SIC codes.

Table 5-28: Section 316(b) Facilities in the Aluminum Industries (SIC 333/335)

SIC Code	SIC Description	Total Number of Existing Facilities	In-Scope Survey Respondents	
			No.	%
3334	Primary Production of Aluminum	31	11	34.3%
3353	Aluminum Sheet, Plate, and Foil	57	6	11.1%
	Total SIC 333, 335	**88**	**17**	**19.2%**

Source: U.S. EPA, 2000; OMB, 1987.

EPA analyzed these two industry segments to determine the number of new in-scope facilities in the Aluminum Industry.

❖ *Projected growth in shipments*

Total shipments for all sectors of the aluminum industry are expected to increase 2.5 percent annually from 1999 through 2004 (McGraw-Hill, 2000). EPA therefore assumed that shipments of primary aluminum smelters (SIC 3334) and aluminum sheet, plate, and foil (SIC 3353) will increase at an annual rate of 2.5 percent.

❖ *Share of growth from new facilities*

Domestic production is expected to increase as idled capacity is reactivated. The U.S. is responsible for approximately 40 percent of the idle capacity worldwide (McGraw-Hill, 2000). The 1998 capacity utilization rate of 88 percent was well below the 1987 rate of approximately 97 percent. The U.S. aluminum industry requires substantial amounts of capital to mine bauxite, handle materials, and operate smelters, rolling mills, and finishing plants. It would be extremely difficult for a new

facility to enter this industry and operate as a vertically integrated firm (S&P, 2001a). These conditions make it likely that any capacity increases will involve using existing capacity or expansions at existing facilities, rather than the construction of new greenfield and stand-alone facilities. No new primary smelters have been constructed in the U.S. since 1980 (McGraw-Hill, 2000). According to Standard & Poor's, construction of new minimill capacity is also unlikely given the potential that added capacity would drive down prices in the face of slow growth in the markets for minimill products (S&P, 2001a). EPA therefore assumed that all projected growth in primary aluminum shipments (SIC 3334) will result from using the currently-idled capacity or from expansions at existing facilities. In the absence of specific information for SIC code 3353, EPA assumed that half of the growth in shipments would result from new facilities, rather than from idled capacity or expansions at existing facilities.

❖ *Projected number of new facilities*

Table 5-29 presents the number of existing facilities in the analyzed SIC code, the projected industry growth (annual growth rate and compounded growth rate over ten years), the share of growth from new facilities, and the number of projected new facilities (total and in-scope). To calculate the number of projected new facilities, EPA applied the industry-specific 10-year growth rate and the percentage of capacity growth from new facilities to the total number of existing facilities. EPA then applied the in-scope percentage (based on information from the section 316(b) *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures*) o the 10-year forecast of new facilities to derive the projected number of new in-scope facilities over 10 years. Both the number of new facilities and the number of new in-scope facilities were doubled to calculate the 20-year projection. EPA estimates that 16 new facilities may be constructed in the relevant aluminum sectors, over the next twenty years. Of these, two new Aluminum Sheet, Plate and Foil facilities (SIC code 3353) are expected to be in scope of the final section 316(b) New Facility Rule.

Table 5-29: Projected Number of New Aluminum and Other Nonferrous Metal Facilities (SIC 333,335)

SIC Code	Total Number of Existing Facilities	Projected Industry Growth Rate			Estimated Number of New Facilities				
					Ten Year Forecast (2001-2010)			Twenty Year Forecast (2001-2020)[d]	
		Annual	Over 10 Years[a]	Share of Growth from New Facilities	Total[b]	In-Scope Percentage	In-Scope[c]	Total	In-Scope
3334	31	2.5%	28.0%	0.0%	0	34.3%	0	0	0
3353	57	2.5%	28.0%	50.0%	8	11.1%	1	16	2
Total	88				8	**19.2%**	1	16	2

[a] Total percentage growth over 10 years, based on the forecasted annual growth rate [(1 + Annual Rate)^{10} - 1].
[b] Equal to Total Number of Existing Facilities * 10-Year Growth Rate * Share of Growth from New Facilities.
[c] Equal to Estimated Number of New Facilities * In-Scope Percentage.
[d] Equal to 2 * the 10-Year Forecast.

Source: U.S. EPA analysis, 2001.

❖ *Characteristics of existing facilities*

EPA used information from EPA's section 316(b) *Detailed Industry Questionnaire: Phase II Cooling Water Intake Structures* to estimate characteristics of the new in-scope aluminum facilities projected over the 2001-2020 analysis period. The survey requested technical information, including the facility's cooling system type, source water body, and intake flow in addition to economic and financial information.

EPA used the following survey data on existing aluminum facilities to project characteristics of the two new aluminum facilities:[26]

- **Cooling system type:** There were six existing in-scope aluminum facilities in SIC code 3353. Three of these

[26] The numbers in this section may not add up to totals because the survey facilities are sample-weighted and rounded.

facilities have a recirculating system and three have a once-through system.

- **Water body type:** All six of the in-scope aluminum facilities withdraw cooling water from a freshwater body.

Table 5-30 below presents the distribution of the six in-scope facilities that meet these cooling system criteria by water body type and cooling system type.

Table 5-30: Existing Aluminum Facilities by Water Body Type and Cooling System Type (SIC 3353)

SIC Code	Recirculating				Once-Through				Total	
	Freshwater		Marine		Freshwater		Marine			
	No	%	No	%	No	%	No	%	No	%
3353	3	50%	0	0%	3	50%	0	0%	6	100%

Source: U.S. EPA, 2000; U.S. EPA analysis, 2001.

❖ ***Development of model facilities***

EPA projected that two new in-scope aluminum facilities will begin operation in the next 20 years. The distribution of existing facilities across water body and cooling system types showed that 50 percent of the existing aluminum facilities operate a recirculating system and withdraw from a freshwater body and 50 percent operate once-through systems and withdraw from a freshwater body. EPA therefore assumed that the two new projected facilities would have those characteristics. Table 5-31 below presents the model facility type, the number of in-scope survey facilities upon which the model facility type was based, and the number of projected new facilities that belong to that model type.

Table 5-31: SIC 3353 Model Facilities

Model Facility Type	SIC Code	Cooling System Type	Source Water Body	Number of Existing In-Scope Facilities	Number of Projected New Facilities
MAN OT/F-3353	3353	Once-Through	Freshwater	3	1
MAN RE/F-3353	3353	Recirculating	Freshwater	3	1
Total				**6**	**2**

Source: U.S. EPA analysis, 2001.

5.2.3 Summary of Forecasts for New Manufacturing Facilities

EPA estimates that a total of 380 new manufacturing facilities will begin operation between 2001 and 2020. Thirty-eight of these are expected to be in scope of the final section 316(b) New Facility Rule. Of the 38 facilities, 22 are chemical facilities, ten are steel facilities, two are petroleum refineries, two are paper mills, and two are aluminum facilities. Table 5-32 summarizes the results of the analysis.

Table 5-32: Number of Projected New Manufacturers (2001 to 2020)

Facility Type	Total Number of New Facilities	Facilities In Scope of the Final Rule				
		Recirculating		Once-Through		Total
		Freshwater	Marine	Freshwater	Marine	
Paper and Allied Products (SIC 26)	2	0	0	2	0	2
Chemicals and Allied Products (SIC 28)	282	2	0	17	3	22
Petroleum Refining And Related Industries (SIC 29)	2	1	0	1	0	2
Blast Furnaces and Basic Steel Products (SIC 331)	78	3	0	7	0	10
Aluminum Sheet, Plate, and Foil (SIC 3353)	16	1	0	1	0	2
Total	**380**	**7**	**0**	**28**	**3**	**38**

Source: U.S. EPA analysis, 2001.

5.2.4 Uncertainties and Limitations

There are uncertainties in EPA's projections of the number of new manufacturing facilities that will be subject to the final section 316(b) New Facility Rule. EPA's results depend on several key assumptions:

- **Industry growth forecasts are accurate.** For most industries, EPA used 5-year growth forecasts developed in late 2000. EPA assumed that the projected growth will continue over the next 10 years. EPA then doubled this estimate to project the number of new facilities over the next 20 years. There are two main uncertainties associated with this approach. First, predicting growth over a 20-year time period is always uncertain. Applying a 5-year forecast to a 20-year analysis period therefore introduces uncertainty. Second, the economy has recently experienced a substantial slow-down. This development has not been reflected in the industry forecasts used for this analysis. It is therefore likely that the analysis presented in this chapter overstates the number of new manufacturing facilities that will be subject to the final § 316(b) New Facility Rule, at least for the near term.

- **EPA accurately predicted the share of industry growth from new (greenfield and stand-alone) facilities.** While 5 year forecasts of industry shipments are available for most of the relevant industries, forecasts of the likely growth in capacity and numbers of new facilities are less readily available. Those that are available generally apply only for the next few years. For the steel sectors and the aluminum sheet, plate, and foil sector, no industry-specific information on new facility construction was available. EPA made the assumption that 50 percent of future growth in these sectors will occur at new (greenfield and stand-alone) facilities.[27] This assumption was likely to be conservative when EPA proposed this rule. With the recent economic slow-down, new facility construction has become even less likely. EPA therefore believes that the analysis in support of this rule overstates the number of new manufacturing facilities that will be subject to the final § 316(b) New Facility Rule over the next 20 years.

- **Future manufacturing facilities will have the same size as the analyzed survey facilities.** EPA's methodology for estimating the number of new (greenfield and stand-alone) facilities rests on the assumption that future facilities will have the same size as existing ones in the same SIC code. If future facilities are likely to be either larger or smaller than existing facilities, EPA's estimate will overstate or understate, respectively, the number of new facilities.

[27] The steel sectors and the aluminum sheet, plate, and foil sectors account for 12 of the 38 projected in-scope manufacturing facilities.

- **Future facilities will have the same cooling water characteristics as the analyzed survey facilities.** EPA's forecasts assume that the characteristics of new facilities that determine their regulatory status under the final rule will be the same as those of the existing facilities in the same industries. A variety of factors may lead new facilities to use municipal or ground water instead of a water of the U.S. or to recycle the process water more often than do existing facilities. Thus, this assumption may overstate the number of new facilities.

5.3 Summary of Baseline Projections

EPA estimates that over the next 20 years a total of 656 new greenfield and stand-alone facilities will be built in the industry sectors analyzed for this final regulation. Two hundred and seventy-six of these new facilities will be steam electric generating facilities and 380 will be manufacturing facilities. As Table 5-33 shows, only 121 of the 656 new facilities are projected to be in scope of the final section 316(b) New Facility Rule, including 83 electric generators, 22 chemical facilities, 12 primary metals facilities, two new pulp and paper, and two petroleum facilities.

Table 5-33: Projected Number of New In-Scope Facilities (2001 to 2020)

SIC	SIC Description	Projected Number of New Facilities	
		Total	In-Scope
	Electric Generators		
SIC 49	Electric Generators	276	83
	Manufacturing Facilities		
SIC 26	Paper and Allied Products	2	2
SIC 28	Chemicals and Allied Products	282	22
SIC 29	Petroleum Refining And Related Industries	2	2
SIC 33	Primary Metals Industries		
SIC 331	Blast Furnaces and Basic Steel Products	78	10
SIC 333 SIC 335	Primary Aluminum, Aluminum Rolling, and Drawing and Other Nonferrous Metals	16	2
Total Manufacturing		*380*	*38*
Total		**656**	**121**

Source: U.S. EPA analysis, 2001.

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Appendix to Chapter 5

This Appendix presents additional, more detailed information on the data sources, calculations, and results of the projection of new facilities subject to the final section 316(b) New Facility Rule.

5.A.1 Background

The electric power industry is currently experiencing a rapid expansion due to the transition from a highly regulated monopolistic industry to a more competitive industry. This expansion has contributed to a surge in the number of generating plants being planned or under construction. As discussed in other parts of this EA, only steam electric facilities use substantial amounts of cooling water and were considered for this analysis. The AEO2001 and the NEWGen data show a trend toward combined-cycle generating technologies. This trend may reflect the transition toward competitive pricing for electricity. In competitive markets, prices will reflect the interaction of supply and demand for electricity. During most time periods, the price of electricity will be set by the generating unit with the highest operating costs needed to meet spot market demand (i.e., the "marginal cost" of production). The lower capital and operating cost usually associated with gas generation technologies may be one reason for the trend toward combined-cycle generating technology employed by new facilities.

The NEWGen data and the section 316(b) Industry Survey data also show a trend away from the use of waters of the U.S. as a source of cooling water. EPA believes this trend reflects the increased competition for water and an increasing awareness of the need for water conservation. As a result, the projected number of new electric generators subject to this rule is low, despite the expected expansion in new generating capacity.

5.A.2 Annual Energy Outlook 2001

As described in Section 5.1.1.a, EPA used a forecast of capacity additions between 2001 and 2020 (presented in the AEO2001) to estimate the number of new combined-cycle and coal-fired plants. The AEO2001 projects both planned and unplanned capacity additions between 2001 and 2020 for eight facility types (coal steam, other fossil steam, combined-cycle, combustion turbine/diesel, nuclear, pumped storage/other, fuel cells and renewables).

Table 5.A-1 below presents AEO2001's forecast of total annual capacity additions between 2001 and 2020. The total forecasted capacity additions represent the sum of all planned and unplanned capacity additions for each year and each technology type. In addition, the table presents EPA's distribution of the projected 276 new combined-cycle and coal plants, as well as the projected 83 new in-scope combined-cycle and coal plants over the 20-year analysis period. This distribution is proportionate to the distribution of new combined-cycle and coal capacity additions over the 20 years.

Table 5.A-1: Total Annual Additions and Number of New Plants (2001-2020)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2001 - 2010
Total Annual Additions (in megawatts of capacity)											
Coal Steam	0	0	0	0	2,397	5,031	7,457	2,244	920	465	**18,514**
Other Fossil Steam[a]	0	0	0	0	0	0	0	0	0	0	**0**
Combined-Cycle	1,540	456	0	7,282	15,110	16,997	14,406	16,431	14,485	14,237	**100,943**
Combustion Turbine/Diesel	8,316	9,126	10,507	6,725	19,209	5,541	15,358	4,204	6,646	3,086	**88,719**
Nuclear Power	0	0	0	0	0	0	0	0	0	0	**0**
Pumped Storage/Other[b]	0	0	0	0	0	0	0	0	0	0	**0**
Fuel Cells	0	0	4	4	5	9	18	27	36	45	**147**
Renewable[c]	913	371	282	1,057	777	520	832	689	659	508	**6,607**
Total Additions	10,769	9,953	10,793	15,069	37,498	28,097	38,071	23,593	22,745	18,342	**216,931**
Number of New Plants											
Coal Steam - Total	0	0	0	0	5	8	12	4	1	1	**31**
Coal Steam - In-Scope	0	0	0	2	3	5	1	1	0	0	**12**
Combined-Cycle - Total	2	1	0	7	18	20	17	19	17	17	**118**
Combined-Cycle - In-Scope	0	0	0	1	5	6	5	6	5	5	**33**
Total In-Scope	0	0	0	3	8	11	6	7	5	5	**45**
	2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2011 - 2020**
Total Annual Additions (in megawatts of capacity)											
Coal Steam	500	182	184	0	157	0	239	336	816	885	**3,299**
Other Fossil Steam[a]	0	0	0	0	0	0	0	0	0	0	**0**
Combined-Cycle	10,723	11,862	10,766	12,878	9,050	10,885	8,948	10,876	9,302	7,752	**103,042**
Combustion Turbine/Diesel	4,399	2,418	6,217	1,487	6,650	3,964	5,185	6,501	6,523	4,023	**47,367**
Nuclear Power	0	0	0	0	0	0	0	0	0	0	**0**
Pumped Storage/Other[b]	0	0	0	0	0	0	0	0	0	0	**0**
Fuel Cells	55	65	0	0	0	21	0	0	0	0	**142**
Renewable[c]	440	436	61	70	107	186	62	63	91	88	**1,602**
Total Additions	16,117	14,964	17,228	14,434	15,963	15,056	14,434	17,776	16,732	12,747	**157,462**
Number of New Plants											
Coal Steam - Total	1	0	0	0	0	0	0	1	1	1	**4**
Coal Steam - In-Scope	0	0	0	0	0	0	0	0	1	1	**2**
Combined Cycle - Total	13	14	13	15	11	13	11	13	11	9	**123**
Combined Cycle - In-Scope	4	4	4	4	3	4	3	4	3	3	**36**
Total In-Scope	4	4	4	4	3	4	3	4	4	4	**38**

[a] Includes oil-, gas-, and dual-fired capability.

[b] Other includes methane, propane gas, and blast furnace gas for utilities; and hydrogen, sulfur, batteries, chemicals, fish oil, and spent sulfite liquor.

[c] Includes conventional hydroelectric, geothermal, wood, wood waste, municipal solid waste, other biomass, solar thermal, photovoltaics, and wind power.

Source: *U.S. DOE, 2000a; U.S. EPA analysis, 2001.*

5.A.3 Cooling Water Source Characteristics of New Combined-Cycle Facilities

The screening analysis of the NEWGen database and EPA's research of public data sources produced information on cooling water use for 199 new combined-cycle facilities. Table 5.A-2 below presents the number and capacity of these 199 facilities by cooling water source. The table shows that approximately two thirds of new combined-cycle facilities do not use waters of the U.S. for cooling purposes. For those facilities the most common alternative sources of cooling water are: municipal water (22 percent), groundwater (16 percent), gray water (12 percent),[28] and dry cooling (11 percent). The remaining facilities that do not use waters of the U.S. use either unknown or multiple non-surface sources of cooling water. The table also indicates that the average capacity per facility is relatively stable across the different cooling water sources, ranging from 643 to 907 MW. The average capacity for the 199 facilities is 741 MW.

Table 5.A-2: NEWGen Combined-Cycle Facilities by Cooling Water Source

Cooling Water Source	Number of Facilities	Percent of Facilities	Capacity (MW)	Percent of Capacity	Average Capacity per Facility
Water of the U.S.[a]	67	34%	49,760	34%	743
Municipal Water	44	22%	33,789	23%	768
Groundwater	32	16%	25,184	17%	787
Gray Water	23	12%	15,226	10%	662
Dry Cooling	22	11%	14,154	10%	643
unknown non-surface	5	3%	3,900	3%	780
multiple non-surface	6	3%	5,443	4%	907
Total	199	100%	147,455	100%	741

[a] Sixty-seven new combined-cycle facilities withdraw from a water of the U.S. However, 10 of these are not considered in scope of the final section 316(b) New Facility Rule because they do not meet one or more of the other in-scope criteria.

Source: EPA analysis of information from state permitting authorities, 2001.

5.A.4 Cooling Water Source Characteristics of In-Scope NEWGen Combined-Cycle Facilities

Of the 199 new combined-cycle facilities with cooling water information, 57 were determined to be in scope of the final section 316(b) New Facility Rule. Table 5.A-3 below presents the distribution of planned cooling water sources for the 57 new in-scope combined-cycle facilities. The table shows that the majority of in-scope facilities, 84 percent, plans to draw cooling water from freshwater sources, while the remaining 16 percent will withdraw water from marine sources.[29] In addition, the table indicates that 77 percent of in-scope facilities draw cooling water from rivers, both freshwater and tidal. The most common source of cooling water is freshwater rivers, with 65 percent of all in-scope facilities. The second most common surface water body types are tidal rivers, and lakes and reservoirs, with about 12 percent each.

[28] Gray water is treated effluent from sewage systems.

[29] Marine sources of cooling water include oceans, estuaries, and tidal rivers.

Table 5.A-3: In-Scope NEWGen Combined-Cycle Facilities by Cooling Water Source				
Cooling Water Source	**Number of Facilities**	**Percent of Facilities**	**Capacity (MW)**	**Percent of Capacity**
Freshwater				
River	37	65%	28,000	66%
Lake/Reservoir	7	12%	5,030	12%
Canal	1	2%	265	1%
Multiple surface waters of the U.S.	2	4%	1,310	3%
Unknown surface water of the U.S.	1	2%	846	2%
Total Freshwater	***48***	***84%***	***35,451***	***83%***
Marine				
River	7	12%	4,682	11%
Canal	1	2%	1,030	2%
Unknown surface water of the U.S.	1	2%	1,400	3%
Total Marine	***9***	***16%***	***7,112***	***17%***
Total	**57**	**100%**	**42,563**	**100%**

Source: RDI, 2001.

5.A.5 Distribution of New Combined-Cycle Capacity by NERC Region

Figure 5.A-1 presents the distribution of projected new combined-cycle capacity additions by North American Electric Reliability Council (NERC) region. Figure 5.A.1 contains two graphs: The graph on the left presents the capacity of the 199 NEWGen combined-cycle facilities with available cooling water information. These are the facilities upon which EPA's analysis of new combined-cycle facilities is based. For comparison purposes, the graph on the right presents the combined-cycle capacity addition forecasts for 2001 to 2020 from the *Annual Energy Outlook 2001* (AEO2001).

- ***199 NEWGen combined-cycle facilities:*** The first graph shows that the largest share of capacity additions, approximately 24 percent, will be in WSCC (the Western Systems Coordinating Council). SERC (the Southeastern Electric Reliability Council) accounts for the second largest share with 21 percent. Only one NERC region, MAPP (the Mid-Continent Area Power Pool), did not have any planned NEWGen facility with known cooling water characteristics.[30]

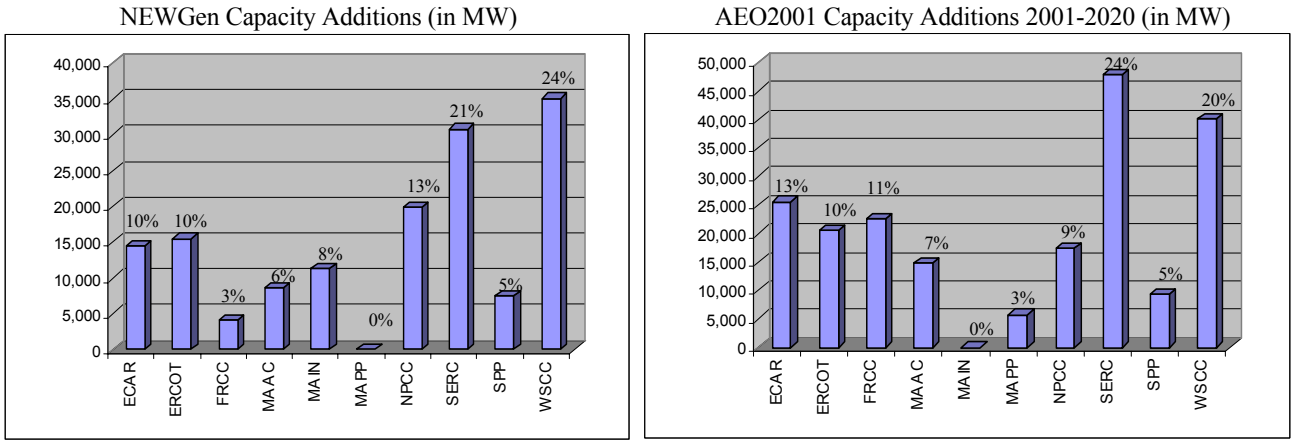
- ***AEO2001:*** The second graph shows that, similar to the NEWGen capacity additions, SERC (24 percent) and WSCC (20 percent) are the two regions with the largest combined-cycle capacity additions. The only region without projected new combined-cycle capacity is MAIN (the Mid-America Interconnected Network).

A comparison of the two graphs shows that the regional capacity distribution projected by the two data sources is very similar. Only for two of the ten NERC regions do the forecasts differ by 5 percent or more: (1) FRCC (the Florida Reliability Coordinating Council) only accounts for three percent of the capacity additions in the NEWGen database whereas it accounts for 11 percent in the AEO2001; and (2) MAIN does not have any combined-cycle capacity additions in the AEO2001

[30] The absence of new combined-cycle NEWGen facilities located in MAPP may be partially explained by the fact that the AEO2001 does not forecast new combined-cycle additions in MAPP until 2009, which is beyond the time-period covered by the NEWGen database.

whereas it accounts for 8 percent of the NEWGen capacity additions.

Figure 5.A-1: Distribution of New Combined-Cycle Capacity Additions by NERC Region[a]



[a] The NERC regions included in these graphs are: ECAR – East Central Area Reliability Coordination Agreement; ERCOT – Electric Reliability Council of Texas; FRCC – Florida Reliability Coordinating Council; MAAC – Mid-Atlantic Area Council; MAIN – Mid-America Interconnect Network; MAPP – Mid-Continent Area Power Pool; NPCC – Northeast Power Coordinating Council; SERC – Southeastern Electric Reliability Council; SPP – Southwest Power Pool; WSCC – Western Systems Coordinating Council.

Source: RDI, 2001; U.S. DOE 2000a; U.S. EPA analysis, 2001.

5.A.6 Development of Combined-Cycle Model Facilities

EPA's analysis projected 69 new in-scope combined-cycle facilities. The cooling water and economic characteristics of these 69 facilities were based on the 57 in-scope combined-cycle facilities identified from the NEWGen database. EPA developed six model facility types:

- ***Model Facility 1***, developed based on 15 freshwater/recirculating facilities with relatively small capacities (on average 439 MW);
- ***Model Facility 2,*** developed based on 17 freshwater/recirculating facilities with medium capacities (on average 699 MW);
- ***Model Facility 3,*** developed based on 16 freshwater/recirculating facilities with relatively large capacities (on average 1,061 MW);
- ***Model Facility 4,*** developed based on 4 marine/once-through facilities with an average size of 1,031 MW;
- ***Model Facility 5,*** developed based on 4 marine/recirculating facilities with relatively small capacities (on average 489 MW);
- ***Model Facility 6***, developed based on 1 marine/recirculating facility with a relatively large capacity (1,030 MW).

In general, the number of model facility types for each water body/cooling system combination depended on the number of NEWGen facilities with that combination of characteristics and their size distribution: EPA developed more model facilities for water body/cooling system combinations with a large number of NEWGen facilities and/or with a wide range of facility sizes.

Table 5.A-4 below presents the characteristics of the 57 new in-scope combined-cycle facilities (water body type, cooling system type, and actual steam-electric capacity) as well as the model facility by which they are represented and their model facility capacity.

Table 5.A-4: In-Scope NEWGen Facilities

No.	NEWGen Facility	Water Body Type	Baseline CWS Type	Actual Steam Capacity (MW)	Model Facility ID	Model Steam Capacity (MW)
1	NEWGen 1	Freshwater	Recirculating	165	CC R/FW-1	439
1	NEWGen 2	Freshwater	Recirculating	265	CC R/FW-1	439
1	NEWGen 3	Freshwater	Recirculating	265	CC R/FW-1	439
1	NEWGen 4	Freshwater	Recirculating	343	CC R/FW-1	439
1	NEWGen 5	Freshwater	Recirculating	360	CC R/FW-1	439
1	NEWGen 6	Freshwater	Recirculating	493	CC R/FW-1	439
1	NEWGen 7	Freshwater	Recirculating	500	CC R/FW-1	439
1	NEWGen 8	Freshwater	Recirculating	503	CC R/FW-1	439
1	NEWGen 9	Freshwater	Recirculating	510	CC R/FW-1	439
1	NEWGen 10	Freshwater	Recirculating	510	CC R/FW-1	439
1	NEWGen 11	Freshwater	Recirculating	520	CC R/FW-1	439
1	NEWGen 12	Freshwater	Recirculating	520	CC R/FW-1	439
1	NEWGen 13	Freshwater	Recirculating	530	CC R/FW-1	439
1	NEWGen 14	Freshwater	Recirculating	544	CC R/FW-1	439
1	NEWGen 15	Freshwater	Recirculating	550	CC R/FW-1	439
2	NEWGen 16	Freshwater	Recirculating	600	CC R/FW-2	699
2	NEWGen 17	Freshwater	Recirculating	600	CC R/FW-2	699
2	NEWGen 18	Freshwater	Recirculating	600	CC R/FW-2	699
2	NEWGen 19	Freshwater	Recirculating	620	CC R/FW-2	699
2	NEWGen 20	Freshwater	Recirculating	620	CC R/FW-2	699
2	NEWGen 21	Freshwater	Recirculating	620	CC R/FW-2	699
2	NEWGen 22	Freshwater	Recirculating	640	CC R/FW-2	699
2	NEWGen 23	Freshwater	Recirculating	660	CC R/FW-2	699
2	NEWGen 24	Freshwater	Recirculating	673	CC R/FW-2	699
2	NEWGen 25	Freshwater	Recirculating	700	CC R/FW-2	699
2	NEWGen 26	Freshwater	Recirculating	750	CC R/FW-2	699
2	NEWGen 27	Freshwater	Recirculating	775	CC R/FW-2	699
2	NEWGen 28	Freshwater	Recirculating	800	CC R/FW-2	699
2	NEWGen 29	Freshwater	Recirculating	800	CC R/FW-2	699
2	NEWGen 30	Freshwater	Recirculating	800	CC R/FW-2	699
2	NEWGen 31	Freshwater	Recirculating	808	CC R/FW-2	699
2	NEWGen 32	Freshwater	Recirculating	825	CC R/FW-2	699
3	NEWGen 33	Freshwater	Recirculating	837	CC R/FW-3	1,061
3	NEWGen 34	Freshwater	Recirculating	846	CC R/FW-3	1,061
3	NEWGen 35	Freshwater	Recirculating	850	CC R/FW-3	1,061
3	NEWGen 36	Freshwater	Recirculating	850	CC R/FW-3	1,061
3	NEWGen 37	Freshwater	Recirculating	900	CC R/FW-3	1,061
3	NEWGen 38	Freshwater	Recirculating	975	CC R/FW-3	1,061
3	NEWGen 39	Freshwater	Recirculating	1,000	CC R/FW-3	1,061
3	NEWGen 40	Freshwater	Recirculating	1,000	CC R/FW-3	1,061
3	NEWGen 41	Freshwater	Recirculating	1,075	CC R/FW-3	1,061
3	NEWGen 42	Freshwater	Recirculating	1,086	CC R/FW-3	1,061
3	NEWGen 43	Freshwater	Recirculating	1,100	CC R/FW-3	1,061
3	NEWGen 44	Freshwater	Recirculating	1,130	CC R/FW-3	1,061
3	NEWGen 45	Freshwater	Recirculating	1,134	CC R/FW-3	1,061
3	NEWGen 46	Freshwater	Recirculating	1,200	CC R/FW-3	1,061

Table 5.A-4: In-Scope NEWGen Facilities

No.	NEWGen Facility	Water Body Type	Baseline CWS Type	Actual Steam Capacity (MW)	Model Facility ID	Model Steam Capacity (MW)
3	NEWGen 47	Freshwater	Recirculating	1,400	CC R/FW-3	1,061
3	NEWGen 48	Freshwater	Recirculating	1,600	CC R/FW-3	1,061
4	NEWGen 49	Marine	Once-Through	750	CC OT/M-1	1,031
4	NEWGen 50	Marine	Once-Through	900	CC OT/M-1	1,031
4	NEWGen 51	Marine	Once-Through	1,075	CC OT/M-1	1,031
4	NEWGen 52	Marine	Once-Through	1,400	CC OT/M-1	1,031
5	NEWGen 53	Marine	Recirculating	440	CC R/M-1	489
5	NEWGen 54	Marine	Recirculating	448	CC R/M-1	489
5	NEWGen 55	Marine	Recirculating	525	CC R/M-1	489
5	NEWGen 56	Marine	Recirculating	544	CC R/M-1	489
6	NEWGen 57	Marine	Recirculating	1,030	CC R/M-2	1,030

Source: RDI, 2001; U.S. EPA analysis, 2001.

5.A.7 Development of Coal Model Facilities

The approach to developing coal model facilities was the same as that described for combined-cycle model facilities. EPA's analysis projected 14 new in-scope coal facilities. The cooling water and economic characteristics of these 14 facilities were based on the 41 existing coal facilities with "in-scope" characteristics identified from the section 316(b) Industry Survey. EPA developed eight coal model facility types.

- ***Model Facility 1,*** based on 10 freshwater/recirculating facilities with relatively small capacities (on average 173 MW);
- ***Model Facility 2,*** based on 7 freshwater/recirculating facilities with medium capacities (on average 625 MW);
- ***Model Facility 3,*** based on 8 freshwater/recirculating facilities with relatively large capacities (on average 1,564 MW);
- ***Model Facility 4,*** based on 4 freshwater/recirculating facilities with cooling lakes with an average size of 660 MW;
- ***Model Facility 5,*** based on 3 freshwater/once-through facilities with very small capacities (on average 63 MW);
- ***Model Facility 6,*** based on 5 freshwater/once-through facilities with medium capacities (on average 515 MW);
- ***Model Facility 7,*** based on 1 freshwater/once-through facility with a very large capacity (on average 3,564 MW);
- ***Model Facility 8***, based on 3 marine/recirculating facilities with an average size of 812 MW.

As with the combined-cycle analysis, the number of model facility types for each water body/cooling system combination depended on the number of survey facilities with that combination of characteristics and their size distribution: EPA developed more model facilities for water body/cooling system combinations with a large number of survey facilities and/or with a wide range of facility sizes.

Table 5.A-5 below presents the characteristics of the 41 coal survey facilities (water body type, cooling system type, and actual steam-electric capacity) as well as the model facility by which they are represented and their model facility capacity.

Table 5.A-5: Coal Survey Facilities with In-Scope Characteristics

No.	Survey Facility	Water Body Type	Baseline CWS Type	Actual Steam Capacity (MW)	Model Facility ID	Model Steam Capacity (MW)
1	Survey 1	Freshwater	Recirculating	58	Coal R/FW-1	173
1	Survey 2	Freshwater	Recirculating	58	Coal R/FW-1	173
1	Survey 3	Freshwater	Recirculating	95	Coal R/FW-1	173
1	Survey 4	Freshwater	Recirculating	96	Coal R/FW-1	173
1	Survey 5	Freshwater	Recirculating	114	Coal R/FW-1	173
1	Survey 6	Freshwater	Recirculating	140	Coal R/FW-1	173
1	Survey 7	Freshwater	Recirculating	182	Coal R/FW-1	173
1	Survey 8	Freshwater	Recirculating	240	Coal R/FW-1	173
1	Survey 9	Freshwater	Recirculating	330	Coal R/FW-1	173
1	Survey 10	Freshwater	Recirculating	417	Coal R/FW-1	173
2	Survey 11	Freshwater	Recirculating	450	Coal R/FW-2	625
2	Survey 12	Freshwater	Recirculating	509	Coal R/FW-2	625
2	Survey 13	Freshwater	Recirculating	566	Coal R/FW-2	625
2	Survey 14	Freshwater	Recirculating	664	Coal R/FW-2	625
2	Survey 15	Freshwater	Recirculating	721	Coal R/FW-2	625
2	Survey 16	Freshwater	Recirculating	726	Coal R/FW-2	625
2	Survey 17	Freshwater	Recirculating	736	Coal R/FW-2	625
3	Survey 18	Freshwater	Recirculating	1,010	Coal R/FW-3	1,564
3	Survey 19	Freshwater	Recirculating	1,147	Coal R/FW-3	1,564
3	Survey 20	Freshwater	Recirculating	1,300	Coal R/FW-3	1,564
3	Survey 21	Freshwater	Recirculating	1,429	Coal R/FW-3	1,564
3	Survey 22	Freshwater	Recirculating	1,627	Coal R/FW-3	1,564
3	Survey 23	Freshwater	Recirculating	1,700	Coal R/FW-3	1,564
3	Survey 24	Freshwater	Recirculating	1,700	Coal R/FW-3	1,564
3	Survey 25	Freshwater	Recirculating	2,600	Coal R/FW-3	1,564
4	Survey 26	Freshwater	Recirculating w. Lake	444	Coal RL/FW-1	660
4	Survey 27	Freshwater	Recirculating w. Lake	546	Coal RL/FW-1	660
4	Survey 28	Freshwater	Recirculating w. Lake	570	Coal RL/FW-1	660
4	Survey 29	Freshwater	Recirculating w. Lake	1,080	Coal RL/FW-1	660
5	Survey 30	Freshwater	Once-Through	50	Coal OT/FW-1	63
5	Survey 31	Freshwater	Once-Through	69	Coal OT/FW-1	63
5	Survey 32	Freshwater	Once-Through	70	Coal OT/FW-1	63
6	Survey 33	Freshwater	Once-Through	213	Coal OT/FW-2	515
6	Survey 34	Freshwater	Once-Through	261	Coal OT/FW-2	515
6	Survey 35	Freshwater	Once-Through	655	Coal OT/FW-2	515
6	Survey 36	Freshwater	Once-Through	721	Coal OT/FW-2	515
6	Survey 37	Freshwater	Once-Through	725	Coal OT/FW-2	515
7	Survey 38	Freshwater	Once-Through	3,564	Coal OT/FW-3	3,564
8	Survey 39	Marine	Recirculating	230	Coal R/M-1	812
8	Survey 40	Marine	Recirculating	848	Coal R/M-1	812
8	Survey 41	Marine	Recirculating	1,358	Coal R/M-1	812

Source: U.S. EPA 2000; U.S. EPA analysis, 2001.