

# Chapter B2: Cost Impact Analysis

## INTRODUCTION

This chapter presents an assessment of the magnitude of compliance costs associated with the Proposed Section 316(b) Phase II Existing Facilities Rule, including a cost-to-revenue analysis at the facility and firm levels, a state-level analysis of compliance costs per household, and an analysis of compliance costs relative to electricity price projections at the North American Electric Reliability Council (NERC) level. Later chapters consider the potential energy effects of the proposed rule on regional energy markets and facilities subject to Phase II regulation (*Chapter B3: Electricity Market Model Analysis*), impacts on small entities (*Chapter B4: Regulatory Flexibility Analysis*), and impacts on governments (*Chapter B5: UMRA Analysis*). *Chapter B7: Alternative Options - Costs and Economic Impacts* evaluates the magnitude of four other regulatory alternatives considered by EPA.

### CHAPTER CONTENTS

B2-1	Cost-to-Revenue Measure .....	B2-1
	B2-1.1 Facility Analysis .....	B2-2
	B2-1.2 Firm Analysis .....	B2-3
B2-2	Cost Per Household .....	B2-4
B2-3	Electricity Price Analysis .....	B2-6
References	.....	B2-8

Based on the analyses presented in this chapter, EPA concludes that compliance with this proposed rule is both economically practicable and achievable.<sup>1</sup>

## B2-1 COST-TO-REVENUE MEASURE

The “cost-to-revenue measure” is used to assess the magnitude of compliance costs relative to revenues. This test is commonly used to evaluate the economic practicability of regulatory requirements. The cost-to-revenue measure is a useful test because it compares the cost of reducing adverse environmental impact from the operation of the facility’s cooling water intake structure (CWIS) with the economic value (i.e., revenue) of the facility’s economic activities. EPA conducted this test at the facility and firm levels.

Depending on the policy option analyzed, annualized compliance costs include all capital costs, O&M costs, administrative costs, energy penalty costs, and plant outage costs of compliance with the proposed Phase II rule. O&M costs include the cost of auxiliary power requirements as a result of the operation of recirculating cooling towers. To derive the constant annual value of the capital costs and the value of the cooling tower construction and/or connection plant outage, EPA annualized them over 30 years, using a seven percent discount rate. The costs of condenser upgrades were annualized over 20 years. Other capital costs, which include fine-mesh traveling screens with and without fish handling as well as fish handling and return systems, were annualized over 10 years. EPA then added the annualized capital and connection outage costs to annual O&M costs, administrative costs, and the cost of the energy penalty to derive each facility’s total annual cost of complying with the Phase II rule.<sup>2</sup> For a detailed analysis of the compliance cost components developed for this analysis, see *Chapter B1: Summary of Compliance Costs* and the § 316(b) *Technical Development Document*.

EPA compared the annualized compliance costs to the estimated facility and firm revenues to determine the economic practicability of the proposed Phase II rule on both the facility and firm levels. This analysis uses impact thresholds of one and three percent.

<sup>1</sup> It should be noted that the following measures are intended to give an indication of the magnitude of compliance costs. These measures are not used to predict closures or other types of economic impacts on facilities subject to the proposed Phase II rule. EPA did not rely on any one of these measures to assess the magnitude of costs.

<sup>2</sup> This annualization methodology is different from that conducted for the national cost estimate presented in *Chapter B1: Overview of Costs and Economic Impacts*. For the national cost estimate, the present value was determined as of the first year the Phase II rule will take effect (2004). In contrast, for the impact analysis, the present value was determined as of the first year of compliance of each facility (2004 to 2012).

### B2-1.1 Facility Analysis

To estimate the impact on facilities due to the proposed Phase II rule, EPA compared the annualized post-tax compliance costs of the proposed rule as a percentage of annual revenues for each of the 550 in-scope facilities. EPA used facility-specific revenue projections from ICF Consulting’s Integrated Planning Model (IPM®) for 2008 for this analysis. The IPM did not provide revenues for 21 of the 550 in-scope facilities. Eleven of these facilities are estimated to be baseline closures and 10 facilities were not modeled by the IPM. In addition, 9 facilities were projected by IPM to have zero baseline revenues. EPA used facility-specific electricity generation and firm-specific wholesale prices as reported to the Energy Information Administration (EIA) to calculate the cost-to-revenue ratio for the 19 non-baseline closure facilities with missing information. The revenues for one of these facilities remained unknown.

Table B2-1 below presents the results of the facility-level cost-to-revenue measure conducted for the 550 electric generating facilities subject to the Phase II rule, by facility ownership type and fuel type. For each facility type the table presents (1) the total number of facilities; (2) the number of facilities with a cost-to-revenue ratio of less than 0.5 percent, between 0.5 and one percent, between one and three percent, and greater than three percent; and (3) the minimum and maximum ratio.

Table B2-1: Facility-Level Cost-to-Revenue Measure									
Facility Type	Total Number of Facilities	Number of Facilities with a Ratio of						Minimum Ratio	Maximum Ratio
		<0.5%	0.5 -1%	1 - 3%	> 3%	Baseline Closure	n/a		
<b>By Ownership Type</b>									
Investor-Owned Utility	313	218	39	37	12	6	1	0.02%	15.8%
Federal Utility	13	12	1	-	-	-	-	0.07%	0.5%
State-Owned Utility	6	3	2	1	-	-	-	0.09%	1.9%
Political Subdivision	8	4	-	2	1	1	-	0.07%	28.0%
Municipality & Municipal Marketing Authority	50	13	6	16	15	-	-	0.09%	34.3%
Rural Electric Cooperative	25	10	4	6	5	-	-	0.09%	9.0%
Nonutility (former utility)	120	69	24	15	8	4	-	0.02%	6.4%
Nonutility (original)	14	2	2	5	5	-	-	0.29%	12.1%
<b>Total<sup>a</sup></b>	<b>550</b>	<b>331</b>	<b>78</b>	<b>82</b>	<b>46</b>	<b>11</b>	<b>1</b>	<b>0.02%</b>	<b>32.3%</b>
<b>By Fuel Type</b>									
Coal	299	218	44	26	10	-	-	0.02%	12.1%
Combined-Cycle	16	6	3	3	3	-	-	0.04%	11.5%
Nuclear	57	47	2	-	-	8	-	0.02%	0.8%
Oil	169	60	26	48	31	3	-	0.05%	34.3%
Other Steam	8	-	2	5	1	-	-	0.51%	4.5%
Unknown	1	-	-	-	-	-	1	n/a	n/a
<b>Total<sup>a</sup></b>	<b>550</b>	<b>331</b>	<b>78</b>	<b>82</b>	<b>46</b>	<b>11</b>	<b>1</b>	<b>0.02%</b>	<b>32.3%</b>

<sup>a</sup> Individual numbers may not add up due to independent rounding.

Source: IPM analysis: model run for Section 316(b) base case; U.S. EPA analysis, 2002.

Table B2-1 shows that the vast majority of facilities subject to the proposed Phase II rule incur very low compliance costs when compared to facility-level revenues. Out of the 550 facilities subject to the proposed Phase II rule, 409, or approximately 74 percent, incur annualized costs of less than 1 percent of revenues. Of these, 331, or approximately 60 percent, incur annualized costs of less than 0.5 percent of revenues. Eighty-two facilities, or 15 percent would incur costs of between 1 and 3 percent of revenues, and 46 facilities, or 8 percent, would incur costs of greater than 3 percent. EPA estimates that eleven facilities would be baseline closures, and for one facility, revenues are unknown. Based on these results, EPA concludes that the proposed Phase II rule would be economically practicable at the facility level.

### B2-1.2 Firm Analysis

The facility-level analysis above showed that compliance costs are low compared to facility-level revenues. However, impacts experienced at the firm-level may be significant for firms that own multiple facilities subject to the proposed Phase II rule. EPA therefore also analyzed the economic practicability of the proposed Phase II rule at the firm level.

To evaluate the economic practicability of this rule on the firms owning the in-scope facilities, EPA first identified the domestic parent entity of each in-scope Phase II facility. For a detailed description of how EPA identified the domestic parent entity of each in-scope facility, see *Chapter B4: Regulatory Flexibility Analysis*. From this analysis, EPA identified the 131 unique domestic parent entities owning facilities subject to the proposed Phase II regulation. EPA obtained the sales revenues for the 131 domestic parent entities from publicly available data sources (the 1999 Forms EIA-860A, EIA-860B, and EIA-861; and the Dun and Bradstreet database) as well as EPA’s 2000 Section 316(b) Industry Survey. The firm-level analysis is based on the aggregated post-tax compliance costs for each facility owned by the 131 parent entities to the firm’s total sales revenue. EPA identified 70 entities, out of the 131 unique domestic parent entities, that own more than one facility subject to the proposed Phase II rule.

Table B2-2 below summarizes the results of the cost-to-revenue measure conducted for the 131 entities owning in-scope electric generating facilities by the parent entity type. For each entity type the table presents (1) the total number of facilities owned; (2) the total number of firms; (3) the number of firms with a cost-to-revenue ratio of less than 0.5 percent, between 0.5 and one percent, between one and three percent, greater than three percent; and (4) the minimum and maximum ratio.

Entity Type	Total Number of Facilities	Total Number of Firms	Number of Firms with a Ratio of					Minimum Ratio	Maximum Ratio
			<0.5%	0.5-1%	1 - 3%	> 3%	Baseline Closure		
Municipality & Municipal Marketing Authority	50	37	18	8	8	3	-	0.05%	5.29%
Political Subdivision	8	4	3	-	1	-	-	0.03%	1.22%
Rural Electric Cooperative	25	15	12	2	1	-	-	0.06%	1.41%
State	7	4	2	2	-	-	-	0.10%	0.84%
Federal	13	1	1	-	-	-	-	0.16%	0.16%
Private	446	70	68	-	-	-	2	0.00%	0.44%
<b>Total<sup>a</sup></b>	<b>550</b>	<b>131</b>	<b>104</b>	<b>12</b>	<b>10</b>	<b>3</b>	<b>2</b>	<b>0.00%</b>	<b>5.29%</b>

<sup>a</sup> Individual numbers may not add up to totals due to independent rounding.

Source: IPM analysis: model run for Section 316(b) base case; EPA analysis, 2002.

EPA estimates that the compliance costs will comprise a very low percentage of firm-level revenues. Of the 131 unique entities with facilities subject to the proposed Phase II rule, 116, or approximately 89 percent, incur annualized costs of less than 1 percent of revenues. Of these, 104, or approximately 79 percent, incur annualized costs of less than 0.5 percent of revenues. Ten entities would incur costs of between 1 and 3 percent of revenues, and only three entities would incur costs of greater than 3 percent. EPA estimates that two entities only own facilities projected to be baseline closures. For both entities, the compliance costs incurred would have been less than 0.5 percent of revenues. Overall, the estimated annualized compliance costs represent between 0.002 and 5.3 percent of the entities' annual sales revenue. Based on the results from this analysis, EPA concludes that the proposed Phase II rule would be economically practicable at the firm level.

## B2-2 COST PER HOUSEHOLD

EPA also conducted an analysis that evaluates the potential cost per household<sup>3</sup>, if Phase II facilities were able to pass compliance costs on to their customers. This analysis estimates the average compliance cost per household for each NERC region, using two data inputs: (1) the average annual compliance cost per megawatt hour (MWh) of sales and (2) the average annual MWh of electricity sales per household. Both data elements were calculated by NERC region using the following approach.

**Average annual compliance cost per MWh of sales:** EPA compiled data on total electricity sales (including residential, commercial, industrial, public street highway and lighting, and other sales) from the 2000 Form EIA-861 database. Utility-level sales were aggregated by NERC region to derive each region's total electricity sales in 2000. In addition, EPA aggregated the national pre-tax compliance costs by the NERC region in which the 550 Phase II facilities are located. The average compliance cost per MWh of electricity sales is calculated by dividing total electricity sales by total pre-tax compliance costs for each region.

**Average annual electricity sales per household:** Form EIA-861 differentiates electricity sales by customer type and also presents the number of customers that account for the sales. The average annual electricity sales per household is therefore calculated by dividing the MWh of residential sales by the number of households. This calculation was again done by NERC region.

EPA calculated the annual cost of the proposed rule per household by multiplying the average annual compliance cost per MWh of sales by the average annual electricity sales per household. This analysis assumes that power generators pass costs on to consumers, on a dollar-to-dollar basis, and that each sector (i.e., residential, industrial, commercial, public street highway and lighting, and other) bears an equal burden of compliance costs per MWh of electricity.

Table B2-3 shows the results of this analysis: the cost per residential consumer would range from \$0.33 per year in ASCC to \$2.55 per year in HI. Regions with electricity use higher than the average (ERCOT, FRCC, SERC, and SPP) are regions with warm climates where air conditioning use is high.

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<sup>3</sup> The number of residential consumers reported in Form EIA-861 is based on the number of utility meters. This is a proxy for the number of households but can differ slightly due to bulk metering in some multi-family housing.

**Table B2-3: Annual Compliance Cost per Residential Consumer by NERC Region in 2000**

NERC Region <sup>a</sup>	Total Electricity Sales ( MWh)	Total National Pre-Tax Compliance Cost	Annualized Pre-Tax Compliance Cost (\$ / MWh Sales)	Residential Electricity Sales (MWh)	Number of Households	Annual Residential Sales/ Consumer (MWh)	Annual Compliance Cost/ Residential Consumer
ASCC	5,309,970	\$215,459	\$0.04	1,854,968	230,534	8.05	\$0.33
ECAR	522,187,334	\$51,335,018	\$0.10	158,037,771	15,626,013	10.11	\$0.99
ERCOT	285,347,453	\$19,569,370	\$0.07	103,478,697	7,021,590	14.74	\$1.01
FRCC	182,848,371	\$20,999,501	\$0.11	92,391,451	6,721,120	13.75	\$1.58
HI	9,271,676	\$3,108,587	\$0.34	2,627,203	344,882	7.62	\$2.55
MAAC	229,193,120	\$28,742,057	\$0.13	82,890,271	8,982,600	9.23	\$1.16
MAIN	247,759,377	\$23,384,949	\$0.09	72,946,752	8,188,189	8.91	\$0.84
MAPP	139,246,194	\$12,444,394	\$0.09	47,997,755	4,848,274	9.90	\$0.88
NPCC	256,382,568	\$41,090,108	\$0.16	85,806,190	12,650,908	6.78	\$1.09
SERC	764,593,949	\$45,131,984	\$0.06	282,503,216	20,192,159	13.99	\$0.83
SPP	171,473,599	\$8,952,539	\$0.05	59,902,473	4,909,350	12.20	\$0.64
WSCC	599,645,124	\$23,714,787	\$0.04	201,895,024	22,010,686	9.17	\$0.36
<b>U.S.</b>	<b>3,413,258,735</b>	<b>\$278,688,755</b>	<b>\$0.08</b>	<b>1,192,331,771</b>	<b>111,726,305</b>	<b>10.67</b>	<b>\$0.87</b>

<sup>a</sup> **Key to NERC regions:** ASCC – Alaska Systems Coordinating Council; ECAR – East Central Area Reliability Coordination Agreement; ERCOT – Electric Reliability Council of Texas; FRCC – Florida Reliability Coordinating Council; HI – Hawaii; 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: U.S. DOE, 2000; EPA analysis, 2002.

## B2-3 ELECTRICITY PRICE ANALYSIS

EPA also considered potential effects of the proposed Phase II rule on electricity prices. EPA used three data inputs in this analysis: (1) total pre-tax compliance cost incurred by facilities subject to the proposed rule, (2) total electricity sales, based on the Annual Energy Outlook (AEO) 2002, and (3) prices by consumer type (residential, commercial, industrial, and transportation), also from the AEO 2002. All three data elements were calculated by NERC region.<sup>4</sup>

Table B2-4 shows the annualized costs of complying with the proposed Phase II rule, total electricity sales (MWh), and the cost in cents per kilowatt hour (KWh) of total electricity sales by NERC region. The costs range from 0.004 cents per KWh sales in WSCC to 0.017 cents per KWh sales in NPCC.

<b>NERC Region</b>	<b>Annualized Pre-Tax Compliance Costs (National; \$2001)</b>	<b>Total Electricity Sales (MWh; 2000)</b>	<b>Annualized Pre-Tax Compliance Cost (Cents / KWh Sales)</b>
ASCC	\$215,459	---	---
ECAR	\$51,335,018	517,730,286	0.010
ERCOT	\$19,569,370	269,072,083	0.007
HI	\$3,108,587	---	---
MAAC	\$28,742,057	246,302,490	0.012
MAIN	\$23,384,949	231,949,219	0.010
MAPP	\$12,444,394	153,681,396	0.008
NPCC	\$41,090,108	243,035,378	0.017
FRCC	\$20,999,501	182,241,013	0.012
SERC	\$45,131,984	759,772,644	0.006
SPP	\$8,952,539	171,100,266	0.005
WSCC	\$23,714,787	627,001,373	0.004
<b>U.S.</b>	<b>\$278,688,755</b>	<b>3,418,263,184</b>	<b>0.008</b>

Source: U.S. DOE, 2001; U.S. EPA analysis, 2002.

To determine potential effects on electricity prices as a result of the proposed rule, EPA compared the compliance cost per KWh of sales, presented in Table B2-4, to baseline electricity prices. Table B2-5 shows the annualized pre-tax compliance cost in cents per KWh of electricity sales and the AEO projected electricity prices for each consumer type. In addition, the table presents the price increase by consumer type that would result from the proposed Phase II rule. The largest potential increase in electricity prices would be 0.31 percent cents per KWh for an industrial facility in NPCC. The average increase in electricity prices would only be between 0.09 percent for households (0.008 / 8.81) and 0.17 percent for industrial customers (0.008 / 4.88).

This analysis assumes that power generators fully recover compliance costs from consumers and that each sector (i.e., residential, commercial, industrial, and transportation) bears an equal burden of compliance costs per MWh of purchased electricity.

<sup>4</sup> The Annual Energy Outlook does not include two NERC regions, ASCC and HI.

Region	Annualized Pre-Tax Compliance Cost (Cents / KWh Sales)	Residential		Commercial		Industrial		Transportation		All Sectors Average	
		Price	% Change	Price	% Change	Price	% Change	Price	% Change	Price	% Change
ECAR	0.010	8.04	0.12%	7.43	0.13%	4.63	0.21%	7.08	0.14%	6.44	0.15%
ERCOT	0.007	8.35	0.09%	7.40	0.10%	4.35	0.17%	6.54	0.11%	6.80	0.11%
MAAC	0.012	10.43	0.11%	9.19	0.13%	7.09	0.16%	9.13	0.13%	9.11	0.13%
MAIN	0.010	9.09	0.11%	7.60	0.13%	5.03	0.20%	7.55	0.13%	7.13	0.14%
MAPP	0.008	8.27	0.10%	6.82	0.12%	4.62	0.18%	6.76	0.12%	6.43	0.13%
NPCC	0.017	11.42	0.15%	8.40	0.20%	5.52	0.31%	8.33	0.20%	8.93	0.19%
FRCC	0.012	8.30	0.14%	7.17	0.16%	5.31	0.22%	6.49	0.18%	7.60	0.15%
SERC	0.006	7.33	0.08%	6.52	0.09%	4.20	0.14%	5.63	0.11%	6.08	0.10%
SPP	0.005	7.14	0.07%	6.08	0.09%	4.03	0.13%	5.14	0.10%	5.86	0.09%
WSCC	0.004	9.17	0.04%	8.03	0.05%	5.08	0.07%	6.83	0.06%	7.58	0.05%
<b>U.S.</b>	<b>0.008</b>	<b>8.81</b>	<b>0.09%</b>	<b>8.00</b>	<b>0.10%</b>	<b>4.88</b>	<b>0.17%</b>	<b>7.88</b>	<b>0.10%</b>	<b>7.31</b>	<b>0.11%</b>

<sup>a</sup> Prices are in cents per KWh.

Source: EPA analysis, 2002.

## REFERENCES

U.S. Department of Energy (U.S. DOE). 2001. Energy Information Administration (EIA). *Annual Energy Outlook 2002 With Projections to 2020*. DOE/EIA-0383(2002). December 2001.

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