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Analysis of S.139, the Climate Stewardship Act of 2003

Table 5.1. Key Electricity Sector Results, 2010, 2020, and 2025

		2010				2020				2025			
	2000	Refer-ence	S.139	Corp20	Corp80	Refer-ence	S.139	Corp20	Corp80	Refer-ence	S.139	Corp20	Corp80
Generation By Fuel (billion kilowatthours)													
Coal	1,966	2,293	1,980	1,984	1,986	2,568	876	910	887	2,803	560	649	541
Oil and Other	121	63	46	45	45	73	45	46	45	81	47	47	47
Natural Gas	601	946	1,095	1,094	1,079	1,441	2,077	2,066	2,013	1,637	2,332	2,317	2,320
Nuclear	754	790	801	801	801	793	934	933	938	793	1,186	1,186	1,190
Renewable	356	442	566	564	565	474	1,051	1,064	1,065	489	1,188	1,184	1,200
Total	3,798	4,534	4,488	4,488	4,476	5,349	4,982	5,020	4,949	5,803	5,314	5,385	5,298
Generating Capacity (gigawatts)													
Coal	310.6	315.3	293.4	292.9	292.7	348.6	200.3	197.5	203.3	380.8	104.8	107.2	103.2
Coal with Sequestration	0.0	0.0	0.0	0.0	0.0	0.0	12.2	16.1	11.1	0.0	37.7	50.6	35.5
Coal Subtotal	*310.6*	*315.3*	*293.4*	*292.9*	*292.7*	*348.6*	*212.5*	*213.6*	*214.4*	*380.8*	*142.5*	*157.9*	*138.7*
Other Fossil Steam	136.0	79.0	81.8	81.7	82.1	73.0	65.9	68.0	63.3	72.2	54.1	55.1	56.4
Combined Cycle	46.0	181.3	208.0	209.1	208.1	265.9	306.7	310.6	305.2	311.1	305.0	309.2	303.5
Combined Cycle with Sequestration	0.0	0.0	0.8	0.9	1.0	0.0	45.4	42.7	30.3	0.0	102.1	104.4	92.8
Combined Cycle Subtotal	*46.0*	*181.3*	*208.9*	*210.0*	*209.1*	*265.9*	*352.1*	*353.3*	*335.5*	*311.1*	*407.1*	*413.6*	*396.3*
Combustion Turbine	81.8	131.7	128.5	128.9	128.8	153.3	126.7	126.6	126.1	169.5	123.4	123.9	123.7
Nuclear	98.0	98.7	100.3	100.3	100.3	99.0	117.2	117.2	117.7	99.0	149.2	149.2	149.7
Renewable	88.4	97.4	129.2	128.7	128.8	101.2	225.3	226.7	230.9	102.8	245.8	243.9	249.2
Other	19.8	22.1	22.1	22.0	22.1	32.2	25.5	25.3	25.0	38.2	25.5	25.5	25.1
Total	**780.6**	**925.6**	**964.2**	**964.5**	**963.9**	**1,073.4**	**1,125.1**	**1,130.7**	**1,112.9**	**1,173.7**	**1,147.6**	**1,168.9**	**1,139.0**
Electricity Demand (billion kilowatthours) and Prices (2001 cents per kilowatthour)													
Electricity Sales	3,438	4,104	4,050	4,056	4,039	4,848	4,467	4,525	4,423	5,246	4,653	4,770	4,621
Electricity Prices	6.89	6.40	6.96	6.96	7.23	6.66	8.83	8.43	9.05	6.71	9.79	9.05	9.82
Emissions (million tons SO_2 and NO_x, tons of mercury, and million metric tons carbon)													
Sulfur Dioxide	11.2	9.7	9.8	9.9	9.8	8.9	5.9	5.9	6.1	8.9	1.9	1.9	2.1
Nitrogen Oxide	5.1	3.9	3.5	3.5	3.5	4.0	1.5	1.5	1.5	4.1	0.7	0.7	0.7
Mercury	50.3	53.6	48.7	48.5	48.2	54.1	19.1	19.3	19.0	54.8	7.2	7.2	6.9
Carbon	621.1	697.4	614.8	616.4	614.6	802.5	351.9	358.0	357.0	867.8	204.8	208.3	206.7

Note: Capacity excludes end-use combined heat and power.
Source: Energy Information Administration, Office of Integrated Analysis and Forecasting, National Energy Modeling System runs MLBASE.D050303A, MLBILL.D050503A, ML_CCCC20.D050503A, and ML_CCCC80.D050503A.

Table 5.2. Renewable Generation by Fuel in the Reference and S.139 Cases, 2010, 2020, and 2025 (billion kilowatthours)

		2010		2020		2025	
Fuel	**2000**	**Reference**	**S.139**	**Reference**	**S.139**	**Reference**	**S.139**
Hydroelectric	275.3	305.1	305.1	304.3	304.2	304.6	304.3
Geothermal	14.1	22.0	44.6	33.4	73.1	38.1	77.2
Municipal Solid Waste	22.6	31.4	37.3	33.8	39.8	34.0	40.0
Biomass	37.8	59.0	64.4	70.5	352.7	76.8	482.5
Solar	0.5	1.8	1.8	2.9	3.2	3.8	4.3
Wind	5.6	22.9	112.5	29.2	277.7	32.0	280.1
Total	**355.9**	**442.3**	**565.8**	**474.1**	**1,050.6**	**489.4**	**1,188.4**

Sources: Energy Information Administration, Office of Integrated Analysis and Forecasting, National Energy Modeling System runs MLBASE.D050303A and MLBILL.D050503A.

Table 5.3. Cost and Performance of Selected New Generating Technologies in 2002

Analysis Case	Overnight Costs (2001$/kW)	Variable O&M (2001 mills/kWh)	Fixed O&M (2001$/kW)	Heat Rate in 2002 (Btu/kWh)	Heat Rate nth-of-kind (Btu/kWh)
Advanced Nuclear					
Reference	2,118	0.4	58.5	N/A	N/A
High Technology	1,801	0.4	58.5	N/A	N/A
Advanced Coal					
Reference	1,367	2.0	33.7	8,000	7,200
High Technology	1,162	2.0	33.7	8,000	6,120
Advanced Coal With Sequestration					
Reference	2,070	2.5	40.0	9,600	7,920
High Technology	1,760	2.5	40.0	9,600	6,732
Advanced Gas Combined Cycle					
Reference	608	2.0	10.2	7,000	6,350
High Technology	562	2.0	10.2	7,000	5,874
Advanced Gas CC With Sequestration					
Reference	1,068	2.6	14.8	8,750	7,300
High Technology	908	2.6	14.8	8,750	6,205
Biomass					
Reference	1,764	3.1	46.0	8,911	8,911
High Technology	1,495	3.1	46.0	8,911	8,911
Wind					
Reference	1,004	0.0	26.1	N/A	N/A
High Technology	928	0.0	26.1	N/A	N/A

Note: Costs include adjustments for technological optimism and contingencies.
Source: Energy Information Administration, Office of Integrated Analysis and Forecasting.

Table 5.4. Key Electricity Sector Results in Sensitivity Cases—High Technology

		2010			2020			2025		
	2000	Reference	Reference W/High Technology	S.139 W/High Technology	Reference	Reference W/High Technology	S.139 W/High Technology	Reference	Reference W/High Technology	S.139 W/High Technology
Generation by Fuel (billion kilowatthours)										
Coal	1,966	2,293	2,247	2,031	2,568	2,450	1,150	2,803	2,615	696
Oil and Other	121	63	57	41	73	54	33	81	59	36
Natural Gas	601	946	910	988	1,441	1,347	1,812	1,637	1,549	2,256
Nuclear	754	790	783	801	793	779	912	793	771	1,126
Renewable	356	442	456	546	474	520	940	489	550	1,029
Total	**3,798**	**4,534**	**4,454**	**4,406**	**5,349**	**5,150**	**4,847**	**5,803**	**5,543**	**5,142**
Generating Capacity (gigawatts)										
Coal	310.6	315.3	311.7	291.1	348.6	336.7	220.9	380.8	359.5	159.4
Coal with Sequestration	0.0	0.0	0.0	0.0	0.0	0.0	5.2	0.0	0.0	17.5
Coal Subtotal	310.6	315.3	311.7	291.1	348.6	336.7	226.1	380.8	359.5	176.9
Other Fossil Steam	136.0	79.0	77.1	78.0	73.0	68.2	58.8	72.2	65.2	54.7
Combined Cycle	46.0	181.3	178.4	199.4	265.9	280.8	294.7	311.1	331.8	294.5
Combined Cycle with Sequestration	0.0	0.0	0.0	0.6	0.0	0.0	43.9	0.0	0.0	115.8
Combined Cycle Subtotal	46.0	181.3	178.4	200.1	265.9	280.8	338.5	311.1	331.8	410.3
Combustion Turbine	81.8	131.7	127.1	125.3	153.3	126.7	120.2	169.5	133.7	119.0
Nuclear	98.0	98.7	97.7	100.3	99.0	97.0	114.8	99.0	95.9	141.5
Renewable	88.4	97.4	99.2	120.5	101.2	106.1	196.8	102.8	108.9	207.8
Other	19.8	22.1	21.6	21.3	32.2	25.1	22.3	38.2	28.6	22.6
Total	**780.6**	**925.6**	**912.8**	**936.6**	**1,073.4**	**1,040.6**	**1,077.6**	**1,173.7**	**1,123.6**	**1,132.9**
Electricity Demand (billion kilowatthours) and Prices (2001 cents per kilowatthour)										
Electricity Sales	3,438	4,104	4,020	3,965	4,848	4,652	4,331	5,246	4,997	4,481
Electricity Prices	6.89	6.40	6.29	6.71	6.66	6.32	7.93	6.71	6.25	8.57
Emissions (million tons SO_2 and NO_x, tons of mercury, and million metric tons of carbon)										
Sulfur Dioxide	11.2	9.7	9.7	9.9	8.9	8.9	8.8	8.9	8.9	4.2
Nitrogen Oxide	5.1	3.9	3.8	3.6	4.0	3.8	2.0	4.1	3.8	1.1
Mercury	50.3	53.6	53.2	49.5	54.1	53.2	27.9	54.8	53.6	13.3
Carbon	621.1	697.4	677.3	616.1	802.5	735.4	406.3	867.8	768.5	251.2

Note: Capacity excludes end-use combined heat and power.
Source: Energy Information Administration, Office of Integrated Analysis and Forecasting, National Energy Modeling System runs MLBASE_HT.D052003C, MLBILL.D050503A, and ML_HT.D050503A.

Table 5.5. Key Electricity Sector Results in Sensitivity Cases—No Nuclear or Geological Sequestration

		2010			2020			2025		
	2000	Reference	S.139	No Nuclear or Geological Sequestration	Reference	S.139	No Nuclear or Geological Sequestration	Reference	S.139	No Nuclear or Geological Sequestration
Generation by Fuel (billion kilowatthours)										
Coal	1,966	2,293	1,980	1,957	2,568	876	607	2,803	560	206
Oil and Other	121	63	46	47	73	45	47	81	47	52
Natural Gas	601	946	1,095	1,101	1,441	2,077	2,173	1,637	2,332	2,623
Nuclear	754	790	801	801	793	934	804	793	1,186	804
Renewable	356	442	566	575	474	1,051	1,311	489	1,188	1,564
Total	**3,798**	**4,534**	**4,488**	**4,481**	**5,349**	**4,982**	**4,943**	**5,803**	**5,314**	**5,250**
Generating Capacity (gigawatts)										
Coal	310.6	315.3	293.4	293.2	348.6	200.3	185.9	380.8	104.8	109.2
Coal with Sequestration	0.0	0.0	0.0	0.0	0.0	12.2	0.0	0.0	37.7	0.0
Coal Subtotal	*310.6*	*315.3*	*293.4*	*293.2*	*348.6*	*212.5*	*185.9*	*380.8*	*142.5*	*109.2*
Other Fossil Steam	136.0	79.0	81.8	86.9	73.0	65.9	67.7	72.2	54.1	54.5
Combined Cycle	46.0	181.3	208.0	209.6	265.9	306.7	351.2	311.1	305.0	398.0
Combined Cycle with Sequestration	0.0	0.0	0.8	0.0	0.0	45.4	0.0	0.0	102.1	0.0
Combined Cycle Subtotal	*46.0*	*181.3*	*208.9*	*209.6*	*265.9*	*352.1*	*351.2*	*311.1*	*407.1*	*398.0*
Combustion Turbine	81.8	131.7	128.5	126.7	153.3	126.7	125.2	169.5	123.4	126.1
Nuclear	98.0	98.7	100.3	100.3	99.0	117.2	100.7	99.0	149.2	100.7
Renewable	88.4	97.4	129.2	132.3	101.2	225.3	272.0	102.8	245.8	303.3
Other	19.8	22.1	22.1	22.4	32.2	25.5	24.9	38.2	25.5	26.8
Total	**780.6**	**925.6**	**964.2**	**971.3**	**1,073.4**	**1,125.1**	**1,127.6**	**1,173.7**	**1,147.6**	**1,118.5**
Electricity Demand (billion kilowatthours) and Prices (2001 cents per kilowatthour)										
Electricity Sales	3,438	4,104	4,050	4,044	4,848	4,467	4,424	5,246	4,653	4,573
Electricity Prices	6.89	6.40	6.96	7.04	6.66	8.83	9.12	6.71	9.79	10.68
Emissions (million tons SO2 and NOx, tons of mercury, and million metric tons of carbon)										
Sulfur Dioxide	11.2	9.7	9.8	9.6	8.9	5.9	4.6	8.9	1.9	1.6
Nitrogen Oxide	5.1	3.9	3.5	3.5	4.0	1.5	1.2	4.1	0.7	0.6
Mercury	50.3	53.6	48.7	47.4	54.1	19.1	15.4	54.8	7.2	4.6
Carbon	621.1	697.4	614.8	609.4	802.5	351.9	343.1	867.8	204.8	272.9

Note: Capacity excludes end-use combined heat and power.
Source: Energy Information Administration, Office of Integrated Analysis and Forecasting, National Energy Modeling System runs MLBASE.D050303A, MLBILL.D050503A, and ML0NUCSEQ.D050403A.

Table 5.6. Unplanned Capacity Additions in the S.139 and Offset 50 Cases (gigawatts of capacity added through 2025)

Technology	S.139	Offset 50
Coal with Sequestration	37.7	5.0
Advanced Gas without Sequestration	156.5	191.2
Advanced Gas with Sequestration	102.1	13.3
Nuclear	48.5	48.6
Renewables	148.2	135.3
Wind	75.1	64.7
Biomass	65.2	62.3

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting, National Energy Modeling System runs MLBILL.D050503A and OFFSET50.D052303A.

Table 5.7. Unplanned Capacity Additions in the S.139 and S.139 High Gas Price Cases (gigawatts of capacity added through 2025)

Technology	S.139	S.139 High Gas Price
Coal with Sequestration	37.7	80.9
Advanced Gas without Sequestration	156.5	127.7
Advanced Gas with Sequestration	102.1	49.4
Nuclear	48.5	64.6
Renewables	148.2	177.7
Wind	75.1	83.9
Biomass	65.2	85.2

Source: Energy Information Administration, Office of Integrated Analysis and Forecasting, National Energy Modeling System runs MLBILL.D050503A and MLBILL_HGP.D052303A.