

Energy Market and Economic Impacts of S. 280, the Climate Stewardship and Innovation Act of 2007

Table 1. Reference emissions and emission cap derivation, 2005-2050
(million metric tons CO₂ equivalent)

	2005	2012	2020	2030	2050
Emissions in covered sectors					
Nonexempt sources					
Energy-related carbon dioxide					
Industrial (excluding agriculture and construction)	902	954	992	1119	
Transportation, petroleum	1922	2053	2288	2626	
Natural gas used in pipelines	30	36	42	42	
Electric power sector	2375	2571	2832	3338	
Non-energy related carbon dioxide (cement and lime production)	60	65	72	80	
Methane (coal mining)	66	69	70	76	
Nitrous oxide (includes adipic and nitric acid)	34	36	38	41	
Fluorinated gases (HFCs, SF ₆ , and PFCs)	160	239	340	518	
Total non-exempt covered emissions	5548	6023	6673	7839	9565
Exempt sources					
Energy-related carbon dioxide					
Commercial	230	248	270	298	
Construction	63	63	70	77	
Natural gas, transportation	2	4	5	6	
Other carbon dioxide (including accounting adjustments)	4	3	2	2	
Methane					
Landfills	156	158	163	172	
Natural gas and oil systems	154	182	221	284	
Nitrous oxide (mobile sources)	53	44	47	52	
Total, exempt sources	661	701	779	891	1087
Emissions in noncovered sectors					
Energy-Related carbon dioxide					
Residential	368	387	393	390	
Agriculture	54	54	53	55	
Methane (agriculture)	237	239	239	241	
Nitrous oxide (agriculture)	280	292	302	316	
Total, noncovered sectors	939	971	987	1001	1222
Total Gross GHG Emissions (excludes changes in carbon sinks)	7147	7696	8439	9731	11874
S.280 Emission Cap, Before Exemptions		6130	5239	4100	2096
Exempted emissions in covered sectors		701	779	891	1087
S.280 Emission Cap, After Exemptions		5429	4460	3209	1009

Sources: **History:** EIA, Emissions of Greenhouse Gases in the United States 2005, DOE/EIA-0573(2005) (Washington, DC, November 2006).

Projections through 2030: CO₂ Emissions: EIA, *Annual Energy Outlook 2007*, with additional sectoral breakouts and non-energy emissions estimated by the EIA Office of Integrated Analysis and Forecasting.

Non-CO₂ Emissions: 2005-to-2020 growth rates from EPA, *Global Anthropogenic Non-CO₂ Greenhouse Gas Emissions: 1990-2020*, supplementary spreadsheets, case without methane and fluorinated gas technology adoption measures.

2050 Figures: extrapolation from 2030 at 1 percent per year growth for illustrative purposes.

Table 2. International Emissions Baseline, Abatement Commitments, and Assumed Abatement Demand, 2010-2030
(million metric tons carbon dioxide equivalent)

	Emissions Baseline		Abatement Commitment		Cap		Abatement Demand		
	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2	Total
1990	8,188	16,268	Baseline	Baseline	8,188	16,268	0	0	0
2010	9,027	24,463	5.0% below 1990	Baseline	7,778	24,463	1,248	0	1,248
2015	9,184	27,389	8.2% below 1990	Baseline	7,516	27,389	1,667	0	1,667
2020	9,317	30,289	16.4% below 1990	Baseline	6,845	30,289	2,472	0	2,472
2025	9,412	32,856	16.4% below 1990	2020 levels	6,845	27,389	2,567	2,567	5,134
2030	9,520	35,527	26.4% below 1990	2020 levels	6,026	27,389	3,494	5,238	8,732

Table 3. Abatement Supply of Coal-Related Methane, 2012-2030

(quantities in million metric tons of CO₂ equivalent; prices in 2005 dollars per metric ton of CO₂ equivalent)

Allowance Price	2012	2015	2020	2025	2030
1	14.5	16.1	18.4	21.2	23.5
3	15.0	16.9	19.5	22.4	24.8
5	15.5	17.6	20.5	23.6	25.8
10	16.6	19.4	22.8	25.8	27.7
15	17.7	21.1	24.6	27.3	28.7
20	18.8	22.7	26.1	28.3	29.3
30	20.7	25.3	28.0	29.4	29.8
40	22.4	27.3	29.0	29.7	29.9
50	23.8	28.7	29.5	29.9	29.9
60	24.9	29.7	29.7	29.9	29.9

Table 4. Abatement Supply of Nitrous Oxide from Adipic and Nitric Acid Production, 2012-2030

(quantities in million metric tons of CO₂ equivalent; prices in 2005 dollars per metric ton of CO₂ equivalent)

Allowance Price	2012	2015	2020	2025	2030
1	1.8	2.1	2.8	3.2	3.5
3	6.9	8.3	10.7	12.4	13.7
5	8.1	9.8	12.8	14.7	16.1
10	8.7	10.8	14.2	16.1	17.2
15	9.3	11.7	15.3	17.0	17.9
20	9.9	12.6	16.2	17.6	18.2
30	10.9	14.1	17.5	18.3	18.5
40	11.8	15.2	18.1	18.5	18.6
50	12.5	16.0	18.4	18.6	18.6
60	13.1	16.5	18.5	18.6	18.6

Table 5. Abatement Supply of Fluorinated Gases, 2012-2030

(quantities in million metric tons of CO₂ equivalent; prices in 2005 dollars per metric ton of CO₂ equivalent)

Allowance Price	2012	2015	2020	2025	2030
1	8.8	12.8	21.8	25.1	27.8
3	10.2	15.2	26.4	30.5	33.6
5	11.7	17.8	31.4	36.1	39.6
10	15.8	24.9	44.9	50.9	54.6
15	20.3	32.7	59.5	66.0	69.3
20	23.0	37.8	66.4	72.1	74.6
30	25.5	42.1	72.6	76.2	77.2
40	27.6	45.5	75.5	77.4	77.8
50	29.3	48.0	77.0	78.0	78.2
60	30.6	49.7	77.7	78.2	78.3

Table 6. Offsets from Methane, Natural Gas and Oil Systems, 2012-2030

(quantities in million metric tons of CO₂ equivalent; prices in 2005 dollars per metric ton of CO₂ equivalent)

Allowance Price	2012	2015	2020	2025	2030
1	3.8	4.5	5.9	6.8	7.6
3	4.6	5.6	7.4	8.5	9.4
5	4.9	6.0	8.0	9.2	10.1
10	5.3	6.7	8.9	10.1	10.9
15	5.8	7.3	9.8	10.9	11.4
20	7.9	10.2	13.4	14.6	15.0
30	11.5	15.0	18.9	19.8	20.1
40	14.0	18.3	22.2	22.8	22.9
50	14.9	19.3	22.6	22.9	23.0
60	15.7	20.0	22.8	23.0	23.0

Table 7. Offsets from Methane, Landfills, 2012-2030

(quantities in million metric tons of CO₂ equivalent; prices in 2005 dollars per metric ton of CO₂ equivalent)

Allowance Price	2012	2015	2020	2025	2030
1	8.9	10.1	12.1	13.9	15.4
3	17.6	20.3	24.4	28.2	31.1
5	19.8	23.0	27.9	32.1	35.2
10	28.5	33.9	41.5	47.1	50.5
15	30.4	36.9	45.0	49.9	52.5
20	37.6	46.2	55.4	60.0	62.0
30	44.6	55.6	64.1	67.2	68.2
40	48.2	59.9	66.4	68.1	68.4
50	51.2	63.0	67.5	68.4	68.5
60	53.7	65.2	68.1	68.5	68.5

Table 8. Offsets from Methane, Agriculture, 2012-2030

(quantities in million metric tons of CO₂ equivalent; prices in 2005 dollars per metric ton of CO₂ equivalent)

Allowance Price	2012	2015	2020	2025	2030
1	0.2	0.2	0.3	0.4	0.5
3	0.6	0.7	0.9	1.2	1.5
5	0.9	1.0	1.5	2.8	2.5
10	1.7	2.2	3.6	3.6	4.4
15	2.5	3.1	4.2	5.3	5.8
20	3.3	4.0	5.7	7.0	7.0
30	5.2	6.4	8.7	10.4	9.6
40	7.3	9.1	11.7	13.7	12.0
50	9.5	11.8	14.7	16.9	14.4
60	11.9	14.5	17.6	20.1	16.8

Table 9. Offsets from Nitrous Oxide, Agriculture, 2012-2030

(quantities in million metric tons of CO₂ equivalent; prices in 2005 dollars per metric ton of CO₂ equivalent)

Allowance Price	2012	2015	2020	2025	2030
1	1.2	1.4	1.6	1.7	1.3
3	3.7	4.3	4.8	5.1	4.0
5	4.6	5.4	6.9	8.3	6.6
10	6.0	7.2	9.9	12.3	10.6
15	7.5	9.2	12.8	15.9	13.8
20	9.2	11.3	15.8	19.4	16.9
30	12.7	15.9	21.7	26.2	23.1
40	16.5	20.6	27.5	32.7	29.0
50	20.5	25.4	33.0	39.1	34.9
60	24.7	30.1	38.4	45.4	40.8

Table 10. Offsets from Carbon Sequestration, 2012-2030

(quantities in million metric tons of CO₂ equivalent; prices in 2005 dollars per metric ton of CO₂ equivalent)

Allowance Price	2012	2015	2020	2025	2030
1	9.7	11.1	6.3	-0.9	10.0
3	29.3	33.9	19.4	-2.8	30.4
5	41.4	48.3	31.2	3.7	57.2
10	69.1	82.7	91.9	92.4	159.5
15	99.9	121.8	165.3	200.8	264.8
20	134.5	166.2	246.0	315.4	371.4
30	208.9	261.2	413.0	547.1	582.8
40	292.0	364.6	582.8	777.8	791.7
50	380.7	470.5	750.6	1006.2	999.4
60	473.2	576.3	915.9	1233.1	1206.6

Table 11. Offsets from International Sources, 2012-2030

(quantities in million metric tons of CO₂ equivalent; prices in 2005 dollars per metric ton of CO₂ equivalent)

Allowance Price	2012	2015	2020	2025	2030
1	-1092.4	-1346.2	-1923.3	-4256.0	-7097.1
3	-836.8	-1145.7	-1753.2	-3309.9	-5871.4
5	-594.7	-918.2	-1465.9	-2406.1	-4861.3
10	-169.7	-442.8	-831.7	-449.2	-2749.0
15	266.4	121.7	0.2	1295.4	-905.7
20	665.7	651.9	840.3	2958.1	666.2
30	1411.2	1592.4	2230.9	6134.7	3672.7
40	2138.3	2456.2	3361.7	8444.1	6489.0
50	2868.9	3304.7	4467.0	10676.2	8488.0
60	3603.0	4138.8	5562.0	12929.3	10511.6
	Price at which Surplus Becomes Available				
	2012	2015	2020	2025	2030
	12	14	15	11	18

Table 12. Analysis Cases

Case Name	Description and Assumptions
Non-Policy Cases	
Reference	Updated <i>AEO2007</i> reference case with some modeling revisions as described in Appendix D. Non-CO ₂ emissions growth based on EPA “no measures” and “no voluntary technology adoption” cases
High Technology	Updated <i>AEO2007</i> integrated high technology case (without S. 280): <ul style="list-style-type: none"> • Includes more optimistic characteristics for energy technology, including a combination of earlier availability of advanced technologies, lower costs, and better performance. Applies to residential, commercial, industrial, transportation, and electric power sectors
Main Policy Cases	
S. 280 Core	Primary Policy Case. Key assumptions include: <ul style="list-style-type: none"> • Updated <i>AEO2007</i> reference case assumptions • Discount rate for allowance banking: 8 percent • Allowance auction share: 30 percent in 2012, growing linearly to 90 percent in 2030 • Commercial sector entities treated as exempt • Half of the incremental cost of energy-efficient appliances in the residential and commercial sector assumed to be subsidized through CCCC rebates and subsidies, as a result of S. 280 economic impact measures and innovation programs • In aggregate, up to 30 percent offsets allowed as determined from offset supply curves • Non-CO₂ emissions growth, before abatement, based on EPA “with measures” and “voluntary technology adoption” cases. • Non-CO₂ abatement, biogenic carbon sequestration, and international offset supply assumptions derived from EPA sources (Appendix D) by discounting to account for incomplete market penetration, exclusion of international forestry offsets from developing countries, and alternative foreign abatement targets
No International	Allowance offsets from international sources unavailable
Fixed 30 Percent Offsets	Offsets meet a fixed, 30-percent share of allowances, and: <ul style="list-style-type: none"> • Offsets prices match the prevailing allowance price • International sources assumed to provide the balance of the 30 percent of offsets not met by domestic sources
Alternative Policy Cases	
Unlimited Offsets	An unlimited share of allowance obligations can be met by offsets.
Low Discount	The discount rate for allowance banking is 4 percent
High Auction	The allowance auction share is 70 percent in 2012, growing to 90 percent in 2030
No Nuclear	No nuclear generating plant additions beyond the reference case level allowed.
Commercial Covered	All commercial sector entities treated as covered without exemptions; S. 280 caps adjusted accordingly.
S. 280 High Technology	S. 280 Core with integrated high technology case assumptions.