Economic Impacts of the Energy Efficiency Provisions in the Energy Savings & Industrial Competitiveness Act of 2013 and Select Amendments

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Contents

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Executive Summary

On May 16, 2011, Senators Jeanne Shaheen (D-NH) and Rob Portman (R-OH) introduced the *Energy Savings and Industrial Competitiveness Act of 2011* (S. 1000, often called the Shaheen-Portman bill). This bill contained a variety of provisions designed to promote energy efficiency technologies and foster job creation. In 2012, ACEEE analyzed the cost and energy savings as well as the jobs impacts of S. 1000, but the bill stalled in Congress. A modified version of the bill entitled the *Energy Savings and Industrial Competitiveness Act of 2013* (S. 761) was introduced in April of 2013 and was reported out of the Senate Committee on Energy and Natural Resources in May of 2013 in a bipartisan voice vote where 19 members supported the bill and only 3 opposed it. A modified version (S. 1392) was introduced for floor consideration on July 30, 2013.

This paper summarizes an updated assessment of the impacts of S. 1392 as well as a number of amendments that are being considered with the bill. The first scenario analyzed includes the provisions of S. 1392 and select amendments. This package of legislation is referred to herein as "Group A." In addition, we analyzed a "Group A+." Group A+ includes all of Group A as well as some additional promising amendments. The specific provisions and amendments included in each group are listed in Table 1 of the report.

The results demonstrate that the bill and many of the proposed amendments can reduce energy use, save consumers money, and support a significantly larger number of jobs than would be sustained without the energy efficiency improvements. Some findings are summarized in the table below.

Summary of Key Findings for S. 1392 and Selected Amendments

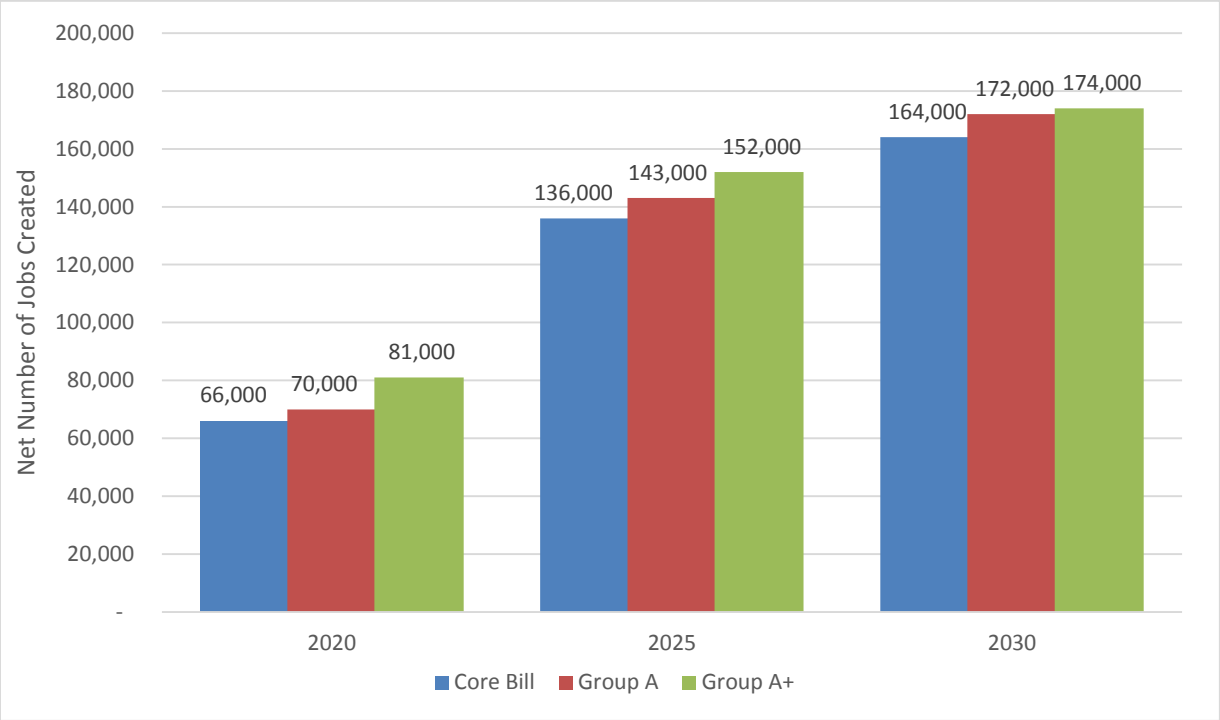
		Net Jobs Created	Net Annual Savings (billion 2011$)	Annual Primary Energy Savings (quadrilllion Btu)	Annual CO_2 Emissions Avoided (MMT)
2020	Core Bill*	66,000	$ 2.1	0.3	16.4
	Group A	70,000	$ 2.3	0.3	18.1
	Group A+	81,000	$ 3.3	0.5	25.1
2030	Core Bill	164,000	$ 13.7	1.5	80.2
	Group A	172,000	$ 14.7	1.6	85.1
	Group A+	174,000	$ 15.2	1.7	87.6

*Core Bill includes the provisions included in S. 1392. See Table 1 for a complete list.

Based on our initial assessment, the provisions in S. 1392 would likely achieve more than 9.9 "quads" of cumulative energy savings by 2030.[1] The amendments being considered could also result in significant savings. If implemented, Group A would result in 10.7 quads of energy savings by 2030 and the Group A+ savings would be 13.6 quads. We estimate the cumulative discounted net savings (benefits minus costs) of Group A provisions are $52.9 billion over the 2014–2030 time period. For Group A+, this total is $65.3 billion. The figure below shows the total number of net jobs supported by adoption of the Core Bill, Group A, and Group A+ scenarios in 2020, 2025, and 2030.

[1] One quad is a quadrillion (a 1,000 trillion) British Thermal Units (Btu) of energy.

New Jobs by Scenario in 2020, 2025, and 2030



We estimate that the core provisions of S. 1392 would support 164,000 jobs in 2030, while the Group A provisions would support 172,000 jobs and the extra provisions in Group A+ would bring jobs in 2030 to a total of 174,000.

Introduction

Since the passage of the *Energy Independence and Security Act of 2007,* Congress has been considering significant energy efficiency legislation. A number of bills progressed in the 111th Congress, but ultimately were not enacted. In the first session of the 112th Congress (2011), a variety of bills were introduced, and two energy efficiency bills were reported out of the Senate Energy and Natural Resources Committee. One of these bills was the *Energy Savings and Industrial Competitiveness Act of 2011* (S. 1000). In May of 2013, the Senate Committee on Energy and Natural Resources reported out the updated version of this bill—the *Energy Savings and Industrial Competitiveness Act of 2013* (S. 761). Over the past several Congresses, the American Council for an Energy-Efficient Economy (ACEEE) has been examining the energy savings and macroeconomic impacts of major energy efficiency legislation (e.g., see Farley et al. 2012; Gold et al. 2009; Laitner et al. 2010). This white paper provides a similar analysis of S. 1392 and a number of amendments to the bill that are being considered.

Shaheen-Portman Bill

On May 16, 2011, Senators Jeanne Shaheen (D-NH) and Rob Portman (R-OH) introduced the Shaheen-Portman bill. The bill contains a variety of provisions designed "to increase the use of energy efficiency technologies in the residential, commercial, and industrial sectors of our economy, while also fostering job creation." In 2012, we analyzed an amended version of the bill as reported out by the Senate Energy and Natural Resources Committee by a 18–3 vote in July, 2011. A new version of the bill, S. 761, was ordered out of the Senate Energy and Natural Resources Committee in May, 2013. In July, a revised version of S. 761, renumbered as S. 1392, was introduced in the Senate.

We analyzed the energy and cost savings for the major provisions in S. 1392 as well as for a number of amendments related to energy efficiency that are also being considered. We also evaluated the impacts of these provisions on employment. In this paper, we present the results for two scenarios. The first scenario includes the provisions in S. 1392 as well as a select group of likely amendments. These amendments have bipartisan support and, as far as we know, no opposition. This scenario is referred to as "Group A." We also include results for a second scenario that includes Group A as well as a longer list of amendments. These additional amendments also have substantial support but raise some issues that may cause opposition. For example, some of these amendments have a significant cost to the federal government. Given the current federal deficit, some Senators may vote against amendments that could add to the deficit unless there are suitable offsets to the costs. This second scenario is referred to as "Group A+." Table 1 lists the provisions and amendments included in both Group A and Group A+.

Table 1: Energy Efficiency Provisions Analyzed in Group A and Group A+

	Title	Subtitle	Section
Group A	I—Buildings	A—Building Energy Codes	Sec. 101 Greater Energy Efficiency in Building Codes
		B—Worker Training and Capacity Building	Sec. 111 Building Training and Assessment Centers
			Sec. 112 Career Skills Training
	II—Industrial Efficiency and Competitiveness	A—Manufacturing Energy Efficiency	Sec. 202 Future of Industry Program
			Sec. 203 Sustainable Manufacturing Initiative
		B—Supply Star	Sec. 211 Supply Star
		C—Electric Motor Rebate Program	Sec. 221 Energy Saving Motor Control, Electric Motor, and Advanced Motor Systems Rebate Program
		D—Transformer Rebate Program	Sec. 231 Energy Efficient Transformer Rebate Program
	III—Federal Agency Energy Efficiency		Sec. 301 Adoption of Information and Communications Technology Power Savings Techniques by Federal Agencies
	Amendments		Tenant Star
			Schools
			Benchmarking
			Data Centers
			Nonprofit Organizations
Group A+			Building Finance
			Electricity Supply Efficiency
			Residential Finance
			Race to Top
			Grid-Enabled Water Heaters

The provisions we analyzed from the bill and amendments are listed in Table 1 above and are briefly summarized in Appendices B and C, respectively. The detailed energy and economic impacts of each of these provisions are included in Appendix A.

Methodology

We estimated energy savings, provision by provision, using the best available data. Where possible, our assumptions are based on the data from the *Annual Energy Outlook 2013* (EIA 2013b). Our approach was based on bottom-up estimates of the energy savings and investments that would occur under each provision or amendment. Our methodology and key assumptions are discussed in more detail in Appendix D. One key assumption is that where federal appropriations are required, we assume that the appropriation will be half of the amount authorized in S. 1392 and the various amendments. Our cost and energy savings calculations were then run through our "DEEPER" input-output economic modeling system to estimate economy-wide impacts including the net increase in jobs and impact on Gross Domestic Product (GDP). For these estimates, we used a simplified version of the full DEEPER model, which is described in Appendix E.

Results

Implementation of the energy efficiency provisions in S. 1392 and the selected amendments would produce significant energy and financial savings. The combination of more productive investments and the anticipated reduction in overall energy costs would catalyze an increase in the number of jobs within the United States. The results are summarized below in Table 2, and detailed results from the analysis are presented in Appendix A. In the following sections we discuss impacts of the bill in greater detail.

Table 2: Summary of the Impacts of S. 1392 and Select Amendments

		Net Jobs Created	Net Annual Savings (billion 2011$)	Annual Primary Energy Savings (quadrilllion Btu)	Annual CO_2 Emissions Avoided (MMT)
2020	Core Bill*	66,000	$ 2.1	0.3	16.4
	Group A	70,000	$ 2.3	0.3	18.1
	Group A+	81,000	$ 3.3	0.5	25.1
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*Core Bill includes the provisions included in S. 1392. See Table 1 for a complete list.

Energy Savings

Overall, we estimate that by 2030 the Group A provisions will result in a cumulative reduction of U.S. energy use of 10.7 quads. This reduction is equivalent to the combined annual energy consumption of California and Michigan (EIA 2013a). The largest contributor to savings in S. 1392 is by far Section 101 focusing on building energy codes, which accounts for over 8 quads of cumulative energy savings by 2030. In the Group A+, scenario savings are even greater, reaching a cumulative 13.6 quads by 2030. After the building codes provision, large savings are also potentially available from an amendment on supply-side efficiency from power plants, the Race to the Top amendment, and a combination of several industrial provisions from Title II, Subtitle A of the bill itself.

The majority of the savings in Group A are from electricity but savings from natural gas are also substantial. Fuel oil savings are minimal. These energy savings will also reduce peak demand for electricity and the need for new power plants. We estimate peak demand savings in just the year 2030 for Group A would be 30,000 MW, equivalent to the output of about 54 power plants of 500 MW each. Figures 1 and 2 below show energy savings over time for Group A and Group A+, respectively.

Figure 1: Annual Energy Savings by Provision: Group A

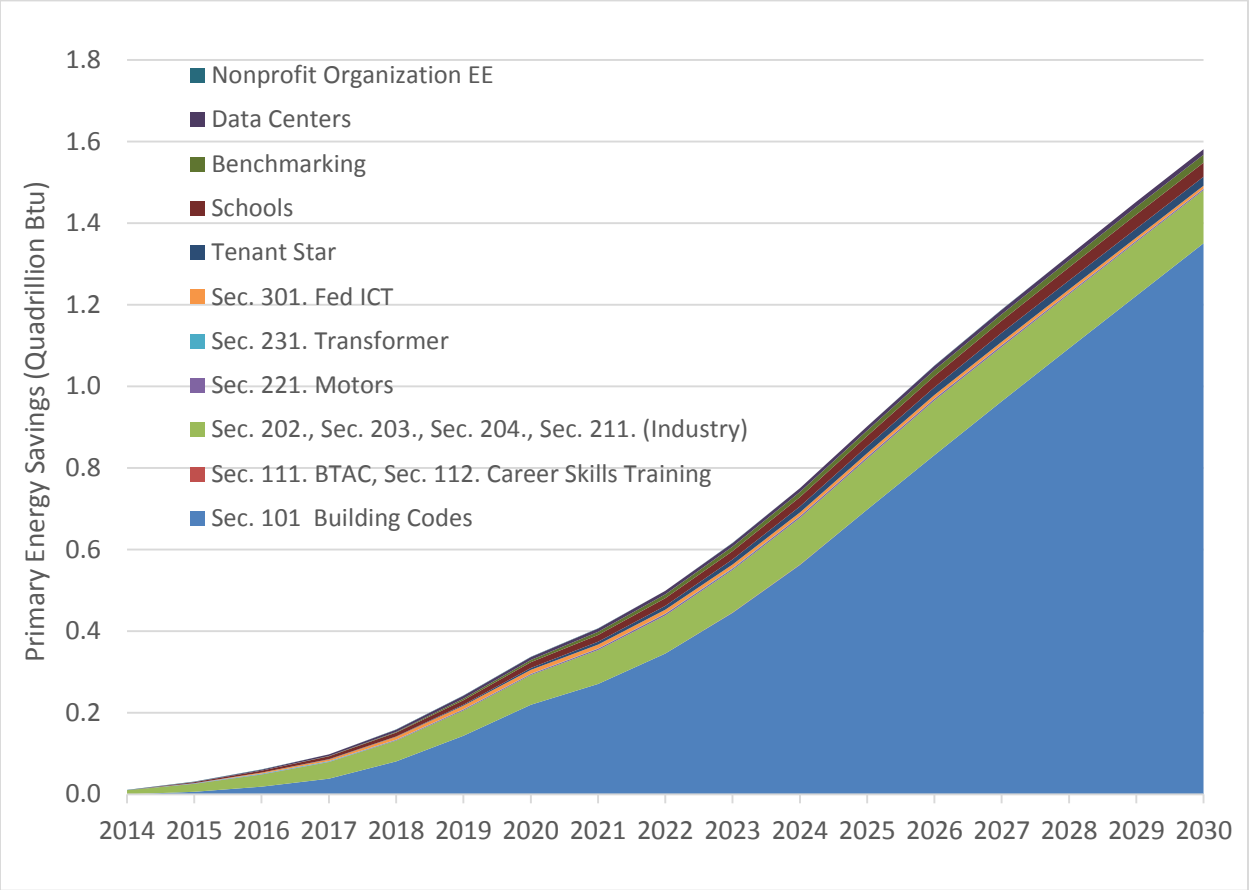
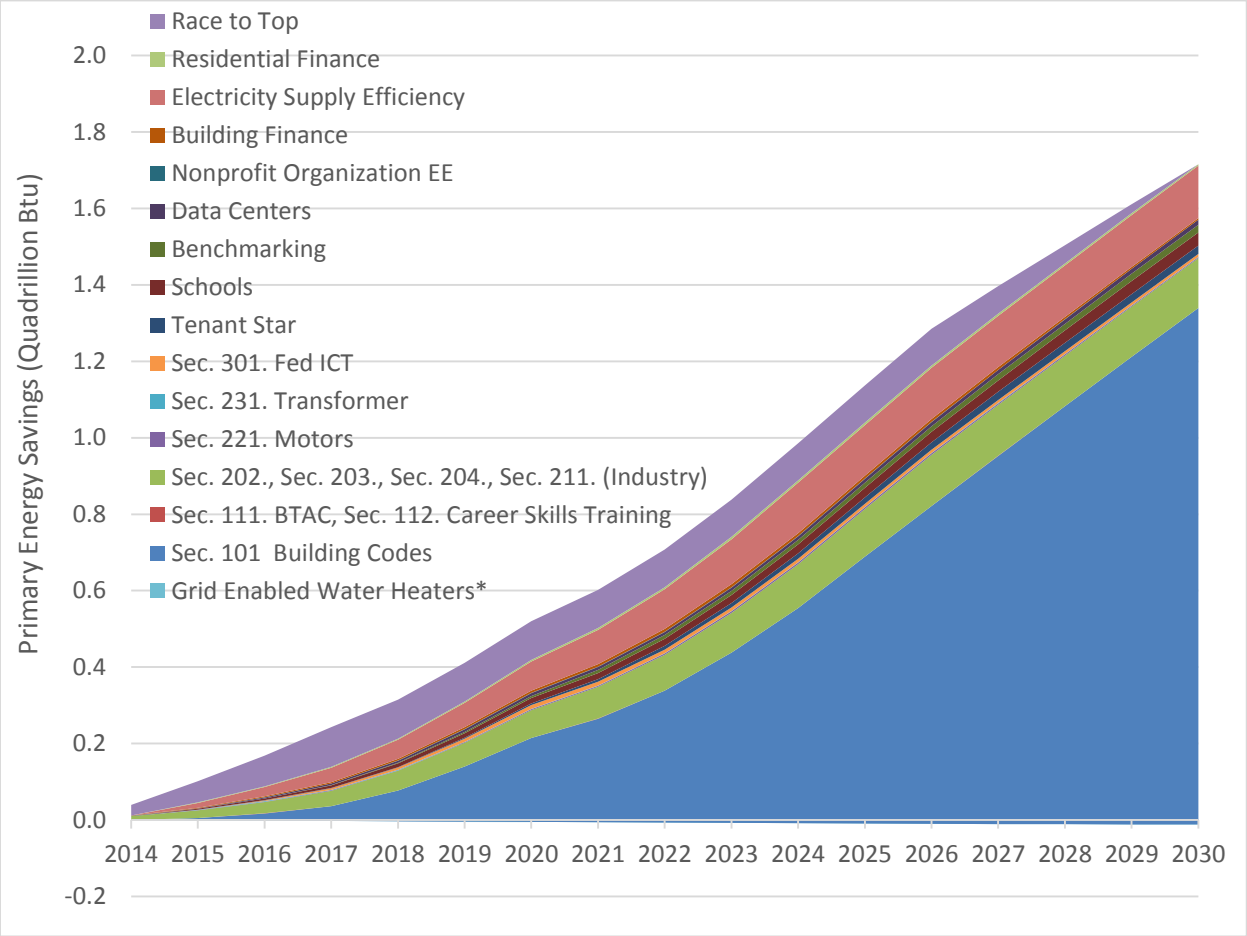


Figure 2: Annual Energy Savings by Provision: Group A+



Note: *Grid-Enabled Water Heaters is a provision that will increase energy consumption and therefore the energy savings of the provision are negative. However, the negative effect is so small relative to the savings of the other provisions that it is not visible in this figure.

Economic Savings

Our findings show that consumers would save money due to the energy efficiency provisions in S. 1392 as well as many of the proposed amendments. We expect net annual savings in the Group A scenario to be $2.3 billion in 2020 and $14.7 billion in 2030, after subtracting annual costs[2] expected to be about $1.1 billion in 2020 and $4.4 billion in 2030. For Group A+, we project net annual savings to be $3.3 billion in 2020 and $15.2 billion in 2030. Annual costs for Group A+ are estimated to be $1.5 billion in 2020 and $4.4 billion in 2030.

Cumulative investment (both federal and consumer) in the Group A scenario is expected to be about $10.9 billion in 2020 and $14.5 billion for the Group A+ scenario. In 2030, the cumulative investments would total approximately $67.2 billion for Group A and $72.3 billion for Group A+, nearly all of which comes from the private sector. The total cost to the federal government over the 2012–2030 period would be about $2.6 billion under Group A and $3.0 billion under Group A+, but there also will be significant

[2] Annual costs include both federal and consumer costs in the given year. The costs for the following provisions are treated as being financed over time in annualized payments using a net present value calculation and a 5% discount rate: Building Codes; Residential Finance; Building Finance; and Tenant Star.

federal energy cost savings.[3] Figures 3 and 4 below show the net dollar savings that would be realized annually in the Group A and A+ scenarios.

Figure 3. Net Annual Savings from Energy Efficiency Provisions: Group A

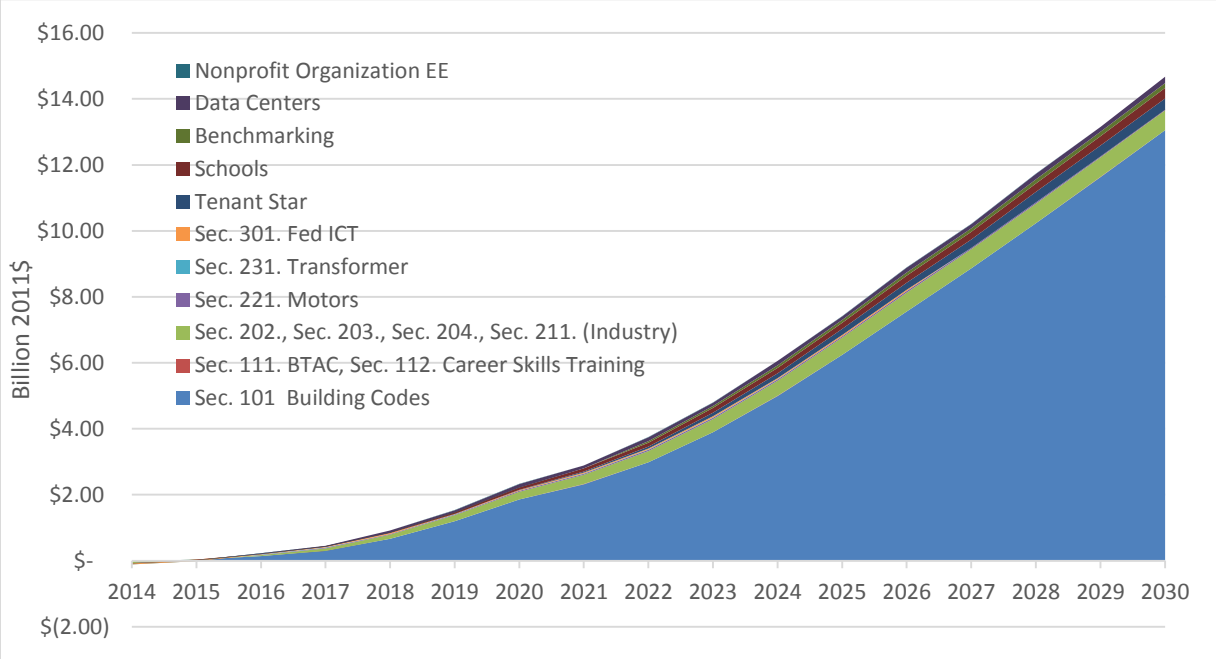
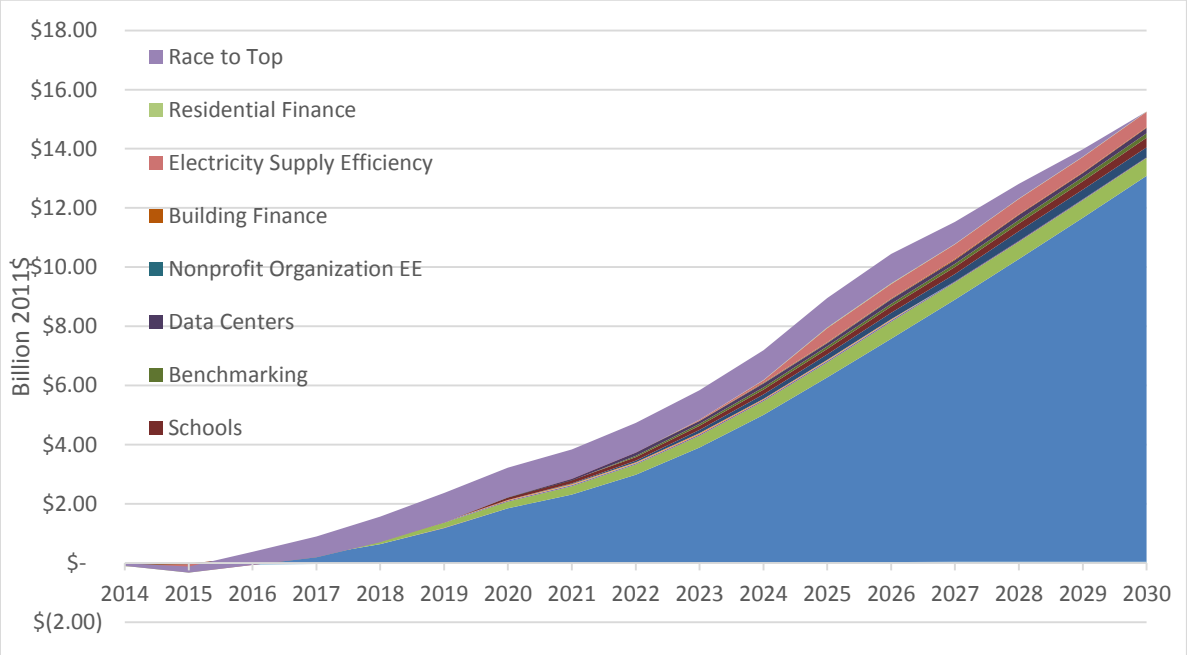


Figure 4. Net Annual Savings from Energy Efficiency Provisions: Group A+



[3] Assumes that appropriations will be 50% of authorized amounts.

The discounted net savings over the 2014–2030 period are estimated to be $52.9 billion for the Group A scenario and $65.3 billion for Group A+. These numbers were derived assuming a 5% real discount rate and provide some perspective on the cumulative value of these measures to consumers. The cumulative net savings and benefit-cost ratio for all of the provisions are listed in Tables 3 and 4, respectively.

Table 3. Cumulative Net Savings by Provision, 2012–2030

Provision/Amendment	Cumulative Net Savings (billion 2011$)
Sec. 101 Building Codes	$ 39.91
Race to Top	$ 11.80
Sec. 202, Sec. 203, Sec. 204, Sec. 211 (Industry)	$ 5.50
Schools	$ 2.21
Tenant Star	$ 1.96
Electricity Supply Efficiency	$ 1.90
Data Centers	$ 1.64
Benchmarking	$ 0.77
Sec. 221 Motors	$ 0.42
Sec. 301 Fed ICT	$ 0.36
Building Finance	$ 0.34
Residential Finance	$ 0.29
Sec. 231 Transformer	$ 0.07
Nonprofit Organization EE	$ 0.04
Sec. 111 BTAC, Sec. 112 Career Skills Training	$ 0.01
Grid Enabled Water Heaters	N/A

Table 4. Benefit-Cost Ratio by Provision, 2012–2030

Provision/Amendment	Benefit-Cost Ratio
Race to Top	8.4
Sec. 221 Motors	5.6
Sec. 101 Building Codes	5.0
Schools	3.7
Tenant Star	3.3
Sec. 202, Sec. 203, Sec. 204, Sec. 211 (Industry)	2.3
Sec. 301 Fed ICT	2.1
Sec. 231 Transformer	2.0
Data Centers	1.9
Benchmarking	1.9
Residential Finance	1.5
Building Finance	1.4
Nonprofit Organization EE	1.3
Sec. 111 BTAC, Sec. 112 Career Skills Training	1.3
Electricity Supply Efficiency	1.2
Grid Enabled Water Heaters	N/A

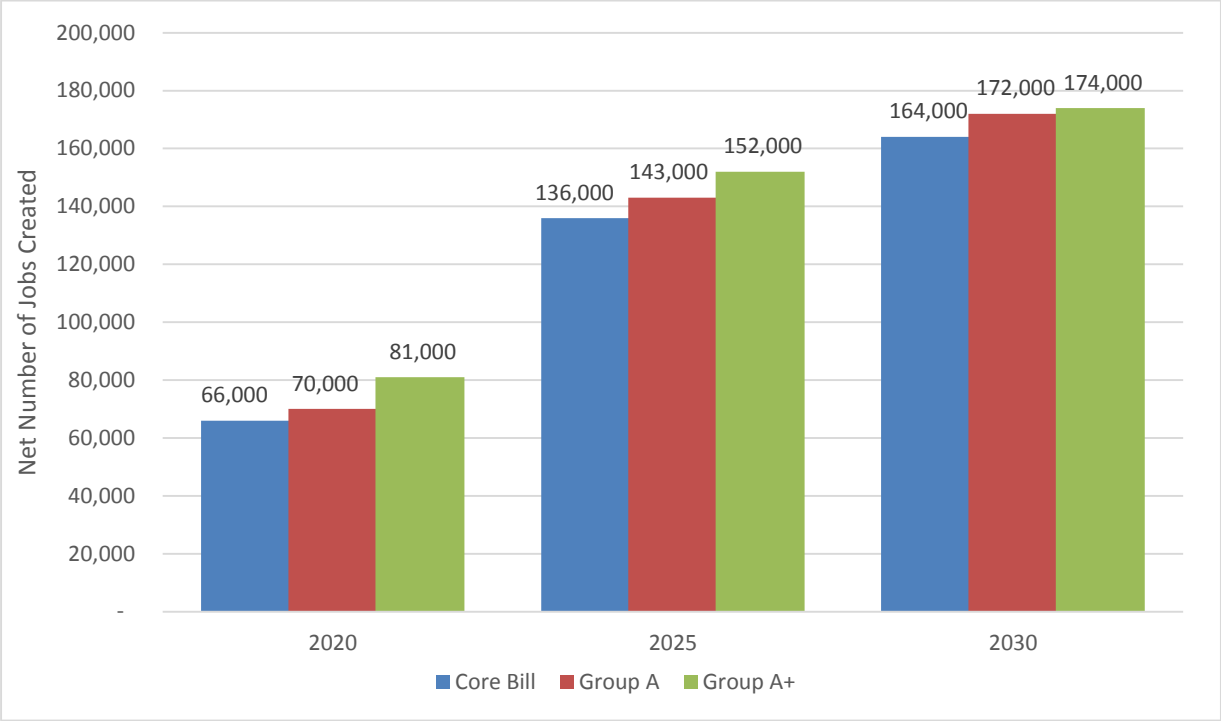
Job Creation

We estimate that the provisions in S. 1392 will support 66,000 jobs in 2020 and 136,00 jobs in 2025, while Group A would support a net increase of 70,000 jobs in 2020, rising to 143,000 in 2025. In 2030, S. 1392 would support 164,000 net jobs and Group A would support 172,000 jobs. In the Group A+ scenario we estimate a net increase of 81,000 jobs in 2020, 152,000 jobs in 2025, and 174,000 in 2030.

Some of these jobs will be direct jobs in construction and manufacturing, such as air conditioning manufacturers. Others will be indirect jobs, such as electrical equipment wholesalers. And a significant number will be induced jobs, created as workers whose jobs were created through the implementation of these provisions spend their earnings in other sectors of the economy. Jobs are created through shifts in spending patterns catalyzed by the implementation of the various provisions, and from consumer and business energy bill savings being spent in other sectors of the economy.[4] A comparison of jobs supported under S. 1392 and the Group A and A+ amendments is provided in Figure 5.

[4] For more information on how ACEEE conducts jobs analysis, please see “How Does Energy Efficiency Create Jobs?” at http://aceee.org/fact-sheet/ee-job-creation.

Figure 5: New Jobs Supported by Energy Efficiency Provisions



Emissions Reductions

By reducing fuel consumed, these energy efficiency provisions will reduce the emissions of carbon dioxide (CO_2) and other air pollutants. The Group A scenario is expected to reduce annual CO_2 emissions by about 18.1 million metric tons (MMT) in 2020, with annual reduction in emissions of 85.1 MMT in 2030. Group A+ would provide additional reductions for a total of 25.1 MMT in 2020 and 87.6 MMT in 2030.

Conclusion

The energy efficiency provisions in S. 1392 and the selected amendments we analyzed will likely drive important energy savings for consumers, even as they create American jobs. Our assessment suggests that successful implementation of the Group A provisions will result in a net present value savings of $52.9 billion over the 2012–2030 period and, in turn, support a net increase of 172,000 jobs in 2030. The Group A+ scenario generates even greater savings and more jobs. The cumulative net savings achievable under the Group A+ scenario are $65.3 billion and net jobs will increase by 174,000 in 2030. In addition, the scenarios would reduce the cumulative amount of CO_2 emitted in 2030 by nearly 575 million metric tons and 676 million metric tons, respectively.

S. 1392 represents an important opportunity to enhance the U.S. economy while providing energy and environmental benefits. In the current economy, creating jobs and helping consumers and businesses to reduce energy costs is more important than ever.

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Appendix A: Detailed National Results of Energy Efficiency Provisions in S. 1392 and Select Amendments

Table A1. Energy Savings and Avoided Carbon Dioxide Emissions

				2020						2030							
	Title	Subtitle	Section	Electricity (TWh)	Avoided Peak Demand (MW)	Direct Natural Gas (TBtu)	Fuel Oil Savings (Million barrels per day)	Primary Energy Savings (Quads)	Carbon Dioxide Savings (MMT)	Electricity (TWh)	Avoided Peak Demand (MW)	Direct Natural Gas (TBtu)	Fuel Oil Savings (Million barrels per day)	Primary Energy Savings (Quads)	Carbon Dioxide Savings (MMT)	Cumulative Energy Savings (quads)	Cumulative Carbon Dioxide Savings (MMT)
Group A	I - Buildings	A - Building Energy Codes	Sec. 101 Greater Energy Efficiency in Building Codes	14.7	3978.2	69.14	0.00	0.22	11.70	94.1	25407.1	404.01	0.00	1.35	72.48	8.29	443.19
		B - Worker Training and Capacity Building	Sec. 111 - Sec. 112 Building Training and Assessment Centers and Career Skills Training	0.0	4.6	0.04	0.00	0.00	0.01	0.0	1.8	0.04	0.00	0.00	0.01	0.00	0.15
	II - Industrial Efficiency and Competitveness	A - Manufacturing Energy Efficiency B - Supply Star	Sec. 202 Future of Industry Program, Sec. 203 Sustainable Manufacturing Initative, Sec. 204 Conforming Amendments, Sec. 211 Supply Star	4.3	1155.0	28.82	0.00	0.07	3.90	7.8	2093.7	52.33	0.00	0.13	7.08	1.47	79.23
		C - Electric Motor Rebate Program	Sec. 221. Energy saving motor control, electric motor, and advanced motor systems rebate program.	0.4	112.0	0.00	0.00	0.00	0.21	0.4	112.0	0.00	0.00	0.00	0.20	0.04	3.55
		D - Transformer Rebate Program	Sec. 231. Energy efficient transformer rebate program.	0.1	26.1	0.00	0.00	0.00	0.05	0.1	26.1	0.00	0.00	0.00	0.05	0.02	0.83
	III - Federal Agency Energy Efficiency		Sec. 301. Adoption of information and communications technology power savings techniques by Federal agencies.	0.8	228.0	1.00	0.00	0.01	0.51	0.6	169.1	0.74	0.00	0.01	0.38	0.12	6.05
	Amendments		Tenant Star	0.4	105.6	0.37	0.00	0.00	0.29	2.0	534.6	1.85	0.00	0.02	1.47	0.17	11.75
			Schools	0.7	192.2	5.48	0.00	0.01	0.69	1.9	503.5	13.17	0.00	0.03	1.74	0.31	15.50
			Benchmarking	0.5	142.9	0.22	0.00	0.01	0.29	1.9	514.4	0.80	0.00	0.02	1.04	0.15	7.92
			Data Centers	0.7	191.7	0.00	0.00	0.01	0.37	1.3	356.4	0.00	0.00	0.01	0.69	0.13	6.63
			Nonprofit Organization EE	0.1	17.2	0.02	0.00	0.00	0.04	0.0	0.0	0.00	0.00	0.00	0.00	0.01	0.46
	Subtotal Group A			**22.8**	**6153.4**	**105.1**	**0.0**	**0.3**	**18.1**	**110.1**	**29718.8**	**472.9**	**0.0**	**1.6**	**85.1**	**10.7**	**575.2**
+	Amendments		Building Finance	0.4	117.8	1.25	0.00	0.01	0.30	0.4	97.4	1.03	0.00	0.00	0.25	0.09	4.88
			Electricity Supply Efficiency	n/a	n/a	25.21	0.00	0.08	1.50	n/a	n/a	45.40	0.00	0.14	2.73	1.51	29.82
			Residential Finance	0.4	107.0	0.26	0.00	0.00	0.01	0.3	91.7	0.23	0.00	0.00	0.01	0.07	0.10
			Race to Top	4.9	1336.3	47.82	0.00	0.10	5.51	0.0	0.0	0.00	0.00	0.00	0.00	1.30	71.25
			Grid Enabled Water Heaters	-0.5	-131.5	0.00	0.00	0.00	-0.24	-1.1	-299.3	0.00	0.00	-0.01	-0.54	-0.11	-5.34
	Subtotal Group A+			**28.1**	**7583.0**	**179.6**	**0.0**	**0.5**	**25.1**	**109.7**	**29608.7**	**519.6**	**0.0**	**1.7**	**87.6**	**13.6**	**676.0**
Other Amendments			FEMA	0.0	0.0	4.24	0.00	0.01	0.26	0.0	0.1	7.28	0.00	0.01	0.45	0.12	5.15
			WAP-SEP	7.1	1929.7	105.56	0.00	0.18	10.08	1.7	449.2	25.34	0.00	0.04	2.43	2.34	132.12

Table A2. Economic Impact

				2020						2030							
	Title	Subtitle	Section	Cumulative Federal Costs (billion 2011 $)	Cumulative Consumer Investments (billion 2011 $)	Cumulative Savings (billion 2011$)	Annual Cost (billion 2011$)	Annual Savings (billion 2011$)	Net Annual Savings (billion 2011$)	Cumulative Federal Costs (billion 2011 $)	Cumulative Consumer Investments (billion 2011 $)	Cumulative Savings (billion 2011$)	Cumulative Net Savings (billion 2011$)	Annual Cost (billion 2011$)	Annual Savings (billion 2011$)	Net Annual Savings (billion 2011$)	Benefit-Cost Ratio
Group A	I - Buildings	A - Building Energy Codes	Sec. 101 Greater Energy Efficiency in Building Codes	$ 0.07	$ 8.36	$ 5.53	$ 0.55	$ 2.41	$ 1.86	$ 0.10	$ 58.78	$ 98.79	$ 39.91	$ 3.82	$ 16.88	$ 13.05	5.0
		B - Worker Training and Capacity Building	Sec. 111 - Sec. 112 Building Training and Assessment Centers and Career Skills Training	$ 0.01	$ 0.00	$ 0.01	$ -	$ 0.00	$ 0.00	$ 0.01	$ 0.00	$ 0.03	$ 0.01	$ 0.00	$ 0.00	$ 0.00	1.3
	II - Industrial Efficiency and Competitiveness	A - Manufacturing Energy Efficiency B - Supply Star	Sec. 202 Future of Industry Program, Sec. 203 Sustainable Manufacturing Initative, Sec. 204 Conforming Amendments, Sec. 211 Supply Star	$ 0.05	$ 1.08	$ 1.70	$ 0.21	$ 0.44	$ 0.23	$ 0.13	$ 3.77	$ 9.40	$ 5.50	$ 0.28	$ 0.88	$ 0.60	2.3
		C - Electric Motor Rebate Program	Sec. 221. Energy saving motor control, electric motor, and advanced motor systems rebate program.	$ 0.05	$ -	$ 0.10	$ -	$ 0.03	$ 0.03	$ 0.05	$ -	$ 0.47	$ 0.42	$ -	$ 0.03	$ 0.03	5.6
		D - Transformer Rebate Program	Sec. 231. Energy efficient transformer rebate program.	$ 0.00	$ 0.04	$ 0.04	$ -	$ 0.01	$ 0.01	$ 0.00	$ 0.04	$ 0.11	$ 0.07	$ -	$ 0.01	$ 0.01	2.0
	III - Federal Agency Energy Efficiency		Sec. 301. Adoption of information and communications technology power savings techniques by Federal agencies.	$ 0.17	$ -	$ 0.36	$ 0.04	$ 0.06	$ 0.02	$ 0.36	$ -	$ 0.72	$ 0.36	$ 0.02	$ 0.01	$ (0.01)	2.1
	Amendments		Tenant Star	$ 0.01	$ 0.13	$ 0.12	$ 0.06	$ 0.06	$ 0.00	$ 0.02	$ 0.69	$ 2.67	$ 1.96	$ 0.01	$ 0.34	$ 0.33	3.3
			Schools	$ 0.01	$ 0.24	$ 0.43	$ 0.04	$ 0.12	$ 0.08	$ 0.02	$ 0.65	$ 2.88	$ 2.21	$ 0.01	$ 0.33	$ 0.32	3.7
			Benchmarking	$ 0.04	$ 0.17	$ 0.12	$ 0.07	$ 0.05	$ (0.01)	$ 0.11	$ 0.60	$ 1.48	$ 0.77	$ 0.05	$ 0.20	$ 0.15	1.9
			Data Centers	$ 0.39	$ -	$ 0.70	$ 0.08	$ 0.19	$ 0.11	$ 1.82	$ -	$ 3.45	$ 1.64	$ 0.17	$ 0.36	$ 0.19	1.9
			Nonprofit Organization EE	$ 0.03	$ 0.03	$ 0.04	$ -	$ 0.01	$ 0.01	$ 0.03	$ 0.03	$ 0.09	$ 0.04	$ -	$ -	$ -	1.3
	Subtotal Group A			**$ 0.83**	**$ 10.04**	**$ 9.14**	**$ 1.06**	**$ 3.39**	**$ 2.33**	**$ 2.63**	**$ 64.56**	**$ 120.08**	**$ 52.89**	**$ 4.36**	**$ 19.03**	**$ 14.67**	
+	Amendments		Building Finance	$ 0.09	$ 0.30	$ 0.22	$ 0.05	$ 0.05	$ 0.01	$ 0.13	$ 0.43	$ 0.89	$ 0.34	$ 0.03	$ 0.05	$ 0.02	1.4
			Electricity Supply Efficiency	$ 0.00	$ 2.03	$ 0.89	$ 0.36	$ 0.26	$ (0.10)	$ 0.00	$ 3.78	$ 5.68	$ 1.90	$ 0.03	$ 0.56	$ 0.53	1.2
			Residential Finance	$ 0.09	$ 0.30	$ 0.20	$ 0.05	$ 0.05	$ (0.00)	$ 0.13	$ 0.43	$ 0.84	$ 0.29	$ 0.04	$ 0.05	$ 0.01	1.5
			Race to Top	$ 0.10	$ 1.10	$ 5.50	$ -	$ 1.00	$ 1.00	$ 0.10	$ 1.10	$ 13.00	$ 11.80	$ -	$ -	$ -	8.4
			Grid Enabled Water Heaters	$ -	$ (0.34)	$ (0.15)	$ (0.06)	$ (0.04)	$ 0.02	$ -	$ (0.93)	$ (0.94)	$ (1.87)	$ (0.06)	$ (0.09)	$ (0.03)	n/a
	Subtotal Group A+			**$ 1.10**	**$ 13.43**	**$ 15.80**	**$ 1.47**	**$ 4.72**	**$ 3.25**	**$ 2.98**	**$ 69.36**	**$ 139.55**	**$ 65.34**	**$ 4.40**	**$ 19.59**	**$ 15.20**	
Other Amendments			FEMA	$ 0.50	$ -	$ 0.41	$ 0.07	$ 0.10	$ 0.03	$ 1.42	$ -	$ 2.07	$ 0.66	$ 0.11	$ 0.20	$ 0.10	1.6
			WAP-SEP	$ 1.43	$ 2.06	$ 9.95	$ -	$ 2.05	$ 2.05	$ 1.43	$ 2.06	$ 27.34	$ 23.85	$ -	$ 0.54	$ 0.54	6.0

All savings are annual unless otherwise specified as cumulative.

Appendix B: Descriptions of Energy Efficiency Provisions in S. 1392

Title I—BUILDINGS

Building Energy Codes

- Strengthens national model building codes for new homes and commercial buildings by requiring the Department of Energy (DOE) to support their development, including the setting of energy savings targets and providing of technical assistance to the code-setting and standard development organizations.
- Changes the State certification process so that within two years after model building codes are updated, States are to certify whether or not they have updated their building codes, and demonstrate if the building codes have met or exceeded energy savings targets. States also are to measure compliance of buildings with the energy codes and certify whether they have met compliance targets.
    - The legislation reserves adoption and enforcement of model building codes to the States, but empowers DOE to offer technical assistance.
    - Authorizes $200 million in funding to incentivize and assist States to meet the goals and requirements of the provision.

Worker Training and Capacity Building

- Trains the next generation of workers in energy-efficient commercial building design and operation through two worker training programs.
    - Establishes a DOE program for university-based Building Training and Assessment Centers, modeled after the existing Industrial Assessment Centers (IACs). The program authorized at $10 million will provide worker training in energy-efficient commercial building design and operations for engineers, architects and building workers.
    - Establishes a DOE career skills program to provide grants to nonprofit partnerships for worker training for the construction and installation of energy-efficient building technologies. Authorizes $10 million in funding to carry out this section and establishes a 50 percent federal cost share.

Title II—INDUSTRIAL EFFICIENCY AND COMPETITIVENESS

Manufacturing Energy Efficiency

- Reforms and reorients DOE's industry-led efficiency programs by providing clearer guidance on responsibilities.
- Requires DOE's Office of Energy Efficiency and Renewable Energy (EERE) to provide onsite technical assessments to manufacturers seeking efficiency opportunities.
- Streamlines efforts by directing Industrial Assessment Centers (IACs) to coordinate with the Manufacturing Extension Partnership Centers of the National Institute of Standards and Technology and DOE's Building Technologies Program, and increases partnerships with the national laboratories and energy service and technology providers to leverage private sector expertise.

Supply Star

- Creates a DOE pilot program modeled on and in coordination with ENERGY STAR to identify examples and opportunities and promote practices for highly efficient supply chains.
- Allows DOE to award companies financing (competitive grants/other incentives), technical support and training to improve supply side efficiency.
- Authorizes $10 million for FY2014 through FY2018.

Electric Motor Rebate Program

- Establishes a DOE rebate program to incentivize purchase of a new, high efficiency motor or a high efficiency motor system that reduces motor energy use by no less than 5%.
- Authorizes $5 million for FY2014 and FY2015.

Transformer Rebate Program

- Directs DOE to create an incentive rebate for the purchase of energy efficient transformers for industrial/manufacturing facilities or commercial/multifamily residential buildings.
- Authorizes $5 million for FY2014 and FY2015.

Title III—FEDERAL AGENCY ENERGY EFFICIENCY

- Requires the federal government – the single largest energy user in the country – to adopt energy saving techniques for computers, saving energy and taxpayer dollars.
    - Directs DOE, in consultation with other federal agencies, to issue recommendations to employ energy efficiency through the use of information and communications technologies – including computer hardware, operation and maintenance processes, energy efficiency software, and power management tools.
    - Allows the General Services Administration to utilize funding to update the project design of approved building construction to meet efficiency standards.
- Directs the Office of E-Government and Information Technology to develop and publish a goal for energy and cost savings through the consolidation of federal data centers.

Appendix C: Amendment Summaries

S. 1206—Benchmarking

S. 1206, which was introduced by Senator Franken, would promote benchmarking of large commercial and multifamily buildings. Building benchmarking is a process that allows building owners to assess the energy use of their buildings and compare them to otherwise similar buildings. This process helps to identify buildings that would most benefit from building upgrades.

Specific provisions in the bill call for:

- Benchmarking additional federal buildings.
- A study by the U.S. Department of Energy (DOE) on best practices for benchmarking, energy use data aggregation, and energy use disclosure.
- Establishing a small competitive grant program for utilities, their partners, and utility regulators to make whole building energy use data available to building owners.

S. 1191—Better Buildings Act (Tenant Star)

S. 1191, introduced by Senators Bennet and Ayote, would encourage landlords and tenants to cooperate on energy efficiency. Presently most leased buildings suffer from a "split incentive" problem. Tenants pay energy bills but are usually not in buildings long enough to justify making energy-saving capital investments. Building owners make capital investments but since tenants pay the energy costs, they have little incentive to invest in energy efficiency upgrades. This bill would help address these problems by:

- Identifying best practices for energy efficiency during tenant "fit-outs"—the improvements to a space tenants make between when they sign a lease and when they move in.
- Establishing a new voluntary "Tenant Star" program to recognize tenants whose energy performance is substantially above average, complementing the existing whole building ENERGY STAR Buildings program.
- Encouraging "energy-aligned" federal leasing by having the General Services Administration develop model leasing provisions that would spur cooperation on energy savings between federal tenants and building owners.

S. 1084—School Retrofits

S. 1084, introduced by Senators Udall and Collins, would have DOE coordinate federal efforts to help school systems, including K-12 and higher education, make their buildings more efficient. Currently there is a patchwork of efforts by various departments that are not well coordinated. We believe this is a useful objective that will make it easier for school systems to retrofit their buildings.

717—Non-Profit Energy Efficiency Act

S. 717, introduced by Senators Klobuchar and Hoeven, would help non-profit organizations save energy. It provides matching grants, up to a cap, so that the non-profit organizations themselves will have to provide a significant contribution. A total of $50 million is authorized over five years.

Data Centers

The Energy Efficient Government Technology Act, previously known as "Sec. 404. Federal Data Center Consolidation" of S. 761, was introduced by Senator Udall and Senator Risch. The bill requires the federal government to reduce energy consumption in federal data centers through consolidation.

Group A+ Amendments

Manchin Power Plant Efficiency

This bill has not been introduced yet but would direct DOE to conduct a state-by-state study on opportunities to improve the efficiency of existing electrical generation plants. There are significant opportunities to improve existing power plants[5] and this bill would help identify the most promising approaches, helping power plant owners and regulators to identify cost-effective opportunities to improve their plants.

Building Finance

This bill used to be Section 201 of S.1392 when it was known as S. 761. The bill directs the DOE to establish a program known as the Commercial Building Energy Efficiency Financing Initiative, which provides grants to states to establish or expand programs to promote financing energy efficiency retrofit projects for commercial buildings. This funding is permitted to create or expand a number of finance programs, for example: revolving loan funds; the use of energy service and performance contracts; on-bill financing; leases that address split-incentives; and more.

Residential Finance

The Residential Finance bill, introduced by Senator Sanders and Senator Wyden, provides loans for residential building energy efficiency upgrades. The bill directs the DOE to supply funding to states to establish or expand programs that provide residential property owners or tenants financing for energy efficiency upgrades. This funding is permitted to create or expand a number of finance programs, for example: revolving loan funds; credit enhancement; or any other program that provides financing for energy efficiency gains.

Race to the Top

Race to the Top, introduced by Senator Warner, is a competitive grant program aimed to spur innovation in states to drive increases in energy productivity. The bill directs the DOE to invite states to submit plans to participate in an electric and thermal energy productivity challenge. Up to 25 states will be awarded between $1 million and $3.5 million based on their plans. A year and a half after states receive their grants they must supply the DOE with a report that describes their performance and activities carried out with the grant funding. The DOE will also coordinate with the National Research Council and State Energy Conservation Programs to evaluate program performance and effectiveness.

Grid-Enabled Water Heaters

The Grid-Enabled Water Heaters bill allows the DOE to eliminate or create separate efficiency requirements for grid-enabled water heaters. This bill will effectively roll back the efficiency standards for grid-enabled water heaters.

Other Amendments Not Included in Group A or Group A+

Use of Federal Disaster Relief and Emergency Assistance for Energy-Efficient Products and Services

Senator Gillibrand is now developing a bill to authorize and encourage the use of efficient products and services when buildings and other structures need to be replaced following a disaster. Under current law, if the old building was inefficient, disaster funds cannot be used to replace it with a more efficient building, which just perpetuates inefficiency. The proposed bill will specifically authorize acquisition of efficient equipment that has been screened by the ENERGY

[5] For example, the Electric Power Research Institute hosted a conference on this topic in February, 2013. See http://mydocs.epri.com/docs/PublicMeetingMaterials/1202/epri/call_to_papers.pdf.

STAR or Federal Energy Management Program, or efficient buildings that meet national model building codes.

S. 1020—All of the Above Federal Energy Conservation Act

S. 1020, anticipated to be introduced by Senators Hoeven and Manchin, would repeal Section 433 of the Energy Independence and Security Act of 2007 and replace it with two new provisions that would extend and improve energy performance requirements for federal buildings and extend the federal energy efficiency performance standards that now apply to new construction to also include alterations. At the time of publication the details of this amendment were still being developed. Therefore we were unable to include this amendment in the analysis.

S. 1213—WAP and SEP Reauthorization

S. 1213, introduced by Senators Coons, Collins and Reed, reauthorizes the low-income Weatherization Assistance Program (WAP) and the State Energy Program (SEP). WAP has been the key federal program to help low-income households to reduce their energy bills. It makes sense to help these households reduce their energy bills on an on-going basis, rather than just help to pay bills through the federal Fuel Assistance program (e.g., recall the old proverb, "Give a man a fish, and you feed him for a day; show him how to catch fish, and you feed him for a lifetime"). The WAP program has been very successful—the last "meta-evaluation" on the program found average energy savings of more than 20% (Schweitzer 2005). The new legislation includes several useful improvements to the current program—a requirement that DOE develop minimum professional standards for WAP contractors and workers, a requirement for an independent quality assurance program, and a new competitive leveraged grant program for non-profit agencies that have a track record of success in serving low-income communities. This bill will also reauthorize the SEP program, which has been a key program funding State Energy Offices in all states, including some states where this is the only funding.

Appendix D: Methodology for the Assessment of S. 1392

Introduction

This appendix explains the construction of the Excel model used in this analysis and presents the key assumptions that were made in this analysis.

Methodology

The foundation of this model is an assessment of the energy efficiency provisions in S. 1392 and selected amendments at the national level. This analysis projects the aggregate energy, carbon, and economic savings for individual provisions. The estimates of jobs impacts rely on a different model, DEEPER, discussed in Appendix E.

Overall Scoring Methodology

For each of the policies mentioned below, this analysis estimates energy savings in 2020 and 2030. Estimates were calculated for electricity use, natural gas use, oil savings (including diesel, and home fuel oil), and all energy sources together. This analysis also estimates federal and consumer costs, as well as gross savings (based upon dollar savings from unused energy) and net savings. In general, EIA's *Annual Energy Outlook 2013* (EIA 2013b) was used as the reference case. A number of key assumptions were taken from this document. These assumptions included projected energy prices and consumption by sector and by fuel type, power plant heat rates, and carbon dioxide emissions per unit of fuel saved.

A few sections of the bill authorize the establishment of a specific program, sometimes with an accompanying funding level. However, these authorizations must be followed by an explicit appropriation of funds, handled by the House and Senate Appropriations Committees. For our analysis we assumed that appropriations would be 50% of the levels authorized in the bills.

Interest Rates Used

To calculate annualized net consumer investment values, we amortized consumer investments for each provision in a given year (and in years with savings from prior investments) using an interest rate of 5% real (e.g. not including inflation; if the nominal interest rate is 8% and inflation is 3%, then the real interest rate is approximately 5%). These amortized net investment values were subtracted from the gross savings to calculate net savings. For many measures we used a 13-year measure life (based on studies showing an average measure life of about 13 years for utility demand-side management programs (Friedrich et al. 2009). For building codes, we used an average measure life of 30 years.

Peak Savings and Emissions Savings

To calculate peak generation savings, we multiplied electric generation savings by a peak factor (kilowatt per kilowatt-hour) that quantifies the fraction of a product's annual hours of usage that occur during times of peak system demand. For this analysis we used a peak factor of 0.27 kW per MWh of energy savings. This figure was derived by ACEEE from data collected by EIA on energy and peak savings from utility energy efficiency programs.

CO_2 reductions were calculated separately for each fuel (electricity, natural gas and oil) using annual emissions factors we derived from energy use and emissions as estimated in EIA's *Annual Energy Outlook 2013* (EIA 2013b).

Key Assumptions Used in Analysis of Individual Sections

Section 101: Greater Energy Efficiency in Building Codes

For commercial codes, we calculated the amount of electricity and natural gas consumed on average per square foot of commercial space. Those buildings affected by the code are new

stock, so we used new additions as the amount of square footage participating, and then applied an average of 30% electricity and natural gas savings in 2015 and 50% savings in 2021. The 30% savings are contained in national model reference codes adopted in 2010. The 50% savings levels are being targeted for 2020 codes, but we build in a delay. Not all states are likely to implement these codes, so we assumed that state adoption increases from 10% to 80% between 2015 and 2020. We assume adoption drops to 35% in 2021 when the more stringent codes are introduced, before returning to 75% in 2025. We also assumed that 60% of buildings would correctly implement the codes initially in 2015, with compliance rising to 80% by 2020. Compliance drops to 70% when the new codes are implemented in 2021, but rises to 90% in 2021.

For residential codes, we calculated new additions to the residential stock of Single-Family Homes by subtracting the difference in the new stock from the previous year, and included an assumption that 1/100 of the stock would be lost to demolition each year (EIA 2009g). The amount of electricity and natural gas per home was calculated by dividing the delivered electricity and natural gas consumption by the number of homes. The same implementation assumptions for commercial buildings (e.g. percent savings, years, state adoption rates, etc.) were used for residential buildings.

An authorization of $200 million is included in the bill. We assume an appropriation of $10 million per year for ten years, beginning in 2012 (e.g., that total appropriations are half of the authorization).

Section 111: Building Training and Assessment Centers; Section 112. Career Skills Training.
Building Training and Assessment Center (BTAC) and Career Skills Training savings were based upon an assumed appropriation of $10 million total for BTAC and the Career Skills Training programs. Based on that funding level we assumed that the programs would ramp-up to 30 centers in 2016 (3 centers per million dollars invested). We also assumed there would be 26 assessments per center per year, based on Industrial Assessment Center data. This is a new program, so the number of centers will initially be zero. This analysis calculated electricity, natural gas, and fuel oil use per square foot and assumed a mean commercial building size of 13,900 sq. ft. (EIA 2007) and energy savings of 10% to calculate savings from each assessment.

Section 202. Future of Industry Program; Sec. 203 Sustainable Manufacturing Initiative; and Sec. 211 Supply Star
For Section 202 we assume the policy will improve the implementation rate of the Industrial Assessment Center's program model. We assume an increase in funding for audits of $2.5 million. Based on data from the Industrial Assessment Center Database we assume that industry will see 113,981 kWh and 745 mmBtu saved per audit, based on a 42 percent implementation rate and the policy will spur 530 new audits per year until 2030.

In Section 203 we assume an annual increase in funding by $5 million and that the audits spurred by the policy will cost about $200,000 each. We assumed that 25 plants will receive audits each year and will save 0.19 TBtu per plant, based on data from the Oak Ridge National Laboratory (Wright et al.). To calculate consumer costs we assume a 2 year simple payback for upgrades made to plants.

To calculate costs and savings for Section 211 we assume a ramp up to 1% savings over 4 years starting in 2016. These savings are realized in 40 companies over the course of 10 years. We assume that $250 million worth of energy is spent in the supply chain and that 50 percent of the supply is reached by the participating companies. To calculate cost to the company we assume a 2 year simple payback.

Section 221. Energy Saving Motor Control, Electric Motor, and Advanced Motor Systems Rebate Program.

In Section 221 we assume that 50 percent of the $5 million authorized for the section will be appropriated in 2014 and 2015. We assume that the life span of these equipment is 13 years and that the new, higher efficiency motors are 10 percent more efficient that then old versions. We also assume that the equipment will run for 4000 hours a year.

Section 231: Energy Efficient Transformer Rebate Program
We assume that $2.5 million is appropriated for 2012 and 2013, half of the amount authorized. We analyze this provision by estimating the number of kVA that could receive rebates within the funding available. Costs and savings per kVA come from a DOE analysis for pending new transformer efficiency standards. We estimate that in 2012 the program is just getting going and our assumed funding is adequate, but in 2013 that the program will be oversubscribed. While funding is capped, we do assume that in 2013 an equal number of customers purchase such transformers on their own, after the rebate funds run out. And we assume similar self-funded implementation in 2014, after the program ends but attributable to the attention the program brings to efficient transformers.

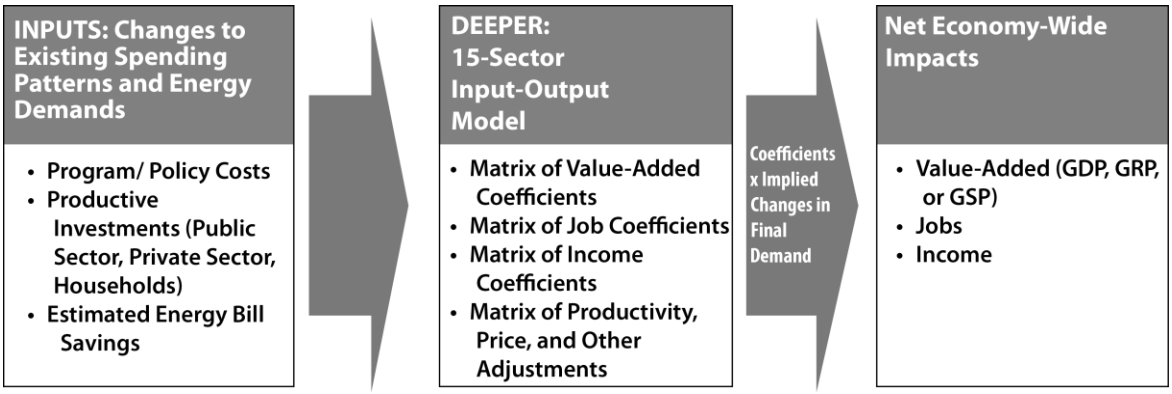
Section 301. Adoption of Information and Communications Technology Power Savings Techniques by Federal Agencies.
We assume a ramp up to 1.25 percent savings over 5 years which is based on study done by the World Wildlife Federation on the potential for CO_2 reductions from Information and Communications Technology (ICT) programs. WWF assumes ICT can save 12% of energy use and we assume the U.S. government will realize one tenth of that. We calculate the savings based on data projecting government energy consumption from (DOE 2011).

Appendix E: Methodology of the Macroeconomic Model

To evaluate the macroeconomic impacts of a variety of energy efficiency, renewable energy, and climate policies at the local, state, and national level, ACEEE uses the proprietary **D**ynamic **E**nergy **E**fficiency **P**olicy **E**valuation **R**outine, or DEEPER model. The model has a 20-year history of use and development, though it was more recently renamed "DEEPER."

The DEEPER Modeling System is a 15-sector[6] quasi-dynamic input-output (I/O) model[7] of the U.S. economy that draws upon social accounting matrices[8] from the Minnesota IMPLAN Group,[9] energy use data from the U.S. Energy Information Administration's Annual Energy Outlook (AEO), and employment and labor data from the Bureau of Labor Statistics (BLS). The Excel-based tool is made up of three linked modules ((i) the Energy and Emissions Module; (ii) the Electricity Production Module; and (iii) the Macroeconomic Module)[10] and contains approximately two dozen interdependent worksheets. The model functions as laid out in the flow diagram below:

Diagram of the DEEPER Model



DEEPER results are driven by adjustments to energy service demands and alternative investment patterns resulting from projected changes in policies and prices between baseline and policy scenarios. The model is capable of evaluating policies at the national level through 2050. However, given uncertainty surrounding future economic conditions and the life of the impacts resulting from the policies analyzed, it is often used to evaluate out 10–15 years. Although the DEEPER Model, like most I/O models, is not a general equilibrium model,[11] it does provide accounting detail that balances changes in investments and expenditures within a sector of the

[6] The current mix of 15 sectors reflects the analyst's efforts to exhibit key outcomes while maintaining a model of manageable size. It is possible to expand and reduce the number of sectors in the model with relatively easy programming adjustments. If the analyst chooses to reflect a different mix of sectors and stay within the 15 x 15 matrix, that can be easily accomplished through minor changes.

[7] Input-output models use economic data to study the relationships among producers, suppliers, and consumers. They are often used to show how interactions among all three impact the macroeconomy.

[8] A social accounting matrix is a data framework for an economy that represents how different institutions—households, industries, businesses, and governments—all trade goods and services with one another.

[9] See http://implan.com/V4/Index.php. The entire IMPLAN database for the U.S. economy can be expanded to more than 400 sectors as needed.

[10] See Laitner and DeCicco (1998) for an example of an earlier set of modeling results. For a more recent review of modeling assessments, see Laitner and McKinney (2008).

[11] General equilibrium models operate on the assumption that a set of prices exists for an economy to ensure that supply and demand are in an overall equilibrium.

economy. With consideration for goods or services that are imported, it balances the variety of changes across all sectors of the economy.[12]

The Macroeconomic Module contains the factors of production—including capital (or investment), labor, and energy resources—that drive the U.S. economy for a given "base year." DEEPER uses a set of economic accounts that specify how different sectors of the economy buy (purchase inputs) from and sell (deliver outputs) to each other.[13]

The DEEPER model is typically used to evaluate impacts of selected policies in 15 different economic sectors that are usually affected by changes in energy use and investment: Agriculture, Oil and Gas Extraction, Coal Mining, Other Mining, Electric Utilities, Natural Gas Distribution, Construction, Manufacturing, Wholesale Trade, Transportation and Other Public Utilities (including water and sewage), Retail Trade, Services, Finance, Government, and Households.[14] The model looks at different labor intensities[15] in different sectors to provide insights about the net employment benefits to the economy.

The Macroeconomic Module translates the selected different policy scenarios, including necessary program spending and research and development (R&D) expenditures, into an annual array of physical energy impacts, investment flows, and energy expenditures over the desired period of analysis. DEEPER evaluates the policy-driven investment path for the various financing strategies, as well as the net energy bill savings anticipated over the study period. It also evaluates the impacts of avoided or reduced investments and expenditures otherwise required by the electric and natural gas sectors. These quantities and expenditures feed directly into the final demand worksheet of the module that generates the net changes in sector spending.

The resulting positive and negative changes in spending and investments in each year are converted into sector-specific changes in aggregate demand.[16] These results then drive the I/O matrices utilizing a predictive algebraic expression known as the Leontief Inverse Matrix,[17] which drives the input-output model according to the following predictive model:

$$X = (I-A)^{-1} * Y$$

where:

X = total industry output by sector
I = an identity matrix consisting of a series of 0's and 1's in a row and column format for each sector (with the 1's organized along the diagonal of the matrix)
A = the matrix of production coefficients for each row and column within the matrix (in effect, how each column buys products from other sectors and how each row sells products to all other sectors)
Y = final demand, which is a column of net changes in spending by each sector as that spending pattern is affected by the policy case assumptions (changes in energy prices, energy consumption, investments, etc.)

This set of relationships can also be interpreted as

$$\Delta X = (I-A)^{-1} * \Delta Y$$

[12] When both equilibrium and dynamic input-output models use the same technology assumptions, both models should generate a reasonably comparable set of outcomes. See Hanson and Laitner (2005) for a diagnostic assessment that reached that conclusion.
[13] Further details on this set of linkages can be found in Hanson and Laitner (2009).
[14] Household spending is allocated to each of the sectors using the personal consumption expenditure data provided in the IMPLAN data set.
[15] This is the magnitude of jobs supported by a given level of investment.
[16] This is the total demand for final goods and services in the economy at a given time and price level.
[17] For a more complete discussion of these concepts, see Miller and Blair (1985).

which reads, a change in total sector output equals the expression $(I-A)^{-1}$ times a change in final demand for each sector.[18]

Employment quantities are adjusted annually according to assumptions about the anticipated labor productivity improvements based on forecasts from the Bureau of Labor Statistics. The DEEPER Macroeconomic Module traces how changes in spending will ripple through the U.S. economy in each year of the assessment period. **The end result is a net change between the reference and policy scenarios in jobs, income, and value-added,[19] which is typically measured as Gross Domestic Product (GDP), Gross Regional Product (GRP), or Gross State Product (GSP) for the study region (e.g., national, state, or local).**

Like all economic models, DEEPER has strengths and weaknesses. It is robust by comparison to some I/O models because it can account for price and quantity changes over time and is sensitive to shifts in investment flows. It also reflects sector-specific labor intensities across the U.S economy. However, it is important to remember when interpreting results for the DEEPER model that the results rely heavily on the quality of the information that is provided and the modeler's own assumptions and judgment. The results are unique to the specified policy design. The results reflect differences between scenarios in a future year, and like any prediction of the future, they are subject to uncertainty.

[18] Perhaps one way to understand the notation $(I-A)^{-1}$ is to think of this as the positive or negative impact multiplier depending on whether the change in spending is positive or negative for a given sector within a given year.
[19] This is the market value of all final goods and services produced within a country in a given period.