

CHAPTER 15. NET NATIONAL EMPLOYMENT IMPACT ANALYSIS

TABLE OF CONTENTS

15.1 ASSUMPTIONS..... 15-1
15.2 METHODOLOGY 15-1
15.3 RESULTS 15-2
REFERENCES 15-7

LIST OF TABLES

Table 15.3.1 Net National Change in Jobs for VOP.RC.M by TSL..... 15-2
Table 15.3.2 Net National Change in Jobs for VOP.RC.L by TSL..... 15-3
Table 15.3.3 Net National Change in Jobs for VOP.SC.M by TSL 15-3
Table 15.3.4 Net National Change in Jobs for VCT.RC.M by TSL..... 15-3
Table 15.3.5 Net National Change in Jobs for VCT.RC.L by TSL..... 15-3
Table 15.3.6 Net National Change in Jobs for VCT.SC.I by TSL 15-3
Table 15.3.7 Net National Change in Jobs for VCS.SC.I by TSL..... 15-4
Table 15.3.8 Net National Change in Jobs for SVO.RC.M by TSL..... 15-4
Table 15.3.9 Net National Change in Jobs for SVO.SC.M by TSL 15-4
Table 15.3.10 Net National Change in Jobs for SOC.RC.M by TSL..... 15-4
Table 15.3.11 Net National Change in Jobs for HZO.RC.M by TSL..... 15-4
Table 15.3.12 Net National Change in Jobs for HZO.RC.L by TSL..... 15-5
Table 15.3.13 Net National Change in Jobs for HZO.SC.M by TSL..... 15-5
Table 15.3.14 Net National Change in Jobs for HZO.SC.L by TSL 15-5
Table 15.3.15 Net National Change in Jobs for HCT.SC.I by TSL 15-5
Table 15.3.16 Net National Change in Jobs for all Commercial Refrigeration Equipment
by TSL 15-6

CHAPTER 15. NET NATIONAL EMPLOYMENT IMPACT ANALYSIS

The U.S. Department of Energy (DOE) conducted the employment impact analysis to estimate indirect national job creation or elimination resulting from proposed energy conservation standards because of reallocation of the associated commercial expenditures for purchasing and distributing commercial refrigeration equipment (CRE). DOE estimated the national impacts on major sectors of the U.S. economy using publicly available data and incorporating different energy price scenarios. The employment impact analysis does not evaluate direct employment impacts at manufacturers' facilities, which are considered in the manufacturer impact analysis (see Chapter 12 of the TSD).

15.1 ASSUMPTIONS

If promulgated, DOE expects CRE-amended energy conservation standards to decrease the national energy consumption, and, therefore, reduce energy expenditures. The savings in energy expenditures may be used on new investment or not at all (i.e., they may remain "saved"). The amended energy conservation standards may increase the purchase price (i.e., equipment price plus sales tax) and installation costs of commercial refrigeration equipment.

Using an input-output model of the U.S. economy, this analysis estimated the year-to-year effect of these expenditure impacts on net economic output and employment. DOE intended this analysis to quantify the indirect employment impacts of reduced expenditures for energy and reallocation of that money toward other sectors of the economy.

15.2 METHODOLOGY

DOE defines the net national employment impacts resulting from proposed amended energy conservation standards for commercial refrigeration equipment as the net national change in jobs in the general economy. The key factors affecting the outcome of net change in jobs are (1) increased spending on the purchase and installation of commercial refrigeration equipment meeting the amended standards, (2) reduced customer spending on electricity, (3) reduced spending on new investment or capacity by energy companies, and (4) the associated indirect effects of the above.

DOE based its analysis on the Impact of Sector Energy Technologies (ImSET) model developed by Pacific Northwest National Laboratory (PNNL) for DOE's Office of Energy Efficiency and Renewable Energy (EERE).¹ ImSET is an input/output model of the U.S. economy that estimates the effects of standards on major sectors of the economy related to buildings and the net impact of standards on jobs. ImSET's input/output structure is based on the 1997 Benchmark U.S. table aggregated to 188 sectors to estimate the employment and income effects of building energy technologies.² In comparison with simple economic multiplier approaches, ImSET allows for more complete and automated analysis of the economic impacts of energy efficiency investments in buildings.

In an input/output model, the level of employment in an economy is determined by the relationship of different sectors of the economy and the spending flows among them. Different sectors have different levels of labor intensity, and changes in the level of spending (e.g., due to

the effects of an amended energy conservation standard) in one sector of the economy will affect spending in other sectors, which in turn will affect the overall level of employment.

ImSET uses a 188-sector model to predict the economic effects of residential and commercial buildings technologies. ImSET collects estimates of initial investments, energy savings, and economic activity associated with spending the savings resulting from amended standards (e.g., changes in final demand in personal consumption, business investment and spending, government spending). It provides overall estimates of the change in national output for each input-output sector. Then, the model applies estimates of employment and wage income per dollar of economic output for each sector and calculates impacts on national employment and wage income.

ImSET calculates the total effect of standards on employment, including job creation or deletion in the manufacturing sector. As described above, DOE analyzed the direct employment impacts (i.e., those that would occur at the manufacturing plants of commercial refrigeration equipment) in the manufacturer impact analysis (see Chapter 13 of the TSD).

Energy efficiency technology primarily affects the U.S. economy along three spending pathways. First, general investment funds are diverted to sectors that manufacture, install, and maintain energy efficient technologies. The increased cost of technology leads to higher employment in the refrigeration equipment manufacturing sector, including commercial refrigeration equipment, and lower employment in other economic sectors. Second, commercial firm spending is redirected from utilities toward firms that supply commercial production inputs. Third, electric utility sector investment funds are released for use in other sectors of the economy. When customers use less energy, electric utilities experience relative reductions in demand, which in turn leads to reductions in utility sector investment and employment.

15.3 RESULTS

The results show the total effects of amended energy conservation standards on employment for the selected years. Table 15.3.1 through Table 15.3.15 show the net national employment impacts of the amended CRE energy conservation standards for each of the 15 CRE products by Trial Standard Level (TSL) and specified years for the entire CRE market.

Table 15.3.1 Net National Change in Jobs for VOP.RC.M by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	4	6	7
2	0	20	28	32
3	-1	44	62	70
4	-1	44	62	70
5	-1	45	64	73

Table 15.3.2 Net National Change in Jobs for VOP.RC.L by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	12	17	19
2	0	20	28	32
3	0	23	32	37
4	-1	33	47	53
5	-1	33	47	53

Table 15.3.3 Net National Change in Jobs for VOP.SC.M by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	10	15	17
2	0	29	41	47
3	-1	57	80	92
4	-1	57	80	92
5	-3	72	110	122

Table 15.3.4 Net National Change in Jobs for VCT.RC.M by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	1	1	2
2	0	4	6	7
3	-1	45	63	72
4	-1	45	64	73
5	-1	45	64	73

Table 15.3.5 Net National Change in Jobs for VCT.RC.L by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	65	91	105
2	-5	724	1016	1163
3	-8	1037	1455	1665
4	-9	1060	1487	1701
5	-9	1060	1487	1701

Table 15.3.6 Net National Change in Jobs for VCT.SC.I by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	16	23	27
2	0	43	60	69
3	-1	49	70	80
4	-1	51	74	83
5	-1	51	74	83

Table 15.3.7 Net National Change in Jobs for VCS.SC.I by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	0	1	1
2	0	2	2	3
3	0	3	5	6
4	0	3	5	6
5	0	3	5	6

Table 15.3.8 Net National Change in Jobs for SVO.RC.M by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	53	75	85
2	-1	78	110	126
3	-1	156	219	251
4	-1	156	219	251
5	-16	263	373	426

Table 15.3.9 Net National Change in Jobs for SVO.SC.M by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	9	13	15
2	0	28	39	45
3	-1	60	85	97
4	-1	60	85	97
5	-3	76	119	131

Table 15.3.10 Net National Change in Jobs for SOC.RC.M by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	3	5	6
2	0	13	18	21
3	0	25	36	41
4	0	25	36	41
5	-3	84	124	140

Table 15.3.11 Net National Change in Jobs for HZO.RC.M by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	2	3	4
2	0	9	13	15
3	0	14	19	22
4	0	15	21	24
5	0	15	21	24

Table 15.3.12 Net National Change in Jobs for HZO.RC.L by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	23	32	37
2	0	51	71	82
3	-1	59	83	95
4	-1	59	83	95
5	-1	59	83	95

Table 15.3.13 Net National Change in Jobs for HZO.SC.M by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	0	0	0
2	0	1	2	2
3	0	3	4	5
4	0	3	5	6
5	0	3	5	6

Table 15.3.14 Net National Change in Jobs for HZO.SC.L by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	1	2	2
2	0	5	7	8
3	0	12	18	20
4	0	13	21	23
5	0	13	21	23

Table 15.3.15 Net National Change in Jobs for HCT.SC.I by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	3	5	5
2	0	29	41	47
3	0	31	44	50
4	-1	34	48	55
5	-1	34	48	55

As shown in Table 15.3.1 through Table 15.3.15, the range of efficiency levels for the individual CRE product classes has virtually no initial impact on jobs and has a small positive impact on jobs in later years. This is further illustrated in Table 15.3.16, which provides the sum of employment impacts for commercial refrigeration equipment by TSL and the maximum total employment impact associated with the highest efficiency level for each CRE product class.

Table 15.3.16 Net National Change in Jobs for all Commercial Refrigeration Equipment by TSL

Trial Standard Level	Net National Change in Jobs			
	2012	2022	2032	2042
1	0	202	289	332
2	-6	1,056	1,482	1,699
3	-15	1,618	2,275	2,603
4	-18	1,658	2,337	2,670
5	-40	1,856	2,645	3,011

As shown in the above tables, the proposed CRE standards have virtually no initial impact on jobs and have a small positive impact on jobs in later years. This is explained by the fact that the required initial investment in the efficient equipment costs (a few) jobs because the investment is capital-intensive relative to other spending in the economy that would be displaced to pay for the investment. However, in the long term, the benefit to the economy of the energy savings from the installed equipment more than makes up for the initial investment, and the net effect on employment is positive. The long-term positive and increasing impact occurs because the energy savings in future years are obtained from both current and previous efficiency investments reflected in the installed stock of efficient equipment while investment costs for the equipment occur only once. Also, employment increases with higher efficiency levels because of the energy savings.

Employment levels exhibit a decreasing rate of increase through time because the energy savings decrease through time as the energy efficiency of the stock of equipment increases. The increasing efficiency of the stock results from sales of the more efficient equipment and initial replacement of less efficient equipment. Over time, only new sales account for efficiency increases in the stock because the number of less efficient units being replaced declines to zero. Thus, the energy savings and resulting impact on the economy are greater initially, and then increase more slowly over time.

REFERENCES

1. Roop, J.M., M.J. Scott and R.W. Schultz. 2005. *ImSET: Impact of Sector Energy Technologies*. PNNL-15273, Pacific Northwest National Laboratory, Richland, Washington.
2. Lawson, Ann M., K.S. Bersani, Mahnaz Fahim-Nader, and Jiemin Guo. 2002. "Benchmark Input-Output Accounts of the U.S. Economy, 1997," *Survey of Current Business*, December, pp. 19-117.