CHAPTER 17. REGULATORY IMPACT ANALYSIS

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CHAPTER 17. REGULATORY IMPACT ANALYSIS

17.1 INTRODUCTION

Under the Process Rule, the U.S. Department of Energy (DOE) is committed to exploring non-regulatory alternatives to energy conservation standards. DOE will prepare a draft regulatory analysis under Executive Order 12866, "Regulatory Planning and Review," which will be subject to review by the Office of Information and Regulatory Affairs. 58 FR 51735 (September 30, 1993).

DOE identified five major alternatives to energy conservation standards as feasible policy options to achieve product energy efficiency. It will evaluate each alternative in terms of its ability to achieve significant energy savings at a reasonable cost, and will compare the effectiveness of each alternative to the effectiveness of the proposed standard.

The non-regulatory means of achieving energy savings that DOE proposes to analyze are listed below. The Technical Support Document (TSD) in support of DOE's Notice of Proposed Rulemaking will include a quantitative analysis of each alternative, the methodology for which is discussed briefly below.

- no new regulatory action
- commercial customer tax credits
- commercial customer rebates
- early replacement
- bulk government purchases

17.2 METHODOLOGY

DOE used the national energy savings (NES) spreadsheet model to calculate the NES and the net present value (NPV) corresponding to each alternative of the proposed standards. The NES spreadsheet model is discussed extensively in Chapter 11 of the TSD. To compare each alternative quantitatively to proposed energy conservation standards, it was first necessary to quantify the effect of each alternative on the purchase and use of energy-efficient commercial equipment. Once each alternative is properly quantified, DOE made the appropriate revisions to the inputs in the NES spreadsheet model. Key inputs that DOE revised in the NES spreadsheet model are:

- energy prices and escalation factors;
- implicit market discount rates for trading off purchase price against operating expense when choosing equipment efficiency;
- customer purchase price, operating cost, and income elasticities;
- customer price versus efficiency relationships; and
- equipment stock data (purchase of new equipment or turnover rates for inventories).

The key measures of the impact of each alternative will be as listed below.

- Commercial energy use in Quads (10^{15} Btu); the cumulative energy use of the equipment from 2012 to 2042. DOE reports electricity consumption in terms of primary energy.
- National energy savings is the cumulative national energy use from the base case projection less the alternative policy case projection.
- Net present value is the value of future operating cost savings from commercial refrigeration equipment bought in the period from 2012 to 2062. DOE calculates the NPV as the difference between the present value of equipment and operating expenditures (including energy) in the base case, and the present value of expenditures in each alternative policy case for the life of the equipment. DOE discounts future operating and equipment expenditures to 2008 using seven and three percent real discount rates.

17.2.1 Policy Considerations

17.2.1.1 Policy Assumptions

The impacts of non-regulatory programs are uncertain by nature, since they depend on program implementation and marketing efforts, and the subsequent response in customer behavior. The projected impacts depend on the assumptions for the customer participation rate, and are therefore subject to greater uncertainty than the impacts of mandatory standards, which DOE assumed would have full compliance.

DOE assumed that each alternative policy would induce commercial customers to voluntarily purchase at least some additional more energy efficient units as opposed to mandatory purchases of more efficient equipment that would result from the proposed energy conservation standards at any of the candidate standard levels (TSLs). Table 17.2.1 shows the energy savings associated with standards at each of the considered TSLs (see Chapter 11 of the TSD for additional information). In contrast to a standard at one of the TSLs, however, the adoption rate of the alternative non-regulatory policy cases may not be 100 percent, which would result in lower energy savings than a standard.

DOE assumed that the non-regulatory policy effects last from the assumed start date for the mandatory amended energy conservation standards, 2012, through the end of the analysis period, 2042 for energy savings and 2062 for NPV. This simplifying assumption means that the policy affects the market for the entire analysis period, whether or not the incentives actually continue. DOE did not consider administrative costs for any of the non-regulatory policies in its analysis. Inclusion of such costs would decrease the NPV by a small amount.

Table 17.2.1 Cumulative National Energy Savings in Quads for Commercial Refrigeration Equipment, 2012-2042

Equipment Class	National Energy Savings (quads*) by Trial Standard Level				
	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
VOP.RC.M	0.057	0.082	0.157	0.157	0.294
VOP.RC.L	0.006	0.011	0.012	0.018	0.018
VOP.SC.M	0.006	0.016	0.031	0.031	0.041
VCT.RC.M	0.001	0.002	0.024	0.025	0.025
VCT.RC.L	0.035	0.392	0.561	0.574	0.574
VCT.SC.I	0.009	0.023	0.027	0.028	0.028
VCS.SC.I	0.000	0.001	0.002	0.002	0.002
SVO.RC.M	0.029	0.043	0.085	0.085	0.157
SVO.SC.M	0.005	0.015	0.033	0.033	0.043
SOC.RC.M	0.002	0.007	0.014	0.014	0.048
HZO.RC.M	0.001	0.005	0.008	0.008	0.008
HZO.RC.L	0.013	0.028	0.032	0.032	0.032
HZO.SC.M	0.000	0.001	0.002	0.002	0.002
HZO.SC.L	0.001	0.003	0.007	0.007	0.007
HCT.SC.I	0.002	0.016	0.017	0.019	0.019
Total	**0.168**	**0.645**	**1.013**	**1.035**	**1.298**

*0.000 indicates savings are less than 0.0005 quadrillion Btu.

17.2.1.2 Policy Interactions

DOE calculated the impacts of each regulatory policy separately from those of the other policies. In actual practice, certain policies are often most effective when implemented in combination to provide incentives, such as early replacement and customer rebates, or early replacement and bulk government purchases. DOE attempted to make conservative assumptions to avoid double-counting policy impacts. Therefore, the policy impacts reported below are not additive (i.e. the combined impact of several or all of the policies may not be inferred by adding the results together).

17.2.2 Non-Regulatory Policy Assumptions

17.2.2.1 No New Regulatory Action

The case in which no regulatory action is taken constitutes the base case scenario described in the CRE TSD, (See Chapter 11, National Impact Analysis). From its assessment of current market shares and equipment and operating costs, DOE estimated forecasted shipments and the distribution of efficiencies of the stock, from 2012 through 2042. This defines the basis of comparison for all other scenarios, including the policy cases and the standard cases. By

definition, no new regulatory action yields zero energy savings and a net present value of zero dollars.

17.2.2.2 Financial Incentives Policies

DOE considered several scenarios in which the Federal government would provide some form of financial incentive. It analyzed in detail two types of incentives: commercial customer tax credits and commercial customer rebates. Tax credits could be granted to commercial customers who purchase high efficiency CRE equipment. Alternatively, the government could issue tax credits to manufacturers to offset costs associated with producing high-efficiency equipment. For this analysis, only a commercial customer tax credit, patterned after provisions in the EPACT of 2005, was considered. The second incentive program involved a commercial customer rebate program that was nominally patterned after existing rebate programs currently offered by several utilities.

17.2.2.3 Commercial Customer Tax Credits

DOE assumed a (commercial or industrial) customer tax credit that is patterned after the tax credits that were created in EPACT 2005. EPACT 2005 provided tax credits to customers who purchase and install specific products such energy-efficient windows, insulation, doors, roofs, and heating and cooling equipment. For many of these equipment types, the tax credit is equal to the 10 percent of the retail cost, up to specific dollar limits.

For the CRE tax credits analysis, DOE presumed the presence of a certification or other program that could be used to identify high efficiency CRE products by energy consumption. ARI is currently working to develop such a certification program. DOE proposed TSL 3 and TSL 5 as likely candidate levels for a tax credit incentive. TSL 3 was chosen given that DOE had already identified it as the minimum life-cycle cost level and maximum-NPV level for CRE customers. TSL 5 is the max-tech efficiency level and provides the maximum energy savings for each customer incentivized to purchase TSL 5 equipment.

DOE reviewed the incremental customer price increase to reach each efficiency level across all 15 equipment classes. For 12 of the equipment classes (VOP.RC.M, VOP.RC.L, VOP.SC.M, VCT.RC.M, VCT.RC.L, VCT.SC.I, VCS.SC.I, SVO.RC.M, SVO.SC.M, HZO.SC.M, HZO.SC.L, and HCT.SC.I), the incremental price at TSL 3 was between 6.8 and 22.5 percent higher than for baseline equipment. For three equipment classes (SOC.RC.M, HZO.RC.M, and HZO.RC.L), the incremental cost was less than six percent. For the TSL 3 tax credit scenario analysis, DOE assumed a tax credit equal to five percent of the customer prices could be applied to the 12 product classes, but did not provide a credit for the three product classes for which the incremental cost was less than six percent. The credits were assumed to apply only to the retail cost of the equipment and not to any additional costs related to installation.

The cost increments from the baseline to reach TSL 5 is wider than to reach TSL 3, ranging from a 4.0 percent to a 83.1 percent cost increase. Three products at TSL 5 had a total incremental cost increase of less than 10 percent (HZO.RC.M , HZO.RC.L, and VCS.SC.I). Three additional equipment classes had an incremental cost of less than 20 percent (HZO.SC.M, HCT.SC.I, HZO.SC.L). The remaining nine equipment classes had incremental cost increases of

21 to 83 percent. DOE opted to analyze a scenario DOE where a tax credit equal to 10 percent of the customer prices would be available for purchase of TSL 5 efficiency level equipment for 12 product classes (HZO.SC.M, HCT.SC.I, HZO.SC.L, VOP.RC.L, SOC.RC.M, VCT.RC.M, VCT.RC.L, VCT.SC.I, SVO.RC.M, SVO.SC.M, VOP.SC.M, VOP.RC.M). It assumed no tax credit incentive for the three product classes for which the incremental cost was less than 10 percent at TSL 5.

The presence of a commercial customer tax credit in either the TSL 3 or TSL 5 tax credit scenario elicits greater purchases of equipment with efficiencies above the baseline, which leads to higher average aggregate efficiency and lower average aggregate energy consumption. The change in market shares that may result from a five-percent tax credit scenario or the 10-percent tax credit scenario was estimated per the method described in Chapter 11, and was similarly done for the analysis for commercial customer rebates. No change in total equipment sales was presumed.

From a societal point of view, tax credits, like rebates, do not change the installed cost of the commercial refrigeration equipment; they simply transfer a portion of the cost from the customer to taxpayers as a whole. Thus, for calculation of total cost of equipment in the modified NIA study, the increase in sales by efficiency level due to tax credits estimates are multiplied by the pre-rebate costs identical to those used in the base NIA discussed in Chapter 11.

Table 17.2.2 compares the cumulative energy savings and calculated NPV for the national rebate program envisioned with those of the proposed standards action.

Table 17.2.2 Tax Credit Energy Savings and NPV

Policy alternatives	Cumulative Energy Savings* (quads), 2012-2042	Net Present Value** (billion 2006$), 2012-2062	
		7% Discount Rate	3% Discount Rate
No New Regulatory Action	0	0	0
Commercial Customer Tax Credits (5% Scenario)	0.111	0.231	0.489
Commercial Customer Tax Credits (10% Scenario)	0.082	0.140	0.303
Today's Standards at TSL 4	1.035	1.414	3.930

* Energy savings are in source quads.
** Net present value is the value in the present of a time series of costs and savings.

17.2.2.4 Commercial Customer Rebates

DOE modeled the impact of the customer rebate policy by determining the increased customer participation rate due to the rebates (i.e., the percentage increase in customers purchasing high-efficiency equipment). It then applied the resulting increase in market share of efficient units to the NES Spreadsheet Model to estimate the resulting NES and NPV with respect to the base case.

After reviewing several utility rebate programs currently in place (see Chapter 3 of the TSD), DOE decided to pattern the analysis of a national rebate program after the EnergySmart Grocer program offered by the California Public Utilities Commission, which provides rebates for the use of specific component technologies. Several other utility programs identified in Chapter 3 also appear to provide rebates for similar CRE component technologies. None of the programs base rebates on an energy consumption threshold, as that data is largely unavailable from either manufacturers or a central source such as a certification program. Eligible participants in the EnergySmart Grocer program include grocery and convenience stores, food processors, and refrigerated warehouses operating in Pacific Gas & Electric, Southern California Edison, or San Diego Gas & Electric service territories.

Rebates were not considered in two cases. In the first case, for the rebate programs identified in Chapter 3 provide rebates based on improved components, rebates are generally available for both new equipment purchases and for retrofits to existing commercial refrigeration equipment, although often at different rebated levels and with qualifiers. For the RIA, DOE only considered rebates on newly purchased commercial refrigeration equipment and not for retrofit of existing equipment, as the standards action for which a non regulatory approach is being compared with only addresses newly purchased equipment. In the second case, other utility rebate or incentive programs available to CRE customers provide general rebates based on the calculated annual kWh or kW reduction estimates, however such programs were not considered by DOE in the RIA as these programs do not specifically target commercial refrigeration equipment.

Under the EnergySmart Grocer programs, commercial and industrial businesses that purchase commercial refrigeration equipment can receive payments for the incorporation of specific technologies and/or for specific performance characteristics achieved in various classes of commercial refrigeration equipment such as display cases, walk in coolers, and equipment with remote condensers. Other rebate programs analyzed did not necessarily define the same set of minimum conditions for eligibility.

DOE reviewed and incorporated, in the RIA, the rebates offered for energy saving technologies considered applicable to the commercial refrigeration equipment product classes analyzed in the engineering analysis. The technologies examined and rebates applied were: Low-heat doors, $50/door; ECM motors, $20 per display case evaporator fan motor; LED Lamps, $56 for each fluorescent lamp replaced. These values are currently used in the EnergySmart Grocer program and represent values roughly in the middle of the ranges found for other rebate programs. Where these technologies are employed in each class of commercial refrigeration equipment, the average first cost reduction to all customers was calculated for each of the efficiency levels analyzed in the LCC. The average percentage cost reduction was calculated for each efficiency level in turn taking the rebates into account.

The rebates were then entered into the LCC analysis spreadsheet for each equipment class as percentage reductions in equipment price. When compared against the incremental retail price of higher efficiency commercial refrigeration equipment, as developed in Chapter 8 of the TSD, the rebates range between 0 percent to up to 18 percent of the customer price depending on TSL level and equipment class. Table 17.2.3 shows the calculated rebates by equipment class at each TSL Level. For example, under the provisions of the national rebate program constructed

for this analysis, a vertical closed transparent, remote condensing, low temperature display case (VCT.RC.L) would receive a rebate equivalent to 4.92 percent of the average purchase price, not including installation, at TSL 3. At TSL 5, the total rebate for incorporation of the set of technologies would be 4.87 percent of the purchase price.

Table 17.2.3 Average Percentage Price Reduction due to Rebate Program

Equipment Class*	Calculated Average Percentage Price Reduction due to Rebate Program				
	TSL 1	TSL 2	TSL 3	TSL 4	TSL 5
VOP.RC.M	1.96%	1.93%	1.84%	1.84%	17.94%
VOP.RC.L	2.97%	2.86%	2.83%	7.11%	7.11%
VOP.SC.M	1.26%	2.98%	2.72%	2.72%	13.80%
VCT.RC.M	0.00%	1.04%	5.45%	5.41%	5.41%
VCT.RC.L	0.95%	2.90%	4.92%	4.87%	4.87%
VCT.SC.I	2.84%	4.23%	4.09%	4.66%	4.66%
VCS.SC.I	0.00%	1.31%	2.45%	2.45%	2.45%
SVO.RC.M	1.46%	1.44%	1.39%	1.39%	15.77%
SVO.SC.M	0.78%	1.49%	1.36%	1.36%	12.04%
SOC.RC.M	0.00%	0.75%	0.74%	0.74%	7.99%
HZO.RC.M	0.00%	1.30%	1.28%	1.27%	1.27%
HZO.RC.L	1.29%	1.26%	1.25%	1.25%	1.25%
HZO.SC.M	0.00%	0.86%	1.61%	1.57%	1.57%
HZO.SC.L	0.00%	0.73%	1.34%	1.31%	1.31%
HCT.SC.I	0.00%	0.00%	1.23%	1.18%	1.18%

* Equipment class designations consist of a combination (in sequential order separated by periods) of a equipment family code (VOP=vertical open, SVO=semivertical open, HZO=horizontal open, VCT=vertical transparent doors, VCS=vertical solid doors, HCT=horizontal transparent doors, HCS=horizontal solid doors, or SOC=service over counter), an operating mode code (RC=remote condensing or SC=self-contained), and a rating temperature code (M=medium temperature (38°F), L=low temperature (0°F), or I=ice-cream temperature (-15°F)). For example, "VOP.RC.M refers to the "vertical open, remote condensing, medium temperature" equipment class. See Chapter 3, Market and Technology Assessment, of the TSD for a more detailed explanation of the equipment class terminology

The rebates elicit increased purchases of higher efficiency equipment that lower the overall average annual energy consumption per unit. Using the method described in Chapter 11 of the TSD to estimate market shares, a new distribution of sales by efficiency level (corresponding to the various TSLs) was computed. The resulting increase in sales of higher efficiency level equipment results in energy savings compared with the base case.

Although the rebate program lowers the retail cost to the customer, it must be financed by tax revenues. So, from a societal point of view, the installed cost at any efficiency level does *not* change with the rebate policy, it simply transfers part of the cost from the customer to taxpayers as a whole. Thus, the calculation of equipment total cost in the rebate case is calculated as the revised estimated sales by efficiency level due to the rebates multiplied by the pre-rebate equipment prices (identical to those in the base NIA discussed in Chapter 11). Table 17.2.4 compares the cumulative energy savings and calculated NPV for the national rebate program envisioned with those of the proposed standards action.

Table 17.2.4 Rebate Energy Savings and NPV

Policy alternatives	Cumulative Energy Savings* (quads), 2012-2042	Net Present Value** (billion 2006$), 2012-2062	
		7% Discount Rate	3% Discount Rate
No New Regulatory Action	0	0	0
Commercial Customer Rebates	0.107	0.157	0.345
Today's Standards at TSL 4	1.035	1.414	3.930

* Energy savings are in source quads.
** Net present value is the value in the present of a time series of costs and savings.

17.2.2.5 Early Replacement Incentives

Early replacement refers to the replacement of commercial refrigeration equipment before the end of their useful lives. The purpose of this policy is to retrofit or replace old, inefficient equipment with high efficiency units. DOE studied the feasibility of a Federal program to promote early replacement of appliances and equipment under EPACT 1992. In this study, DOE identified Federal policy options for early replacement that include a direct national program, replacement of Federally-owned equipment, promotion through equipment manufacturers, customer incentives, incentives to utilities, market behavior research, and building regulations.

While cost-effective opportunities to install units that are more efficient exist, DOE determined that a Federal early replacement program is not economically justified because the market for CRE is relatively small and distributed across abroad set of customers, the savings are not expected to be significant. In addition, a temporary surge in CRE sales in the early 2000s effectively reduces the size of the market that would be subject to early replacement, thus further reducing the potential for an effective early replacement program.

17.2.2.6 Bulk Government Purchases

In this policy alternative, bulk government purchases refers to Federal, State, and local governments being encouraged to purchase equipment meeting the energy conservation standards. The motivations for this policy are that (1) aggregating public sector demand could provide a market signal to manufacturers and vendors that some of their largest customers seek suppliers with equipment that meet an efficiency target at good prices, and (2) this could induce "market pull" impacts through the effects of manufacturers and vendors achieving economies of scale for high efficiency equipment.

As with the early replacement, bulk government purchases may provide cost effective opportunities to install more efficient equipment on a limited basis, however it was concluded that a widespread bulk purchase program was not economically justified. This is because the segment/share of the market that would be affected by a bulk government purchase program is a small portion of an already relatively small market, as the vast majority of the shipments/sales are to non-governmental customers.

17.2.2.7 Regional Energy Conservation Standards

DOE lacks authority to adopt regional standards, so it must reject this alternative. However, DOE does have authority to grant State petitions for an exemption from Federal preemption of higher standards, if the State filing the petition demonstrates unusual and compelling State or local energy interests (42 U.S.C. 6297(d) and 6316(b)(2)(D)). The State has a heavy burden in making such a showing, and DOE must reject the petition if "interested persons" establish that the State regulation would "significantly burden manufacturing, marketing, distribution, sale or servicing" of the covered equipment on a national basis. (42 U.S.C. 6297(d))

Because of the potential variability of standards by State and the widely differing economic and climate situations, DOE did not undertake a quantitative analysis of regional standards.

17.2.3 Results Summary

Table 17.2.5 shows the national energy savings (NES) and NPV for the non-regulatory alternatives analyzed. The case in which no regulatory action is taken with regard to commercial refrigeration equipment constitutes the base case (or "No Action") scenario. Since this is the base case, energy savings and NPV are zero by definition. For comparison, the table includes the results of the NES and NPV for TSL 4 associated with a possible energy conservation standard. Energy savings expressed in quadrillion Btu (Quads) in terms of primary or source energy, which includes generation and transmission losses from electricity utility sector (the estimation of source energy is explained in Chapter 10. The NPVs shown in the table refer to the NPV for commercial customers based on real discount rates of 7 and 3 percent.

As indicated in Table 17.2.5, none of the policy alternatives DOE examined would save as much energy as and have a lower NPV than several of the TSLs for energy conservation standards. Also, several of the alternatives would require new enabling legislation, such as commercial customer or Federal tax credits, since authority to carry out those alternatives does not presently exist.

Table 17.2.5 Non-Regulatory Alternatives to Standards

Policy alternatives	Cumulative Energy Savings* (quads), 2012-2042	Net Present Value** (billion 2006$), 2012-2062	
		7% Discount Rate	3% Discount Rate
No New Regulatory Action	0	0	0
Commercial Customer Tax Credits: 5%	0.111	0.231	0.489
Commercial Customer Tax Credits: 10%	0.082	0.140	0.303
Commercial Customer Rebates	0.107	0.157	0.345
Today's Standards at TSL 4	0.715	1.20	3.25

* Energy savings are in source quads.

** Net present value is the value in the present of a time series of costs and savings.

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