REGULATORY IMPACT ANALYSIS FOR PROPOSED ENERGY CONSERVATION STANDARDS FOR RESIDENTIAL FURNACES AND BOILERS

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TABLE OF CONTENTS

1.0 INTRODUCTION RIA-1
2.0 NON-REGULATORY POLICIES RIA-2
2.1 Methodology RIA-2
2.1.1 Modeling Method RIA-2
2.1.2 Policy Assumptions RIA-3
2.1.3 Policy Interactions RIA-4
2.2 Non-Regulatory Policy Assumptions RIA-4
2.2.1 No New Regulatory Action RIA-4
2.2.2 Financial Incentives Policies RIA-5
2.2.3 Voluntary Energy-Efficiency Targets RIA-10
2.2.4 Early Replacement RIA-12
2.2.5 Bulk Government Purchases RIA-13
2.3 Non-Regulatory Policy Market Share Impacts RIA-14
2.4 Results Summary for Non-Regulatory Alternatives RIA-16

LIST OF TABLES

Table RIA.1 Policy Alternatives to Proposed National Furnace and Boiler Standards . . RIA-1
Table RIA.2 Trial Standard Levels for Residential Furnaces and Boilers RIA-3
Table RIA.3 Benefit/Cost Ratios for Proposed Standard and Rebate Policy Cases RIA-7
Table RIA.4 Increased Market Share Penetration Levels from Voluntary Furnace and Boiler Programs RIA-11
Table RIA.5 Non-Regulatory Alternatives with Target Levels at TSL 2 . . . . . RIA-16
Table RIA.6 Non-Regulatory Alternatives with Target Levels at TSL 2 (NWGF at TSL 3) RIA-16

LIST OF FIGURES

Figure RIA.1 Market Penetration Curve for Non-Weatherized Gas Furnaces at 80 Percent AFUE Level RIA-8
Figure RIA.2 Market Penetration Curve for Non-Weatherized Gas Furnaces at 81 Percent AFUE Level RIA-8
Figure RIA.3 Market Penetration Curve for Gas Boilers RIA-9
Figure RIA.4 Early Replacement Shipments Projections for Non-Weatherized Gas Furnaces RIA-13

Figure RIA.5 Penetration Rates for Non-Weatherized Gas Furnaces at 80 Percent AFUE RIA-14
Figure RIA.6 Penetration Rates for Non-Weatherized Gas Furnaces at 81 Percent AFUE RIA-15
Figure RIA.7 Penetration Rates for Gas Boilers at 84 Percent AFUE RIA-15

REGULATORY IMPACT ANALYSIS FOR RESIDENTIAL FURNACES AND BOILERS

1.0 INTRODUCTION

The Department of Energy has determined that residential furnace and boiler energy-efficiency standards constitute an "economically significant regulatory action" under Executive Order (E.O.) 12866 "Regulatory Planning and Review." 58 FR 51735, October 4,1993. Therefore, the proposed energy conservation standards require a regulatory impact analysis (RIA), which involves an evaluation of non-regulatory alternatives to the proposed standards. This document evaluates several possible alternatives to the proposed standards, and compares the costs and benefits of each to the proposed standards. As described in section 2 of this report, the proposed standards are those in Trial Standard Level (TSL) 2. As an alternative in this RIA, the Department also conducted the analysis assuming that the proposed standard is TSL 2, except for non-weatherized gas furnaces which is TSL 3. (81 percent average fuel utilization efficiency (AFUE)).

Under the Process Rule, the Department is committed to continually explore non-regulatory alternatives to standards. DOE has prepared this draft regulatory analysis pursuant to E.O. 12866, which is subject to review under the Executive Order by the Office of Information and Regulatory Affairs (OIRA). 58 FR 51735.

The Department identified six major non-regulatory alternatives to standards as representing feasible policy options to achieve consumer product energy efficiency. These are listed in Table RIA.1. The Department evaluated each alternative in terms of its ability to achieve significant energy savings at a reasonable cost, and compared the effectiveness of each one to the effectiveness of the proposed standards.

Table RIA.1 Policy Alternatives to Proposed National Furnace and Boiler Standards

No New Regulatory Action
Consumer Rebates
Consumer Tax Credits
Manufacturer Tax Credits
Voluntary Energy-Efficiency Targets
Early Replacement
Bulk Government Purchases
State Energy-Efficiency Standards

2.0 NON-REGULATORY POLICIES

2.1 Methodology

This section describes the approach used to analyze non-regulatory policies for the most common furnace and the most common boiler product classes, which are non-weatherized gas furnaces and gas boilers. DOE used a similar approach to estimate the impacts of the policy alternatives for the other furnace and boiler product classes.

2.1.1 Modeling Method

To calculate the national energy savings (NES) and the net present value (NPV) corresponding to each policy alternative, the Department used the NES Spreadsheet Model (see Chapter 10 of the TSD for a description of the NES Spreadsheet Model). To compare each alternative to the proposed standards, the Department quantified the effect of each alternative on the purchase of furnace and boiler equipment meeting the target levels. Once it had made the quantitative assumptions for each, DOE made the appropriate revisions to the inputs in the NES Spreadsheet Model. The main model inputs that DOE revised were (1) market shares of equipment at target efficiencies, and (2) equipment replacement rates.

The shipments for any given year are comprised of a distribution of efficiency levels. The Department assumed that standards would affect 100 percent of the shipments, while the non-regulatory policies affect a smaller percentage of the shipments. In each policy case, DOE made particular assumptions about the percentage of shipments impacted by the policy under analysis. The Department then calculated shipment-weighted average energy consumption and cost using these market shares.

A shift in market share to higher efficiency may increase the average installed cost of furnace and boiler equipment. Operating costs will generally decrease due to a decline in energy consumption. Therefore, a NPV can be calculated for non-regulatory alternatives in the same way as for the proposed standard. In some scenarios, total installed cost increases are partially mitigated by government rebates or tax credits. The Department assumed that credits and rebates would be paid for by consumers in another form (such as additional taxes), and therefore did not include them as a benefit for the purposes of calculating the national NPV.

The key measures of the impact of each alternative are:

- National energy savings in quadrillion Btus (quads): Cumulative national primary energy savings for equipment bought in the period from the effective date of the policy case (2015) to the year 2038. NES results account for a 15 percent rebound effect.

- Net present value: The value of net monetary savings from equipment bought in the period from the effective date of the policy case (2015) to the year 2038. The Department calculated 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. The Department calculated operating expenses (including energy) for the life of the equipment.

2.1.2 Policy Assumptions

The impacts of non-regulatory policies are by nature uncertain, since they depend on program implementation and marketing efforts and the subsequent consumer behavior response. The projected impacts depend on the assumptions for the consumer participation rate, and are therefore subject to more uncertainties than the impacts of mandatory standards, which the Department assumed will have full compliance. To increase the robustness of the analysis, the Department conducted a literature review on each non-regulatory policy and consulted with key experts to gather information on similar incentive programs that have been implemented in the U.S. By studying field experience with sample programs of each type, DOE sought to make credible assumptions of their potential market impacts. Section 2.2 below reports the conclusions from this research as they apply to the policy modeling assumptions and includes the corresponding literature citations.

Each of the policy alternatives to the proposed standards that DOE considered improves the average efficiency of new furnace and boiler equipment relative to the base case (no new regulatory action). The analysis considers that each alternative policy would induce residential consumers to purchase units at the same efficiency levels as required by the proposed standards. This report refers to these levels as *target levels*. In contrast to the proposed standards, however, the penetration rate in the alternative policy cases may not be 100 percent.

The proposed standards are those in TSL 2 as shown in Table RIA.2.

Table RIA.2 Trial Standard Levels for Residential Furnaces and Boilers

Trial Standard Levels	NWGF	WGF	MHF	OF	GB	OB
	AFUE %	AFUE %	AFUE %	AFUE %	AFUE %	AFUE %
TSL 1	80	80	80	80	82	83
TSL 2	**80**	**83**	**80**	**82**	**84**	**83**
TSL 3	81	83	81	82	84	83
TSL 4	90	83	90	84	84	84
TSL 5	96	83	90	85	99	95

Product class list with current standard level in parentheses:

- NWGF = Non-Weatherized Gas Furnace (78%)
- WGF = Weatherized Gas Furnace (78%)
- MHF = Mobile Home Gas Furnace (75%)
- OF = Oil-fired Furnace (78%)
- GB = Gas Boiler (80%)
- OB = Oil-fired Boiler (80%)

For non-weatherized gas furnaces the Department considered two scenarios. In one, the non-regulatory policy efficiency target (and the proposed standard) is 80 percent AFUE (per TSL 2); in the other, the non-regulatory policy efficiency target (and the proposed standard) is 81 percent AFUE (per TSL 3).

The size of the eligible market for the policies varies among the product classes. The NES model projects that 1.7 percent of the non-weatherized gas furnace market in 2015 will be below 80 percent AFUE and 64 percent will be at 80 percent AFUE. Therefore, policies that target an 80 percent AFUE level will impact some portion of 1.7 percent of the non-weatherized gas furnace market, and those that target 81 percent AFUE will impact some portion of 64 percent of the market. For gas boilers, the NES model projects that 85 percent of the market will be below the target level of 84 percent AFUE. Non-regulatory policies would thus impact some fraction of this 85 percent portion of the market.

The Department assumed that the non-regulatory policy impacts last from the effective date for proposed furnace and boiler standards, 2015, through the end of the analysis period, 2038.

The Department did not consider administrative costs for any of the non-regulatory policies in its analysis. Inclusion of such costs would decrease their NPV by a small amount.

2.1.3 Policy Interactions

The Department 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 with consumer rebates, or early replacement with bulk government purchases. The Department attempted to make conservative assumptions to avoid double counting policy impacts. Therefore, the policy impacts reported below are not additive; the combined impact of several or all of the policies may not be inferred from adding the results together.

Section 2.3 presents the resulting market penetration curves for non-weatherized gas furnaces and gas boilers.

2.2 Non-Regulatory Policy Assumptions

2.2.1 No New Regulatory Action

The case in which no new regulatory action is taken with regard to residential furnace and boiler efficiency constitutes the base case scenario described in Chapter 10 of the Furnace and Boiler TSD.[1] This case defines the basis of comparison for all other scenarios. By definition, no new regulatory action yields zero energy savings and a net present value of zero dollars.

2.2.2 Financial Incentives Policies

The Department considered scenarios in which the Federal government would provide two types of financial incentives: tax credits and rebates. Tax credits could be granted to consumers who purchased target-level furnace and boiler equipment, or the government could issue tax credits to manufacturers to offset costs associated with producing such equipment. The government also could provide consumers with a cash rebate at the time of purchase.

DOE's evaluation of financial incentive policies utilized a comprehensive study of the potential for energy efficiency in California performed by Xenergy, Inc., which summarizes experience with various utility rebate programs.[2] Xenergy developed a re-parameterized mixed-source information diffusion model to estimate market impacts induced by financial incentives for energy-efficient appliances. The basic premise of this mixed-source model is that information diffusion drives technology adoption. The model is formulated to characterize the influences of both internal and external sources of information on consumer behavior by superimposing two components in the equation, each capturing the effect of one of two different types of information source. The effects of these two types of information diffusion mechanisms are different. *Internal* sources of information influence consumers to purchase new products due mainly to word-of-mouth from early adopters, while *external* information sources influence consumers to change their adoption decisions as a result of marketing efforts and information coming from outside the consumer group. The mixed-source model describes a combined impact of the two information-source types, and specific parameterization determines consumer adoption behavior. (Appendix X contains further details.)

Xenergy's model combined these two information diffusion mechanisms and generated a set of "implementation curves," which Xenergy calibrated using evaluation data from utility rebate programs conducted in the1990s. Consumer response to rebate incentives appears to be a combination of the two information source types. The implementation curves illustrate the increased penetration of efficient equipment (i.e., increased market share) as a result of consumer response to benefit/cost (B/C) ratio changes induced by a specific rebate program. The implementation curves are used to depict various diffusion patterns based on perceived barriers to consumer purchase of high-efficiency equipment. There are implementation curves for varying levels of market barriers, from "no barriers" to "extremely high barriers." These curves provide a means to study the impact of changing the B/C ratio, by reducing the initial equipment cost through financial incentives, on the consumer participation rate.

To further understand the impacts of financial incentives policies, the Department used studies on forecasting the impact of consumer tax credits.[3, 4] This research differentiated the impact of tax credits into the "direct price effect," which arises from the incremental equipment cost savings, and the "announcement effect," which is independent of the rebate amount. The announcement effect derives from the credibility that a particular technology receives from its inclusion in an incentive program, as well as changes in product marketing strategy, and the resulting modifications in markups and pricing. The Department assumed that the direct price effect and the announcement effect would also apply to rebate programs, and that half of the

increases in market penetration associated with rebates would be due to the direct price effect and half to the announcement effect.

Consumer Rebates

The Department modeled the impact of the consumer rebate policy by determining the increase in market penetration of target-level equipment relative to the base case.

For non-weatherized gas furnaces, the Department estimated the impact of increasing the B/C ratio via a rebate that paid 29 percent of the incremental installed cost between a non-weatherized gas furnace meeting the base case efficiency level[a] and a unit meeting the target efficiency. The Department based the 29 percent rebate amount on rebate programs for condensing gas furnaces throughout the nation.[5, 6, 7, 8, 9, 10, 11, 12, 13, 14] The average rebate in these programs amounted to about 29 percent of the incremental installed cost for condensing furnaces[b].

For gas boilers, the Department assumed that the rebate would cover 79 percent of the incremental installed cost between a boiler meeting the base case efficiency level and a unit meeting the target efficiency. This amount was based on the average rebate level in programs for 85 percent AFUE gas boilers,[c] which amounted to about 79 percent of incremental installed cost.[5, 7, 8, 9, 10, 11, 15]

The Department assumed the rebates would remain in effect until they had transformed the market so that the market shift in efficiency shares seen in the first year of the program would be maintained throughout the forecast period (2015–2038).

The Department first calculated the B/C ratio for the unit meeting the target level relative to the base case with no rebate. It then calculated another B/C ratio for the unit meeting the target level, with a rebate, relative to the base case unit. Because of the incremental cost reduction due to the rebate, the B/C ratio for the rebate policy unit is larger (see Table RIA.3).

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[a] The base case is a market weighted-average of units at several AFUE levels.

[b] While the target level (80 percent or 81 percent) is lower than the condensing furnace efficiency used for these rebate programs, DOE assumed that a rebate program could be designed to pay an equivalent percentage of the incremental installed costs of the targeted non-condensing gas furnaces.

[c] While the target level (84 percent) is lower than 85 percent AFUE for these rebate programs, DOE assumed that a rebate program could be designed to pay an equivalent percentage of the incremental installed costs of the targeted gas boilers.

Table RIA.3 Benefit/Cost Ratios for Proposed Standard and Rebate Policy Cases

	NWGF at 80% AFUE	NWGF at 81% AFUE	GB Standard at 84% AFUE
Benefit (Lifetime Operating Cost Savings)	$95	$59	$374
Incremental Installed Cost (Increased Installed Cost)	$55	$68	$220
B/C Ratio with no rebate	**1.7**	**0.9**	**1.7**
Rebate Amount	$16	$20	$174
Adjusted Incremental Installed Cost (Increased Installed Cost after Rebate)	$39	$48	$46
B/C Ratio for Rebate Policy Case	**2.5**	**1.2**	**8.1**

The Department then used the curves shown in Figures RIA.1, RIA.2 and RIA.3 to estimate the increased percentage of consumers who would purchase the units that meet the policy target levels if given a rebate incentive. For non-weatherized gas furnaces at the 80 percent standard level, DOE chose the "no barriers" curve since the bulk of the market is already at 80 percent AFUE. For non-weatherized gas furnaces at the 81 percent standard level, DOE chose the "moderate barriers" curve since 81 percent AFUE represented a small market in 2004 and there are considerations with regard to installation and safety. For gas boilers at the 84 percent standard level, DOE chose the "low barriers" curve since 84 percent is a common product AFUE (albeit with relatively low market share in 2004). DOE also used the "low barriers" curve for the other product classes.

Figures RIA.1 through RIA.3 show the penetration rates of target-level units as a function of B/C ratios. Using this method, the Department estimated, that for the non-weatherized gas furnace product class, the market share of equipment meeting the policy target due to a rebate policy would increase by 8 percent at a target level of 80 percent AFUE and by 2 percent at a target level of 81 percent AFUE. For the gas boiler product class, DOE estimated that the market share of equipment meeting the policy target due to a rebate policy would increase by 33 percent. To calculate the impacts of this policy, DOE adjusted the base case shipments projection in the NES model to reflect these percentage increases in market share of efficient furnace and boiler models.

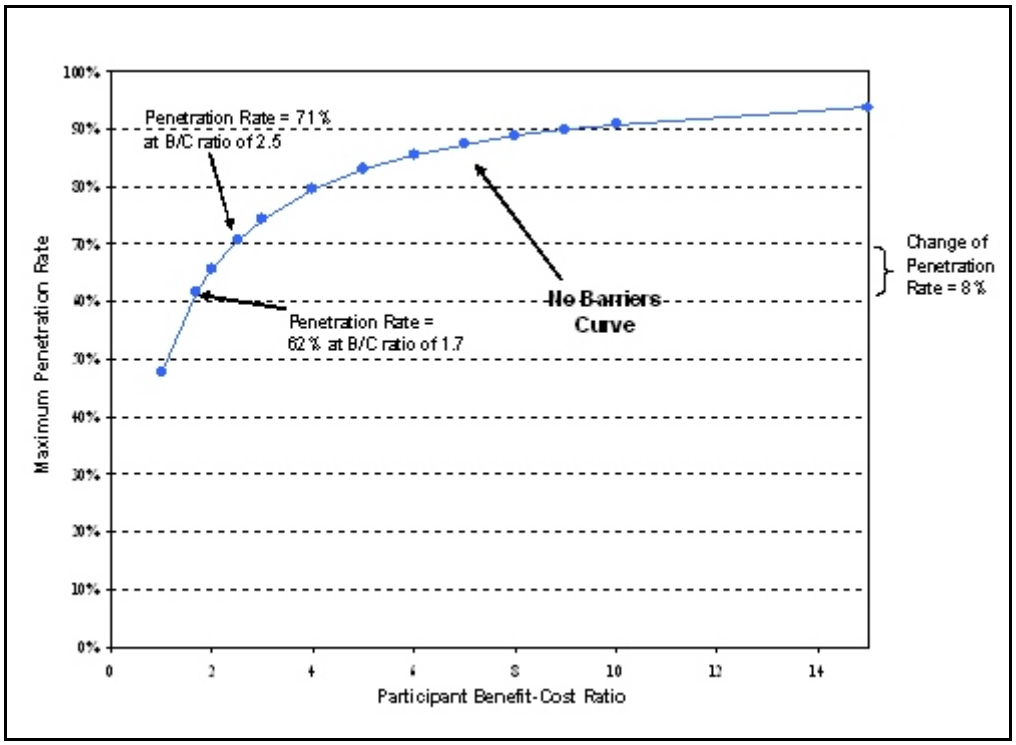

Figure RIA.1 Market Penetration Curve for Non-Weatherized Gas Furnaces at 80 Percent AFUE Level

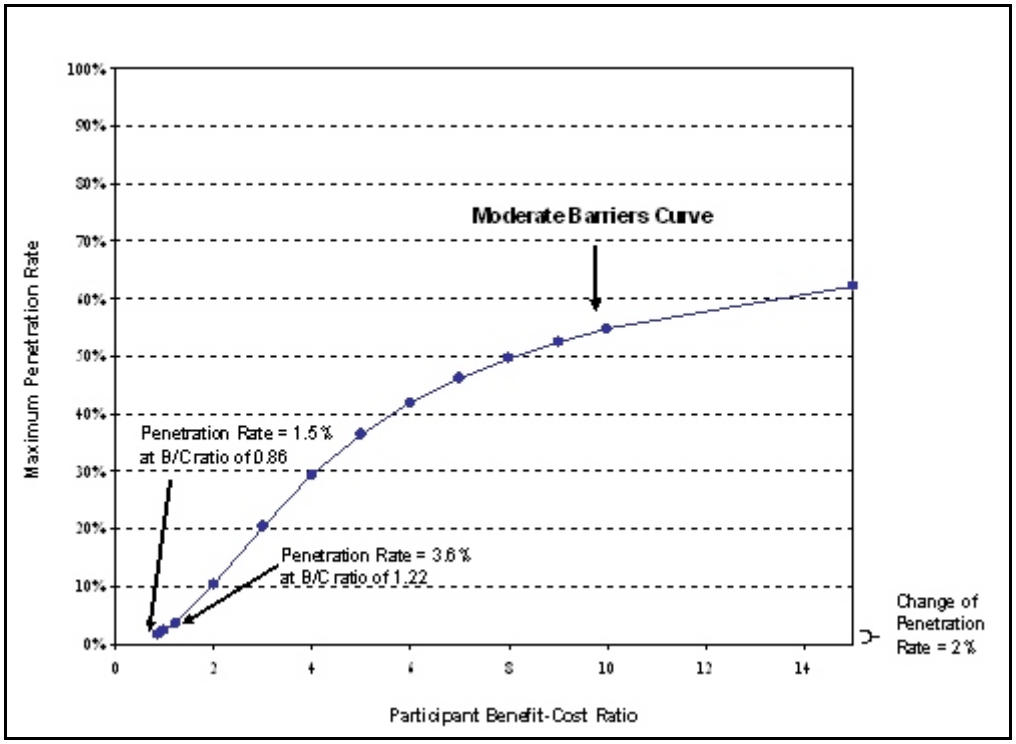

Figure RIA.2 Market Penetration Curve for Non-Weatherized Gas Furnaces at 81 Percent AFUE Level

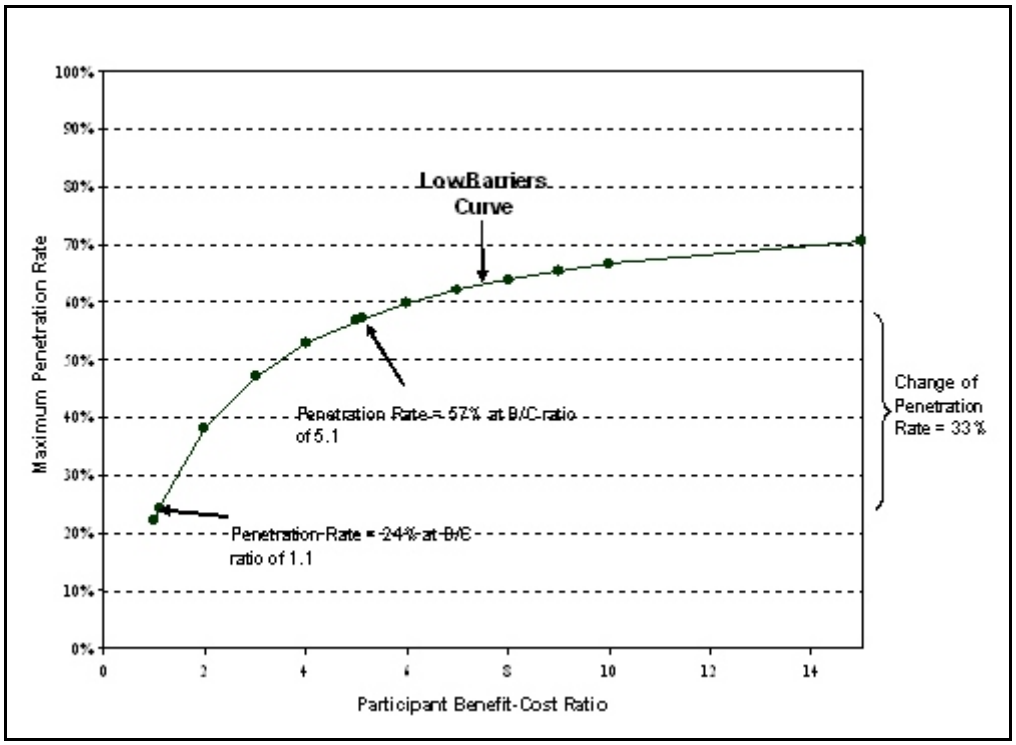

Figure RIA.3 Market Penetration Curve for Gas Boilers

Consumer Tax Credits

The Department assumed a consumer tax credit equivalent to the amount covered by rebates (i.e., 29 percent of the incremental cost between non-weatherized gas furnace base case equipment and equipment meeting the policy target levels and 79 percent of the incremental cost for gas boilers). The Department estimated that the consumer participation rate would be lower than that for consumer rebates. Research on tax credits has shown that the time delay to the consumer in receiving a reimbursement via tax credit, plus the added transaction costs in tax return preparation, make the tax credit incentive less effective than a rebate received at purchase time. Based on previous analysis,[16] DOE assumed that only 60 percent as many consumers would take advantage of the tax credit as would take advantage of a rebate.

Using a similar approach for the rebate policy, DOE estimated that the market share of target efficiency gas furnace units would increase due to consumer tax credits by 5 percent over the base case at the 80 percent AFUE level and by 1 percent at the 81 percent AFUE level. For gas boilers, the market share would increase by 20 percent. The Department assumed the impact of this policy would be to permanently transform the market so that the shipment-weighted efficiency gain seen in the first year of the program would be maintained throughout the forecast period.

Manufacturer Tax Credits

The Department assumed that a manufacturer tax credit program would effectively result in a lower price to the consumer by an amount equivalent to that provided by rebates (i.e., 30 percent of the incremental price difference for furnaces meeting base case efficiency levels and those meeting the policy targets and 79 percent of the incremental price difference for boilers). Because these tax credits would go to manufacturers instead of consumers, the Department assumed that manufacturers would pass on the reduced costs, causing the direct price effect. However, DOE assumed that the announcement effect would not occur because the program would not be visible to the consumers. Since the direct price effect is approximately equivalent to the announcement effect,[3] the Department assumed that half of the consumers assumed to take advantage of consumer tax credits would purchase more-efficient products with a manufacturer tax credit program. As a result, DOE estimated that the market share of efficient non-weatherized gas furnaces would increase due to manufacturer tax credits by 2 percent over the base case for at the 80 percent AFUE standard level, by 0.5 percent at the 81 percent AFUE standard level, and by 10 percent for gas boilers. The Department assumed the impact of this policy would be to permanently transform the market so that the shipment-weighted efficiency gain seen in the first year of the program would be maintained throughout the forecast period.

2.2.3 Voluntary Energy-Efficiency Targets

For a non-weatherized gas furnace target level of 80 percent AFUE, DOE assumed that the voluntary target would be achieved through manufacturer participation in a gradual phase-out of production of units below 80 percent AFUE. It assumed that this phase-out would increase linearly from 2015, reaching 75 percent of the eligible market in the tenth year of the program (2024)[d].

For a non-weatherized gas furnace target level of 81 percent AFUE and for gas boilers, DOE modeled the voluntary efficiency target policy assuming expansion of existing ENERGY STAR programs conducted by the Environmental Protection Agency and DOE for these two products.[17] The ENERGY STAR program sets minimum energy-efficiency specifications for various products, including furnace and boiler equipment. ENERGY STAR encourages consumer adoption of these products through marketing to promote consumer label recognition, adoption of the specifications by various efficiency incentive programs, and manufacturer production and promotion of ENERGY STAR-compliant appliances.

For the voluntary policy at the 81 percent AFUE target level, DOE assumed that ENERGY STAR would conduct a parallel program that targeted 81 percent AFUE within the non-condensing non-weatherized gas furnace market. It assumed that the program targeting 81 percent AFUE would cause a small increase in market penetration of efficient non-condensing furnaces since furnace manufacturers have some concerns regarding the safety of 81 percent AFUE units. For gas boilers, the Department estimated that an expanded ENERGY STAR

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[d] DOE used an upper limit of 75 percent because there are some replacement situations in which installation of an 80 percent AFUE furnace is not easily accomplished.

program that targeted 84 percent AFUE could moderately increase the market share at this level. In both cases, the Department utilized estimates of the market impact of the existing ENERGY STAR programs.[18, 19] The Department assumed that the programs resulting from this voluntary efficiency targets policy would increase projected market share of the targeted units above the penetration increases estimated by the ENERGY STAR program by 20 percent for non-weatherized gas furnaces at the 81 percent AFUE target level and by 50 percent for gas boilers. Current ENERGY STAR efficiency specifications of 90 percent AFUE for gas furnaces target condensing furnaces. The ENERGY STAR level for gas boilers is 85 percent.

Table RIA.4 shows the estimated market share increases from the voluntary efficiency target policy.

Table RIA.4 Increased Market Share Penetration Levels from Voluntary Furnace and Boiler Programs*

Year of Program	Non-Weatherized Gas Furnaces		Gas Boilers
	Efficiency Target, 80% AFUE	Efficiency Target, 81% AFUE	Efficiency Target, 84% AFUE
2015	8%	0%	0%
2016	15%	0%	2%
2017	23%	0%	3%
2018	30%	0%	5%
2019	38%	0%	7%
2020	45%	1%	9%
2021	53%	1%	10%
2022	60%	1%	12%
2023	68%	1%	14%
2024	75%	1%	15%
2025	75%	1%	17%
2026	75%	1%	17%
2027	75%	1%	17%
2028	75%	1%	17%
2029	75%	1%	17%
2030	75%	1%	17%
2031	75%	1%	18%
2032	75%	1%	18%
2033	75%	1%	18%
2034	75%	2%	18%
2035	75%	2%	18%
2036	75%	2%	18%
2037	75%	2%	18%
2038	75%	2%	18%

* The percentages in each column refer to shares of the eligible market in each case.

2.2.4 Early Replacement

Early replacement refers to the replacement of furnace and boiler units before the end of their useful lives. The purpose of this policy is to replace old, inefficient equipment with higher-efficiency units.

In the 1990s, the Department studied the feasibility of a Federal program to promote early replacement of appliances under the Energy Policy Act of 1992.[20] This study identified policy options for early replacement that included a direct national early replacement program, replacement of federally owned appliances, promotion through equipment manufacturers, consumer incentives, incentives to utilities, and building regulations[e].

For this analysis, the Department considered a program that targets the units in the stock that have efficiency levels lower than the policy target level and encourages their early replacement with products at the target efficiency level. Shipments not affected by the early replacement program have base case efficiency levels. Shipments to new construction in 2015 and beyond are not affected by this program. (Chapter 9 of the TSD describes the general approach for estimating replacements in each year; the NES model uses a retirement function that tracks the percentage of units retiring and surviving for each vintage.)

The Department assumed that a portion of the furnace and boiler units in the existing stock in 2015, the first year of the analysis period, would be replaced by models meeting the target levels. It modeled this policy by assuming an increase of 20 percent (over the natural replacement rate based on units being replaced at the end of their useful lives) in the number of replaced units in the first year. It based this level on one of the cases in the report described above. The Department assumed that the program would last as long as it took to completely replace all of the eligible furnaces and boilers in the stock in the year that the program began (2015).

The policy would create a jump in shipments relative to the base case in the early years of the program (see Figure RIA.4). As a result, more higher-efficiency units that meet the policy targets would be quickly brought into the equipment stock, leading to an immediate gain in the weighted-average equipment efficiency compared to the base case. However, unlike the other policy cases discussed, the weighted-average efficiency would drop back down to meet the levels in the base case as the eligible stock of equipment for early replacement became depleted.

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[e] The analysis concluded that while cost-effective opportunities for early replacement exist, a widespread federal early replacement program was not economically justified. Because premature retirement means that a unit may be replaced by an appliance less efficient than the eventual replacement would probably have been, energy savings would be smaller than anticipated. Early replacement programs could increase sales volatility in the long run by encouraging a temporary increase in production followed by a lull in demand. Early replacement could be economical in localities with high energy cost conditions or environmental constraints, when replacement appliances are much more efficient than existing stock, or when a major technology breakthrough has recently occurred, creating the need for a ready market.

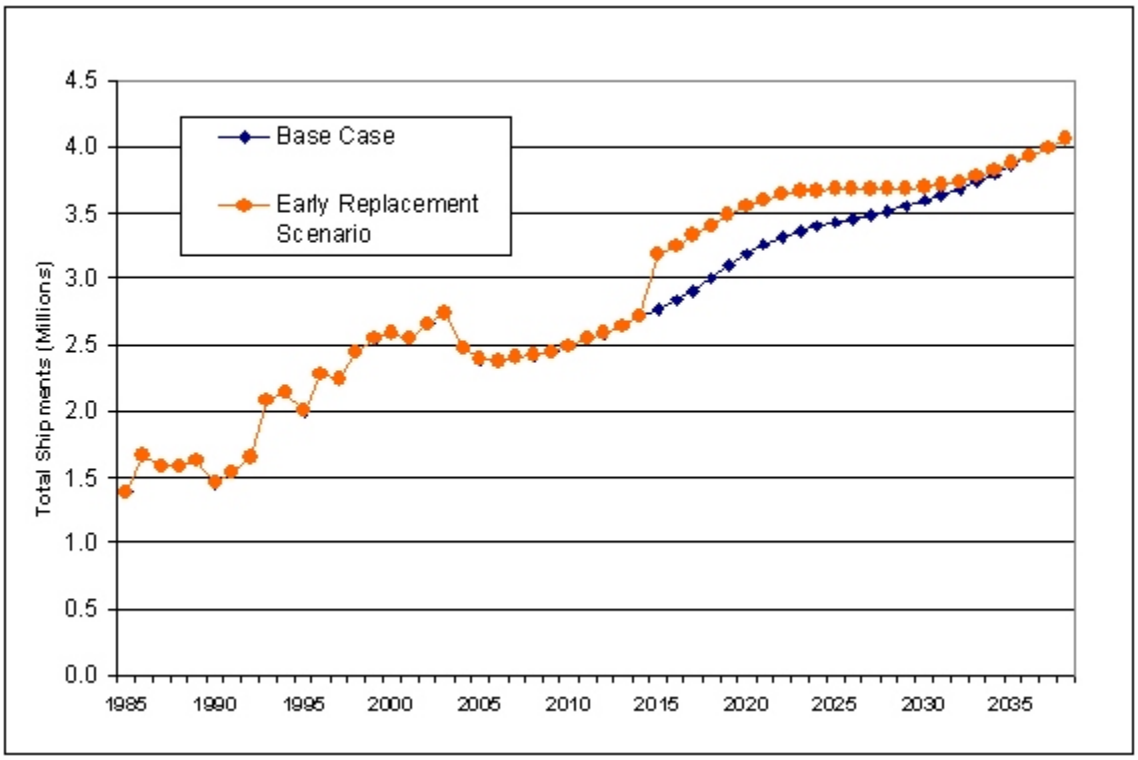

Figure RIA.4 Early Replacement Shipments Projections for Non-Weatherized Gas Furnaces

2.2.5 Bulk Government Purchases

The Department assumed that a bulk government purchase policy would encourage Federal, State, and local governments to purchase equipment meeting the target levels. Aggregating public sector demand could provide a market signal to manufacturers and vendors that some of their largest customers seek suppliers with products that meet an efficiency target at good prices. This program also could induce "market pull" impacts through the effects of manufacturers and vendors achieving economies of scale for high-efficiency products.

The Department assumed that government agencies, such as the Department of Housing and Urban Development (HUD), would administer such a program. At the Federal level, this would be an enhancement to the existing Federal Energy Management Program (FEMP). The FEMP program has procurement guidelines for Federal government equipment purchasing, and Federal construction requirements include these guidelines for installing or replacing equipment.[21]

The Department assumed that this policy would impact a subset of housing units for which government agencies purchase or influence the purchase of furnaces and boilers. This subset would mainly consist of public housing and housing on military bases. To represent this subset, DOE considered low-income households identified in the Residential Energy

Consumption Survey (RECS) 2001 (see Chapter 11 of the TSD for description of the low-income household sample). According to RECS 2001, 7.8 percent of the households with gas furnaces and 17.5 percent of those with gas boilers were classified as low-income. DOE assumed that these same percentages of furnace and boiler shipments would go to low-income households in each year.

To estimate the market impact, the Department considered previous analysis of the bulk government purchasing policy in the residential air conditioner RIA[22], where it assumed a 5 percent increase in market share of higher-efficiency units over the base case due to the policy. Since DOE envisions that the policy for furnaces and boilers would build on the existing FEMP program for gas furnaces, DOE assumed that the government purchase policy would likely cause a 10 percent increase in market share in each year. Thus, an additional 10 percent (above the base case) of shipments to eligible low-income households would meet the target levels through this policy. The result is an additional penetration of equipment meeting the target efficiency levels of 0.8 percent and 1.8 percent (10 percent respectively).

2.3 Non-Regulatory Policy Market Share Impacts

Figures RIA.5 through RIA.7 show the market share (penetration rate) impacts for each of the non-regulatory policy cases for non-weatherized gas furnaces and gas boilers. In each case, the market penetration refers to the eligible market for the particular product. For each product class, the proposed standard (not shown in the figures) would result in a 100 percent penetration.

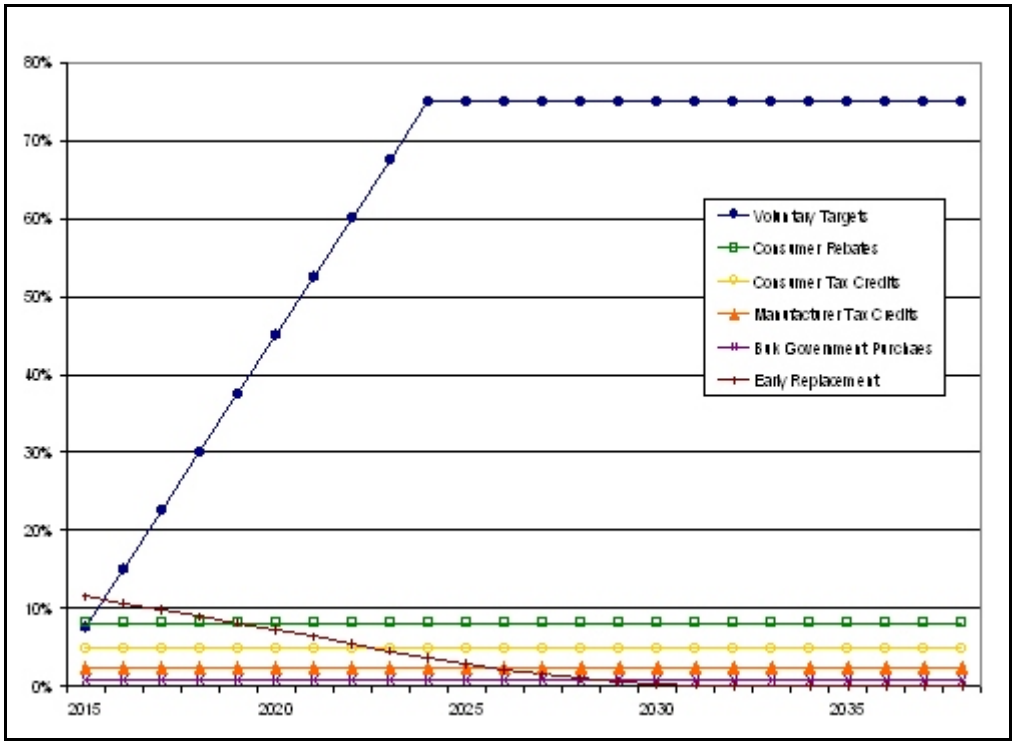

Figure RIA.5 Penetration Rates for Non-Weatherized Gas Furnaces at 80 Percent AFUE

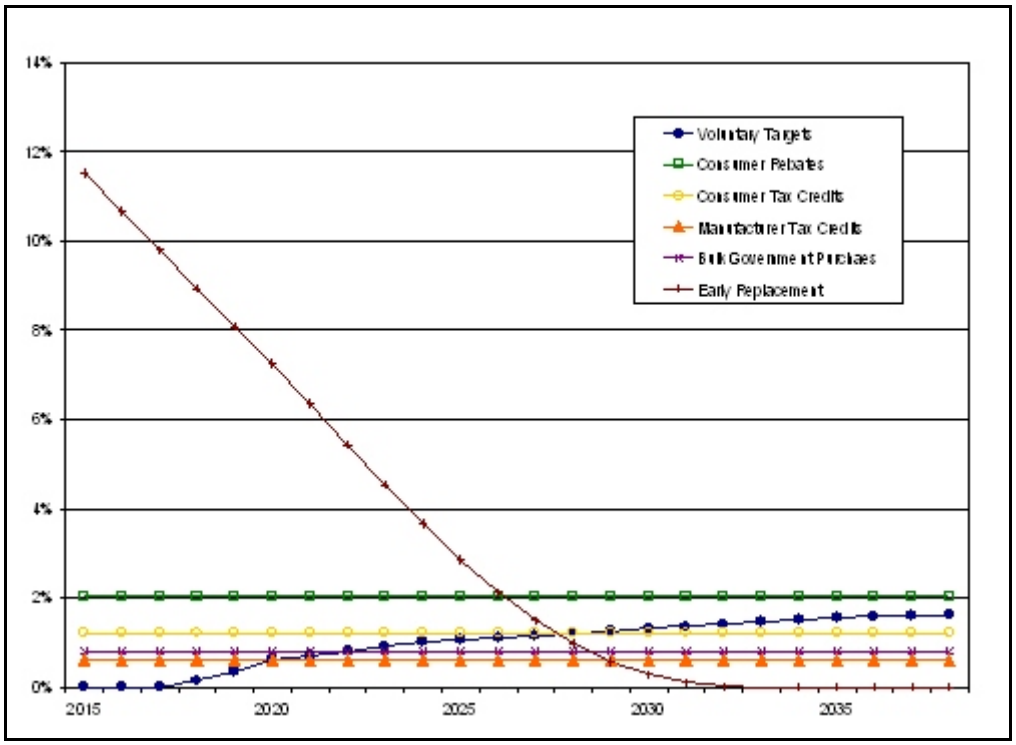

Figure RIA.6 Penetration Rates for Non-Weatherized Gas Furnaces at 81 Percent AFUE

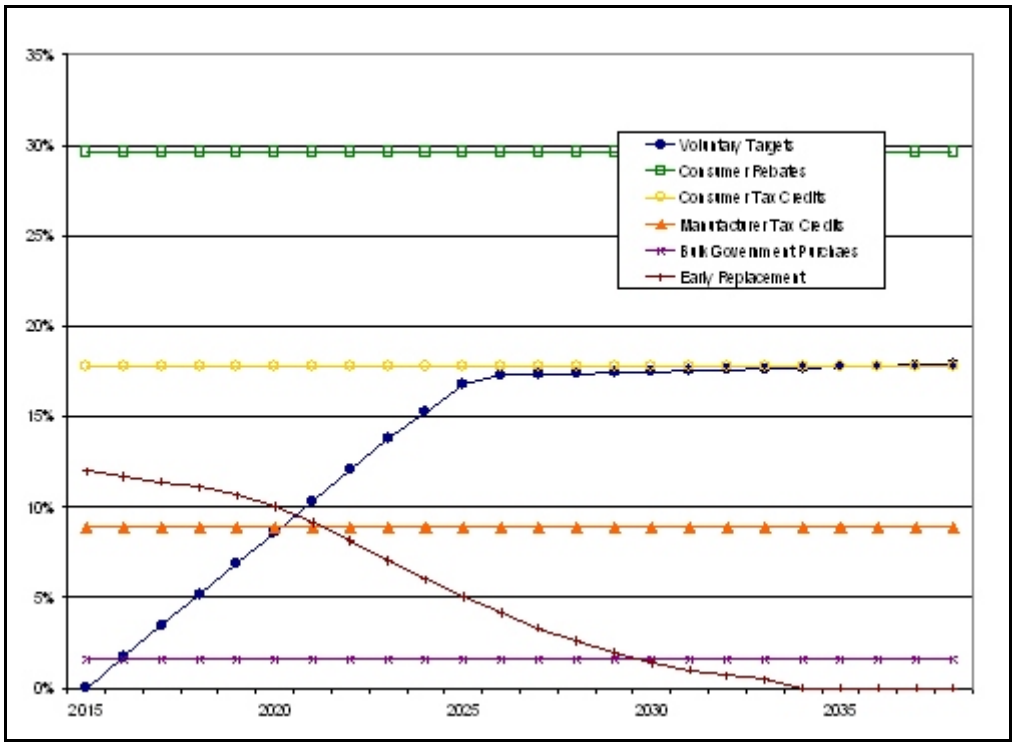

Figure RIA.7 Penetration Rates for Gas Boilers at 84 Percent AFUE

2.4 Results Summary for Non-Regulatory Alternatives

Tables RIA.5 and RIA.6 show the NES and NPV of each of the non-regulatory alternatives. The results are for all six product classes. Table RIA.5 shows the results if the efficiency target levels are equal to TSL 2, and Table RIA.6 shows the results if the efficiency target levels are equal to TSL 2, with the exception of non-weatherized gas furnaces, for which the target is TSL 3 (81 percent AFUE). The case in which no regulatory action is taken with regard to furnaces and boilers 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 impacts of the proposed energy conservation standards. The NPV amounts shown in Tables RIA.5 and RIA.6 refer to the NPV based on two discount rates (seven percent and three percent real).

Table RIA.5 Non-Regulatory Alternatives with Target Levels at TSL 2

Policy Alternatives	Primary Energy Savings (quads)	Net Present Value* (billion $2004)	
		7% discount rate	3% discount rate
No New Regulatory Action	0.0	0.0	0.0
Consumer Rebates	0.078	0.086	0.369
Consumer Tax Credits	0.047	0.052	0.221
Manufacturer Tax Credits	0.023	0.026	0.111
Voluntary Energy Efficiency Targets	0.046	0.074	0.298
Early Replacement	0.025	0.059	0.160
Bulk Government Purchases	0.005	0.006	0.026
Proposed Standards at TSL 2	0.410	0.646	2.480

Table RIA.6 Non-Regulatory Alternatives with Target Levels at TSL 2 (NWGF at TSL 3)

Policy Alternatives	Primary Energy Savings (quads)	Net Present Value* (billion $2004)	
		7% discount rate	3% discount rate
No New Regulatory Action	0.0	0.0	0.0
Consumer Rebates	0.083	0.083	0.374
Consumer Tax Credits	0.050	0.050	0.225
Manufacturer Tax Credits	0.025	0.025	0.112
Voluntary Energy Efficiency Targets	0.041	0.056	0.244
Early Replacement	0.050	0.048	0.183
Bulk Government Purchases	0.008	0.006	0.030
Proposed Standards at TSL 2 (NWGF at TSL 3)	0.704	0.585	3.096

* Net present value is the value of a time series of costs and savings. The net present value was determined from 2015 to 2038 in billions of 2004 dollars.

None of the alternatives DOE examined would save as much energy or have as high NPV as the standards. Consumer rebates is the only policy that results in more than 20 percent of the savings potential from the proposed standards. Also, several of the alternatives would require new enabling legislation, such as consumer or manufacturer tax credits, since authority to carry out those alternatives does not presently exist.

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