REGULATORY IMPACT ANALYSIS

1. INTRODUCTION

The Department of Energy has determined that proposed central air conditioner and heat pump efficiency standards constitute an "economically significant regulatory action" under Executive Order 12866 "Regulatory Planning and Review" (58 FR 51735, October 4,1993). Therefore, the efficiency standards proposal requires a regulatory analysis. This document details several possible alternatives to the current proposal, and analyzes the costs and benefits of each.

2. METHODOLOGY

Each of the alternatives considered improves the overall efficiency of the stock of central air conditioners and heat pumps. In each case, the analysis makes a particular assumption about the resulting market share of high-efficiency models. The efficiency market share distribution of the base case is described in detail in Chapters 6 and 7. The effect of non-regulatory alternatives is generally to cause a shift of a small amount of market share towards more efficient models.

A shift in market share to higher efficiency may increase the average retail price and installation cost of air conditioners and heat pumps. Operating costs will generally decrease due to a decline in energy consumption. Therefore, a Net Present Value can be calculated for non-regulatory alternatives in the same way as for proposed standards. In some scenarios, cost increases are partially mitigated by government rebates or credits. Credits and rebates are assumed to be paid for by consumers in another form (such as additional taxes), and are therefore not included as a benefit for the purposes of calculating NPV.

2.1 No New Regulatory Action

We have carefully evaluated the case in which no regulatory action is taken with regard to central air conditioning and heat pump efficiency. This constitutes the "base case" scenario referred to in the previous chapters. From our assessment of current market shares, equipment and operating costs, we forecast shipments and subsequent efficiency of the stock, from 2006 through 2030. We then calculate total source energy consumption for central air conditioners and heat pumps. From this analysis, we expect a total consumption of 46 quads of source energy over the forecast period. This defines the basis of comparison for all other scenarios, defining zero energy savings and a net present value of zero dollars.

2.2 Informational Action

The two informational action alternatives considered are consumer product labeling and DOE public education and information programs. In each case, we assume that the programs will influence a small fraction of consumers to purchase more efficient appliances, thereby improving the overall efficiency of the stock. We also assume that informational programs last for 6 years. Efficiency market shares are influenced only during this time, reverting to the base case scenario when the program is terminated.

2.2.1 Consumer Product Labeling

The first of these two scenarios implements a program of product labeling designed to inform consumers about the operating cost savings associated with buying a more efficient air conditioner or heat pump. We assume that 50% of consumers will be impacted by the program, that is, they will consider the efficiency information presented. Of these, we expect that 10% are likely to change their purchase decision based on the available information. This results in a total market shift of 5%. Specifically, we model this alternative by assuming that five percent of the consumers currently purchasing 10 SEER equipment would purchase 12 SEER units, and five percent of those currently purchasing 12 SEER equipment would purchase 13 SEER equipment. These market share shifts continue only during the six years that the program is in effect.

The result of this scenario is an overall source energy savings of 0.1 quads relative to the base case. The program produces no significant NPV to consumers.

2.2.2 Public Education

A similar approach is to consider an Energy Star® program for 12 SEER and 13 SEER central air conditioners and heat pumps. We assume that such a program would increase the current market share for these high-efficiency units by 20%, compared to their current values. As with the consumer product labeling program, it is assumed that the education program would last six years and upon its expiration, sales would drop back to their market share levels prior to the program's implementation. This consumer education program results in energy savings equal to 0.1 quad, with no significant NPV.

2.3 Prescriptive Standards

One alternative to regulating minimum central air conditioner and heat pump efficiency performance is the requirement that newly manufactured air conditioners and heat pumps utilize a particular efficiency-related design technology. For central air conditioners and heat pumps, DOE assumes that prescriptive standards are somewhat below the performance standards because a

prescriptive standard reduces a manufacturer's flexibility to find a more cost-effective solution.

In order to model this alternative, we assume that a prescriptive standard is implemented to ensure that all central air conditioners and heat pumps are equipped with thermostatic expansion valves (TXVs). The resulting efficiency increase is 0.5 SEER, that is, the baseline efficiency is assumed to increase from 10 to 10.5 SEER as a result of the prescriptive standard. Manufacturer costs associated with this standard were calculated by linearly interpolating between costs associated with the baseline, and those associated with the 11 SEER level. The resulting energy savings is 1.1 quad, with an expected NPV of 0.1 $Billion.

2.4 Financial Incentives

We consider several scenarios in which some form of financial incentive is provided to consumers in order to encourage the purchase of high efficiency central air conditioners and heat pumps. There are three types of incentives: tax credits, rebates and subsidies. Tax credits can be granted to consumers who purchase high efficiency central air conditioners and heat pumps. Alternatively, the government can issue tax credits to manufacturers in order to offset costs associated with producing high efficiency designs. We also consider the scenario in which the government provides consumers with a cash rebate at the time of purchase. The effects of rebates are similar to those of tax credits. Finally, we consider the case of subsidies designed to remove market barriers which affect primarily low income households. The analysis models financial incentive programs assuming that they begin in 2006 and continue for six years, after which the program ends, and the market returns to the base case scenario. In calculating NPV, we include benefits to consumers arising from lowered operating costs. The amount of the incentive is not included as a financial benefit, because we assume that the cost of such programs will be subsidized by consumers in another form (e.g., taxes).

2.4.1 Tax Credits to Consumers

DOE assumes tax credits equal to 50% of the difference between retail price of baseline (10 SEER) and high-efficiency (12 SEER) models. We assume that, as a direct effect of tax credits, 5% of total market share will be shifted from baseline to high efficiency models. Although the program remains in effect for only six years, it will produce energy savings throughout the period from 2006 to 2030, because high efficiency units bought under the program remain in the stock for many years. Total source energy savings expected from this program is 0.2 quads, no significant NPV.

2.4.2 Tax Credits to Manufacturers

We consider a manufacturer tax credit equal to 20% of all tooling and machinery costs associated with designing and producing high efficiency units. We assume that this mitigation of

costs will be passed directly on to consumers, and that the resulting price break will cause a small (1%) shift in market share from baseline (10 SEER) to high-efficiency (12 SEER) units.

Tax credits to manufacturers would not produce significant energy savings or NPV. The impact of this scenario is negligible because the investment tax credit is assumed applicable only to tooling and machinery costs of the firms. The firms' fixed costs and some of the design improvements that would likely be adopted to manufacture more efficient models would involve purchased parts, the expenses for which are not eligible for tax credits.

2.4.3 Consumer Rebates

Like the tax credit scenarios, a consumer rebate program is assumed to last for 6 years, and increase the market share of 12 SEER units. We assume a rebate of 35% of the retail price difference between baseline and high efficiency models. This incentive is expected to shift 10% of total market share from baseline to high efficiency models. Such a rebate results in a source energy savings of 0.2 quads and no significant NPV.

2.4.4 Low Income Subsidy

The final financial incentive we consider is a subsidy targeted at low income households. The expense of upgrading to more efficient equipment can be a particular burden on low income households. Therefore, we consider a low income subsidy of $500 for these households. According to the RECS survey,[1] 7.9% of current households qualify as low income. We assume that half of these, or 3.95% of all households will take advantage of the program by buying a 12 SEER unit. Consequently a 3.95% market shift results which continues for the 6 years that the program is in place. Total source energy savings associated with this alternative is 0.1 quads. There is no significant NPV for this option.

2.5 Voluntary Efficiency Targets

The voluntary efficiency target scenario considers the possibility that manufactures will include energy efficient design in all new central air conditioners and heat pumps, in the absence of any regulatory intervention. In this scenario, we assume that new appliances would be of a design equivalent to the proposed standard. While the proposed standards are scheduled to go into effect in 2006, voluntary efficiency targets are assumed to take effect at some later date. The analysis considers the possibility that the delay in adoption of more efficient design is either 5 or 10 years.

The effect of voluntary efficiency targets is simply modeled by assuming that all of the market share held by design options which are less efficient than 12 SEER is transferred to the 12

SEER market share. This market shift is assumed to take place abruptly in either 2011 or 2016. The result of this scenario is a source savings of 3.1 quads in the case of a 5-year delay, or a source savings of 1.9 quads in the case of a 10-year delay. Each scenario results in a net loss to consumers, indicated by an NPV of -1.3 $Billion for a 5-year delay, and an NPV of -1.2 $Billion for a 10-year delay.

2.6 Mass Government Purchases

The final non-regulatory scenario that we consider is the purchase of high efficiency (12 SEER) central air conditioners and heat pumps by Federal, State and local governments. We modeled this policy by assuming that government agencies—i.e., US Department of Housing and Urban Development (HUD)— purchase high efficiency units for 5% of the low-income rented housing utilizing air conditioning. Currently, 3.9% of the central air conditioning market qualifies as low income. Therefore, this scenario implies a market shift of 5% * 3.9% = .2% from 10 SEER to 12 SEER units. Such a market shift produces a source energy savings of less than 0.1 quad, and does not present a significant financial benefit.

3. RESULTS

Total source savings and net present value of each of the non-regulatory alternatives is given in Table RIA.1. For comparison, the results of the proposed efficiency standard are included in the table. Such performance standards would result in energy savings under the AEO Reference Case and NAECA efficiency scenario of 4.4 quads, and the NPV would have a cost of $2 billion.

Table RIA.1Regulatory Alternative Results

Scenario	Source Energy Savings (Quads)	NPV (billion 1998$)
Baseline	0.0	0.0
Consumer Product Labeling	0.1	0.0
Public Education	0.1	0.0
Prescriptive Standards	1.1	0.1
Consumer Tax Credits	0.1	0.0
Manufacturer Tax Credits	0.0	0.0
Consumer Rebates	0.2	0.0
Low Income Subsidy	0.1	0.0
Voluntary Efficiency Target (5-year delay)	3.1	-1.3
Voluntary Efficiency Target (10-year delay)	1.9	-1.2
Mass Government Purchases	0.0	0.0
Proposed Standard	4.4	-2.0

REFERENCE

1. U.S. Department of Energy-Energy Information Administration, *Household Energy Consumption and Expenditures 1993 (RECS)*, October, 1995. Washington, DC. Report No. DOE/EIA-0321(93).