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ANALYSIS OF THE ADMINISTRATION'S PROPOSED TAX INCENTIVES FOR ENERGY EFFICIENCY AND THE ENVIRONMENT

INTRODUCTION

A few months ago in the FY 2000 budget the President proposed a \$3.6 billion package of tax incentives over 5 years to encourage energy efficiency, reduce greenhouse gas emissions, and develop renewable energy sources. The tax incentives are part of a larger package of complementary initiatives. In addition to the \$3.6 billion of tax incentives, the Administration proposed to increase funding for R&D in energy efficient technology and renewable energy, a new Clean Air Partnership Fund to boost state and local efforts to reduce greenhouse gases and air pollution, substantial new funding to focus on the ways farms and forests can reduce and offset greenhouse gas emissions, and \$1.8 billion for global climate change research. The total package for FY 2000, including the tax incentives, is over \$4 billion.

This analysis focuses on the Administration's proposed tax incentives and their effects on tax revenues and greenhouse gas emissions.

DISCUSSION

Individuals and businesses underinvest in energy-saving technologies because the private returns from those investments are lower than the total benefits to society. Examples of social benefits include reduced air pollution and greenhouse gases in the atmosphere, and reduced dependence on oil imports. When potential investors only consider the private benefits in making decisions, they may underinvest in technologies that are worthwhile from the point of view of society as a whole, but not profitable to the individual making the investment. Tax incentives are an appropriate tool for addressing the failure of market prices to achieve the desirable level of investment in energy-saving technologies because they can increase the private return from the investment by reducing its cost. This increase in the private return induces additional investment in energy-saving technologies.

Tax incentives may also help to overcome market barriers that hinder investment in energy-saving technologies, such as lack of information on the energy and environmental benefits of certain products and the uncertainty regarding the return to the investment. Tax incentives improve buyers' awareness of highly energy efficient products and improve the return on investments in those products. They encourage buyers to be early purchasers of advanced new products and, in turn, encourage firms to innovate to supply them. By helping to assure future

demand for highly energy efficient products, the incentives reduce the supplier's risk that demand for innovative new products will fail to materialize. The prospect of additional demand may also stimulate competition from new suppliers and create pressure to improve product quality and upgrade technology. Thus, the incentives facilitate a mutually reinforcing process whereby buyers are encouraged to purchase highly energy efficient products and suppliers are encouraged to innovate to produce them.

The proposed incentives are designed to reduce energy consumption and greenhouse gas emissions by encouraging the deployment of technologies that are highly energy efficient and that use renewable energy sources. The proposed incentives are also designed to minimize windfalls for investments that would have been made even absent the incentives and to facilitate tax administration. If taxpayers claim a credit, it is for items that produce energy savings and reductions in greenhouse gas emissions.

The design of the tax incentives incorporate the following considerations:

- (1) **Superior energy efficiency compared to conventional equipment.** The eligible items should meet higher standards for energy efficiency than conventional equipment or use renewable energy sources. This helps to ensure that tax benefits promote energy efficiency and reduce greenhouse gas emissions.
- (2) **High threshold for eligibility.** The eligible items should presently account for a small share of the market. This minimizes windfalls for purchases that would have been made even absent the credit.
- (3) **High up-front costs compared to conventional equipment.** The targeted technologies have significantly higher purchase prices than conventional equipment and, at current market prices, are not universally cost effective. These high up-front costs are another reason relatively few would be purchased without the credit.
- (4) **Commercially available.** The items should be commercially available or near commercialization. This ensures that the incentives encourage the deployment of new technologies that private markets have already developed.
- (5) **Ease of administration.** The items must be able to be defined precisely enough so that the IRS can administer the incentives. This helps to ensure that tax benefits are claimed only for items for which they are intended.

The tax incentives the Administration has proposed cover buildings and homes, vehicles, renewable energy, and industrial equipment.

Buildings and homes

This sector currently accounts for about one-third of energy consumption and the related greenhouse gases. The proposed tax incentives would encourage investment in highly energy efficient building equipment and new homes, and solar energy systems.

Tax credit for energy efficient building equipment

A tax credit of 10 percent or 20 percent would be provided for energy efficient equipment, depending upon the efficiency of the equipment. This credit encourages the purchase of equipment that will improve the energy efficiency of both residential and commercial buildings. The items covered are electric heat pump and natural gas water heaters, electric and natural gas heat pumps, advanced central air conditioners, and fuel cells.

The credit would be 20 percent of the cost of super energy efficient models of the items listed above, subject to a cap. It would be available for 4 years -- 2000 through 2003. A 10 percent credit would be available for electric heat pumps, central air conditioners and natural gas water heaters that meet high efficiency standards, but not as high as the standards for the 20 percent credit. The 10 percent credit would be available for 2 years -- 2000 and 2001.

Items eligible for the 20 percent credit are top-tier technologies that offer superior energy efficiency compared to conventional equipment. For example, compared to typical units on the market, the eligible advanced air conditioning systems and electric heat pumps are 40 percent more efficient, and eligible electric heat pump water heaters and natural gas heat pumps are about twice as efficient. Items eligible for this credit embody new, cutting-edge technologies that have substantial purchase prices and are not universally cost effective. They generally account for less than one percent of market sales. Therefore, few of the credits would be claimed for purchases that would have been made even absent the credit. The 10 percent credit enables the credit to be more widely available to highly energy efficient items, as well as state of the art technology, during a phase in period. Some makes and models of qualifying items are currently available. Energy efficiency standards exist for the designated classes of equipment so that eligible items could be defined precisely enough for IRS to administer the credit.

The revenue cost of this incentive is estimated to be \$1.5 billion for FY 2000 - 2004. The credit for building equipment will increase purchases of energy efficient building equipment by nearly 10 million items through 2009.

Tax credit for energy efficient new homes

Residences account for about one-sixth of US greenhouse gases and offer one of the largest sources of energy saving potential. Over one million new homes and manufactured homes are built and sold each year. Some states and certain Federal programs require new houses to meet certain energy code standards for insulation and related construction standards, and for

heating, cooling and hot water equipment. However, the energy efficiency of new homes could be improved significantly through the use of more energy efficient building practices and more efficient heating and cooling equipment.

To encourage the purchase of energy efficient new homes, a tax credit equal to \$1,000 to \$2,000 would be provided for consumers who purchase energy efficient new homes, depending upon the home's energy efficiency. The tax credits would be: (1) \$1,000 for homes that use at least 30 percent less energy than the standard under the 1998 International Energy Conservation Code (IECC). This credit would be available for 2 years -- 2000 - 2001; (2) \$1,500 for homes that use at least 40 percent less energy than the IECC standard. This credit would be available for 3 years -- 2000 - 2002; and (3) \$2,000 for homes that use 50 percent less energy than the IECC standard. This credit would be available for 5 years -- 2000 - 2004. The revenue cost is estimated to be \$0.4 billion for FY 2000 - 2004.

Again, the threshold for eligibility for the credit was set at high levels of energy efficiency. The largest credit would be available for new homes at the top tier of energy efficiency. Energy used in those homes would be reduced by 75 percent to 85 percent compared to existing housing and by over 50 percent compared to typical new housing. The credit is estimated to result in purchases of over 250 thousand new energy efficient homes through 2009.

Tax credit for solar energy systems

Solar energy systems accounted for 0.02 percent of electricity generation in 1996. These systems produce no greenhouse gas emissions and have the potential to reduce energy costs for businesses and individuals. The tax credit for the purchase of rooftop photovoltaic (PV) systems and solar water heating systems would make these systems more affordable and encourage their purchase. The credit would be 15 percent of the cost of a qualified investment up to a maximum credit of \$2,000 for PV systems and \$1,000 for solar water heating systems. The tax credit for PV systems would be available for 7 years -- 2000 - 2006, and the tax credit for solar water heating systems would be available for 5 years -- 2000 - 2004. The revenue cost of this incentive is estimated to be \$0.1 billion for FY 2000 - 2004.

This incentive will help to achieve the President's goal of one million solar roofs by 2010. Heat and electricity produced from solar energy systems produce no greenhouse gases. The credit is estimated to save 3 billion kilowatt hours of electricity production through 2009.

Vehicles

Cars and light trucks (including minivans, sport utilities, and pickups) currently account for 20 percent of greenhouse gas emissions. These vehicles also account for about 20 to 40 percent of urban smog-forming emissions and 40 percent of U.S. oil consumption. Almost all of these vehicles use a single gasoline-fueled engine.

Hybrid vehicles, which have more than one source of power on-board the vehicle, and electric vehicles have the potential to reduce greenhouse gas emissions, air pollution, and petroleum consumption. The proposed credits will encourage the purchase of vehicles that incorporate advanced automotive technologies and will help to move hybrid vehicles from the laboratory to the highway. These vehicles can significantly reduce emissions of carbon dioxide, the most prevalent greenhouse gas.

The proposal would extend the present tax credit for electric vehicles and fuel cell vehicles. Under current law, a 10 percent credit is provided for the cost of qualified electric vehicles and fuel cell vehicles up to a maximum of \$4,000. The maximum amount of the credit begins to phase down in 2002 and phases out in 2005. The President's proposal would extend the tax credit at its \$4,000 maximum level through 2006.

The proposal also would provide tax credits of \$500 to \$3,000 for certain hybrid vehicles, depending upon requirements for the vehicle's design performance. A qualifying hybrid vehicle is a road vehicle that can draw propulsion energy from both of the following on-board sources of stored energy: (1) a consumable fuel, and (2) a rechargeable energy storage system. These credits would be available for 4 years -- 2003 - 2006. The credits -- available for all qualifying vehicles, including cars, minivans, sport utility vehicles, and pickup trucks -- would be:

- (a) \$500 if the rechargeable energy storage system provides at least 5 percent but less than 10 percent of the maximum available power;
- (b) \$1,000 if the rechargeable energy storage system provides at least 10 percent and less than 20 percent of the maximum available power;
- (c) \$1,500 if the rechargeable energy storage system provides at least 20 percent and less than 30 percent of the maximum available power, and
- (d) \$2,000 if the rechargeable energy storage system provides 30 percent or more of the maximum available power.

If the vehicle actively employs a regenerative braking system, the amount of the credit shown in (a) through (d) above would be increased by the following amounts:

- (i) \$250 if the regenerative braking system supplies at least 20 percent but less than 40 percent of the energy available from braking in a typical 60 miles per hour (mph) to 0 mph braking event to the rechargeable energy storage system.
- (ii) \$500 if the regenerative braking system supplies at least 40 percent but less than 60 percent of such energy; and
- (iii) \$1,000 if the regenerative braking system supplies 60 percent or more of such energy.

The revenue cost of this initiative is estimated to be \$0.9 billion for FY 2000 - 2004. These credits are estimated to result in purchases of 13 million electric and hybrid vehicles through 2009.

These credits provide incentives for the purchase of vehicles that use state of the art technology and that have the potential to reduce petroleum consumption, greenhouse gas emissions and air pollution. Hybrid vehicles eligible for the largest credit would be 50 percent to 100 percent more fuel efficient than a conventional vehicle of the same size and power. Doubling a car's fuel economy reduces its emissions of carbon dioxide by about 50 percent.

Renewable energy

Wind and biomass currently account for about 2 percent of electricity generation from renewable sources. These renewable energy sources produce virtually no net greenhouse gas emissions. To make electricity produced from wind and biomass price competitive with other forms of electricity generation, the proposal would extend the present tax credit for wind and biomass for five years, expand eligible biomass sources, and allow a credit for electricity produced from cofiring biomass with coal.

Current law provides a tax credit of 1.5 cents per kilowatt hour (adjusted for inflation after 1992) for electricity produced from wind and "closed-loop" biomass (organic material from a plant which is planted exclusively for purposes of being used at a qualified facility to produce electricity). The current tax credit covers the first ten years of production from facilities placed in service before July 1, 1999. The President proposes a 5-year extension of this tax credit, to cover facilities placed in service before July 1, 2004.

The proposal also would extend and expand the tax credit for electricity produced from biomass. It would:

- Extend the current biomass credit for 5 years. The present credit is 1.5 cents per kilowatt hour tax credit (adjusted for inflation after 1992) and is scheduled to expire after June 30, 1999.
- Expand definition of eligible biomass for the 1.5 cent credit to include certain forest-related resources and agricultural and other sources, broadening eligible biomass beyond closed loop biomass. This change would be available for facilities placed in service after June 30, 1999 and before July 1, 2004.
- Include cofiring biomass and coal. This proposal adds a 1.0 cent per kilowatt hour tax credit for electricity produced by cofiring biomass in coal plants after the date of enactment and before July 1, 2004. Only the portion of electricity associated with biomass is eligible for the credit.

The revenue cost of this incentive is estimated to be \$0.3 billion over FY 2000 - 2004.

The present credit's restrictions on biomass limit its usefulness. The expansion of the eligible biomass and cofiring will encourage the use of this renewable energy source. The credit is estimated to increase electricity production from renewable energy sources by 32 billion kilowatt hours through 2009.

Industry

The proposal would promote energy efficiency in industry by encouraging investments in combined heat and power (CHP) systems. These systems use the thermal energy that is otherwise wasted in producing electricity by more conventional methods. These systems increase energy efficiency, lower the consumption of primary fossil fuels and reduce greenhouse gas emissions compared with conventional methods.

To encourage and accelerate investment in CHP equipment, an 8 percent tax credit would be provided for eligible CHP investment. A qualified system would be required to produce at least 20 percent of its total useful energy in the form of both thermal energy and electric or mechanical power, and would have to meet certain efficiency standards. The credit would apply to property placed in service during the 3 years -- 2000 - 2002. The revenue cost of this incentives is estimated to be \$0.3 billion for FY 2000 - 2004.

The threshold for eligibility for the credit was set high. Eligible CHP systems should reduce input energy requirements by about one-third compared to conventional systems. The credit is estimated to increase cogeneration electrical capacity by more than 1.2 gigawatts through 2009.

Revenue effects

As noted above, the proposed tax incentives are intended to stimulate the diffusion of highly energy efficient technologies in the marketplace and the adoption of technologies that use renewable energy sources. They are intended to provide a temporary boost to the markets by reducing the cost of eligible items and thereby making their purchase more cost effective for consumers and businesses. As the eligible items become more widely accepted in the market, and producers gain experience in supplying them, the energy-efficient products would become viable without tax incentives. For that reason, the proposed incentives are temporary and generally are available for two to five years.

Because of their short duration, the incentives lose revenue primarily over the ten-year period FY 2000 to 2009. Table 1 shows the estimated revenue losses for the proposed tax incentives for the five-year period FY 2000 through 2004 and for the ten-year period FY 2000

through 2009. Revenue losses beyond FY 2009 are likely to be small and result primarily from the extension of the production tax credit for wind and biomass.¹

Table 1. Revenue Effects of the Climate Change Tax Incentives
(\$ billions)

	Total FY00-04	Total FY00-09
Homes and Buildings		
Provide tax credit for energy-efficient building equipment	-1.5	-1.5
Provide tax credit for new energy-efficient homes	-0.4	-0.5
Provide tax credit for solar energy systems	-0.1	-0.4
Vehicles		
Extend tax credit for electric or fuel cell vehicles and provide tax credits for certain hybrid vehicles	-0.9	-6.0
Renewable Energy		
Extend tax credit for electricity produced from wind and biomass, expand eligible biomass sources, and include coal-biomass cofiring	-0.3	-0.8
Industry		
Provide tax credit for combined heat and power systems	-0.3	-0.4
TOTAL*	-3.6	-9.5

*Total may not add due to rounding.

The estimated revenue cost of the tax incentives increases from \$3.6 billion over the first five years to \$9.5 billion over the ten-year period, with more than half the revenue cost (\$5.9 billion) occurring in the five year period between FY 2005 and 2009. Table 1 shows that the increase in the cost of the program over the second five years is largely attributable to the tax credits for hybrid vehicles, which take effect in 2003. The cost of the tax credit for wind and biomass also increases in the second five years because the credit applies to ten years of production from eligible facilities. The tax credit for solar systems increases in the second five years primarily because the tax credit for photovoltaics is available through 2006. In addition, in

¹The revenue cost from the production tax credit for wind and biomass extends beyond FY2009 because the credit would be available for the first ten years of production from facilities placed in service prior to July 1, 2004. The credit for CHP investment also has minor delayed revenue effects because of changes in depreciation deductions which extend beyond the budget window.

some cases credits earned prior to 2005 will be claimed in later years because of credit carry forwards.²

Environmental benefits of the proposal

In contrast to the relatively short time period over which revenue costs would be incurred, the expected benefits of the provisions are likely to be long term and extend well beyond the ten-year budget window. The benefits are expected to be long term because of the nature of the investments encouraged by the incentives and the effect of the incentives on the market for highly efficient technologies and renewable energy.

The proposed incentives encourage businesses and consumers to increase their investment in highly energy efficient items, new technologies, and renewable energy sources relative to investments in those items that would have been made absent the credit. The investments induced by the credit are long-lived and, therefore, produce energy savings and greenhouse gas reductions for many years after the investment is undertaken. For example, an energy-efficient new home can generate energy savings for several decades. The increase in the market penetration of energy efficient technologies, new technologies, and renewable energy sources can transform markets. By improving the acceptance of those technologies in the marketplace and in some cases lowering the production costs of the targeted items, the credit can move the market toward those investments, influencing purchases even after the credits are no longer in effect.

Table 2 shows the estimates of reductions in greenhouse gas emissions attributable to the increase in investment in items induced by the credit through 2009 over the lifetime of those investments. For example, the tax credit for energy efficient new homes would increase purchases of highly energy efficient new homes compared to new homes constructed using conventional methods. The energy savings from the new home would reduce greenhouse gas emissions over the lifetime of the structure and its components, and these benefits would extend well beyond 2009. The estimates do not reflect the effects on emissions attributable to investment that would have occurred absent the credit, or the benefits attributable to investments undertaken after 2009 that may be attributable to the tax incentives. Thus, the estimates do not take into account the incentives' long-term effects on markets for energy saving items and renewable energy sources that can produce significant benefits in the future. Therefore, the estimates may understate the effect of the incentives on emissions reductions.

Table 2 shows that the cumulative reduction in greenhouse gas emissions attributable to the tax incentives is estimated to be between 100 and 150 million metric tons of carbon equivalent

²Business taxpayers that are unable to use credits in the tax year in which they are earned because of insufficient tax liability or limitations on the use of credits can generally carry the credits back one year and forward 20 years.

(MMTCE) over the lifetime of the investments undertaken from 2000 through 2009.³ Over one-third of the emissions reduction is attributable to the tax credits for electric and hybrid vehicles and over one-fourth to the tax credits for building equipment.

Table 2. Effects of the Climate Change Tax Incentives On Greenhouse Gas Emissions

	Cumulative reductions in greenhouse gas emissions (MMTCE)*
Homes and Buildings	
Provide tax credit for energy-efficient building equipment	28 - 42
Provide tax credit for new energy-efficient homes	7 - 10
Provide tax credit for solar energy systems	2 - 3
Vehicles	
Extend tax credit for electric or fuel cell vehicles and provide tax credits for certain hybrid vehicles	36-54
Renewable Energy	
Extend tax credit for electricity produced from wind and biomass, expand eligible biomass sources, and include coal-biomass cofiring	15 - 23
Industry	
Provide tax credit for combined heat and power systems	12 - 18
TOTAL**	100-150

* Millions of metric tons of carbon equivalent over the lifetime of equipment purchased through 2009.

**Total may not add due to rounding.

In addition to reductions in greenhouse gas emissions, the incentives may generate other benefits to society, such as reductions in other pollutants, and reduce vulnerability to oil supply disruptions. Those benefits were not quantified, and thus the total benefits of the proposal are likely understated. The proposals also may produce private benefits, such as energy savings for consumers and businesses. The present value of energy savings for consumers and business over the lifetime of items purchased through 2009 is estimated to be between \$22 billion and \$33 billion.

³According to the Department of State, *Climate Action Report*, July 1997, US greenhouse gas emissions are estimated to be 1,446 MMTCE in 2000, 1,742 MMTCE in 2005, 1,837 MMTCE in 2010, 1,998 MMTCE in 2020.

CONCLUSION

The proposed package of tax incentives has well-defined goals and is designed to achieve reductions in greenhouse gas emissions and improvements in energy efficiency. Eligible items offer superior energy efficiency or use renewable energy sources. If taxpayers claim a credit, it is for items that produce energy savings and reductions in greenhouse gas emissions.

The proposed incentives are estimated to reduce greenhouse gas emissions by 100 to 150 MMTCE over the lifetime of purchases made through 2009 that were induced by the credits. Those estimates of reductions in greenhouse gas emissions are likely to be understated. The benefits of the proposal should increase significantly in the years beyond the ten-year budget window, and those distant effects, by their very nature, are the most difficult to predict. The estimated impact on energy savings and emissions reductions will hinge on forecasts about the long-term increase in market share which is very difficult to predict. For example, the highly efficient building equipment eligible for the proposed 20 percent tax credit currently captures less than one percent of market sales. With the credit in place, that share of the market will likely increase significantly in the short-term. After the credit has expired the share of the market for highly energy efficient building equipment will still be much larger than it was before. But whether it will double, or triple, or increase by a factor of ten is unclear. Moreover, the proposed incentives may also generate other benefits to society, such as reduced air pollution and vulnerability to oil supply disruptions.

The Administration's proposed tax incentives represent sound policy that can produce significant environmental benefits over the next ten years and for decades to come. The proposals represent investments that will generate long-term benefits for the Nation.