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Before the

U.S. HOUSE OF REPRESENTATIVES SCIENCE COMMITTEE ENERGY SUBCOMMITTEE

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Thank you for the opportunity to speak with the Subcommittee this morning. My name is Steven Nadel, and I am Executive Director of the American Council for an Energy-Efficient Economy (ACEEE). ACEEE is a national nonprofit organization dedicated to advancing energy efficiency for economic prosperity and a cleaner environment. Established in 1980 to build bridges among the very different worlds of energy efficiency technology research, state and national policymakers, and energy consumers, ACEEE conducts research, publishes reports, holds conferences, and provides information to policymakers around the country and the world.

I have been asked by Chairman Biggert to speak with you today about three subjects: (1) a brief overview of expert opinions on today's energy situation and projections for the next 20 years; (2) the potential contribution of energy efficiency and renewable energy for meeting future national energy needs, and the impact increased efficiency would have on natural gas markets; and (3) federal and state policies that have been successful in encouraging efficiency and renewable energy, with an emphasis on research and development (R&D) programs, the subject of today's hearing.

As you are aware, energy price and supply are front-page issues today. Gasoline prices have hit record levels this month, following on the heels of record natural gas prices. Economic and energy experts from Chairman Greenspan on down are now saying that these higher prices are expected to stay high for years to come, as rising energy demand outstrips national and world supply systems. Clearly, there has never been a stronger imperative for a new commitment to energy efficiency as part of a balanced energy policy.

Fortunately, there is a large potential for cost-effective energy savings. Many recent studies indicate that cost-effective energy-efficient technologies and practices could reduce U.S. energy use by 20% or more. Recent research by ACEEE on natural gas markets indicates that even achieving a fraction of these savings would reduce natural gas prices by about 20% — markets are so tight now that even modest demand reductions would have substantial price effects.

In order to realize these opportunities, we recommend five key policy initiatives:

1. Promote substantial improvements in the fuel economy of passenger vehicles.
2. Work with states to substantially expand utility and state energy efficiency programs.

3. Work with industry to establish and implement expanded voluntary energy efficiency commitments.
4. Expand and update federal equipment efficiency standards.
5. Expand federal R&D and deployment programs.

Regarding energy efficiency research, development, and deployment (RD&D) in the United States, our research indicates that a renewed commitment to efficiency RD&D is critical to the nation's economic future and to meeting the environmental challenges we face in air quality and global climate change. We are concerned, however, that declining federal funding for efficiency RD&D in recent years dims the prospects for economic recovery and falls far short of the level needed to respond to the climate challenge. In fact, the overall downward trend in efficiency RD&D may be approaching the point where basic U.S. infrastructure for producing new energy efficiency technologies will be crippled.

In the balance of my testimony, I will expand on each of these points.

The Current Energy Situation

As you are aware, energy price and supply are front-page issues today. Gasoline prices have hit their highest levels in more than a decade, following on the heels of record natural gas prices. Economic and energy experts from Chairman Greenspan on down are now saying that these higher prices are expected to stay high for years to come, as rising energy demand outstrips national and world supply systems. These higher fuel prices are also spilling over into the electricity sector. Coal prices are up sharply this year; and since coal and natural gas together generate two-thirds of U.S. electricity, spot markets for electricity are up as well.

More specifically, according to the Energy Information Administration, retail gasoline prices averaged $1.94 per gallon on May 10, 2004, an increase of $0.10 per gallon relative to a week earlier and an increase of $0.45 per gallon relative to a year earlier.[1] Crude oil closed at a record high of $41.38 a barrel in the New York exchange last Friday (May 14). According to industry experts, these high prices are caused by rising demand (due in particular to economic growth in China, India, and the United States) and tight supplies, particularly for refined products and "sweet crude" (low sulfur crude oil that can be more easily refined than higher sulfur crude). A "risk premium" associated with violence and uncertainty in the Middle East is also a factor.[2]

The big question is how long these high prices will last. Experts agree that there is great uncertainty regarding future prices, with future prices determined by such factors as demand for oil (particularly in key markets such as China and the United States), the supply of sweet crude, the construction of new refineries (particularly refineries that can process the higher sulfur crude that comes from Saudi Arabia), OPEC pricing policies and the degree to which these policies are followed by OPEC and non-OPEC members, and whether there are significant supply interruptions, such as in the Middle East or Venezuela. The Energy Information Administration is probably at the optimistic end of the spectrum of opinion, saying that "[o]il price declines are expected in 2005 as Iraqi oil production continues to increase and inventories are rebuilt toward

[1] http://tonto.eia.doe.gov/oog/info/gdu/gasdiesel.asp.
[2] Banerjee, Neela, 2004, "Tight Oil Supply Won't Ease Soon," *New York Times,* May 16, p. 1.

more normal levels."[3] However, other experts are much less sanguine. For example, speaking at a luncheon at the Petroleum Club in Midland Texas, T. Boone Pickens, the West Texas oilman and financial speculator, predicted that oil prices will never fall below $30 per barrel again. "I think you'll see $50 a barrel before you see $30," he concluded.[4]

Natural gas prices are also very much in the news. Wholesale natural gas prices have been fluctuating around an average of $5–6 per thousand cubic feet (commonly abbreviated *mcf*) for the past year at the key Henry hub distribution point,[5] up from the $2–3 level that prevailed for much of the last decade. As a result, prices charged to consumers, businesses, and power plant operators are up substantially. EIA has recently projected that "[n]atural gas spot prices (composites for producing area hubs) are likely to average about $5.80 per thousand cubic feet (mcf) this year."[6]

Again, there is great uncertainty about future prices. EIA's last long-term forecast, published in January 2004, projects that natural gas wellhead prices (which are slightly lower than prices at transportation hubs) will decline to below $4 per thousand cubic feet by 2010, and will then gradually rise to the $4–5 range by 2015 and stay in that range over the 2015–2025 period.[7] Independent forecasts, such as Energy and Environmental Analysis' widely respected projection, see similar prices in the 2015–2020 period, largely driven by world liquefied natural gas (LNG) prices. For the next few years, its forecasts are higher than the EIA forecast, projecting annual average hub prices rising from $5.46 this year to $6.13 in 2006, before declining to the $4.50–5.00 range towards the end of the decade.[8] Some analysts are more bullish on prices over the next few years. Andrew Weissman, publisher of Energy Business Watch, stated earlier this month that the "supply/demand balance in the U.S. market is deteriorating rapidly, and that a substantial further price adjustment will be required to bring the market back into equilibrium." He suggests that recent "good luck" with mild weather has kept us from realizing how tight markets really are. He is projecting prices above $7.00 per mcf for at least the next year or so.[9]

Volatility and price increases in oil and natural gas markets are in turn affecting other energy sources. For example, natural gas use for generating electricity has been growing rapidly in recent years, and thus natural gas prices have a significant impact on electricity prices. Due largely to natural gas price increases, on a national average basis, electricity prices rose modestly in 2003.[10] With retail prices still regulated in many states, the effect of natural gas prices on electricity prices has been blunted. However, in deregulated markets such as New Jersey and Texas we are seeing 10–20% electricity price increases due to rising fuel prices, and customers

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3 EIA, 2004, *Short-Term Energy Outlook — May 2004,* http://www.eia.doe.gov/emeu/steo/pub/contents.html.
[4] Romero, Simon, 2004, "Why the Saudis May Not Rescue Oil Markets This Time," *New York Times,* May 16, Section 3, p. 5.
[5] Oilnergy, 2004, http://www.oilnergy.com/1gnymex.htm. Spot prices for the past year have varied from a low of $4.50 to a high of almost $7.30 per mcf.
[6] See note #3.
[7] EIA, 2004, *Annual Energy Outlook 2004,* DOE/EIA-0383(2004), p. 153, Washington, DC: U.S. Energy Information Administration.
[8] EEA, 2004, *EEA Natural Gas Forecast April 2004*, Arlington, Va.: Energy and Environment Analysis Inc.
[9] Weissman, Andrew, 2004, "Macro Level Trends," *Energy Pulse,* May 5. http://www.energypulse.net/centers/article/article_print.cfm?a_id=715.
[10] http://www.eia.doe.gov/cneaf/electricity/epm/table5_6_a.html.

in some states such as Maryland and Virginia are likely to see similar increases as price controls come off over the next year or so.

With natural gas prices higher, coal is becoming more attractive, and EIA projects a 4.7% increase in coal prices this year.[11] However, this includes coal under long-term contracts. Looking just at spot prices, according to Reuters, spot prices for northern and central Appalachian coal last Friday (May 14th) were $58 per ton — more than twice the price last August.[12] With coal demand up, railroads are beginning to experience rolling stock availability problems, which appear to be responsible for some of the recent increases in new coal contract prices. Coal reserves are large, so future prices for using coal, while somewhat dependent on prices of competing fuel, will probably be more affected by future air pollution regulations and the availability of rail infrastructure to deliver greater volumes to users. In the short term, some utilities are concerned that they may exceed their emissions allowance for coal power plants as they run those plants more. This situation may result in generators asking state environmental regulators for waivers of allowances to avoid having to shut the plants down later in the year if electric demand remains high. In the longer term, the President's "Clear Skies" proposal calls for gradual tightening of emissions regulations relative to current levels. Other legislative proposals call for more substantial emissions declines. The end result is that the cost of coal as an energy source will go up too, but it is hard to project by how much until Congress chooses which regulatory approach it will take.

Overall, the clear trend is that energy prices are rising. Most experts are projecting higher prices in the future than in the past — the only question is how much higher. If we're lucky, prices will be only modestly higher. But there's also a good chance prices will be substantially higher, providing a considerable drag on our economy, particularly hurting energy-intensive industries such as chemicals, fertilizers, and trucking. Fortunately, prices are determined by the balance between supply and demand. Accelerated efforts to improve energy efficiency would have a significant impact on prices, while also providing substantial environmental and economic benefits. In the next section of my testimony, I will discuss how energy efficiency is a critical part of the balanced energy policy that is needed to address these trends.

The Role of Energy Efficiency

Energy Efficiency's Historic Contributions

Energy efficiency is a quiet but effective energy resource, contributing substantially to our nation's economic growth and increased standard of living over the past 30 years. Energy efficiency improvements since 1973 accounted for approximately 25 quadrillion Btus in 2002, which is about 26% of U.S. energy use and more energy than we now get annually from coal, natural gas, or domestic oil sources. Consider these facts which are based primarily on data published by the federal Energy Information Administration:

[11] See note #3.
[12] Reuters, 2004, "High Coal Price Could Bring Summer Energy Crunch," May 14.

- Total primary energy use per capita in the United States in 2002 was almost identical to that in 1973. Over the same 29-year period, economic output (GDP) per capita increased 74 percent.

- National energy intensity (energy use per unit of GDP) fell 43 percent between 1973 and 2001. About 60% of this decline is attributable to real energy efficiency improvements and about 40% is due to structural changes in the economy and fuel switching.[13]

- If the United States had not dramatically reduced its energy intensity over the past 29 years, consumers and businesses would have spent at least $430 billion more on energy purchases in 2002.

- Between 1996 and 2002, GDP increased 21 percent while primary energy use increased just 2 percent. Imagine how much worse our energy problems would be today if energy use had increased 10 or 20 percent during 1996–2002!

Clearly, improvements in energy efficiency are essential to a healthy economy. Efficiency keeps energy demand growth down to sustainable levels. If demand grows too fast, supply systems cannot keep up, raising energy prices and possibly creating shortages, which hobble the economy. This effect is true whether the energy comes from fossil, nuclear, or renewable sources. There will always be limits on the materials, land, and capital needed to develop supply infrastructure; there is thus no "silver bullet" energy source or supply system that obviates the need for efficiency. Efficiency has been and will continue to be the keystone of a sustainable energy economy.

Energy Efficiency's Future Potential

Even though the United States is much more energy efficient today than it was 25 years ago, there is still enormous potential for additional cost-effective energy savings. Some newer energy efficiency measures have barely begun to be adopted. Other efficiency measures could be developed and commercialized in coming years, with proper support:

$ The Department of Energy's national laboratories estimate that increasing energy efficiency throughout the economy could cut national energy use by 10 percent or more in 2010 and about 20 percent in 2020, with net economic benefits for consumers and businesses.[14]

$ ACEEE, in our *Smart Energy Policies* report, estimates that adopting a comprehensive set of policies for advancing energy efficiency could lower national energy use from EIA projections by as much as 11 percent in 2010 and 26 percent in 2020.[15]

[13] Murtishaw, S. and L. Schipper, 2001, *Untangling Recent Trends in U.S. Energy Use*, Washington, D.C.: U.S. Environmental Protection Agency.
[14] Interlaboratory Working Group, 2000, *Scenarios for a Clean Energy Future,* Washington, D.C.: Interlaboratory Working Group on Energy-Efficient and Clean-Energy Technologies, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy.
[15] Nadel, Steven and Howard Geller, 2001, *Smart Energy Policies: Saving Money and Reducing Pollutant Emissions through Greater Energy Efficiency,* Report E012, Washington, D.C.: American Council for an Energy-Efficient Economy.

- $ Another recent ACEEE paper examined and synthesized the results of a dozen recent studies on the technical, economic, and achievable potential for additional energy savings in the United States. The review found that most studies agree that there is a cost-effective opportunity to reduce U.S. electricity and natural gas use by 20% or more.[16]

- $ The opportunity for saving energy is also illustrated by experience in California in 2001. Prior to 2001, California was already one of the most efficient states in terms of energy use per unit gross state product (ranking 5th in 1997 out of 50 states[17]). But in response to pressing electricity problems, California homeowners and businesses reduced energy use by 6.7% in the summer of 2001 relative to the year before (after adjusting for economic growth and weather),[18] with savings costing an average of 3 cents per kWh,[19] far less than the typical retail or even wholesale price of electricity.

These estimates are generally based on already commercialized technologies. Substantial additional energy can be saved from technologies and practices now being developed by private companies, and through federal and state R&D programs. For example, ACEEE is now completing a study that identifies dozens of promising emerging technologies for use in buildings.[20] A previous ACEEE study identified many emerging technologies that offer promise for cost-effective energy savings in the industrial sector.[21]

Renewable Energy Technology

ACEEE concentrates its work on energy-efficient technologies and practices. While we are not renewable energy experts, I was asked to comment briefly on the potential for renewable energy in the United States. Recent estimates on renewable energy potential have been made by both EIA and the Union of Concerned Scientists (UCS). EIA estimates that non-hydro renewables accounted for about 3.3 quadrillion Btus of energy consumption in 2002, which was about 3.3% of total U.S. energy consumption that year. In its Reference Case, EIA projects that non-hydro renewables will increase to 5.7 quads in 2020, which is about 4.4% of estimated consumption in that year.[22] In contrast, UCS estimates that *with appropriate policy support*, non-hydro renewables can increase to 10.6 quads by 2020. When energy efficiency is factored into the

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[16] Nadel, S., A. Shipley, and R.N. Elliott, 2004, "The Technical, Economic, and Achievable Potential for Energy Efficiency in the United States — A Meta-Analysis of Recent Studies," In *Proceedings of the 2004 ACEEE Summer Study on Energy Efficiency in Buildings* (forthcoming). Washington, D.C.: American Council for an Energy-Efficient Economy.

[17] Geller, Howard and Toru Kubo, 2000, *National and State Energy Use and Carbon Emissions Trends*, Washington, D.C.: American Council for an Energy-Efficient Economy.

[18] California Energy Commission, 2001, *Emergency Conservation and Supply Response 2001,* Report P700-01-005F, Sacramento, Calif.

[19] Global Energy Partners, 2003, *California Summary Study of 2001 Energy Efficiency Programs, Final Report.* Lafayette, Calif.

[20] Sachs, Harvey et al., 2004, *Emerging Energy-Saving Technologies and Practices for the Buildings Sector* (forthcoming), Report A042, Washington, D.C.: American Council for an Energy-Efficient Economy.

[21] Martin, Nathan et al., 2000, *Emerging Energy-Efficient Industrial Technologies,* Report IE003, Washington, D.C.: American Council for an Energy-Efficient Economy.

[22] See note #7.

equation (efficiency reduces consumption), UCS estimates that non-hydro renewables can meet 10.3% of U.S. energy needs in 2020, more than double the level estimated by EIA.[23]

The Impact of Energy Efficiency and Renewable Energy on the Natural Gas Market

In 2003, ACEEE and Energy and Environmental Analysis, Inc. conducted an analysis to investigate the impact of energy efficiency and renewable energy on natural gas prices. The analysis looked at increased levels of energy efficiency and renewable energy investment, resulting in energy savings of about 2% in one year and a total of 5% over five years. These investments are cost effective with a benefit cost ratio of 3.4.

By reducing demand for electricity and natural gas, especially during peak periods, and increasing the share of renewable energy, the study found that natural gas prices will both be reduced and be made less volatile. Specifically, we found that in just 12 months, nationwide efforts at this scale could reduce wholesale natural gas prices by 20% and save consumers $15 billion per year in retail gas and electric power costs. As efficiency investments continue over the following four years, this level of gas price reduction can be maintained. It is worth noting that changes in just one state or region can result in smaller though still significant price reductions in the immediate region as well as more modest reductions in the nation as a whole. Nationwide efficiency and renewable energy efforts would result in energy bill savings to residential, commercial, and industrial consumers exceeding $104 billion and require an investment of slightly more than $30 billion over five years.[24]

This analysis was based on forecasts from almost a year ago. We have seen little change in demand and in fact markets have grown tighter so price effects would likely be even greater were we to rerun the analysis today.

Policies to Encourage Energy Efficiency

From our research, there are several key policies that can do much to help achieve the large available cost-effective efficiency improvements discussed above. In our 2001 report entitled *Smart Energy Policies: Saving Money and Reducing Pollutant Emissions Through Greater Energy Efficiency,* we discuss nine policies that will help the United States to achieve these energy savings.[25] In this testimony, I will briefly summarize several of the most important of these policies.

1. <u>Promote substantial improvements in the fuel economy of passenger vehicles.</u>

The fuel economy of the U.S. passenger cars has declined nearly every year since 1987. In 2003, the average passenger vehicle sold had an EPA composite (lab) fuel economy of 24.2 miles per

[23] Clemmer, Steve et al., 2001, *Clean Energy Blueprint,* Cambridge, Mass.: Union of Concerned Scientists.
[24] Elliott, R. Neal et al., 2003, *Natural Gas Price Effects of Energy Efficiency and Renewable Energy Practices and Policies,* Report E032, Washington, D.C.: American Council for an Energy-Efficient Economy.
[25] See note #15.

gallon (MPG), down from 25.9 in 1987.[26] Since 1987, federal fuel economy regulations have remained essentially unchanged, and SUVs and other light trucks have increased dramatically in sales. Fuel economy improvements in the United States and other countries in the 1970s and 1980s substantially reduced demand relative to previously predicted levels, contributing to an excess of supply relative to demand and reducing world oil prices. A renewed commitment to fuel economy could save large amounts of energy and money, reduce U.S. dependence on imports from unstable regions of the world, and provide downward pressure on oil prices. However, discussions about changing U.S. fuel economy regulations have been highly controversial. There is a need for creative solutions in order to raise average passenger vehicle fuel economy to at least 30 mpg, and preferably to 40 mpg or more.

2. Work with states to substantially expand utility and state energy efficiency programs.

In many states, utility regulators and legislatures have established "demand side management programs" under which utilities and/or state governments encourage customers to reduce energy use and peak demand through information, technical assistance, and financial incentive programs. Currently, such programs exist in more than 20 states, with total annual program funding of more than $1 billion nationwide.[27] These programs can be marketed and refined to reflect state-specific markets and needs. However, some states have very modest programs and other states have no programs at all. States should be encouraged to expand or start such programs. Such encouragement can take the form of matching federal programs and/or requirements to achieve a minimum level of energy and peak savings each year (the latter based on legislation passed in Texas and signed by then Governor Bush[28]). Senator Jeffords has introduced federal legislation along these lines to encourage such state programs.[29]

3. Work with industry to establish and implement expanded voluntary energy efficiency commitments.

Several programs now exist to encourage large companies to make and implement commitments to improve energy efficiency and reduce emissions of greenhouse gases, including EPA's Climate Savers program and DOE's Climate Vision. However, commitments to date have been modest, in part because there is little incentive or technical assistance for firms to participate and in part because rules to track savings (and give credit for these savings in future emissions trading schemes) have not been sufficiently developed.[30] Existing programs should be substantially expanded, and DOE and EPA given: (a) resources to assist industrial customers to participate; and (b) a directive to develop appropriate regulations so that firms can track and receive credit for the reductions they achieve.

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[26] EPA, 2004, *Light-Duty Automotive Technology and Fuel Economy Trends: 1975 Through 2004,* EPA420-R-04-001, Washington, D.C.: U.S. Environmental Protection Agency.
[27] York, Dan and Martin Kushler, 2002, *State Scorecard on Utility Public Benefits Energy Efficiency Programs: An Update,* Report U023, Washington, D.C.: American Council for an Energy-Efficient Economy.
[28] Described in Kushler, Martin, Dan York, and Patti Witte, 2004, *Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies,* Report U042, Washington, D.C.: American Council for an Energy-Efficient Economy.
[29] S. 1754, the *Electric Reliability Security Act.*
[30] Elliott, R. Neal, 2003, *Industrial Voluntary Agreements in Context,* Report IE033, Washington, D.C.: American Council for an Energy-Efficient Economy.

4. Expand and update federal equipment efficiency standards.

One of the federal government's most successful energy efficiency programs has been minimum-efficiency standards on appliances and other energy-consuming equipment. The initial legislation was passed by Congress and signed by President Reagan in 1987; the program was substantially expanded by Congress in 1993 and signed by the first President Bush. As of 2000, the appliance and equipment efficiency standards program had reduced U.S. electricity use more than 2% and saved consumers about $50 billion. Standards already set will increase annual savings approximately three-fold by 2020. Updating existing standards and setting new standards on additional products would increase 2020 savings by an additional 60%.[31] Several new consensus standards are included in pending energy legislation passed by the House and Senate. DOE is working on revising other standards, but has been making very slow progress. Congress should complete action on the energy efficiency title in the pending energy bill and should encourage DOE to speed up now-pending standards rulemakings.

5. Expand federal R&D and deployment programs.

R&D programs at DOE and at the state level help to develop new technologies, so that there continue to be substantial opportunities to improve energy efficiency in the future. We elaborate further on the need to expand federal R&D efforts in the section below. In addition, federal efforts to deploy energy-saving technologies and practices should also be expanded. For example, the EPA/DOE ENERGY STAR program has been very effective in achieving energy savings and emissions reductions. We recommend that this program be doubled in size over the next few years. Likewise, state building codes also achieve substantial energy savings. DOE provides important technical assistance and grants to the states for this work — we also recommend that these programs be doubled as well.

Savings from these Policies

Overall, we estimate that full pursuit of these five policies will reduce U.S. annual energy use by about 27 quadrillion Btus by 2020, a 21% reduction relative to the EIA Reference Case forecast. These policies will result in discounted net economic benefits to consumers and businesses of more than $500 billion (1999 $) and will reduce U.S. carbon emissions by more than 400 million metric tones in 2020, a 20% reduction relative to the EIA Reference Case. In addition, by making the United States a leader again in energy efficiency, we will be well positioned to provide efficient goods and services in world markets and will be less dependent on imports from unstable regions of the world.

The Key Role of Federal RD&D

To realize efficiency's benefits for the economy and the environment, the efficiency technology "pipeline" must continue to flow. Efficiency technologies, especially those developed through

[31] Kubo, Toru, Harvey Sachs, and Steven Nadel, 2001, *Opportunities for New Appliance and Equipment Efficiency Standards: Energy and Economic Savings Beyond Current Standards Programs,* Report A016, Washington, D.C.: American Council for an Energy-Efficient Economy.

U.S. Department of Energy RD&D, have produced enormous benefits over the past three decades. A National Research Council study issued in 2001 quantified the economic benefits of just six Department of Energy-funded technologies at about $30 billion, based on an R&D investment of about $400 million.[32] This reinforced the earlier recommendations of the President's Committee of Advisors on Science and Technology (PCAST):

> *R&D investments in energy efficiency are the most cost-effective way to simultaneously reduce the risks of climate change, oil import interruption, and local air pollution, and to improve the productivity of the economy.*[33]

The PCAST report recommended that DOE's efficiency budget be doubled over a 5-year period. It projected that so doing would return $40 in net economic benefits for every federal dollar invested.

This committee is aware of the broader concerns about the decline of science and technology funding in America. Recent reports bring into dramatic relief the consequences of failing to maintain a robust RD&D infrastructure for the nation's key technologies.[34] Not the least of these is the decline in competitiveness of U.S. industry, especially in the emerging technology markets that represent future economic opportunities. The United States spends less per dollar of GDP than our OECD competitors like Japan and Germany.[35] It's not surprising, therefore, that non-U.S. firms dominate markets for key efficiency and renewable technologies such as lighting, hybrid vehicles, industrial automation and machine tools, solar photovoltaics, and wind power. Without a renewed commitment to federal RD&D, U.S. firms will continue to lose ground in these markets, and the American economy and American consumers will be worse off.

In order to work towards the R&D objectives recommended by PCAST, ACEEE recommends that:

- The Administration should use the authorization levels in the pending energy bill as guidelines for its energy efficiency RD&D requests for the FY 2006–2010 budget requests. These authorizations would allow funding to rise by about 50% above current levels. While this is only half of the PCAST recommendation, it would represent a significant new commitment to these vital technologies.

- The Committee should commission a study on the state of energy efficiency RD&D infrastructure in the United States. This study should examine the history of RD&D since the 1970s, covering federal, state, and private industry funding. It should describe the RD&D infrastructure as it has evolved over time and as it stands today. It should compare

[32] National Research Council, 2001, *Energy Research at DOE: Was It Worth It?* Washington, D.C.: National Academy Press.
[33] President's Committee of Advisors on Science and Technology, 1997, *Federal Energy Research and Development for the Challenges of the Twenty-First Century,* Washington, D.C.: President's Committee of Advisors on Science and Technology.
[34] See, for example, Broad, William, 2004, "U.S. Is Losing its Dominance in the Sciences," *New York Times*, May 3. p. 1.
[35] ACEEE, 2002, "Energy Efficiency Research, Development, and Deployment: Why Is Federal Support Necessary?" Washington, D.C.: American Council for an Energy-Efficient Economy.

and contract U.S. RD&D to that of other OECD nations. It should also assess the current adequacy of RD&D infrastructure and funding levels, and make recommendations for changes needed to improve the United States' position on this key issue.

- The Committee should commission a study of emerging energy technologies that will improve U.S. energy efficiency. This study should include a review of current federal, state, and private industry RD&D programs, identify and assess candidate technologies, project potential energy savings, and recommend a set of RD&D priorities to the Department of Energy and other affected agencies. Such a study should look at energy-saving practices as well as energy-saving technologies. In our recent work, we have found that R&D on practices (e.g., best practice optimization techniques and software) can be just as important as R&D on technologies. Also, in developing research priorities, a balanced portfolio should be assembled. We are concerned, for example, that R&D on fuel cells and hydrogen are squeezing out important research on nearer-term technology options such as improved hybrid vehicles. A balanced portfolio is needed, just as investment professionals recommend a mix of investments rather than putting all investment dollars into a few high-risk gambles.

- The Committee should review the state and practice of energy analysis in the federal government. This includes a review of the macroeconomic models and other analysis tools used by the Energy Information Administration and other federal agencies that do quantitative analysis of energy policy issues. Our experience is that these models are frequently unable to model the effects of energy technologies' effects on markets in a "bottom up" fashion, and thus frequently underestimate the potential economic benefits of energy efficiency RD&D and other policy initiatives. Based on this review, the Committee should make recommendations to the appropriate agencies for improving their analytical processes and tools to better capture the benefits of energy efficiency and other technologies.

In conclusion, it is apparent that energy markets are becoming increasingly volatile and that energy prices are increasing. The amount of the increase is highly uncertain, but accelerated efforts to pursue energy efficiency would save consumers and businesses money and have a moderating impact on prices. There is much that policymakers can do to increase energy efficiency, including expanding federal RD&D programs in order to keep developing new energy-saving technologies and practices. Such efforts will reduce energy bills, moderate energy prices, help protect the environment, and keep the U.S. competitive in the world economy.

ACEEE appreciates the opportunity to share our thoughts with you on these important issues, and we look forward to working with the Committee on them in the future.