Consumer Federation of America

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BUILDING ON THE SUCCESS OF ENERGY EFFICIENCY PROGRAMS TO ENSURE AN AFFORDABLE ENERGY FUTURE:

STATE-BY-STATE SAVINGS ON RESIDENTIAL UTILITY BILLS FROM AGGRESSIVE ENERGY EFFICIENCY POLICIES

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EXECUTIVE SUMMARY

This study demonstrates that energy efficiency is the cornerstone to ensuring affordable energy for American households in the decades ahead. It costs much less to save energy than it does to produce it, so household expenditures for electricity and natural gas can be dramatically reduced by policies to aggressively promote energy efficiency. This provides a huge cushion of cost savings to consumers while also making climate change policies more cost-effective and affordable.

These conclusions were reached through a comprehensive analysis of existing studies of the potential cost savings from policies to promote efficiency and results of aggressive state programs to reduce energy consumption through efficiency programs. The report uses the results of this analysis to project the average annual savings for households for each state if energy consumption is decreased through strong federal and state efficiency policies.

Potential Savings

Section II of the report uses findings of two-dozen studies at the state level conducted in the past decade and three recent studies from major national research organizations (the National Research Council, McKinsey and Company, and the American Council for an Energy Efficient Economy). The estimates of potential savings are based on engineering studies of the use of economically efficient, off-the-shelf technologies. A review of these studies demonstrates that the potential exists to reduce energy consumption by as much as 1 to 2 percent per year, or 20 to 30 percent over the next couple of decades at a cost that is less than one-half the current and projected cost of energy. A large part of the net savings – put at almost three quarters of a trillion dollars by McKinsey and Company – would come in the form of lower household utility bills.

Effective State Policies Increase Energy Efficiency

Section III examines the growing body of evidence that programs can be put on the ground to achieve the levels of energy efficiency projected by the engineering studies. Over the past two decades several states have achieved dramatic success in reducing energy consumption through efficiency programs. Half a dozen states have increased their level of annual energy efficiency to 1 percent per year or more. Despite these successes, many state programs still fall far short of the level necessary to achieve a long-term energy savings target of 20 to 30 percent. Moreover, potential savings from other policies (including appliance standards and building codes) could double the results. Because many states are lagging, to achieve the full benefit of energy efficiency, especially in the context of climate policy, it is critical that Federal policies take a leadership role in promoting efficiency.

Consumer Impacts

Section IV uses the evidence that a 20 percent to 30 percent reduction in energy consumption is possible at very low cost to estimate the impact on consumers of aggressive federal policies to improve energy efficiency. Unlike other studies that have examined economy-wide impacts of efficiency, this study focuses on the component of societal savings that has been a focal point of concern in the recent energy/climate change policy debate – home energy bills. (See the table below.) The great concern about climate change policy is that it will raise consumer costs dramatically. However, the large potential energy savings at low cost suggests that substantial reductions in emissions of carbon dioxide, the most important greenhouse gas, can be achieved without raising household bills. The following Table shows both household level and aggregate national savings.

Annual Savings from Aggressive Energy Efficiency (2030 savings in 2008$)

Impact Measure:	Direct Impact on Utility Bills		Net Savings after Efficiency Cost	
Scenario:	20%	30%	20%	30%
Average Annual Per Household				
Electricity	$230	$345	$158	$237
Natural Gas	71	106	42	62
Total	301	451	200	299
Total National (Billion)				
Electricity	28.5	52.7	19.5	29.3
Natural Gas	8.8	13.1	5.2	7.7
Total	37.3	65.8	24.7	37.0

- A 30 percent reduction in residential electricity and natural gas consumption below current levels, which are virtually identical to the level of consumption EIA predicts for 2030, would lower 2030 electricity bills by $345 and natural gas bills by 106 for a total reduction in the average household bill for these two fuels of $451 per year.
- Even if all of the costs of efficiency fall directly on households, the net savings for electricity and natural gas combined would be substantial, approximately $300 per year.

The state-by-state analysis finds that, on average, households in every state would be better off, if aggressive programs captured the full measure of the benefit of energy efficiency.

- Direct benefits in household utility bills would vary from a low of just over $300 per year in Idaho to a high of more than $600 per year in Connecticut. The reductions in bills would be largest where the current bills are highest.

- Even if all the costs of efficiency fall directly on households, on average, the households would benefit in all states, with a low of about $106 per year and a high of $460 per year.

These substantial direct residential utility bill and consumer pocketbook savings are very conservative estimates of the benefits consumers would see as the result of policies that capture the full measure of energy efficiency benefits available. It is conservative because we have not factored in rising real prices of energy, improvements in technology and the economics of efficiency, or the value of carbon reduction. Each of these factors would make energy efficiency more valuable and would raise the amount of energy that could be saved in the next two decades at economically justified costs.

Policy Implications

This report shows that there is a consumer-friendly way to address the challenge of climate change, which is to get the maximum amount of reduction in greenhouse gas emissions from energy efficiency. Many of the most important measures the U.S. can take to cut emissions in the utility sectors cost less than the current or projected price of energy, which means that bills can be lowered, not raised. This reduction in consumer utility bills provides a vital cushion to soften the blow of more expensive measures to reduce greenhouse gas emissions in other sectors. Therefore, getting the most out of energy efficiency is a critical component of a sustainable, cost-effective climate change policy.

The bottom line of this study is that maximizing the role of energy efficiency in America's energy future is vital to keeping energy affordable, and its importance is magnified in a carbon-constrained environment. Therefore, getting the most out of energy efficiency must be a critical component of a sustainable climate change policy. The potential savings are huge. The obstacles to achieving these savings are widely recognized and substantial, but the benefit of overcoming them make a maximum effort to do so urgent.

Achieving these savings is the central challenge of energy and environmental policy. While the American Clean Energy and Security Act of 2009 (ACES) marks a milestone in policy, it will achieve only a quarter of the economically justified efficiency gains. It is a good start, but more can and should be done. ***First, federal authorities should be more aggressive in establishing the policy conditions to ensure the public benefits from the full measure of efficiency.*** This would include raising the energy efficiency resource standard to a higher level, ensuring building code and appliance efficiency improvements are achieved; and making sure retrofitting activities are fully funded and implemented.

Second, whether or not federal policy provides additional mandates, incentives or guidelines, state authorities should pursue energy efficiency to the limit of its cost-benefit value. Public utility commissions will play a primary role because of the central role of utilities in the consumer energy sector, but building code authorities and state legislatures can play an important part by implementing state policies to achieve maximum cost-justified efficiency.

I. THE EMERGING POLICY CONTEXT

A. EVOLVING POLICY

The House passage of the American Clean Energy and Security Act of 2009 (hereafter HR2454 or ACES) marks a milestone in the climate change policy debate. The bill contains the first nationwide cap on greenhouse gas emissions[1] as well as other complementary clean energy requirements. The bill requires utilities to obtain 20 percent of their energy through a combination of energy efficiency and renewable energy by 2020, with energy efficiency allowed to meet up to 8 percent of the 20% percent.[2] It also includes major improvements in building code energy efficiency,[3] appliance efficiency standards[4] and large-scale, sustained increases in funding for the retrofit of existing buildings to reduce energy consumptions.[5]

At the same time, the bill establishes relatively aggressive emissions targets, including a 42 percent reduction by 2030 and an 83 percent reduction by 2050. The bill also adopts a number of mechanisms that allow utilities flexibility in meeting the greenhouse gas emission targets by buying renewable credits from utilities in other states or international offsets. The exact mix of measures – supply and demand, domestic and international – that will be used to reach the targeted reductions is uncertain.[6] This uncertainty, combined with the relatively low mandates for efficiency and renewables, makes it all the more important to understand the potential costs and benefits to consumers of the key options.

At the same time that the policy process has opened a range of uncertainty and flexibility, studies from three major national research institutions has sent a strong signal indicating the direction that the effort to meet energy needs in a carbon-constrained environment must follow. The National Research Council (NRC), relying on a study by the Lawrence Berkeley National Laboratory (LBL),[7] and McKinsey and Company[8] concluded that

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[1] Titles III and VII define the cap and trade program.

[2] Title IA. According to the American Wind Energy Association, the 20% renewable energy standard in the House bill would not result in a significant increase in new renewable generation beyond what is already being mandated by the states. See AWEA press release, July 16, 2009, http://www.awea.org/newsroom/releases/Energy_Legislation_Needs_Stronger_071609.html.

[3] Title IIA

[4] Title IIB

[5] Title IIC

[6] The immense uncertainty that results from the structure of the bill can be seen in the analysis conducted by the Environmental Protection Agency (*EPA Analysis of the American Clean Energy and Security Act of 2009, H.R. 2454 in the 111th Congress,* June 23, 2009) and the Energy Information Administration of HR2454 (*Energy Market and Economic Impact of H.R. 2454, the American Clean Energy and Security Act of 2009,* August 2009). The range of possible outcomes analyzed is extremely large.

[7] National Research Council of the National Academies, *America's Energy Future,* August 2009. The National Research Council relied on a study from Lawrence Berkeley National Laboratory (Brown, Richard, Sam Borgeson, Jon Koomey and Peter Biermayer, *U.S. Building-Sector Energy Efficiency Potential*, September 2008).

[8] McKinsey & Company, *Unlocking Energy Efficiency in the U.S. Economy,* July 2009.

efficiency can cut energy consumption by 25 percent to 30 percent at costs that are far below the current and projected future cost of energy. The American Council for an Energy-Efficient Economy (ACEEE) took a somewhat different approach by modeling the energy efficiency provisions of the House bill. It found that, as passed, ACES would result in 8 percent reduction in energy use nationwide by 2030, relative to the *Annual Energy Outlook 2009* forecast.[9] At the same time, the ACEEE study found that more aggressive efficiency policies would save a great deal more energy, approximately 27 percent, and produce much larger dollar savings. A 20 percent to 30 percent reduction in energy consumption that results in economic savings of hundreds of billions of dollars is a win-win-win for consumers, national energy security and the environment.

Even without climate change and energy legislation, the role of efficiency in the future of the electricity sector was going to be a major policy issue. With the electric utility industry entering into a phase where the supply-demand balance has tightened and the costs of building and operating generation plants are rising, efficiency has become a more attractive option, regardless of whether or not climate change legislation is enacted.

However, climate change and energy legislation may play a large role in providing the incentives to pursue greater energy efficiency by triggering specific actions through mandated increases in energy efficiency under the energy efficiency standard, increases in energy efficiency in building codes and appliance standards, specific, targeted funding for retrofit of existing buildings and a cap on carbon emissions. With the electricity sector accounting for 40 percent of U.S. greenhouse gas emissions, and likely a larger share of early reductions in emissions, it is important to have a firm analytic grasp on the cost and availability of the full range of alternatives to meet the need for electricity in the decade ahead. The choices of which technologies will be used to achieve the ACES goals will be determined in the resource planning process and proceedings that most utilities engage in at the state level. Those choices will determine the ultimate impact of climate change policy on consumers and the national economy.

B. Purpose and Outline of the Paper

Flexibility is often portrayed as a positive attribute of policy – allowing the marketplace and the entities affected to choose the least-cost solutions to a public policy problem. The legislation passed by the House of Representatives leaves a large gap between the carbon target and the minimum efficiency gains mandated by various sections of the bill. This paper explores the potential role of increased energy efficiency to achieve needed reductions of greenhouse gas emissions and the impact of that choice on residential consumer expenditures for electricity.

Section II develops estimates of potential energy use reductions that can be achieved through the adoption of energy efficiency programs for buildings and the cost to consumers of

[9] Gold, Rachel, Laura, et al., Energy Efficiency in the American Clean Energy and Security Act of 2009: Impact of Current Provisions and Opportunities to Enhance the Legislation, American Council for an Energy Efficient Economy, September 2009), page 5.

implementing those programs. To develop those estimates, Section II reviews the results from over two-dozen studies at the national and state levels.

Section III addresses the issue of whether the potential efficiency gains can be achieved. It examines the track record of efforts to improve efficiency to ascertain whether the higher levels indicated by the technical potential studies are practical goals of more aggressive efficiency policies. In light of the many obstacles to increased energy efficiency, the ability of a significant number of states to achieve high levels of efficiency improvement, even prior to enactment of a carbon cap-and-trade program, is an important indicator of what can be done in the years ahead. The primary focus is on electricity, but natural gas is examined as well.

Using the energy use-reduction and cost estimates developed in Sections II and III, the analysis in Section IV provides estimates of the likely impact of aggressive energy efficiency policies on residential consumers' energy bills and the amount of energy reduction and consumer dollar savings that the House climate and energy bill's energy efficiency provisions fail to capture. Findings are presented for both nationwide consumer impact and the impacts on consumers in each of the 50 states and the District of Columbia.

II. THE POTENTIAL FOR IMPROVEMENTS IN ENERGY EFFICIENCY IN THE UTILITY SECTOR

In an earlier analysis, CFA examined the technically feasible and economically practicable level of energy efficiency improvements that could be achieved in the next few decades in the context of the initial discussion draft of climate change legislation circulated by Congressmen Waxman and Markey.[10] That analysis showed that a reduction of 20 to 30 percent in energy consumption at costs that are far below the cost of energy today is not only theoretically possible, but also a practical goal in reality. As noted above, three recent studies confirmed that finding. Because these studies and dozens of others[11] present rigorous estimates of energy savings, we will not review the details here. Rather, this section looks across the studies to ascertain the level and cost of efficiency savings that are broadly deemed to be available in the next couple of decades.

A. POTENTIAL SAVINGS

The analysis of the potential contribution of efficiency begins with the identification of technologies that are currently or soon will be available to reduce energy consumption. There are literally hundreds of measures that have been identified to lower consumption across the industrial, residential and commercial sectors, including energy efficient lighting, building shell improvements, heating and cooling systems upgrades, and others.[12] These measures are not in widespread use but could be deployed widely over the next two decades. Given the state of technological readiness, these measures have reasonably well known or predictable costs and energy saving benefits in comparison to current practices. This is the foundation of the technical and economic potential analysis.

Exhibit II-1 shows the estimated potential efficiency gains for studies covering two-dozen states and regions, as well as the figures from the NRC/LBL, McKinsey and ACEEE national studies. Because the time frames for these studies differ, we have converted the savings to an annual savings basis. The time frame covered in the studies ranges from 5 to 23 years. Generally, the projected potential saving that can be achieved is about 1 to 2 percent per year. The average (un-weighted) estimate in Exhibit II-1 is 1.6 percent per year. A 1.5 percent per year rate of improvement cumulates to a 34 percent reduction over 20 years. A 1 percent pre year improvement cumulates to a 22 percent improvement over 20 years.

B. THE COST OF CONSERVED ENERGY

There are two ways to evaluate the cost-effectiveness of efficiency in the literature. The most commonly used approach is to estimate how much it will cost to save energy on a per unit basis, which can then be compared to what it costs to produce energy. The cost of

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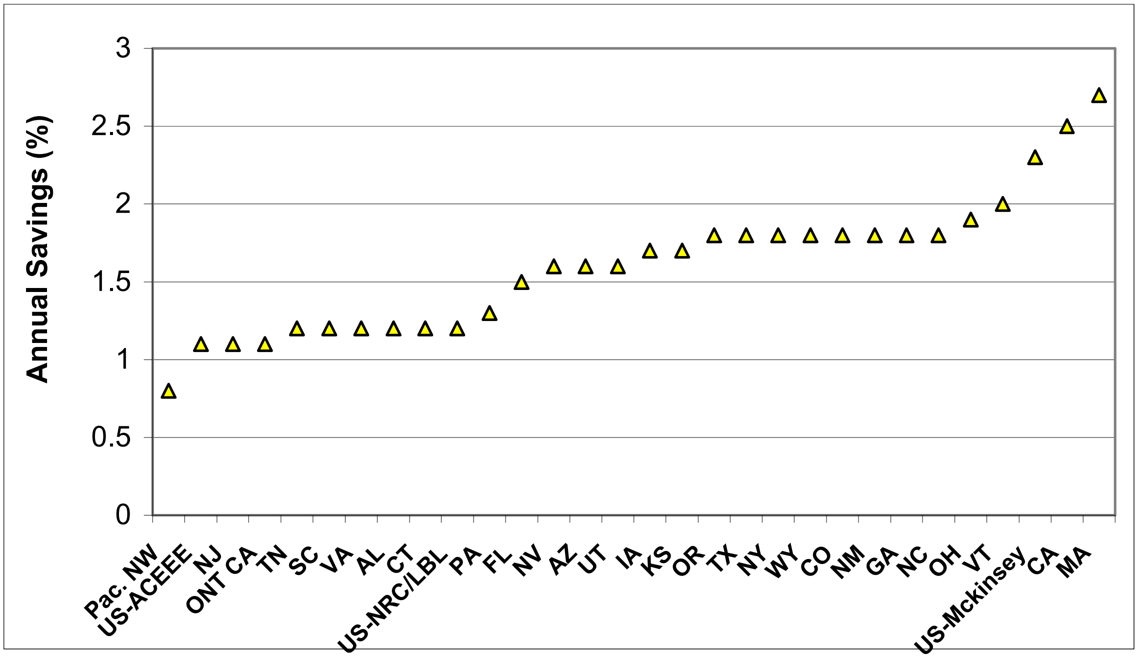
[10] Mark Cooper, *A Consumer Analysis of Energy Efficiency and Renewable Energy Standards: The Cornerstone of Consumer-Friendly Energy/Environmental Policy*, Consumer Federation of America, May 2009.

[11] See the sources in Exhibit II-1 for a list of the studies reviewed for this analysis.

[12] The state-specific studies reviewed below examined as many as 150 measures. The McKinsey study is based on over 675 measures (p.vi).

Exhibit II-1: Potential Economic Energy Savings by State

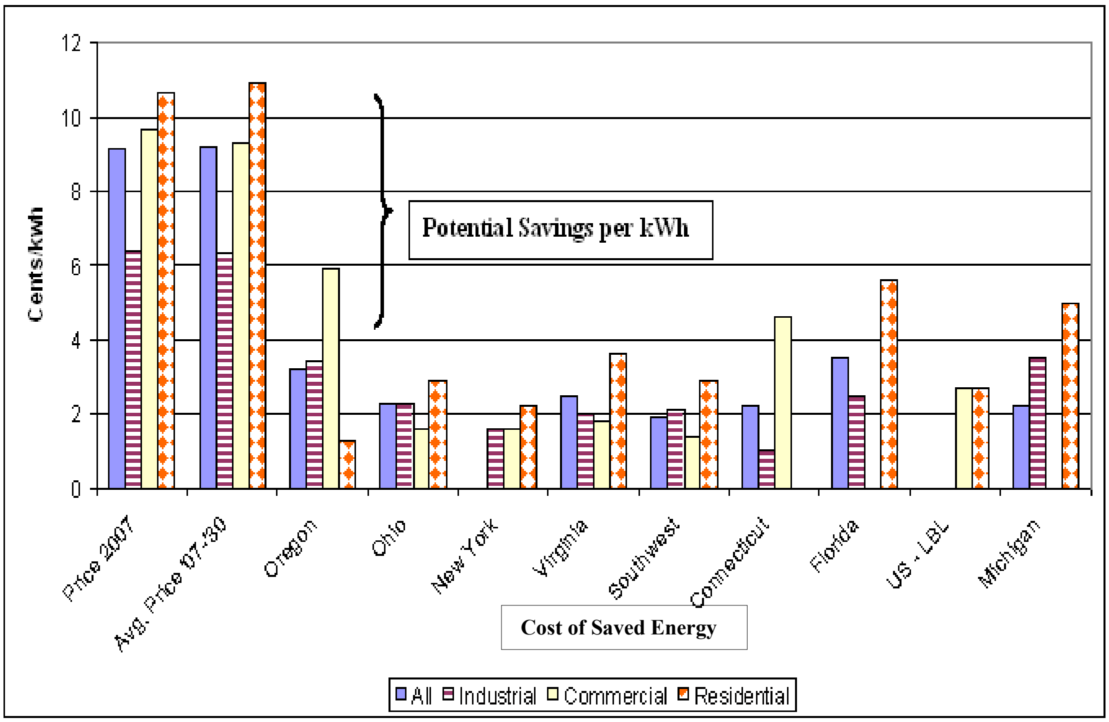


Sources: Beck, Frederic, et al., 2002, *Powering the South: A Clean & Affordable Energy Plan for the Southern United States,* REPP, January 2002. Brown, Richard, Sam Borgeson, Jon Koomey and Peter Biermayer, *U.S. Building-Sector Energy Efficiency Potential* (Lawrence Berkeley National Laboratory, September 2008), pp. 2, 3. American Council for an Energy-Efficient Economy, et al., 2009, *Shaping Ohio's Energy Future,* March 2009, p.13, 15, 17. American Council for an Energy-Efficient Economy, et al., 2008, *Energizing Virginia: Efficiency First,* September 2008, p. 14, 16, 18. American Council for an Energy-Efficient Economy, 2007, Geller, Howard, et al., *Utah Energy Efficiency Strategy: Policy Options,* November 2007. American Council for an Energy-Efficient Economy, 2007, *Energizing Virginia: Efficiency First,"* September 2008. Ecotope, Inc., American Council for an Energy-Efficient Economy, Tellus Institute, Inc., 2003, *Energy Efficiency and Conservation Measure Resource Assessment,* (Energy Trust of Oregon Inc., January 2003). Gold, Rachel, et al., *Energy Efficiency in the American Clean Energy and Security Act of 2009: Impact of Current Provisions and Opportunities to Enhance the Legislation,* American Council for an Energy-Efficient Economy, September 2009), Appendix A. Elliott, R. Neal, et al. *Potential for Energy Efficiency and Renewable Energy to Meet Florida's Growing Energy Demands,* American Council for an Energy-Efficient Economy, June 2007, p. 9, 12. Elliott, R. Neal, et al., 2007, *Potential for Energy Efficiency, Demand Response and Onsite Renewable Energy to Meet Texas' Growing Electricity Needs,* American Council for an Energy-Efficient Economy, March 2007. Laitner, John "Skip," Maggie Eldridge, and R. Neal Elliot, 2007, *The Economic Benefits of an Energy Efficiency and Onsite Renewable Energy Strategy to Meet Growing Electricity Needs in Texas,"* American Council for an Energy-Efficient Economy, September 2007. Optimal Energy Inc, et al., 2003, *Energy Efficiency and Renewable Energy Resource Development Potential in New York State,* August 2003. Kushler, Marty and Dan York, *A Review of Energy Efficiency Potential Studies in the Midwest* (American Council for an Energy-Efficient Economy, December 16, 2008), p. 3. Nadel, Steve, Anna Shipley and R. Neal Elliot, *Technical, Economic and Achievable Potential fro Energy-Efficiency in the U.S. – A Meta-Analysis of Recent Studies* (American Council for an Energy-Efficient Economy, 2004). Prindle, William, R. Rooney, Tom, et al., 2004, *Estimating the Potential for Cost Effective Electric and Peak Demand Savings in Connecticut,* 2004 ACEEE Summer Study on Energy Efficiency in Buildings, 2004. Southwest Energy Efficiency Project, *The New Mother Lode: The Potential for More Efficient Electricity Use in the Southwest,* November 2002, p. 3-13. Stoft, Steven, *The Economics of Conserved-Energy "Supply" Curves,* Program on Workable Energy Regulation, April 1995. Wyandotte Municipal Services Optimization Plan, Michigan Public Service Commission, Case No. U-18558, p. 6.

saved energy is calculated by combining the known cost of technologies that reduce consumption with the estimated energy savings. Taking the time value of money and the life of the technology into account, the analysis produces a cost per kilowatt hour (kWh) or per million BTU saved.

Exhibit II-2 presents the results of a number of studies for the electricity sector prepared for individual states, as well as the national study prepared by NRC/LBL. It shows the results for the residential, commercial and industrial sectors separately, where available. It also includes the average price of electricity for 2008 and the prices projected by the Energy Information Administration (EIA) for the period through 2030.

Exhibit II-2: Electricity Prices (2007$) and the Cost of Saved Electricity by Sectors



Wyandotte Municipal Services Optimization Plan, Michigan Public Service Commission, Case No. U-18558, p. 6. Ecotope, Inc., American Council for an Energy-Efficient Economy, Tellus Institute, Inc., *Energy Efficiency and Conservation Measure Resource Assessment,* (Energy Trust of Oregon Inc., January 2003), p. 9. Southwest Energy Efficiency Project, *The New Mother Lode: The Potential for More Efficient Electricity Use in the Southwest,* November 2002, p. 3-13. R. Neal Elliot, et al. *Potential for Energy Efficiency and Renewable Energy to Meet Florida's Growing Energy Demands* (American Council for an Energy-Efficient Economy, June 2007), p. 9, 12. American Council for an Energy-Efficient Economy, et al., *Shaping Ohio's Energy Future,* March 2009, p.13, 15, 17. American Council for an Energy-Efficient Economy, et al., *Energizing Virginia: Efficiency First,* September 2008, p. 14, 16, 18. Tom Rooney, et al., *Estimating the Potential for Cost Effective Electric and Peak Demand Savings in Connecticut,* 2004 ACEEE Summer Study on Energy Efficiency in Buildings, 2004.

The results are dramatic. Whereas projected electricity prices are just over 9 cents per kWh, the cost of conserved electricity falls in the range of 2 to 3 cents. The NRC/LBL estimate for the national average cost of saved electricity is 2.7 cents per KWh, which is almost 71 percent below the projected average price of electricity. Thus, although the EIA is projecting only small real increases in the price of energy over the next couple of decades, the cost of efficiency is far below the current and future price of electricity.

The McKinsey study did not calculate the cost of conserved electricity, but it did calculate a cost of conserved energy that combined electricity and natural gas savings. The estimate was $4.40 per million BTU, which is 68 percent below the projected average price of supplied energy of $13.80 per million BTU.[13] Thus, the national studies indicate a huge potential cost savings. While the cost of conserved energy varies from state to state, as does the projected price of energy, Exhibit II-2 shows that the cost of conserved energy is likely to be considerably below the cost of energy in both the commercial and residential sectors in all states.

Moreover, the cost projections do not include the impact of carbon abatement policy on the cost of energy. Thus, this comparison provides a conservative basis for estimating the impact of policies to promote efficiency

C. Cost-Benefit Analysis

A second way to look at the potential value of energy savings is to treat the expenditure on energy efficiency as an investment and calculate various cost-benefit ratios.

As shown in Exhibit II-3, the three major national studies are in general agreement about the level and cost of energy savings that can be achieved. The differences between the studies can be readily explained. Potential savings are in the range of 27 to 32 percent across all sectors and for both electricity and natural gas at comparable costs. The differences across the studies can be explained as follows:

The McKinsey study has a shorter time frame and a somewhat lower target for the reduction of energy consumption. It estimates an investment of $354 billion over 10 years to achieve a reduction of 28.1 percent in the energy consumption of the residential and commercial sectors combined, with a benefit-cost ratio of 1.9:1. The NRC/LBL study takes a 20-year view and projects a cost of $441 billion to achieve a reduction of 31.8 percent. Both studies use a 7 percent real discount rate to reflect the time value of money. While NRC/LBL does not provide estimates of savings, it does state that the benefit-cost ratio is almost 3.5 to 1. NRC/LBL presents a second metric for evaluating the investment. It shows that the simple payback on these investments is in the range of 2.4 to 3.7 years. These short payback periods indicate very high rates of return.

[13] McKinsey, Unlocking, p. vii.

Exhibit II-3: Benefit-Cost Ratios for Large-Scale Energy Efficiency Policies

Study	End Year	Energy Source	Energy Meas.	Energy Unit	Sector	BAU 2030 TWh/ Quads	Saving 2030 TWh/ Quads	% Saving	Cost per Unit ($) Saved	Cum Savings Bil. $	Cumulative Cost Bil. $	Ann Savings (End year) Bil. $	B/C Ratio	Simple Payback Years
NRC/LBL	2030	Elect	End Use	kWh	Res	1896	567	29.9	0.027		136	60		2.3
			End Use	kWh	Comm	2062	705	34.2	0.027		163	68		2.4
			End Use	kWh	Total	3958	1272	32.1	0.027		299	128		2.4
		Gas	End Use	Mbtu	Res	5.47	1.51	27.6	6.900		104	19		5.5
			End Use	Mbtu	Comm	4.36	1.51	34.6	2.580		38	17		2.3
			End Use	Mbtu	Total	9.83	3.02	30.7	4.900		142	36		5.0
		Total	Primary	Mbtu	Res	25726	7563	29.4	3.900		240	79		3.7
			Primary	Mbtu	Comm	26329	9022	34.3	2.700		201	85		2.4
			Primary	Mbtu	Total	52055	16585	31.9	3.300		441	164	3.5	3.2
ACEEE Enhanced	2030	Elect	End Use	kWh	Total	3958	1080	27.3	0.025					
		Gas	End Use	Mbtu	Total	9.83	2.7	27.3	3.700					
		Total	Primary	Mbtu	Total		16100	27.3				192	2.2	
McKinsey	2020	Elect	End Use	kWh	Res	1510	390	25.8						
			End Use	kWh	Comm	1660	510	30.7						
			End Use	kWh	Total	3170	900	28.4						
		Gas	End Use	Mbtu	Res	5.2	1.46	28.1						
			End Use	Mbtu	Comm	2.14	0.51	23.8						
			End Use	Mbtu	Total	7.34	1.97	26.8						
		Total	Primary	Mbtu	Res	21410	5650	26.4		395	229	41	1.7	
			Primary	Mbtu	Comm	19790	5920	29.9		290	125	37	2.3	
			Primary	Mbtu	Total	41200	11570	28.1	4.400	685	354	78	1.9	

Sources: McKinsey Global Energy and Materials, *Unlocking Energy Efficiency in the U.S. Economy* (McKinsey & Company, 2009); Richard Brown, Sam Borgeson, Jon Koomey and Peter Biermayer, *U.S. Building-Sector Energy Efficiency Potential* (Lawrence Berkeley National Laboratory, September 2008); Gold, Rachel, et al., Energy Efficiency in the American Clean Energy and Security Act of 2009: Impact of Current Provisions and Opportunities to Enhance the Legislation, American Council for an Energy-Efficient Economy, September 2009. ACEEE benefit-cost ratio is for the end year.

The ACEEE study is different from the other two. While McKinsey and NRC/LBL examine the technological/economic potential, ACEEE models a specific set of policies. The results shown in Exhibit II-3 are taken from the enhanced policy scenario of ACEEE. The ACEEE projected savings are somewhat lower than the other studies (27.3 percent), but ACEEE values savings somewhat higher and estimates the cost to be somewhat higher. The cost-benefit ratio is similar.

The higher dollar value of savings and benefit cost ratio in the NRC/LBL and ACEEE studies can be easily reconciled with the McKinsey study. The difference reflects two primary factors. First, McKinsey values savings at the industrial price of energy, arguing that this is the best estimate of the variable cost of energy. The other two studies value energy at the price to members of the customer class (residential or commercial). McKinsey recognizes that in a long-term study with a large reduction in consumption, the fixed costs of the system, which it has tried to exclude by relying on the industrial price, could be reduced (i.e., become variable). Exhibit II-2 above indicates that the difference would be substantial. The average residential/commercial electricity price is 48 percent higher than the average industrial price. The average residential/commercial natural gas price is 68 percent higher than the average industrial price. Thus, the two sets of assumptions can be seen as alternative views of what the analysis is modeling.

The difference in assumptions about the value of energy savings does not indicate there is something wrong with the analysis; rather it indicates that both studies are based on assumptions that constrain the level of efficiency gains. In a short-term study the variable costs should be considered. In a long-term study fixed costs become variable so total costs can be considered.

D. TECHNOLOGICAL V. ECONOMIC POTENTIAL

The differences in projected energy savings can be explained, in part by the difference in assumptions about the value of energy saved. The level of efficiency gains is dictated by the financial assumptions. Certain efficiency gains are technically feasible but not economically practicable under the assumptions of the studies, but might be considered practicable under different assumptions.

In fact, McKinsey runs several alternative scenarios that indicate a higher technical potential for energy savings:[14]

- A lower discount rate would increase the cumulative amount of energy saved by 13 percent.
- Adding a substantial value of carbon to the value of savings (e.g., $30 - $50 per ton) would increase the amount of cumulative savings by 5 to 10 percent.

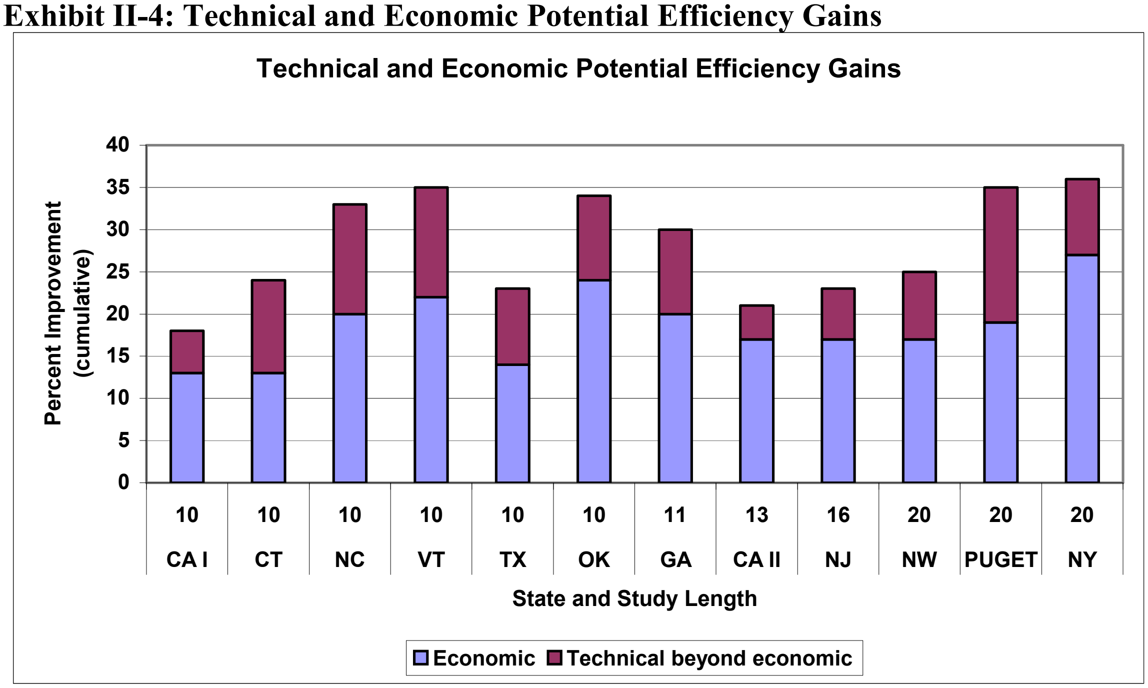
[14] McKinsey, p. 8.

ACEEE also conducted an analysis that shows the importance of policy in achieving energy efficiency.[15] It modeled the provisions of ACES as passed by the House of Representatives and found that it would achieve a reduction in electricity consumption of only 8 percent, compared to an enhanced approach that would achieve a reduction of over 27 percent, much closer to the level of savings potential estimated by McKinsey and NRC.

These alternative cases remind us that all of the studies are driven by economics. There is a substantial technical potential for savings beyond the savings justified by the economic assumptions in the base case of these studies. Exhibit II-4 shows that the McKinsey estimate of greater technical potential is consistent with other recent studies. It shows the difference between the technical potential and economically practicable efficiency gains in a dozen studies.

Much more could be done over longer time frames or at higher costs, or if the cost of some technologies declines over time. Exhibit II-4 shows the difference between the purely technical potential and the economically constrained potential for a dozen cases. This subset is representative of the broader set of studies. The exhibit indicates that potential efficiency gains are in the range of 1 to 2 percent per year. The annualized economic potential is about

Exhibit II-4: Technical and Economic Potential Efficiency Gains



Sources: Nadel, Steve, Anna Shipley and R. Neal Elliot, *Technical, Economic and Achievable Potential for Energy-Efficiency in the U.S. – A Meta-Analysis of Recent Studies* (American Council for an Energy-Efficient Economy, 2004); Kushler, Marty and Dan York, *A Review of Energy Efficiency Potential Studies in the Midwest* (American Council for an Energy-Efficient Economy, December 16, 2008); Sharon (Jess) Chandler and Marilyn A. Brown, *Meta-Review of Efficiency Potential Studies and Their Implications for the South,* Ivan Allen College School of Public Policy, Georgia Tech, August 2009), p. 39.

[15] Gold, Appendix A.

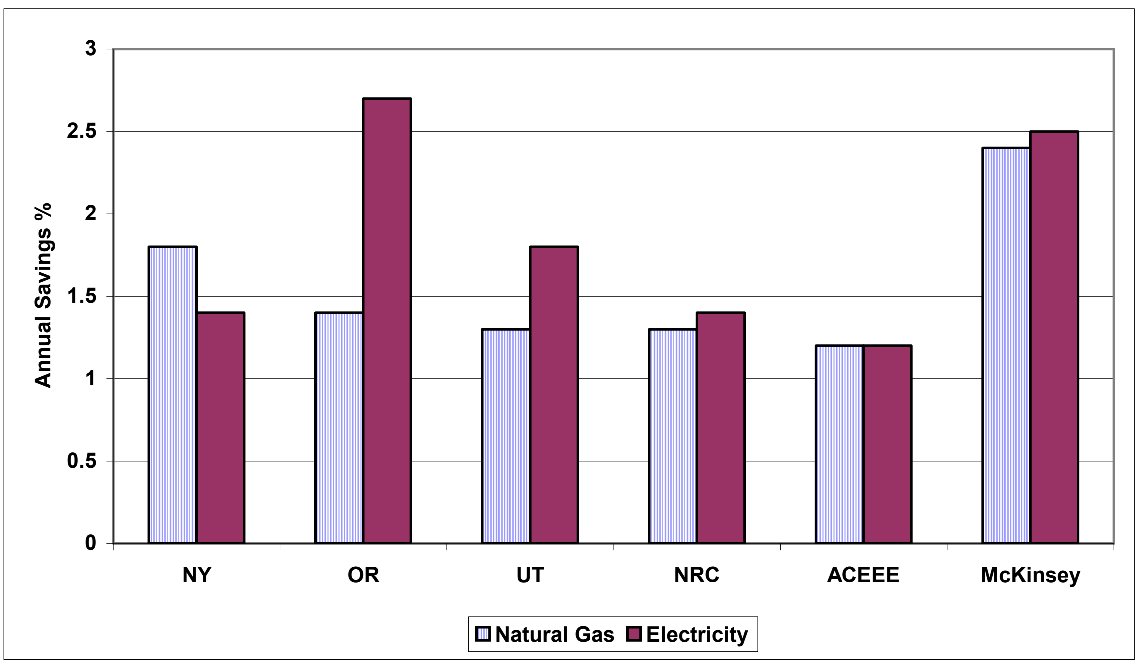
1.3 percent, consistent with the results in Exhibit II-1. That is, the economic potential is about 18.5 percent over an average of just over 13 years. Technical potential is, on average, about 28 percent, about 50 percent higher than economic potential.

Based on the above analyses, we conclude that a reduction in electricity consumption of 20 to 30 percent below business as usual at a cost of 3 cents per kilowatt hour is technically feasible and economically beneficial.

E. NATURAL GAS

The potential for natural gas savings has been studied less frequently than electricity, but the results are similar. As shown in Exhibit II-5, the level of potential savings in several state and national studies is similar for natural gas and electricity. On average, across these six studies, the potential for natural gas savings is slightly higher than for electricity. The average is 1.8 percent per year for natural gas, compared to 1.6 percent for electricity, in this group of studies. This indicates that the group is representative of the larger group of studies of electricity, and a range of 20 to 30 percent savings over the course of two decades is technically feasible and economic.

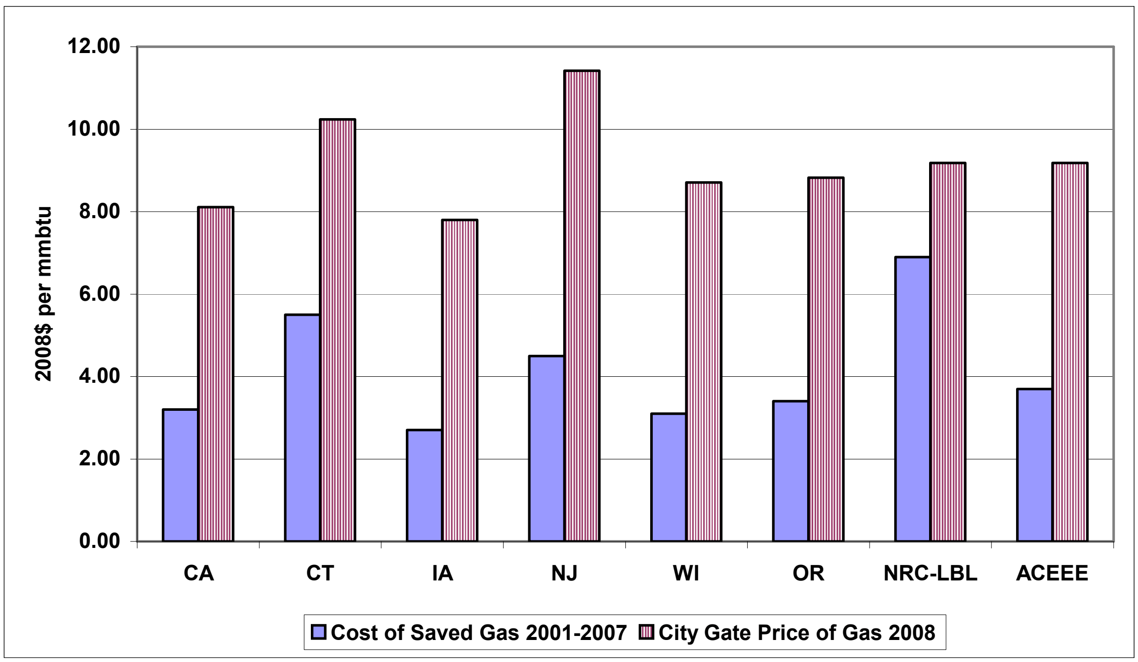
Exhibit II-5: Potential Electricity and Natural Gas Savings



Sources: Ecotope, American Council for an Energy-Efficient Economy and Tellus, *Energy Efficiency and Conservation Measure Resource Assessment, Prepared for the Energy Trust of Oregon, Inc.,* January 2003. Howard Geller, et al., *Utah Energy Efficiency Strategy: Policy Options,* November 2007. Richard Brown, Sam Borgeson, Jon Koomey and Peter Biermayer, *U.S. Building-Sector Energy Efficiency Potential* (Lawrence Berkeley National Laboratory, September 2008). Gold, Rachel, et al., Energy Efficiency in the American Clean Energy and Security Act of 2009: Impact of Current Provisions and Opportunities to Enhance the Legislation, American Council for an Energy-Efficient Economy, September 2009. Optimal Energy Inc., et al., 2003, *Energy Efficiency and Renewable Energy Resource Development Potential in New York State,* August 2003; Optimal Energy Inc., et al. 2006, *Natural Gas Energy Efficiency Resource Development Potential in New York State,* October 31, 2006.

Exhibit II-6 shows the cost of these savings. For comparison we use the city gate price, which excludes the local distribution costs. The potential economic gains are large, although not quite as great as in the electricity sector. In the natural gas sector, the NRC/LBL estimate of the cost of saved energy is about twice as high as the other studies. The McKinsey estimate of the cost of saved energy for natural gas and electricity combined is more consistent with the ACEEE estimates. Since the NRC estimate was based on an extrapolation of a single state study to the nation, we believe the ACEEE estimate is more reliable and will use it in subsequent analysis.

Exhibit II-6: Cost of Saved Gas and City Gate Prices



Source: Friedrich, Katherine, et al., *Saving Energy Cost Effectively: A National Review of the Cost of Energy Saved through Utility-Sector Energy Efficiency Programs,* September 2009.

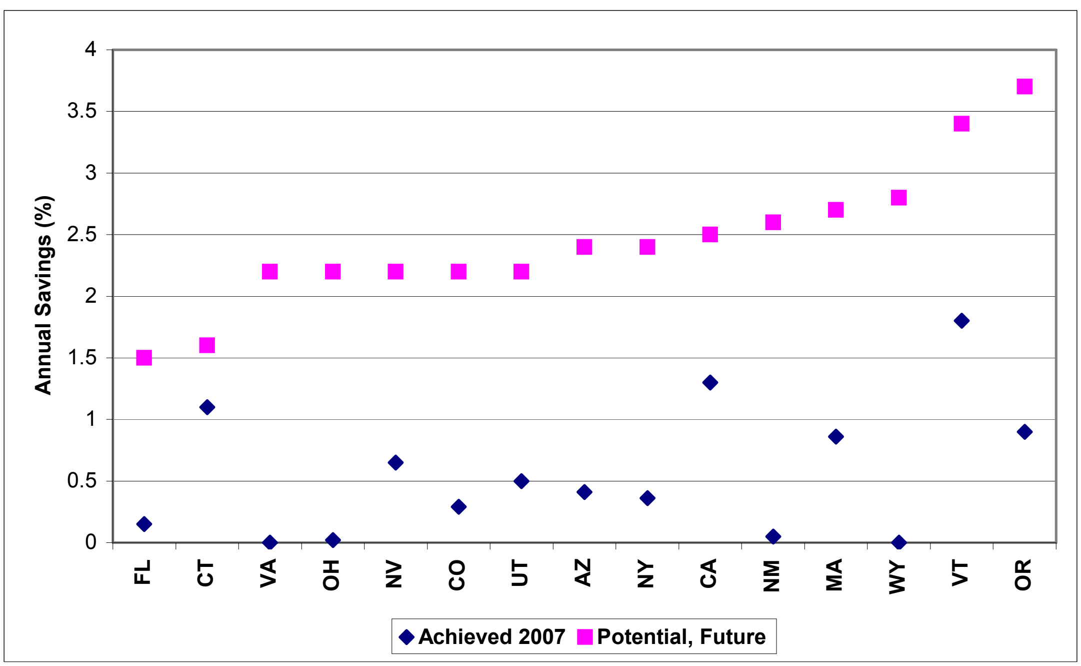
III. The Achievement of Greater Energy Efficiency

A. Achieved v. Potential Savings

The estimates of potential savings are based on engineering studies of the use of technologies that are technically feasible (i.e. the technologies are off-the shelf) and economically efficient (i.e. the investments cost less than the avoided cost of energy). This Section reviews the growing body of evidence that efficiency savings at those levels are also practicable, i.e. programs can be instituted to achieve the levels of energy efficiency at the costs projected by the engineering studies. Over the past two decades several states have achieved dramatic success in reducing energy consumption through efficiency programs. Studies of the achieved levels of efficiency gain in the states that have pursued aggressive policies to lower consumption corroborate the studies of efficiency potential.

The existence of different levels of economic and technological potential suggests that we should expect to see different levels of achievement depending on how vigorously efficiency is pursued in the state. Several of the states for which detailed studies of efficiency potential have been conducted have also been studied to assess the level of energy savings actually achieved in the past decade or so (as shown in Exhibit III-1). The results vary widely.

Exhibit III-1: Achieved v. Potential Electricity Savings by State

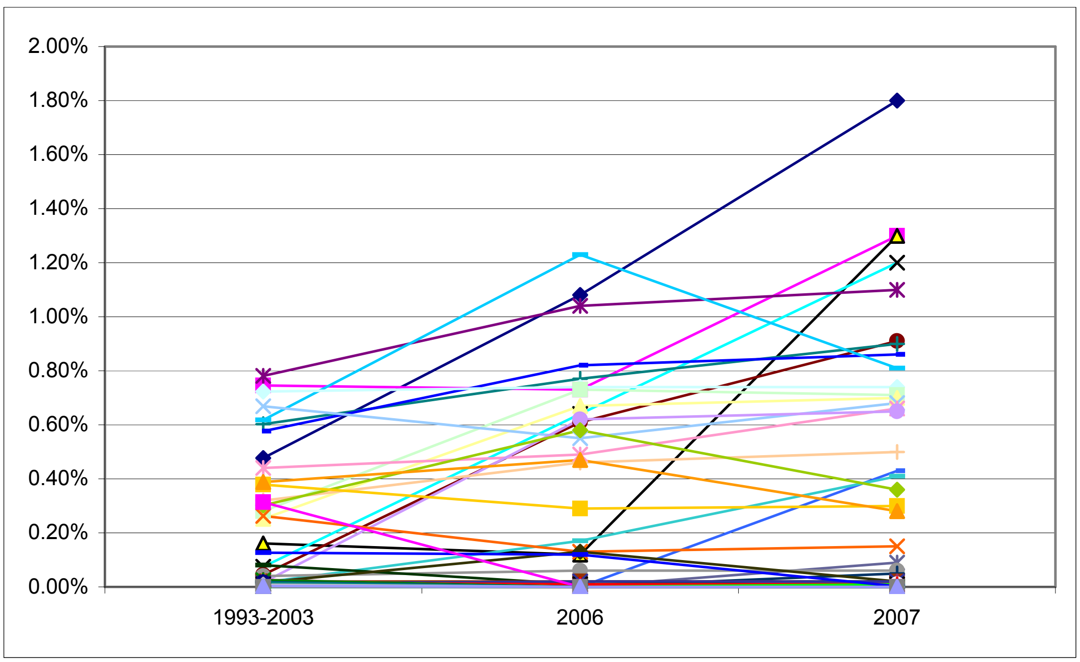


Source: American Council for an Energy Efficient Economy, *The 2009 Energy Efficiency Scorecard,* October 2009. Exhibit II-1.

In the most recent year no state achieved its potential. For these states, the average achieved saved energy is about .5 percent per year, which includes only savings from electric utility programs and not the full range of policies such as building codes, appliance efficiency standards and retrofit programs. The average potential is about 2.3 percent per year. There are a variety of other policies and programs, like building codes and appliance standards that can increase energy efficiency and reduce consumption.

Exhibit III-2 shows the annual savings from efficiency programs in the electricity sector over a fifteen-year period for all the states. There are a small number of states that have increased their efficiency gains, but the vast majority has not. Five states in this set approach or exceed the level of a one percent efficiency gain or more. These five are generally the best performing states and they exhibit increases in efficiency gains over recent years. This Exhibit includes only utility programs, but not building codes, appliance standards and retrofits programs to achieve greater efficiency.

Exhibit III-2: Annual Savings from Electric Utility Efficiency Programs: All States



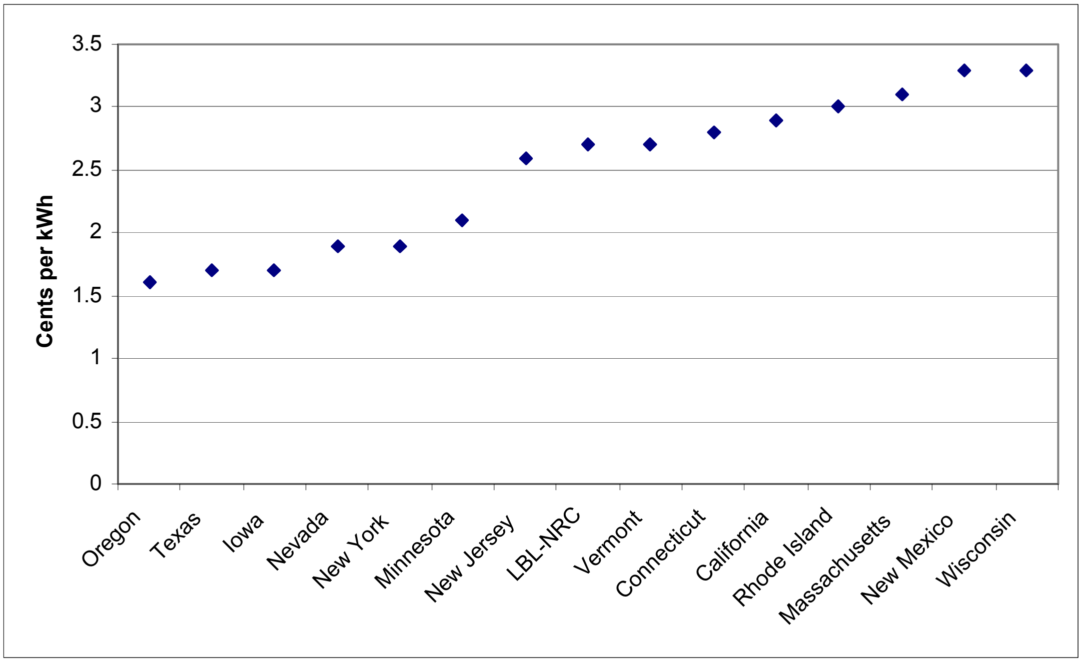
Source: ACEEE, Annual Scorecard on Energy Efficiency, various issues.

The studies of the cost of achieved energy savings also corroborate the earlier estimates of potential savings. ACEEE evaluated the cost of saved energy achieved by states that have adopted aggressive programs to lower consumption.[16] As shown in Exhibit III-3, the

[16] Friedrich, Katherine, et. al., *Saving Energy Cost Effectively: A National Review of the Cost of Energy Saved through Utility-Sector Energy Efficiency Programs,* September 2009. This study updates an earlier study (Kushler, Martin, Dan York, and Patti Witte, *Five Years In: An Examination of the First Half*

state-by-state findings support the NRC-LBL projection of 2.7 cents per kWh as the cost of saved energy. The mean in the individual state studies is 2.5 cents per kWh and the median is 2.7 cents.

Exhibit III-3: Cost of Saved Electricity



Source: Friedrich, Katherine, et. al., *Saving Energy Cost Effectively: A National Review of the Cost of Energy Saved through Utility-Sector Energy Efficiency Programs,* September 2009.

Exhibit III-4 shows the results of the analysis of the cost of saved energy for natural gas in the states studied by ACEEE. They corroborate the earlier estimates of the cost of potential energy savings. The average for these states is abut $3.70 per million BTU, which is close to the estimate used by ACEEE, but substantially below the estimate used by NRC-LBL.

Statistical Analysis of Cross Sectional Data

The above analyses involve a series of case studies. To examine the issue of the effectiveness of policy, we have combined analyses of energy efficiency programs from the ACEEE with a data set on electricity consumption and prices from the Energy Information Administration. ACEEE has evaluated the programs to promote efficiency across the nation for the period 1993-2008. The EIA database provides information on the level of consumption and price of electricity in the states from 1990 to 2007. Combining these allows

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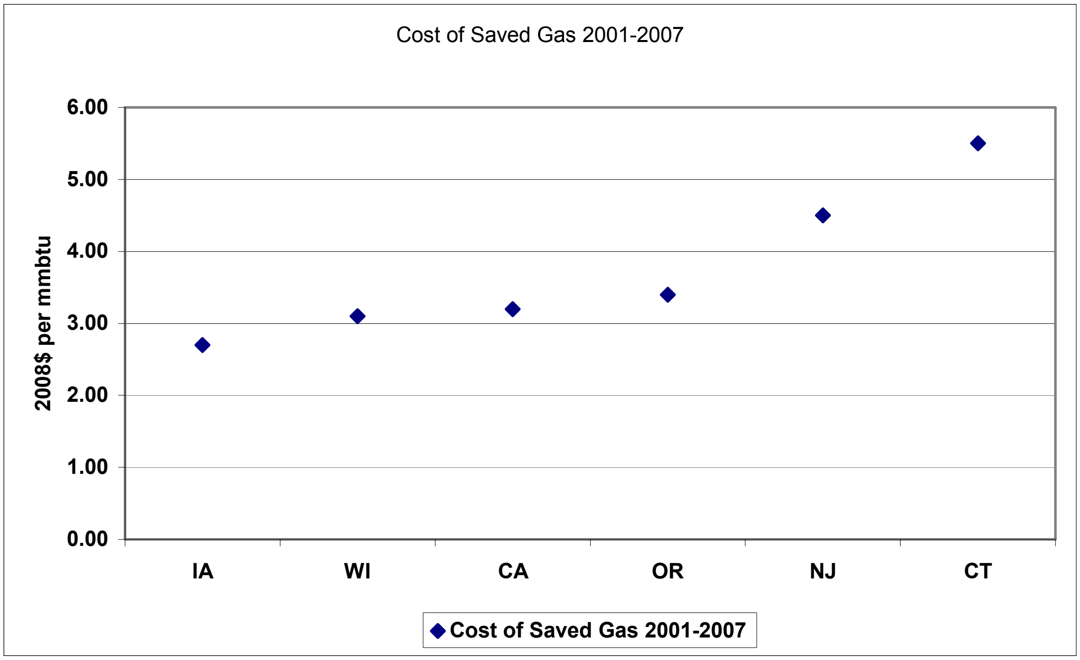
Decade of Public Benefits Energy Efficiency Policies (American Council for an Energy Efficient Economy, 2004).

us to assess whether active policies to promote energy efficiency can achieve the levels of annual efficiency gains identified above as technically feasible and economically practicable.

Exhibit III-4: Cost of Saved Gas and City Gate Prices



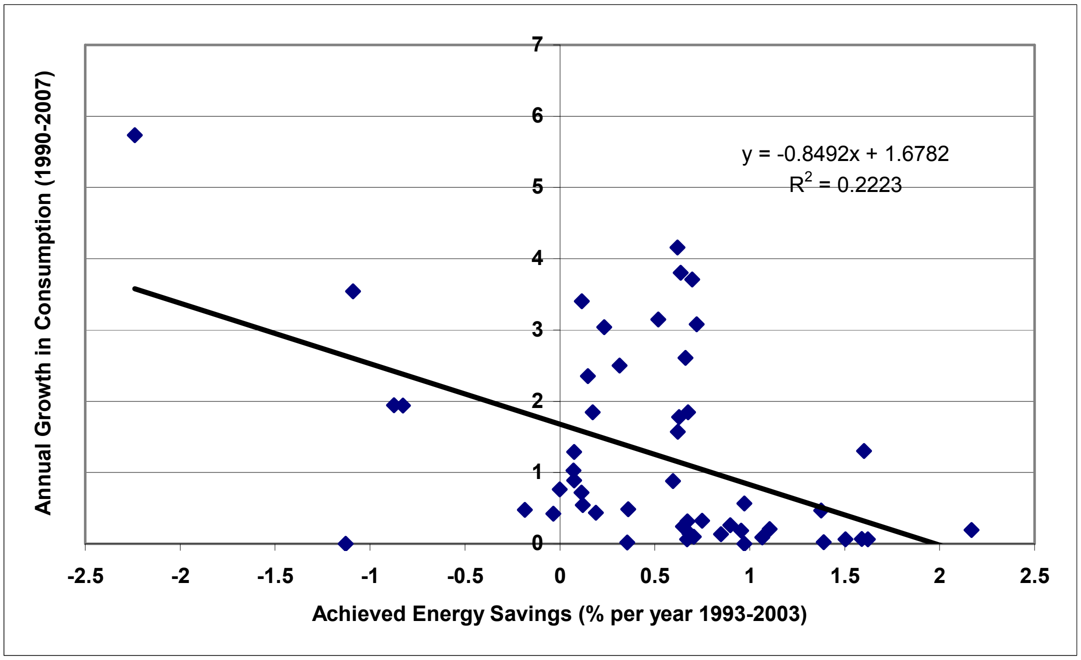
Source: Friedrich, Katherine, et. al., *Saving Energy Cost Effectively: A National Review of the Cost of Energy Saved through Utility-Sector Energy Efficiency Programs,* September 2009.

Looking across all 51 jurisdictions (50 states plus the District of Columbia), we find that there is a significant negative relationship between the energy efficiency savings resulting from state policies and the growth of electricity consumption per capita (see Exhibit III-5). Increases in energy savings from efficiency programs result in a near one-to-one reduction in growth of energy consumption. Efficiency programs explain about a quarter of the growth in consumption.

Best v. Worst States

A simple way to appreciate what can be done with aggressive energy efficiency policy is to contrast the characteristics of the best performing and the worst performing states. While it is an overstatement to say that if one state can achieve a high level of energy savings all states can, the fact that a significant number of states has achieved a much higher level of efficiency is an indicator of the possibility for a much higher level of performance by all states. While any grouping of states will be arbitrary, contrasting the top ten states on energy savings to the bottom ten (the top quintile versus the bottom quintile) should provide a solid basis for comparison.

Exhibit III-5: Efficiency Gains from Policy Compared to Growth in Consumption



Source: American Council for an Energy Efficient, Economy, State Annual Scorecard, various years, EIA consumption database.

Exhibit III-6 shows several key characteristics of the best and worst states. Overall, usage per customer grew by a cumulative total of 16.7% in the worst states over the

Exhibit III-6: Best v. Worst States on Key Energy Efficiency Characteristics

	Best 10	Worst 10
Cumulative Growth Per Account 1990-2007	2.6%	16.7%
Cumulative Price Increase 1990-2007	19%	58%
Efficiency Spending per Capita	$89.2	$6.7
Cumulative Energy Savings	3.6%	0.5%
ACEEE Rankings		
Utility Programs	12.3	1.6
Building Codes	6.5	3.0
Combined Heat Power Policy	3.7	1.8
Appliance Standards	1.7	0

Source: American Council for an Energy Efficient Economy, State Annual Scorecard, various years, EIA consumption database.

seventeen-year period. The consumption growth includes the increase in the number of customers. In contrast, in the best states, usage grew by a cumulative total of just 2.6% in the seventeen-year period. Prices increased by 19% in the states with the fastest consumption growth, in contrast to 58% in the states with the slowest growth. Per capita spending on energy efficiency programs was quite low in the worst states, $6.7 per capita, in contrast to $89.2 in the best states. Not surprisingly, energy savings resulting from efficiency programs was near zero in the worst states (.06%), but quite substantial in the best states (3.6%). The ACEEE rankings of public policy toward efficiency are also instructive. The top ten states have much higher rankings on the policies that have been pursued at the state level for a long period of time -- utility programs, building codes, combined heat and power policies and appliance standards.

B. ECONOMETRIC ANALYSIS

The simple correlations and comparisons discussed above support the conclusion that aggressive policies to promote efficiency have the expected impact on energy consumption. Because they are simple, bivariate relationships, there is the possibility that other variables might actually account for the observed relationships. To examine this possibility, we created an econometric model that controls for other important factors that might be offered as explanatory variables. To explain the current level of consumption in 2007, we examined a simple model in which 2007 consumption is expressed as a function of past consumption, changes in price between 1990 and 2007 and efficiency programs output in 1993-2003.[1] Including the 1990 consumption as a predictor accounts for the myriad of other factors, like climate and local practices, which affect consumption. Price is traditionally a key economic variable affecting consumption.

As shown in Exhibit III-7, the model explains about 84 percent of the variance in current consumption. The signs on the coefficients for all variables are all in the expected direction and statistically significant. The level of consumption in 1990 is positively related to consumption in 2007, explaining about three quarters of the variance in consumption in 2007. Higher levels of spending on efficiency programs are associated with lower levels of consumption. The efficiency program variable and the price variable are similar in size, with the program effects slightly larger and statistically significant at a higher probability.

Exhibit III-7: Econometric Model of Energy Consumption Per Account in 2007

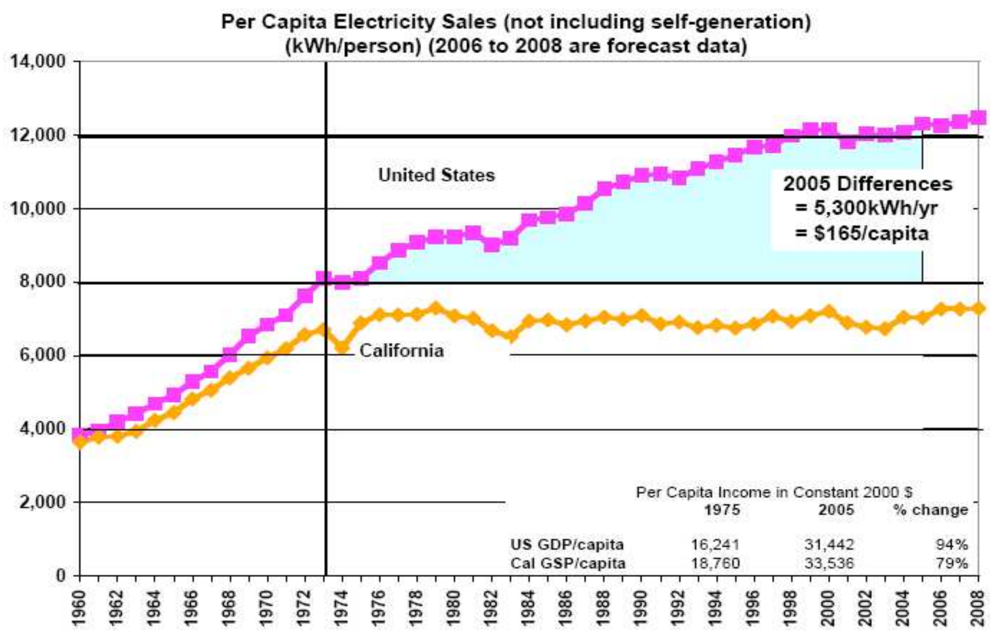
Variable	Beta	Sig.
1990 Consumption	.85	.000
Price increase 1990-2007	-.13	.093
EE spending	-.21	.008
R^2 adjusted	.837	

C. State Case Studies

The finding that aggressive efficiency policy can offset baseline electricity demand growth is consistent with other evidence. The most prominent case is that of California, where aggressive efficiency policy has been pursued for over three decades.[17] There is a debate about what the California experience means, but the pattern of consumption is dramatic. The break in electricity consumption per capita in California compared to the national trend is striking and it is coincident with the up-tick in the commitment to efficiency.

Exhibit III-8 shows annual electricity consumption per capita in California. Per capita consumption in California was essentially flat for 30 years. However, it grew by 50 percent in the rest of the nation. And as population was growing, total electricity consumption was also increasing. Between 1970 and 2007, when per capita consumption was flat, total consumption grew by about 1.3 percent per year. In the other states, it grew an average of 2 percent per year. Thus, consumption grew 50 percent faster in the rest of the nation than in California. That performance has attracted a great deal of attention.

Exhibit III-8: California Per Capita Electricity Consumption 1960-2008

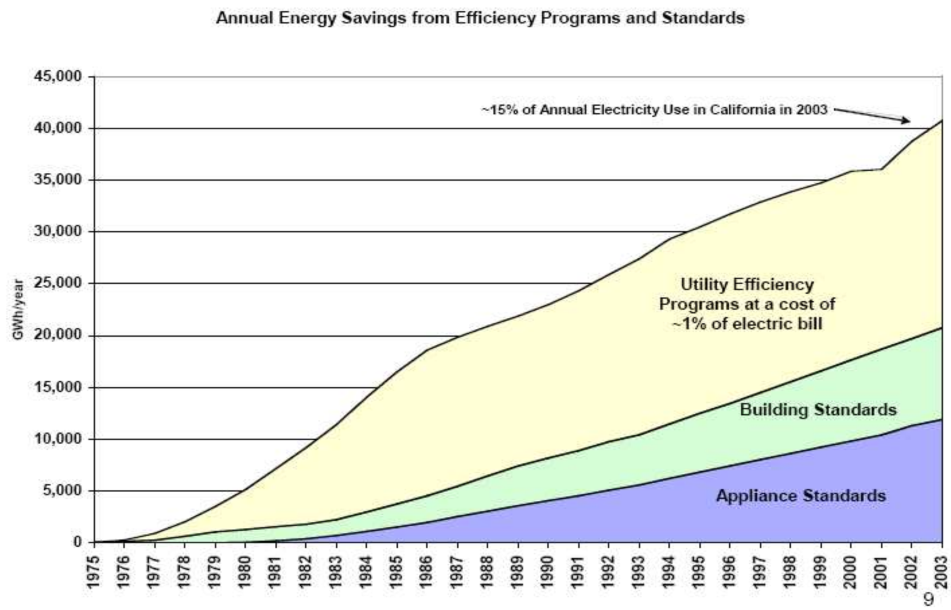


Source: Arthur H. Rosenfeld, *Energy Efficiency: The First and Most Profitable Way to Delay Climate Change,* Pacific Energy Center, San Francisco, May 19, 2008, pp. 8, 9, 18.

[17] See Cooper, *An Analysis*

As shown in Exhibit III-9, the California analysis attributes a little less than half of the energy savings to standards for appliances and buildings. Slightly more than half of the energy savings is attributed to utility-targeted efficiency policy. A variety of challenges have been advanced to rebut the claim that efficiency policy is the key to the outcome in California. A close examination of the data suggests that efficiency policy had a significant impact, although other factors were at work as well.[18]

Exhibit III-9: Aspects of the California Success Story



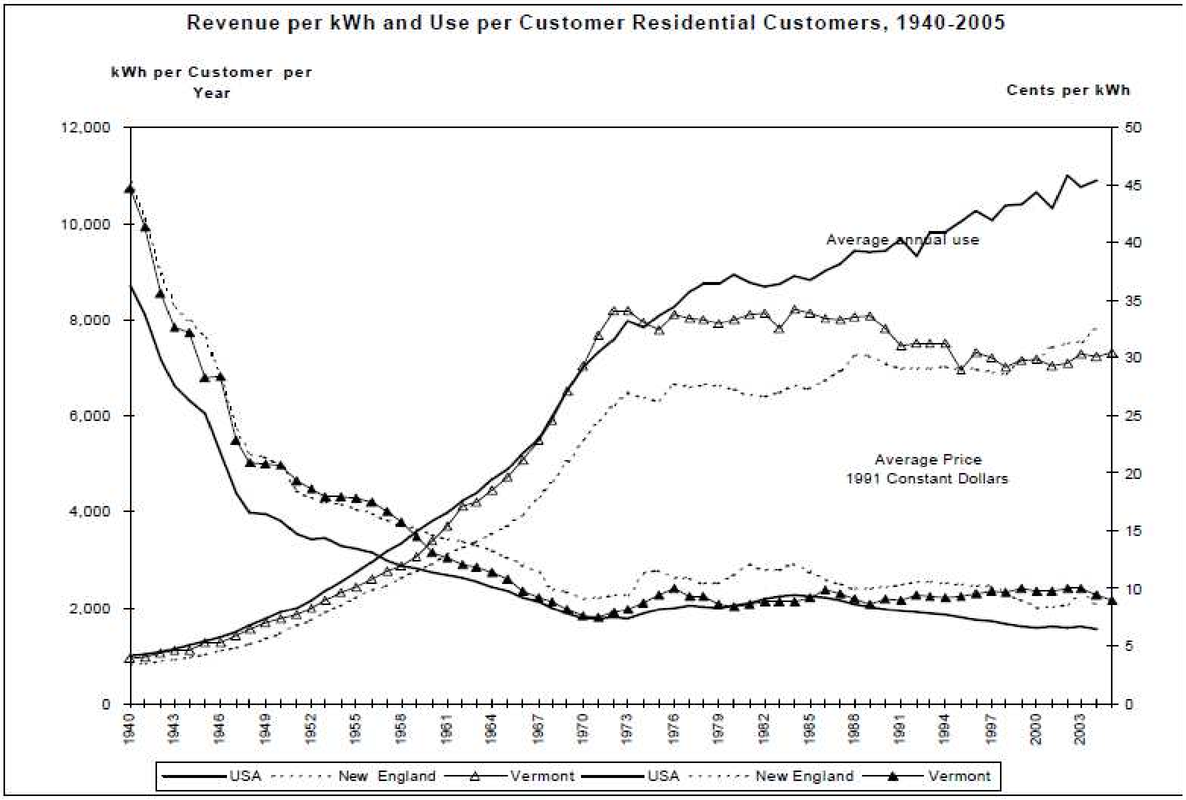
Source: Arthur H. Rosenfeld, *Energy Efficiency: The First and Most Profitable Way to Delay Climate Change,* Pacific Energy Center, San Francisco, May 19, 2008, pp. 8, 9, 18.

California is not the only state to achieve this outcome. Vermont, which has consistently ranked higher than California on many of the ACEEE rankings, exhibits much the same pattern, as shown in Exhibit III-10. In the early 1970s, Vermont was slightly above the national average in per capital electricity consumption, while all of New England was somewhat below the national average. For about a decade and a half, Vermont stabilized its per capita consumption, while in New England per capita consumption increased slightly. National average consumption per capita grew more quickly. In the late 1980s, per capita electricity consumption in Vermont began to decline, while in New England and the nation if continued to rise. By 2004 per capita consumption in Vermont was below that of New England by about 10 percent and about 30 percent below that of the U.S. It has become the most aggressive state in promoting energy efficiency. Indeed, California and Vermont are among the top ten analyzed earlier and they consistent rank at the top of the ACEEE efficiency scorecard.

[18] See Cooper, *An Analysis*

Exhibit III-10: Vermont Electricity Consumption,

Figure 2-1



Source: Vermont Department of Public Service Biennial Review: 2007, p. 70

D. POLICY DEFICIENCIES

The possibility of achieving much higher savings due to untapped technical potential is matched by the possibility that lower savings will result from policies that are deficient. The existence of such large potential savings in a capitalist economy indicates that there are barriers to energy efficiency. The McKinsey analysis is largely devoted to identifying those barriers and the policies that can overcome them. The important point for the current study is that there is strong agreement between three major studies on the very large potential savings at very low costs.

The ACEEE analysis provides an estimate of the policy deficit in ACES and underscores how much is at stake. ACEEE compared the efficiency policies in HR2454 to an enhanced set of policies, which, as we have seen, would bring the performance of the policy much closer to the economic potential identified by NRC/LBL and McKinsey (see Exhibit III-11). The policy deficit for 2030 is largely in the electricity sector, where ACES, as passed, captures less than 40 percent of what the enhanced policy would capture. The end year loss for consumers resulting from the policy deficit is put at over $40 billion in 2007$. Cumulatively, assuming a smooth ramp up in energy savings, the loss resulting from the policy deficit would likely exceed $400 billion. This magnitude of the policy deficit is consistent with the McKinsey analysis. McKinsey estimated a net savings of approximately $700 billion, with energy savings of 28 percent. ACEEE estimates that ACES, as passed, would save only 8 percent, slightly more than one quarter of the potential. This suggests that over $400 billion of potential savings would go unrealized.

Exhibit III-11: The Importance of Aggressive Policies to Capture Efficiency Gains

	Electricity	Natural Gas	2030 Saving Billion 2007$	
	TWh	mmbtu	Gross	Net
ACES as passed	426.4	2.5	118	62
ACES Enhanced	1078.9	2.6	192	105

Gold, Rachel, et al., Energy Efficiency in the American Clean Energy and Security Act of 2009: Impact of Current Provisions and Opportunities to Enhance the Legislation, American Council for an Energy-Efficient Economy, September 2009, Appendix A.

E. CONCLUSION

There are two ways that the policy deficiency in ACES could be made up. One is for the Congress to amend the bill and adopt stronger policies. The second is for utilities and states to use the flexibility in ACES to pursue least-cost approaches to meeting energy needs in a carbon-constrained environment. In fact, it will probably be necessary for both federal and state policymakers to act aggressively to ensure the maximum benefit of energy efficiency is captured.

All of this evidence clearly supports the conclusion that energy efficiency programs can achieve a sustained reduction in consumption of 1 to 2 percent over a long period of time building up to the reduction of 20 to 30 percent that the technical potential studies support. Moreover, it is important to recognize that the states that have done better did so with specific policies to promote efficiency along the lines that have been opened by HR2454. They engaged utilities in the efficiency effort and adopted stronger building codes and appliance standards. They also provided stronger incentives through larger price increases.

IV. Energy Efficiency And Consumer Utility Bills

A. Assumptions and Approach

Introduction

Based upon the analysis in Section II and Section III, we have estimated the impact of an aggressive energy efficiency policy on consumer utility bills. We examine the annual impact on household electric bills of a 20 and a 30 percent reduction in electricity consumption at a cost of 3 cents per kilowatt-hour saved and $3.70 per mmbtu of natural gas saved. The findings represent the long-term impact of an aggressive approach that ensures the maximum capture of energy efficiency over one to two decades.

The analysis of annual impact on household energy bills is divided into two segments: an estimate of the direct impact of energy consumption reductions on the energy bill and an estimate of the out-of-pocket costs to consumers for more-energy-efficient appliances and other efficiency-enhancing improvements. In other words, first we look at the impact on the energy bills of reduced consumption, and then we assume that the full cost of achieving that reduction is paid for by the consumer. By subtracting the cost of efficiency from the direct bill savings, yields the net consumer pocketbook savings.

Analysis of impacts of energy efficiency on consumers' utility bills

For the electric utility bill analysis we start with the average energy consumption and price in 2007, which is the last year for which detailed state-by-state data is available. We then escalate the 2007 estimates by the national average increase in electricity prices in 2007-2008. We treat a part of the bill as fixed, which covers the fixed costs of utility service. This is recovered in a fixed monthly consumer charge. To account for this, we subtract $10 per month from the average electricity bill to reflect fixed costs that are recovered in fixed monthly customer charges. This is higher than the average charge today of about $6. As consumption falls, there will be efforts to recover more of the fixed costs in fixed monthly charges. For natural gas, we calculate savings based on the statewide average city gate price, which excludes the cost of local distribution.

The direct bill estimate, however, does not take into account the cost of making the efficiency gains. Although some of the costs of efficiency might be recovered on the energy bill where the utility is involved in an efficiency program, most of those costs will not be reflected on the consumer's bill. However, the consumer will likely bear those costs in mortgages or appliance costs, which will be higher due to the cost of the energy-saving technologies used to reduce consumption. The consumer pocketbook cost estimate subtracts the cost of the efficiency gains from the total savings on the electricity bill.

For natural gas, we have detailed data on natural gas consumption and prices for 2008. We calculate the average consumption per household in the state, including all households, whether or not they use natural gas. We use the number of households that have electricity as the base. This makes the two estimates comparable. To estimate the direct household bill impact for the value of natural gas we use the city-gate price. This excludes distribution costs and is a good approximation of what consumer bill impact will be. To estimate the net impact of natural gas savings, we use the ACEEE estimate of $3.70 and the state-by-state estimates.

The estimates of consumer impacts are calculated at the average consumption and price for each state. If electricity or natural gas prices rise, as expected, the value of the efficiency savings would be higher. Households that consume more than the average for the state would save more; those that consume less would save less. Since only about 60 percent of households heat with natural gas, the savings for those households will be much larger.

B. Results

Aggregate impacts on consumers' electric bills

Because the average cost of efficiency is substantially below the average cost of energy, energy efficiency lowers the monthly electricity bill and yields a net consumer pocketbook savings when the costs of implementing efficiency are included, as shown in Exhibit IV-1. For 2030, the direct electricity bill savings are estimated at between approximately $230 and $345 per year per household in the 20% and 30% scenarios, respectively. For natural gas the estimated savings are between $71 and $106. The total savings would be between $301 and $451 per household. Nationwide annual savings across all households in the end year are between $37 billion and $66 billion.

Exhibit IV-1: 2030 Savings per Household from Aggressive Energy Efficiency policy

Impact Measure:	Direct Bill Impact		Net Savings	
Scenario:	20%	30%	20%	30%
Per Household (2008$)				
Electricity	$230	$345	$158	$237
Natural Gas	71	106	-42	62
Total	301	451	200	299
Total National (Billion 2008$)				
Electricity	28.5	52.7	19.5	29.3
Natural Gas	8.8	13.1	5.2	7.7
Total	37.3	65.8	24.7	37.0

Netting out the cost of conservation, the consumer pocketbook savings per household for electricity are between approximately $158 and $237 per year in the 20% and 30% scenarios, respectively. For natural gas the projected net savings are between $16 and $62. Total savings would be between $174 and $299 per household. Nationwide annual savings across all households in the end year are between $21.5 billion and $37.1 billion.

The aggregate savings numbers are different from some of the other national studies because of the way we have conceptualized the consumer impact, but the differences can be easily reconciled, as shown in Exhibit IV-2. Our 30 percent scenario assumes a slightly higher level of savings than the national studies. We have used constant 2008 dollars, whereas the national studies used constant 2007 dollars. We have subtracted fixed costs from the value of saved energy. We have estimated only the impact on residential bills, whereas the other studies consider commercial sector impacts as well.

The commercial use of electricity is somewhat less than the residential use. Thus, savings in the commercial sector would be about 90 percent of savings in the residential sector. It is not clear how these commercial sector efficiency gains would impact the consumer pocketbook, but they certainly should factor into any overall evaluation of the program. In the commercial sector it is likely that they will be passed through to consumers in the cost of goods and services they consume. Exhibit IV-2 shows that the estimates for the benefits of capturing the full measure of the benefits from efficiency fall in a narrow range, when the assumptions and scope of the analysis are consistent. The aggregate end-year benefits are in the range of $80-$90 billion. The per-household benefits are in the range of $800-$900 per year.

Exhibit IV-2: Reconciling Energy Savings Estimates

	CFA Adjustment Add in Fixed	LBL Adjustment Inflate to 2008
Gross savings (Billion 2008$) In 2030, residential only	81	86
	CFA Adjustment Add in Fixed Add in Commercial	ACEEE Adjustment Inflate to 2008
Per household savings (2008$)	787	916

State-by-state impacts

Exhibit IV-3 shows the results on a state-by-state basis. In the 20-percent scenario, the direct bill savings fall between $177 and $405, with the vast majority of states falling in the range of $200-$350, while the net impact savings are between $70 and $308, with the vast majority of states falling in the $100-$200 range. For the 30-percent scenario the direct bill savings fall between $265 and $610, with the vast majority of states falling in the range of $300-$500. The net impact savings are between $114 and $462, with the vast majority of states falling in the $120-$300 range. In no case do we estimate a negative impact of achieving these energy savings in the electricity and natural gas sectors.

Exhibit IV-3: 2030 Savings Per Household by State

			20% SCENARIO						30% SCENARIO			
	Electricity		Natural Gas		Total		Electricity		Natural Gas		Total	
	Direct Save	Net Save	Direct Save	Net Save	Direct Save	Net Save	Direct Save	Net Save	Direct Save	Net Save	Direct Save	Net Save
STATE												
AL	286.04	185.79	36.86	11.01	322.90	196.80	429.06	278.68	55.29	16.52	484.35	295.20
AK	232.42	181.41	104.61	-2.48	337.03	178.92	348.63	272.11	156.92	-3.73	505.54	268.39
AZ	256.87	169.14	24.65	4.62	281.53	173.76	385.31	253.71	36.98	6.93	422.29	260.64
AR	224.27	138.39	44.59	9.94	268.86	148.33	336.41	207.58	66.88	14.91	403.29	222.49
CA	188.47	143.92	62.80	9.37	251.27	153.29	282.71	215.88	94.19	14.05	376.91	229.93
CO	142.69	88.14	81.78	0.94	224.47	89.08	214.03	132.21	122.67	1.41	336.70	133.62
CT	348.14	289.45	57.27	18.68	405.41	308.13	522.21	434.17	85.90	28.02	608.11	462.19
DE	298.08	224.33	40.32	6.88	338.40	231.21	447.12	336.49	60.48	10.32	507.60	346.81
DC	195.70	136.31	114.80	38.78	310.50	175.09	293.54	204.47	172.20	58.17	465.75	262.64
FL	308.50	219.15	3.69	1.07	312.19	220.23	462.75	328.73	5.53	1.61	468.28	330.34
GA	247.07	157.11	52.99	13.88	300.05	170.99	370.60	235.66	79.48	20.83	450.08	256.48
HI	379.05	328.73	0.00	0.00	379.05	328.73	568.57	493.09	0.00	0.00	568.57	493.09
ID	149.96	67.14	54.54	4.23	204.50	71.37	224.94	100.72	81.80	6.34	306.74	107.06
IL	179.28	118.59	133.60	24.89	312.88	143.48	268.92	177.89	200.40	37.34	469.32	215.22
IN	198.31	117.03	84.23	19.22	282.54	136.25	297.46	175.54	126.34	28.83	423.81	204.37
IA	188.60	120.54	62.96	7.26	251.56	127.80	282.90	180.81	94.44	10.90	377.34	191.70
KS	167.48	96.80	82.40	18.15	249.87	114.95	251.21	145.20	123.59	27.23	374.81	172.43
KY	203.20	109.70	41.84	6.72	245.04	116.42	304.80	164.56	62.77	10.08	367.57	174.64
LA	280.71	182.69	26.57	1.18	307.29	183.87	421.07	274.03	39.86	1.77	460.93	275.80
ME	198.54	157.82	4.27	2.08	202.81	159.90	297.81	236.73	6.40	3.12	304.21	239.86
MD	305.12	221.69	69.79	22.72	374.91	244.41	457.68	332.53	104.68	34.08	562.36	366.61
MA	238.38	189.60	80.93	26.66	319.31	216.26	357.58	284.40	121.39	39.99	478.97	324.40
MI	153.70	101.00	138.05	34.74	291.75	135.73	230.55	151.50	207.07	52.11	437.62	203.60
MN	170.04	106.12	88.01	15.46	258.05	121.58	255.06	159.18	132.02	23.19	387.08	182.37
MS	276.57	179.69	35.21	10.70	311.78	190.39	414.85	269.54	52.82	16.04	467.67	285.58
MO	195.18	109.06	58.61	8.25	253.79	117.31	292.78	163.60	87.91	12.37	380.69	175.97
MT	159.49	96.18	66.46	6.98	225.95	103.17	239.23	144.28	99.69	10.47	338.92	154.75
NE	174.24	95.26	74.81	11.24	249.05	106.50	261.36	142.89	112.22	16.86	373.57	159.75
NV	272.70	196.95	72.10	19.40	344.80	216.35	409.05	295.43	108.14	29.10	517.19	324.52
NH	215.26	166.71	22.63	6.55	237.89	173.26	322.89	250.06	33.94	9.82	356.83	259.88
NJ	238.87	182.79	137.60	54.46	376.47	237.25	358.31	274.18	206.40	81.69	564.71	355.88
NM	123.97	74.80	53.10	1.13	177.07	75.93	185.95	112.20	79.65	1.69	265.61	113.90
NY	238.79	192.39	106.29	33.46	345.08	225.85	358.19	288.59	159.43	50.19	517.62	338.78
NC	249.37	161.56	29.62	9.82	278.99	171.38	374.06	242.34	44.43	14.72	418.48	257.06
ND	176.00	93.19	42.90	6.04	218.90	99.22	264.01	139.78	64.35	9.06	328.35	148.84
OH	201.28	130.14	120.29	40.56	321.57	170.70	301.92	195.21	180.44	60.84	482.36	256.05
OK	216.26	131.75	60.12	10.74	276.38	142.49	324.39	197.63	90.18	16.10	414.57	213.73
OR	185.91	108.40	46.86	10.20	232.77	118.60	278.87	162.60	70.29	15.30	349.16	177.90
PA	219.33	152.19	85.40	28.68	304.73	180.87	329.00	228.28	128.09	43.03	457.09	271.31
RI	192.98	146.27	88.03	30.83	281.01	177.11	289.47	219.41	132.04	46.25	421.51	265.66
SD	179.20	103.07	116.04	16.70	295.25	119.77	268.81	154.61	174.07	25.05	442.87	179.66
SC	259.15	166.20	11.60	3.81	270.76	170.00	388.73	249.29	17.40	5.71	406.13	255.01
TN	244.35	141.10	44.98	12.07	289.34	153.17	366.53	211.65	67.48	18.10	434.00	229.75
TX	333.34	246.07	34.24	8.56	367.58	254.63	500.01	369.10	51.37	12.84	551.37	381.94
UT	141.84	80.23	106.42	10.06	248.26	90.28	212.76	120.34	159.62	15.08	372.39	135.43
VT	188.91	143.43	20.25	7.14	209.16	150.57	283.37	215.15	30.37	10.71	313.74	225.86
VA	244.68	151.96	50.36	17.61	295.05	169.57	367.03	227.94	75.54	26.42	442.57	254.35
WA	173.93	91.50	45.98	6.86	219.91	98.36	260.89	137.25	68.96	10.29	329.86	147.54
WV	170.63	83.20	71.03	23.54	241.66	106.74	255.94	124.80	106.55	35.31	362.49	160.11
WI	176.06	120.36	82.54	17.15	258.60	137.51	264.08	180.54	123.82	25.73	387.90	206.27
WY	147.32	80.41	69.08	1.18	216.41	81.59	220.98	120.61	103.63	1.77	324.61	122.39

C. Conclusion

We believe that these substantial direct residential bill and consumer pocketbook savings are very conservative estimates of the benefits consumers would see as the result of policies that capture the full measure of energy efficiency benefits available. We have not factored in rising real prices of energy, improvements in the technology and economics of efficiency, or the value of carbon reduction. Each of these factors would make energy efficiency more valuable and would raise the amount of energy that could be saved in the next two decades.

When one looks at the map of potential energy savings versus past demand growth and past energy efficiency policy, given the substantial consumer benefits that can result from achieving higher levels of energy efficiency, we believe the case for aggressive federal legislation to increase the efficiency of building and appliance is compelling. In an analysis entitled *Climate Change and the Electricity Consumer*,[19] we concluded that climate change might be the most important consumer issue of the next several decades. This analysis shows that there is a consumer-friendly way to address the challenge of climate change, which is to get the maximum amount of reduction in greenhouse gas emissions from energy efficiency. The key is to recognize that while prices go up, efficiency lowers consumer bills, which provides an important cushion against other aspects of climate policy that might push bills up.

The bottom line of this study is that a much larger role for energy efficiency will be critical to keeping energy affordable in a carbon-constrained environment. The potential savings are huge, with costs that are much lower than alternatives. The obstacles to achieving these savings are widely recognized and substantial, but the benefit of overcoming them make a maximum effort to do so urgent.

There are two clear policy implications of this analysis. First, federal authorities should be more aggressive in establishing the policy conditions to ensure the public benefits from the full measure of efficiency. This would include:

- raising the energy efficiency resource standard target,
- ensuring building code and appliance efficiency improvements are achieved and
- making sure retrofitting activities are fully funded and implemented.

There is a broader set of policies that could be considered as well, as outlined in the McKinsey report.

Second, whether or not federal policy provides additional mandates, incentives or guidelines, state authorities should pursue energy efficiency to the limit of its cost-benefit value.

- Public utility commissions will play a primary role because of the central role of utilities in the consumer energy sector, but

[19] Mark Cooper, *Climate Change and the Electricity Consumer* (Washington, D.C.: Consumer Federation of America, June 2008).

- Building code authorities and state legislatures can play an important part by implementing state policies to achieve maximum cost-justified efficiency.