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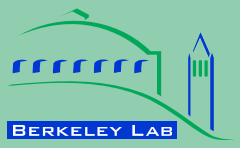

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The Shifting Landscape of Ratepayer-Funded Energy Efficiency in the U.S.

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Environmental Energy Technologies Division

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Prepared for the
Office of Electricity Delivery and Energy Reliability
Permitting, Siting, and Analysis Division
U.S. Department of Energy

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Executive Summary

Over the last two decades, utility ratepayer funding for energy efficiency programs has seen both booms and busts. Currently, roughly 35 states implement some set of ratepayer-funded electric and/or natural gas energy efficiency programs, with a total U.S. budget of $3.1 billion in 2008 (CEE 2008).[1] The top 10 states account for about 80% of this total, each of which planned to spend $100 million or more in 2008. California, the undisputed heavyweight in terms of the absolute magnitude of its spending on energy efficiency, represented one-third of the total U.S. energy efficiency program budget in 2008.

A proliferation of new state-level policies enacted over the past several years suggests that the next decade may see a dramatic and sustained increase in overall funding levels, and a fundamental re-drawing of the energy efficiency map. These new policies include: energy efficiency portfolio or resource standards (EEPS or EERS), requirements that utilities acquire all cost-effective energy efficiency, strengthened integrated resource planning (IRP) or demand-side management (DSM) planning requirements, and regulatory incentive mechanisms to better align utility financial interests with improvements in customer energy efficiency.

To assess the impact of these new policies on energy efficiency spending and savings, we developed a set of projections (low, medium, and high) of ratepayer-funded energy efficiency program spending and savings through 2020, based on a state-by-state review of energy efficiency policies currently on the books or in the pipeline, as well as recent IRPs and DSM plans. The projections suggest the following set of trends:

- Total ratepayer-funded energy efficiency program spending in the U.S. (90% of which is targeted to electric end-uses) is projected to increase from $3.1 billion in 2008 to $5.4-$12.4 billion per year in 2020, with a Medium Case projection of $7.5 billion.
- Much of the projected increase will be centered in populous states that, historically, have been relatively minor players on the national energy efficiency stage, but have recently enacted aggressive new energy efficiency policies, including: Illinois, Maryland, Michigan, North Carolina, Ohio, and Pennsylvania. These six states, which together represented less than 4% of energy efficiency program spending in 2008, account for more than 60% of the projected increase in total U.S. spending from 2008-2020 under our Low Case (and smaller percentages under the other cases).
- Among states that have traditionally provided strong support for ratepayer-funded energy efficiency programs, significant funding increases (i.e., >$200 million per year) are projected under both the Mid Case and High Case scenarios for New Jersey, New York, and Massachusetts. In the High Case, significant funding increases are also projected for a number of other traditional leaders, including California, Connecticut, Minnesota, and Wisconsin.
- Across all three scenarios, spending levels become significantly more evenly distributed across states than is currently the case. In California, ratepayer funding is projected to decline or remain relatively flat, and the gap between it and other leading states narrows considerably, with all of the top-10 states (in terms of absolute funding levels) reaching at

[1] This figure excludes load management.

least $200 million per year in the Low Case and at least $400 million per year in the High Case. Program funding also becomes considerably more evenly distributed at a national level, with a much greater percentage of future energy efficiency spending projected to occur outside of the top-10 states than is currently the case (i.e., roughly 40% by 2020 compared to 20% today).

- Projected increases in ratepayer funding for electric energy efficiency programs are estimated to yield annual electric energy savings in 2020 ranging from 0.45% (Low Case) to 0.93% (High Case) of total U.S. retail sales in that year, with a Mid Case estimate of 0.58%. This compares to estimated annual savings of 0.34% of U.S. retail sales in 2008.
- Cumulative electricity savings projected from ratepayer-funded programs implemented over the 2010-2020 period equal 4.7% of EIA's reference case forecast of 2020 retail electricity sales in the Low Case, 6.1% in the Medium Case, and 8.6% in the High Case.
- Energy savings from ratepayer-funded efficiency programs, as a result of the state-level policies examined in this report, have important implications for the potential incremental impact (in terms of both its size and distribution) of a national EERS or clean energy standard. For example, an EERS requiring *cumulative* savings of only 5% of retail sales by 2020 would result in little or no incremental increase in energy efficiency savings than would likely occur in the absence of such a policy.

The Medium and High Case spending projections represent more than a doubling and quadrupling, respectively, of current national energy efficiency program funding levels. And in some states, program funding is projected to increase by an order of magnitude or more under one or more of the three scenarios. While achieving a ramp-up of this scale over the next decade is most likely feasible, states and program administrators are expected to face a number of near-term and longer-term challenges. These include:

- The economic downturn, which may affect both the ability of programs to acquire savings, and the political feasibility of increasing ratepayer funding for energy efficiency programs;
- General aversion by public utility commissions to the *short-term* rate impacts associated with large-scale energy efficiency implementation (a longer-term issue distinct from the economic downturn);
- Coordination with state/federal energy efficiency programs, including, in the near-term, programs funded through *The American Recovery and Reinvestment Act* (aka, the "stimulus bill");
- The need to develop innovative program designs to reach deeper and broader savings, in order to achieve statewide savings goals significantly beyond what is currently being achieved;
- The effect of new state and/or Federal appliance and lighting efficiency standards on the remaining market potential that can be captured by voluntary energy efficiency programs;
- The need to develop the institutional framework for effective regulatory oversight of ratepayer-funded energy efficiency programs in states that historically have not had significant program activity; and
- The potential, most likely near-term, shortage of trained personnel in the energy efficiency services sector.

1. Introduction

Over the last two decades, utility ratepayer funding for energy efficiency programs – and the associated energy savings – has seen both booms and busts. Currently, about 35 states implement ratepayer-funded energy efficiency programs, with a total U.S. budget of $3.1 billion in 2008, approximately 80% of which is concentrated in just ten states (CEE 2008).[2] However, a proliferation of new state-level policies enacted over the past several years suggests that the next decade may see a dramatic and sustained increase in overall funding levels, and a fundamental re-drawing of the energy efficiency map. These new state energy efficiency policies reflect a variety of concerns, including the increasing cost and siting challenges of building new generation and transmission, fuel cost and supply risks, and the potential cost of future carbon regulations.

Within the past three years, for example, eleven states have adopted energy efficiency portfolio (or resource) standards (EEPS or EERS) that establish specific long-term savings targets that utilities are obligated to meet, and at least three other states are currently considering the same. A growing number of states have recently established laws requiring utilities to acquire all available cost-effective energy efficiency. Regulators in several Western states have also recently revised integrated resource planning (IRP) and demand-side management (DSM) planning rules to require more robust analysis of the resource potential and benefits of energy efficiency, which has resulted in increased savings targets for their energy efficiency portfolios (Hopper et al. 2008). Finally, regulators and utilities in many states are beginning to look more closely at regulatory incentive mechanisms to better align utility financial interests with improvements in customer energy efficiency.

We examined energy efficiency policies on the books or in the pipeline in all 50 states, along with recent IRPs and DSM plans, and developed low, medium and high projections of future energy efficiency spending and savings. Depending on how aggressively and effectively states implement these policies, we estimate that spending on ratepayer-funded energy efficiency could increase from $3.1 billion in 2008 to more than $12 billion (nominal dollars) per year by 2020 in our high case, a growth rate in spending of about 12% per year. Annual electricity savings nationally could triple from an estimated 0.3% of retail electricity sales in 2008 to 0.9% of retail electricity sales in 2020. In the low and medium scenarios, ratepayer funding for electric and gas energy efficiency in the U.S. would increase to $5.4 and $7.5 billion, respectively, by 2020.

What are the implications of such a scale-up of ratepayer-funded energy efficiency activity for national energy policy, such as a national EEPS or future carbon regulations? Can a ramp-up of this scale be achieved, and what practical constraints might slow these efforts?

This paper addresses these questions by first providing an overview of recent trends in state policies pertaining to ratepayer-funded energy efficiency programs in the U.S. The paper then presents our set of projections of future spending and savings from such programs, highlighting key themes. Projected energy savings are compared to what might be required under a future

[2] Depending on the state, ratepayer-funded energy efficiency programs may be administered by utilities, state agencies, or non-profit organizations.

national EEPS (or broader clean energy standard that includes energy efficiency), in order to gauge the potential incremental impact of such policies. In addition, the carbon emission reductions associated with our projection of energy savings from ratepayer-funded programs is compared to the total emission reductions that might be required under the *American Clean Energy and Security Act of 2009* (aka, the Waxman-Markey bill), which was passed by the U.S. House of Representatives in June 2009 and would establish a cap on total greenhouse gas emission for many sectors of the U.S. economy. Last, the paper discusses some of the major obstacles and challenges that states and program administrators may face over the coming decade, as they seek to dramatically ramp-up ratepayer-funded energy efficiency program activity, as projected.

2. Recent Developments and Trends in Ratepayer-Funding for Energy Efficiency Programs

Table 1 shows the 2008 approved electric and gas energy efficiency program budgets for the top-ten states (in terms of the absolute magnitude of the budget[3]), as well as the totals for the other 40 states and for the U.S. as a whole, based on data compiled by the Consortium for Energy Efficiency (CEE 2008).[4] Over 80% of the national total ($3.1 billion) came from electric ratepayers ($2.6 billion), while gas utilities were authorized to spend about $0.5 billion on energy efficiency programs. The 2008 budget total represents approximately a 20% increase over the $2.6 billion combined electric and gas energy efficiency budget in 2007. The top 10 states account for about 78% of the total U.S. energy efficiency budget, each of which planned to spend $100 million or more in 2008. California, the undisputed heavyweight in terms of the absolute magnitude of its spending on energy efficiency, represented one-third of the total U.S. energy efficiency program budget in 2008.

Table 1. 2008 Ratepayer-Funded EE Budgets

Rank	State	2008 Budget ($M)		
		Electric	Gas	Total
1	CA	831	183	1,014
2	NY	258	30	288
3	NJ	135	61	196
4	WA	160	18	179
5	MA	121	28	149
6	WI	76	64	140
7	MN	106	30	137
8	FL	109	15	124
9	CT	107	7	114
10	TX	106	no data	106
All Other States		592	94	686
U.S. Total		2,603	529	3,132

Source: CEE; excludes budget for load management programs.

A proliferation of state-level energy efficiency policies adopted over the past several years suggests that the energy efficiency landscape in the U.S. may be on the verge of dramatic change, with an unprecedented expansion of ratepayer funding and a far-reaching geographical re-alignment of the energy efficiency marketplace. To understand these trends, it is helpful to classify states into three rough groupings: *Leaders*, *Up-and-Comers*, and *Uncommitted States*.

Leaders

Over the past 5-10 years, approximately 15 states have maintained relatively significant ratepayer-funding for energy efficiency programs (i.e., electric energy efficiency budgets equal to 1% or more of revenues from retail electricity sales, and annual electric savings equal to at least 0.5% of retail sales). Many of these leading states are listed in Table 1, although some have

[3] Not evident in the table are the various small states that have relatively aggressive energy efficiency budgets in proportion to their population and retail electricity and gas sales (e.g., VT, OR, ID, IA, RI, NH, UT).
[4] Note that these data represent *approved budgets*, not actual spending.

relatively small populations and thus have energy efficiency budgets that are small in absolute magnitude but large on a per-capita basis. In most leading states, the underlying policy support for energy efficiency program spending has been provided through integrated resource (or DSM-specific) planning and/or systems benefit funding mechanisms, and in some leading states, through statutory requirements that utilities acquire all (achievable) cost-effective energy efficiency savings opportunities.

Going forward, all leading states plan to maintain strong commitments to ratepayer-funded energy efficiency, and many have recently made (or are considering) commitments to substantially expand existing efforts. For example, New York established an aggressive energy efficiency portfolio standard (EEPS) requiring ratepayer-funded electric energy efficiency programs to achieve average annual savings of approximately 1.4% of retail sales from 2009-2015, or more than double current levels. In pursuit of the new goals, the New York Public Service Commission authorized the state's investor-owned electric utilities to spend $330 million per year through 2011 on energy efficiency programs (NYPSC 2008). New Jersey also recently adopted aggressive new long-term energy savings goals that triple current savings levels, reaching approximately 2% of retail sales per year. The New Jersey Board of Public Utilities recently approved expanded budgets for the state's ratepayer-funded energy efficiency programs, rising to $325 million in 2012, in line with the long-term savings goals (NJBPU 2008). A new EEPS policy has also been proposed in Wisconsin, which would require electric savings of 2% of retail sales per year (approximately a quadrupling of current levels) by 2015. A number of other leading states (California, Connecticut, Massachusetts, Rhode Island, and Washington) have enacted statutes that require utilities to obtain all achievable cost-effective energy efficiency opportunities. To meet these mandates, state regulators in Massachusetts and Connecticut are currently considering utility energy efficiency program plans or recommendations from appointed energy efficiency advisory boards that would double or triple 2008 spending levels by 2011, and would result in annual energy savings equivalent to 2-3% of retail energy sales (MEEAC 2009). In the Pacific Northwest, energy efficiency budgets are also likely to increase in the coming years, in order to meet the increasing energy efficiency savings targets identified in recent resource plans filed by major utilities in the region.

In California, the California Public Utilities Commission (CPUC) adopted a Long-Term Energy Efficiency Strategic Plan in September 2008, which provides a ten-year roadmap for a significant scaling up of the state's energy efficiency efforts and sets ambitious market transformation goals (CPUC 2008).[5] California's investor-owned utilities filed new energy efficiency program plans that propose roughly a $400 million (or 43%) increase by 2011 above the spending level authorized for 2008. The CPUC also adopted new long-term energy savings targets which likely will reduce the funding and savings trajectory somewhat for ratepayer-funded energy efficiency programs. The new savings targets represent about a 50% decline in ratepayer-funded efficiency savings by 2020 relative to 2008 levels. In adopting the lower savings targets, the CPUC relied to some extent on an updated statewide market potential study that forecasts lower remaining achievable energy efficiency savings potential.[6] In short, energy efficiency will remain a

[5] The state's market transformation goals include achieving zero net energy in all new residential construction by 2020, in all new commercial construction by 2030, and in 50% of existing commercial buildings by 2030.

[6] The lower savings potential is partially a result of the high saturation of many energy efficiency measures and California's aggressive state building codes and appliance efficiency standards; which also reduces the remaining

cornerstone of California energy policy for the foreseeable future, although the mix of strategies and the funding and savings levels may shift over time.

Up-and-Comers

There is a sizable contingent of states that, at least within recent history, have provided modest or little ratepayer-funding for energy efficiency, but have recently made significant commitments to ramping up energy efficiency programs.[7] Many of these up-and-coming states are located in the Midwest or Mid-Atlantic and have recently adopted aggressive EEPS policies, including: Illinois, Maryland, Michigan, New Mexico, Ohio, Pennsylvania, and Virginia (provisionally). The electric EEPS targets in most of these states rise to 1-2% of retail sales per year within the first 5-10 years of the standard, rivaling the annual savings levels currently being achieved in only a handful of leading states. North Carolina, another state that has, until now, been relatively inactive in the energy efficiency arena, enacted a renewables portfolio standard (RPS) under which energy efficiency can meet up to 40% of the total requirements of the state's investor owned utilities (IOUs) and an unlimited amount of the publicly owned utilities' requirements. Program development efforts in many of the aforementioned states are in their early stages, although the first set of energy efficiency plans have already been approved in Illinois and Maryland, with statewide budgets ramping up to $167 million and $91 million, respectively, over the first three years (ICC 2008a and 2008b; MDPSC 2008a, 2008b, 2008c, 2008d, 2008e).

A number of other up-and-comers have historically provided consistent, but moderate, levels of ratepayer-funding for energy efficiency and are in the process of dramatically ramping up program activity – in many cases, in response to recent policy mandates. Several of the up-and-comers in this group are located in the interior West. For example, Colorado adopted an EEPS with electricity savings targets for Xcel, the state's largest utility, reaching 1.3% of retail sales by 2020. The utility's recently-approved program plan puts it on track to meet its early-year EEPS targets, with a 2010 electric energy efficiency budget of $64 million (COPUC 2008). Nevada expanded its RPS in 2005 to allow energy efficiency to meet up to 25% of the total requirement, and program plans have been approved for the state's two IOUs that commit to achieving efficiency savings in excess of the maximum amount eligible under the RPS (NPC 2006, SPPC 2007). In Arizona, investor-owned utilities are now required to file DSM plans, and in its most-recent IRP, Arizona Public Service proposes to increase energy efficiency funding to $90 million in 2020, up from $23 million in 2008 (APS 2009).

Uncommitted States

Finally, in approximately 20 states, mostly located in the Southeast and parts of the Midwest, state regulators have not authorized utilities to fund energy efficiency programs, or have authorized only minimal funding levels, and have no immediate (public) plans to significantly

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energy efficiency potential that can be obtained through utility programs. The updated market potential study does not, however, account for emerging technologies that may replenish the reservoir of cost-effective savings opportunities over the study period.

[7] Utilities in several of these states (MD, IL, MI) offered energy efficiency programs in the late 1980s and early 1990s, often driven by integrated resource plans, but these energy efficiency efforts were typically abandoned with the onset of electricity restructuring.

step up their efforts. In some of these states, utilities do offer educational or general information programs related to energy efficiency, or offer audits to some customer classes or small pilot programs, but energy efficiency budgets are typically quite small (less than 0.1% of revenues), and programs are quite limited in scope. Going forward, some modest increase in ratepayer-funding for energy efficiency among uncommitted states is likely to occur in the face of escalating costs for new generation and the prospect of even higher costs for fossil fuel based generation as a result of future federal climate change legislation. Some utilities in these states have expressed increased interest in implementing energy efficiency programs, in many cases linking it to deployment of an advanced metering infrastructure (AMI) or approval to build new baseload generation. Already, utilities and PUCs in a number of uncommitted states are considering moderate expansions to their energy efficiency efforts (in some cases contingent on developing an attractive business model for the utility), but have not yet made significant commitments.

3. Adding It All Up: Projected Ratepayer-Funded EE Spending

To gauge the potential impact of existing and impending state policies, legislative requirements, regulatory decisions and integrated resource or DSM plans (see Table 2), we developed a set of projections (low, medium, and high) of ratepayer spending on electric and natural gas energy efficiency programs through 2020. These projections do not account for the approximately $11 billion in federal funding for energy efficiency and related projects, made available through the American Recovery and Reinvestment Act (ARRA) to state and local governments, nor do the projections account for other "non-traditional" funding sources (e.g., revenues from emission auctions and from capacity market auctions). The potential significance of these additional funding sources is discussed briefly in Section V.

3.1 Approach

The projections for leading and up-and-coming states were developed based on varying state- or region-specific assumptions about how effectively and aggressively the energy efficiency policies currently in place (or under consideration) are implemented in the future (see Table 3).[8] For many of the leading states (with the exception of California, which is described separately in Table 3), the Low Case scenario assumes a continuation of current spending and savings levels – e.g., states achieve the spending/savings levels from the most-recently approved energy efficiency program plan or integrated resource plan, but do not exceed those levels in subsequent years. For the High Case, annual electric savings in leading states generally rises to at least 1.5%-2.5% of retail sales by 2020, depending on the region, with spending increasing to 3%-6% of revenues from retail electricity sales.

Most of the up-and-coming states have recently enacted EEPS policies. For those states (Colorado, Michigan, New Mexico, Pennsylvania) with EEPS savings targets that rise to a level consistent with what is currently being achieved in many leading states (i.e., roughly 1.0% of retail sales per year), we assume that the EEPS savings targets are achieved in both the Low and Medium cases, and that somewhat higher savings levels (1.2% to 1.5% of retail sales) are reached in the High Case scenario. For other up-and-coming states with EEPS policies (Ohio, Illinois, Maryland, and Virginia), we make more conservative assumptions, based on a number of different considerations.[9]

For the uncommitted states, we employ a standardized (and admittedly speculative) set of assumptions regarding the extent to which these states increase their support for ratepayer-

[8] A more-complete description of the methodology used to develop the spending projections is available at http://eetd.lbl.gov/EA/EMP/ee-pubs.html.

[9] For example, Illinois and Ohio both have EEPS targets that rise to 2% of retail sales per year, which exceeds the level currently being achieved in virtually all leading states. Moreover, Illinois' EEPS includes a cost cap that, unless modified, is likely to preclude attainment of the statutory savings targets in later years. Ohio's EEPS contains provisions to allow many commercial and industrial customers (referred to as "mercantile customers" in the EEPS statute) to opt out of making funding contributions to the utilities' energy efficiency programs if they can demonstrate investments in energy efficiency at their facility. In Maryland, the EEPS is a voluntary goal, and may be achieved through a combination of ratepayer-funded energy efficiency programs, codes & standards, and other types of market interventions. The Virginia EEPS has not yet been passed into law (as of June 2009), and is assumed to be achieved only in the high case.

funded energy efficiency programs in the future (see Table 3). In each scenario, energy efficiency program *spending* is assumed to increase linearly to a target percentage of revenues by a specified year (0.3% of revenues by 2020 in the Low Case, 0.5% by 2012 in the Medium Case, and 0.8% by 2020 in the High Case). The High Case corresponds roughly to a scenario in which uncommitted states reach current national average spending levels by 2020 (and thus is well below what could be cost-effectively achieved in these states). Somewhat greater spending levels are assumed for Florida compared to the other uncommitted states, as its current spending levels are moderately higher than the other states in this group. Also, for many leading and up-and-coming states, energy efficiency spending by publicly owned utilities (i.e., municipal utilities and rural electric cooperatives) was projected using the same scenario definitions as for the uncommitted states. This convention reflects the fact that publicly owned utilities are generally not subject to the same energy efficiency saving and spending policies as investor-owned utilities, and thus (in some states, at least) have historically provided less aggressive support for energy efficiency than their investor owned counterparts.

Table 2. Key Policy Drivers for Energy Efficiency Spending and Savings Projections

Policy Drivers	**Applicable States***
Statutory requirement that utilities acquire all cost-effective energy efficiency	CA, CT, MA, RI, WA
EEPS	CA, CO, IL, MD, MN, MI, NJ (proposed), NM, NY, OH, PA, TX, VA (provisional), WI (proposed)
Energy efficiency eligibility under state RPS	HI, NC, NV
Recently-approved IRP plan	CO, ID, OR, MT, UT
Recently-approved DSM plan or multi-year budget	AZ, CT, CO, IA, MA, ME, NJ, RI (proposed), VT
System benefit charge	DC

* The Applicable States listed for each policy represents the states for which that policy informed development of spending and savings projections; it does not necessarily represent the totality of all states with that particular policy.

Table 3. Scenario Assumptions Underlying Electric EE Spending and Savings Projections

Group of States	**Scenario**	**Representative Assumptions** (specific assumptions vary by state)
Leaders (non-CA)	*Low*	States generally meet existing EEPS targets or savings levels identified in approved IRPs or maintain spending at existing levels, based on current SBC or approved DSM plan
	Medium	Highly state-specific: an approximate doubling of current spending for many New England states by 2020; no change from low case for some Northwestern states; NY meets its EEPS
	High	States generally reach benchmark 2020 savings level for region (2.0-2.5% of retail sales for most New England states, 1.5% for Northwest states); NY spending reaches 3.5% of revenues by 2020; NJ and WI adopt and meet proposed EEPS targets
California	*Low*	IOU annual savings equal to current long-term savings goals through 2020; POUs' annual savings equal 75% of the average annual savings identified in their 10-yr. EE plans
	Medium	IOU savings same as low case; POUs attain 100% of savings levels identified in their 10-yr plans
	High	IOUs maintain savings at 2008 goal level through 2020; POU savings are same as in medium case
Up-and-Comers	*Low*	Similar to low case assumptions for Leading states, but EEPS targets are not achieved in IL or OH
	Medium	No change from low case for many states; 2020 savings increase to approx. 0.7%-1.0% of retail sales in several others
	High	Savings in most states reach 1.0-1.5% of retail sales by 2020; IL fully meets its EEPS targets; TX reaches annual savings of 1.0% of retail sales by 2020
Uncommitted States	*Low*	Spending increases linearly from 0.1% of revenues in 2008 to 0.3% in 2020; FL spending remains flat at 0.4% of revenues from 2008-2020
	Medium	Spending increases linearly from 0.1% of revenues (0.4% in FL) in 2008 to 0.5% in 2012, and remains flat thereafter
	High	Spending increases linearly from 0.1% of revenues (0.4% in FL) in 2008 to 0.8% in 2020

3.2 Results

Across the set of scenarios developed, ratepayer-funding for energy efficiency is projected to increase from $3.1 billion in 2008 to $4.1-$8.8 billion in 2015 and to $5.4-$12.4 billion in 2020, depending on the scenario (see Table 4 and Figure 1). Under the Medium Case scenario, spending reaches $6.0 billion in 2015 and $7.5 billion in 2020. As a percentage of total revenue from electricity and natural gas retail sales to end-use customers, spending in 2020 is projected to reach 0.8% of total revenues in the Low Case, 1.1% in the Medium Case, and 1.8% in the High Case – compared to 0.6% in 2008. Under all three scenarios, funding for electric energy efficiency is expected to represent approximately 90% of the total for electric and natural gas energy efficiency, which is roughly consistent with the historical funding distribution and is indicative of the greater emphasis of recent state energy efficiency policies on the electric sector.

Table 4. Range in Ratepayer-Funding Projections for 2015 and 2020

	Spending ($billion, nominal)			Spending (% of revenues)		
	2008*	2015	2020	2008*	2015	2020
Electric	2.6	3.7 - 7.8	4.9 - 10.9	0.7%	1.0% - 2.0%	1.0% - 2.2%
Gas	0.5	0.4 - 1.0	0.5 - 1.6	0.3%	0.3% - 0.7%	0.2% - 0.8%
Total	3.1	4.1 - 8.8	5.4 - 12.4	0.6%	0.8% - 1.6%	0.8% - 1.8%

** 2008 data are approved budgets, rather than actual spending; source for 2008 dollar values: CEE (2008)*

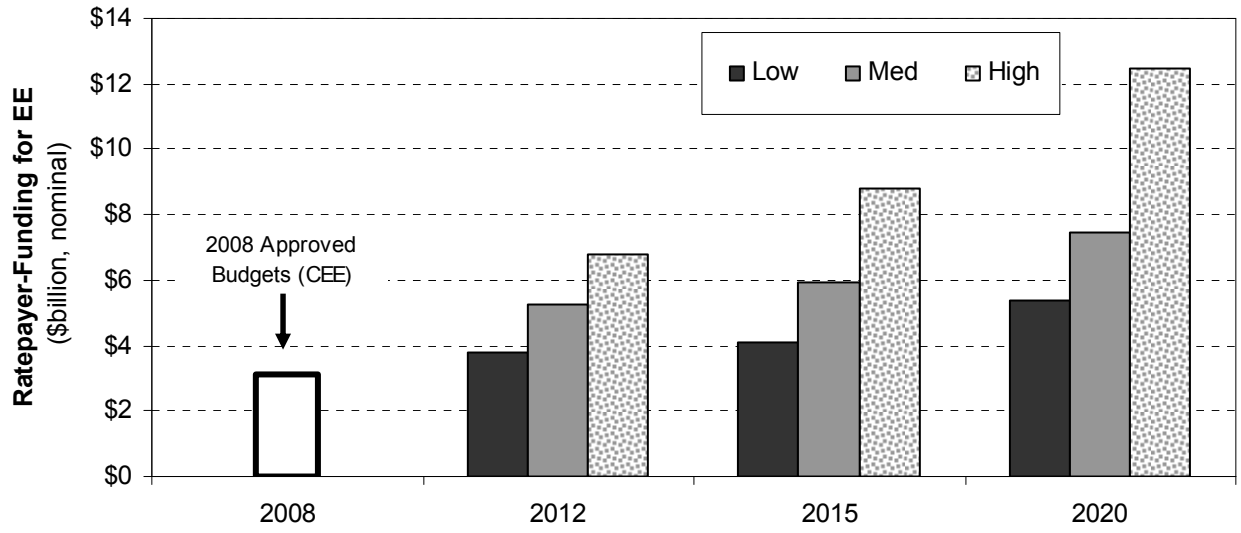

Figure 1. Projected Ratepayer-Funding for Electric and Natural Gas Energy Efficiency Programs in the U.S.

Broad adoption of new state-level energy efficiency policies also raises the prospect for significant geographical re-alignment of energy efficiency markets. Table 5 lists the 10 states with the highest projected levels of ratepayer-funding in 2020 under the Low and High Case scenarios, compared to the top 10 states in 2008, along with aggregate spending in the other 40 states. Several specific trends are worth highlighting. First, as new state energy efficiency portfolio standards are implemented, a number of states with large populations that, heretofore, have been relatively minor players on the national energy efficiency stage (e.g. PA, IL, OH, MI) assume much more prominent roles by 2020. Second, funding levels become markedly more evenly distributed, both within the top tier of states. For example, all of the top-10 states (in

terms of the absolute magnitude of spending) reach projected 2020 funding levels in excess of $200M/yr in the Low Case and $400M/yr in the High Case, and the gap between California and other top-10 states narrows considerably compared to 2008. Funding also becomes considerably more evenly distributed at the broader, national level, with more than 40% of projected funding in 2020 occurring outside of the top-10 states, compared to 22% today.

Table 5. Top-10 Energy Efficiency Markets in 2020, Ranked by Annual Budget Projections

Rank	2008 Budget ($M, nominal)		2020 Spending Projections			
			Low ($M, nominal)		High ($M, nominal)	
1	CA	1,014	CA	492	CA	1,312
2	NY	288	NY	477	NY	1,094
3	NJ	196	OH	350	TX	882
4	WA	179	NJ	344	IL	805
5	MA	149	MA	297	MA	630
6	WI	140	NC	273	OH	595
7	MN	137	PA	247	WI	575
8	FL	124	MI	238	NJ	504
9	CT	114	IL	230	PA	467
10	TX	106	WA	202	MN	413
Top-10 ($M)	2,447		3,150		7,276	
% of U.S.	78%		59%		58%	
Other States ($M)	686		2,211		5,168	
% of U.S.	22%		41%		42%	

Recently adopted energy efficiency policies in many states will require quite dramatic increases in spending over the next decade, which, for up-and-coming states, will have to be built from a quite modest base. Table 6 lists the 10 states with the largest projected funding increases from 2008 to 2020. In the Low Case, spending increases by $100M-$300M in 10 states over the decade. Only three of these states (NY, MA, and NJ) had significant energy efficiency budgets in 2008; the others are all up-and-coming states with recently enacted EEPS policies (or, in North Carolina, an RPS policy in which energy efficiency is a qualifying resource). In the High Case, more than 10 states register spending increases in excess of $300M by 2020, with three large states (NY, TX, and IL) seeing an increase of greater than $750M. In a later section of this paper, we discuss some of the issues that states may confront as they seek to dramatically ramp-up energy efficiency program activity.

Table 6. States with Largest Projected Funding Increase (2008-2020)

Rank	Low Case ($M, nominal)			High Case ($M, nominal)		
	State	2008 Budget	2008-2020 Increase	State	2008 Budget	2008-2020 Increase
1	OH	58	292	NY	288	806
2	NC	0	273	TX	106	775
3	PA	0	247	IL	41	764
4	MI	20	218	OH	58	537
5	NY	288	189	MA	149	481
6	IL	41	189	PA	0	467
7	MA	149	148	WI	140	435
8	NJ	196	148	MD	6	348
9	MD	6	143	NC	0	324
10	CO	26	141	MI	20	313

4. Projected Electricity Savings in Perspective

In 2008, electric energy efficiency programs are estimated to have resulted in incremental annual savings of approximately 13 billion kWh, equivalent to 0.34% of total retail electricity sales nationally in that year.[10] Several leading states have achieved incremental annual savings greater than 1.0% of retail energy sales, and VT reported annual energy savings in 2008 equivalent to 2.5% of retail energy sales (Efficiency Vermont 2009).

Projected increases in ratepayer spending on energy efficiency programs over the next decade are expected to result in significant increases in energy savings. Figure 2 shows our projections of incremental annual savings as a percentage of retail electricity sales, for the three scenarios. From 2010-2020, average annual savings range from 0.41% of retail sales in the Low Case to 0.76% in the High Case. In comparison, EIA's April 2009 reference case forecast (which does not *explicitly* account for ratepayer-funded energy efficiency) projects that retail electricity sales will grow at an average rate of 1.1% per year over this period. *Cumulatively*, electricity savings achieved from ratepayer-funded programs implemented over the 2010-2020 period are projected to reduce U.S. electricity consumption in 2020 by about 4.7% (relative to EIA's reference case forecast of 2020 retail electricity sales) in the Low Case, and by about 8.6% in the High Case. Approximately 90% of all savings is projected to occur within leading and up-and-coming states that have already made a significant commitment to supporting ratepayer-funded energy efficiency.

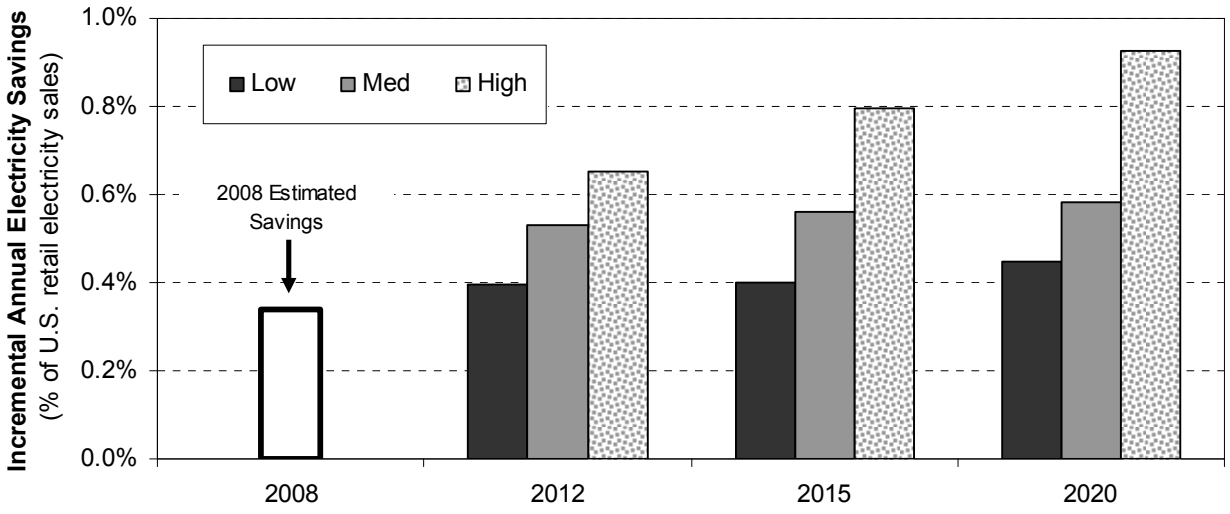

Figure 2. Projected Incremental Annual Electric Energy Efficiency Savings from Ratepayer-Funded Programs in the U.S.

[10] By "incremental annual energy savings" we refer to the annual energy savings resulting from new energy efficiency measures installed in a given year. We estimated 2008 electric energy efficiency savings by applying the savings-to-spending ratio for 2006 (based on the most recent national savings data published ACEEE) to the 2008 electric EE budget (from CEE). For ACEEE data, see Eldridge et al. (2008).

4.1 Incremental Impact of a National EEPS or Clean Energy Standard

Several national EEPS proposals have been introduced in the U.S. Congress in 2009, and several proposed national clean energy standards – including the *American Clean Energy and Security Act of 2009*, which recently passed the House of Representatives – would allow energy efficiency to be used to meet a portion of the overall target in each year. Our projections of state-level energy efficiency program savings do not explicitly account for the effects of future national energy efficiency legislation and can therefore serve as a benchmark for assessing the potential *incremental* impact of such policies.

We estimate the incremental increase in savings from ratepayer-funded electric energy efficiency programs that could occur under several "generic" national EEPS (or clean energy standards) policies, which are modeled on recent federal legislative proposals. Under the generic policies, all retail electricity distributers with greater than 1 million MWh sales per year, on average, would be required to meet specified cumulative electric savings targets by 2020. We consider three potential cumulative savings targets, equal to 5%, 10%, and 15% of retail electricity sales in 2020. Only savings from measures implemented in 2010 or later would count towards the targets. Compliance could be achieved through utility energy efficiency programs, new building energy codes, new appliance efficiency standards, new combined heat and power, and distribution system upgrades. The policy would not create a national market for tradable energy efficiency certificates; however, it would allow obligated retail electricity distributers to meet a portion of their EEPS obligations by purchasing electricity savings from measures implemented in the same state, via bilateral contracts with other distribution utilities, state agencies, or other energy efficiency program providers.

To determine the incremental increase in savings from ratepayer-funded electric energy efficiency programs that would be required under these generic EEPS proposals, we assume that *half* of the total energy savings target in each state would be met through ratepayer-funded programs, and the remaining half would be met through a combination of codes and standards, CHP, distribution system upgrades, and other eligible measures. We further assume that bilateral contracting for electricity savings from measures implemented within each state occurs freely without constraint. Given these assumptions, we estimate that a 5% national EEPS would require a 0-12% increase in savings from ratepayer-funded energy efficiency programs (where the lower percentage number represents the increase relative to our High Case savings projection, and the higher percentage number represents the increase relative to our Low Case savings projection). Similarly, we estimate that a 10% national EEPS would require an 8-37% increase, and a 15% national EEPS would require an 18-68% increase (see Table 7). If states were to rely more heavily on utility programs than we assume, or if intra-state bilateral contracting of energy efficiency savings for compliance with the national EEPS were constrained, then larger percentage increases would be needed. Moreover, the percentage savings increases presented here represent the aggregate national increase. Naturally, the additional savings required in individual states may be substantially higher or lower than the national average, depending on what portion of the state's retail electricity sales is exempt from the EEPS, and on the amount of savings that would occur in the absence of a national EEPS.

Table 7. Projected Incremental Impact of a National EEPS on Ratepayer-Funded Energy Efficiency Program Savings

National EEPS Saving Target: *Cumulative Savings in 2020 as a Percent of Retail Sales*	Percentage Increase in EE Program Savings Relative to No National EEPS
5%	0% - 12%
10%	8% - 37%
15%	18% - 68%

Although our analysis is based on a single generic national EEPS policy, it does reveal that a relatively aggressive national EEPS (e.g., a cumulative savings target on the order of 15% of retail sales by 2020) could require substantial increases in energy savings, even in the face of the spate of aggressive state policies that have recently been adopted. The impact, however, would likely fall primarily on about 20 or so states that have not yet made significant commitments to supporting ratepayer-funded energy efficiency. In addition, the incremental impact of a national EEPS depends heavily on its design – e.g., overall target levels, the set of eligible measures, and allowances for bilateral contracting and/or trading of energy savings certificates. In particular, allowing unrestricted trade of energy savings certificates, without a sufficiently aggressive target, could substantially degrade the incremental impact of a national EEPS.[11]

4.2 Contribution to Greenhouse Gas Emission Reduction Targets

Understanding the potential range of energy savings resulting from ratepayer-funded efficiency programs over the next decade is also important from the perspective of gauging their contribution to future carbon emission reduction targets that Congress may adopt. For example, *The American Clean Energy and Security Act of 2009*, which recently passed the U.S. House of Representatives, would place a cap on greenhouse gas emissions from certain sectors of the U.S. economy.[12] Based on an analysis of the bill by the Environmental Protection Agency (EPA), the 2020 cap would require a reduction of 912 million metric tons of carbon dioxide equivalent ($mmtCO_2e$) in covered sectors, relative to projected 2020 emissions under the reference case scenario.[13] EPA's reference case is based on the Energy Information Administration (EIA)'s April 2009 update to its 2009 Annual Energy Outlook reference case forecast. Although EIA's forecast does not explicitly account for electricity savings from ratepayer-funded energy efficiency programs implemented over the forecast period, it is possible that some fraction of the savings from such programs may be implicitly captured within the forecast. Lacking specific knowledge, if we assume that the reference case includes a continuation of ratepayer-funded energy efficiency savings at 50% of the level achieved in 2008, then our projections of electricity savings from ratepayer-funded programs would yield emission reductions in the range of 42-164 $mmtCO_2e$ by 2020, relative to the reference case.[14] Though not a negligible impact, it is clear

[11] For a further explanation of this argument, see Loper et al. (2008).

[12] The cap on covered greenhouse gas emissions begins at 3% below 2005 levels in 2012, with the percentage reduction relative to 2005 levels increasing each calendar year, reaching 83% below 2005 levels by 2050. The 2020 target is 17% below 2005 levels.

[13] The 2020 GHG emission target for covered sectors is equal to 5,056 $mmtCO_2e$, compared to EPA's reference case projection of 5968 $mmtCO_2e$ for covered sectors in 2020 (EPA 2009).

[14] This range in emission reductions was calculated by reducing our projections of electricity savings from ratepayer-funded programs by the portion assumed to be implicit in the EPA reference forecast, yielding a range in cumulative savings over 2009-2020 equal to 116-270 billion kWh. We then applied to that range of savings

that even the fairly aggressive increases in energy efficiency spending and savings that we project over the next decade would contribute a relatively moderate percentage to the overall emission reductions that future federal climate regulations might potentially require (e.g., 912 mmtCO_2e by 2020 under *The American Clean Energy and Security Act of 2009*). That said, ratepayer-funded energy efficiency programs represent just one strategy for acquiring energy efficiency savings; accounting for the effects of new building codes, appliance efficiency standards, tax incentives and other federal programs would increase the total contribution of energy efficiency towards any future greenhouse gas emission reduction goals.

emission rates ranging from 0.36-0.86 metric tons per MWh. The emission rate range reflects uncertainty and geographical diversity in the emission rate of generation offset by future energy efficiency, with the lower end of the range equal to the emission rate of a combined cycle gas turbine (CCGT) generator and the upper end equal to the mid-point between the emission rates of CCGT and sub-critical pulverized coal generation.

5. Challenges Ahead, Bumps in the Road?

Is a doubling or tripling of ratepayer-funding for energy efficiency over the next decade feasible? What are the fundamental challenges that confront states' efforts to achieve increasing levels of savings from ratepayer-funded programs? Below, we highlight several issues that we believe may dominate the landscape on the road ahead.

The Economic Downturn

At least over the near-term, economic conditions in the U.S. may complicate and constrain efforts to scale-up energy efficiency spending and savings, for several reasons. First, the success of ratepayer-funded energy efficiency programs typically requires customers to pay a portion of the capital outlay for energy efficiency measures. As households and businesses struggle to manage their day-to-day expenses, many may be reluctant make new investments, even those with short payback periods. Second, a slowing or decline in overall economic activity will likely reduce the rate of stock turnover and new housing starts, thereby reducing the amount of energy savings that could be captured through ratepayer-funded programs targeting these market opportunities. Finally, economic hard-times may complicate the political feasibility of increasing ratepayer-spending for energy efficiency, particularly if it results in short-term rate impacts.[15]

Aversion to Short-Term Rate Impacts from Large-Scale Energy Efficiency Implementation

In most states, utilities typically expense program costs for energy efficiency as they are incurred, hence cost recovery is relatively front-loaded compared to cost recovery for most supply-side resource alternatives. As a result, the rate impacts from energy efficiency tend to occur sooner (even if the rate impacts are less over the long-term, and even if average utility bills are reduced compared to supply-side alternatives). Thus, the short-term rate impacts associated with attaining very aggressive levels of savings could pose a political challenge for state regulators, particularly in those states that have seen significant rate hikes in recent years or whose rates are well-above national averages. This issue has surfaced in several states that have recently passed an EERS (e.g. IL, PA) as they have established cost caps or limits on rate impacts. To mitigate concerns about short-term rate impacts, we expect that an increasing number of state PUCs and utilities will explore cost recovery mechanisms that allow better alignment of program costs and system benefits (e.g. amortization of expenses) as well as decoupling and shareholder incentive mechanisms.

Coordination with State/Federal Energy Efficiency Programs

In most states and market segments, ratepayer-funded energy efficiency programs administered by utilities or third parties have been implemented at a much larger scale than state or Federal energy efficiency programs (except for low-income weatherization). The passage of *The*

[15] The economic recession has resulted in a significant reduction in sales of many electric utilities, in some cases resulting in negative growth rates. In this environment, some utilities are concerned about under-recovery of fixed costs (and authorized earnings) because a significant portion of their revenues are derived from volumetric-based rates. Significant increases in funding for energy efficiency may exacerbate this problem.

American Recovery and Reinvestment Act (ARRA) is clearly a "game-changer" in terms of the level of support and funding provided by Federal taxpayers for energy efficiency over the next three years. Funding for the federal low-income weatherization program ($5 billion) and State Energy Program (SEP) formula grants ($3.1 billion targeting energy efficiency retrofits and renewable energy in buildings and industrial facilities) will increase ten-fold from current levels, and the Energy Efficiency and Conservation Block Grant Program will provide an additional $3.2 billion in grants to local governments for various energy efficiency and renewable energy activities. The intent of the SEP formula grants, specifically, is for states to commit their grant funding to expand existing programs, including ratepayer-funded programs, or to create new programs – not to supplant or replace existing funding (U.S. DOE 2009). Thus, state and local energy efficiency programs that are implemented with ARRA funds will require a massive ramp-up in capability to deliver energy efficiency services.

Because we are primarily interested in forecasting longer-term trends in ratepayer-funded energy efficiency programs, our analysis does not explicitly account for the potential short-term impacts of ARRA-funded state and local EE programs on existing and emerging ratepayer-funded EE programs. However, the infusion of funding for energy efficiency provided by ARRA does present several near-term implications for ratepayer-funded programs. First and foremost, a much higher degree of coordination will be required among energy efficiency program administrators in each state (e.g. utilities, state energy office, local governments) in order to ensure consistency in program offerings, obtain support from trade allies, and minimize confusion among customers and program delivery contractors. Because customers will have access to multiple funding sources to buy-down the cost of their energy efficiency projects (e.g. ratepayer and ARRA funds), state PUCs will have to develop guidelines regarding whether program administrators will be able to take full or partial credit for savings funded by different programs.[16] In addition, if state PUCs perceive that end users and the service delivery infrastructure will not be able to absorb the massive increase in funds for energy efficiency because of the ARRA, then some states may delay or slow down their internal plans to ramp-up spending on ratepayer-funded energy efficiency programs until after ARRA funds are committed or spent (2012).

Developing Innovative Program Designs to Reach Deeper and Broader Savings

Given the historic experience of leading states, we are confident that the 20 or so uncommitted states can achieve the energy efficiency savings levels in our High Case scenario (i.e., annual savings of approximately 0.3% of electric retail sales by 2020), because many utilities across a diverse set of circumstances are currently implementing programs that produce significantly greater levels of savings on a sustained basis. However, a number of leading and up-and-coming states have established aggressive energy efficiency savings goals for future years that are well beyond current experience and practice in most leading states (e.g., annual electric savings on the order of 2% or more of retail sales). Based on recent market potential studies in several of these states, savings at this level are achievable and cost-effective compared to supply-side alternatives. However, the challenge for program administrators will be to design and implement programs that can achieve both deeper savings, on average, at customer facilities and have a

[16] A few states (e.g. PA) have already decided that program administrators can take full credit for savings if customers receive a rebate from the utility, even if customers access additional funding sources.

broader reach in terms of market penetration, over a sustained period of time. Service providers will have to achieve savings levels of 25-40% of existing usage at customer facilities compared to current practice in ratepayer-funded programs, which is typically in the 5-20% range. Achieving higher market penetration rates will require programs to target and reach traditionally under-served markets (e.g. small commercial, multi-family, rental housing, non-owner occupied commercial facilities) in far greater numbers than current practice (MEEAC 2009). We are also likely to see increased attention to integrated delivery of electric and gas efficiency programs as well as coordinated delivery of energy efficiency and on-site renewables and combined heat and power, in order to reduce transaction costs and provide customers with tailored, customized service offerings.

Greater Reliance on Aggressive Appliance and Lighting Efficiency Standards

Ratepayer-funded (or taxpayer-funded) energy efficiency programs, federal and state appliance efficiency standards, and building codes represent three major strategies to capture energy efficiency savings potential. These three strategies can complement each other but also are partial substitutes, in the sense that adoption of aggressive minimum efficiency standards for a broad range of consumer products raises the current-practice baseline and may therefore reduce the remaining achievable potential that can be captured by voluntary, ratepayer-funded energy efficiency programs.

For example, in the 2007 energy bill, new standards were adopted for 10 products, including general service lamps, which are required to use about 25-30% less energy than current incandescent bulbs by 2012-14 and 60% less by 2020.[17] When fully phased in, the new standard for general service lamps, combined with increasing market penetration of compact fluorescents lighting (CFLs), may mean that CFLs applications that are eligible measures in many ratepayer-funded programs will have become standard practice. Residential lighting measures often account for 20-40% of total savings in a utility's energy efficiency portfolio and are among the most cost-effective measures. Thus, in the future, program administrators will likely be required to support new measures (e.g., LED lighting) and develop new strategies to capture cost-effective savings opportunities, because some of the measures implemented currently in programs (e.g. standard CFLs) may be covered by appliance efficiency standards.

Our analysis of future spending and savings scenarios for ratepayer-funded EE programs does not explicitly account for the possibility that federal and/or state governments could decide to significantly revise the balance among existing EE policies and decide to rely more heavily on building energy codes and efficiency standards to capture the available savings potential. We recognize that this is an important issue, though, and note that the California PUC, in adopting new savings goals for ratepayer-funded energy efficiency programs for the 2009-2020 period, explicitly accounted for the impacts of new federal standards and state codes and standards. The CPUC correspondingly reduced the remaining market potential for ratepayer-funded energy

[17] Products for which new standards were adopted in 2007 Energy Bill include: general service lamps, reflector lamps, residential boilers, clothes washers, dishwashers, dehumidifiers, electric motors, metal halide lamp fixtures used in high-ceiling commercial and industrial applications, walk-in coolers and freezers, and external power supplies. See Appliance Standards Awareness Project factsheet at http://www.standardsasap.org/documents/2007EnergyBill_Standardsfactsheet.pdf

efficiency programs. It is possible that energy efficiency goals in other states have not fully accounted for the impact of federal appliance standards, if these goals were based on market potential studies conducted prior to enactment of those standards. At the same time, new efficiency opportunities may emerge over the coming decade that will replenish the market potential reservoir.

Developing the Institutional Framework for Energy Efficiency in Up-and-Coming and Uncommitted States

Energy efficiency resources have some distinctive characteristics that require state PUCs to establish an institutional framework for effective regulatory oversight of ratepayer-funded energy efficiency programs. These distinctive elements include: the need for measurement and verification of savings from energy efficiency programs; the fact that energy efficiency programs depend on customer acceptance and adoption; and the fact that, under traditional regulation, the utility's financial interests are not well-aligned with societal interest in pursuing cost-effective efficiency. Many leading states have successfully grappled with these institutional and regulatory policy issues, and a variety of approaches have proven to be effective. Based on this experience, state PUCs must provide leadership in defining energy efficiency policy objectives, establish roles and responsibilities for program administrators, and be willing to devote sufficient staff (or technical consultant) resources so that they can effectively oversee acquisition of large-scale energy efficiency resources.

Workforce Needs and Human Infrastructure

The projected growth in ratepayer- and taxpayer-funded energy efficiency will require significant near- and long-term expansions of the energy efficiency services sector (EESS) workforce. Trained personnel are and will be needed to design, implement, and manage energy efficiency programs, and to design, construct, install and maintain energy efficiency building systems. There is growing concern among policymakers and program administrators about a shortage of well-trained personnel in the EESS. Goldman et al. (2009) attempted to estimate the size and structure of the current EESS workforce, forecast the number of people that will be needed in 2015 and 2020 under various scenarios, and assess shortages and needs in the current workforce in light of expectations for growth (Goldman et al. 2009).

Drawing upon over 300 interviews, survey respondents reported that:

- management positions requiring at least 10 years experience and positions requiring engineering experience with high-efficiency technologies are the most difficult positions to fill (taking up to 12-15 months to fill);
- re-training of the existing construction and building industry workforce to provide energy efficiency services will be critical to success (and that this workforce is "under-employed" given the economic downturn);
- aging workforce is viewed as a problem among building and construction industry association members (40-45% of workforce is over 50) but not in other EESS workforce segments;

- there is a shortage of engineers with efficiency knowledge or experience and energy efficiency services employers are thus willing to hire any engineer with technical aptitude, communication skills and some engineering experience;
- there are not enough certificates or degrees being awarded in energy efficiency related training and education to meet the growing need, although the training/education capability is expanding.

In our view, the combined impact of ratepayer-funded programs and energy efficiency programs that will be funded by the ARRA means that the shortage of well-trained personnel is primarily a near-term issue (e.g. 1-3 years). By 2013, if energy efficiency programs that are funded by the ARRA wind down, there will be a much larger workforce base in the EESS, which should be able to meet workforce demands that would occur under our High Case projection of ratepayer-funded energy efficiency program spending.

6. Conclusions

A proliferation of new state-level energy efficiency policies enacted over the past several years suggests that ratepayer-funded energy efficiency program savings and spending will continue to grow at a brisk pace over the next decade, and that the geographical structure of the energy efficiency market will undergo a fairly dramatic re-alignment. Based on a bottom-up analysis of state-level energy efficiency policies, we project that ratepayer-funding for electric and gas energy efficiency programs will rise from $3.1 billion in 2008 to between $5.4 billion (Low Case) and $12.4 billion (High Case) by 2020, with a Medium Case estimate of $7.5 billion. Along with the increase in aggregate spending, we project a significant broadening of the national energy efficiency market. A large portion of the overall projected increase will be centered in relatively populous states that, until recently, have been relatively minor players on the national energy efficiency stage (e.g., IL, MI, NC, OH, and PA). Thus, for example, we project in our Medium Case that 15 states will have annual energy efficiency budgets greater than $200 million in 2020, compared to just 2 states in 2008.

Our aggregate U.S. spending projections equate to average annual growth rates of 4.6% (Low Case), 7.5% (Medium Case), and 12.2% (High Case). In comparison, spending grew by 18% per year, on average, from 2006-2008. Moreover, the projections do not account for recent federal stimulus funding (ARRA), the potential impact of future national energy efficiency legislation (e.g., a national EEPS or a national RPS with an energy efficiency component) or future federal climate change legislation. Thus, our Medium Case is arguably a somewhat conservative estimate of the "most likely" spending trajectory, and our High Case projection is a more probable outcome than the Low Case.

That said, states are likely to face a number of key challenges as they seek to ramp up energy efficiency program activity. Some of these challenges are primarily near-term issues – e.g., the economic downturn, shortages within the energy efficiency workforce, and the (sometimes painstaking) process of developing the requisite institutional infrastructure and regulatory oversight mechanisms in states that are in the early phases of implementing ratepayer-funded efficiency programs. Other issues are ongoing or longer-term, such as the need to develop new and innovative program designs to achieve deeper and broader energy savings, in order to reach state energy savings goals that significantly exceed what is currently being achieved. This challenge will become increasingly pertinent as new appliance efficiency standards and building codes deplete some of the traditional low-hanging fruit for voluntary energy efficiency programs. While significant, we believe that these challenges are surmountable.

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Technical Appendix: Methodology and Assumptions Used to Develop Spending and Savings Projections

The paper presents the projections, developed by Lawrence Berkeley National Laboratory, of ratepayer-funded energy efficiency program spending (electric and natural gas) and savings (electric only) through 2020. This technical appendix describes the methods and assumptions used to develop these projections.

A1. Electric Energy Efficiency Spending & Savings Projections

Low, medium, and high projections of future electric energy efficiency program savings and spending were developed on a state-by-state basis. Although many of the specific assumptions and the approach to defining scenarios varied by state, the basic methodology used in all states consisted of several common components, including:

- Developing projections of retail electricity sales and revenues from retail electricity sales
- Defining low, medium, and high scenarios of future ratepayer-funded energy efficiency program savings and spending for the electricity sector
- Defining the amount of spending required to achieve different levels of savings

Each of these elements is described further below.

A1.1 Retail Sales and Revenue Projections

Projections of annual retail electricity sales and revenue from retail electricity sales were used to develop energy efficiency program spending and savings projections, and were also used to develop metrics that allow for comparison of spending and savings levels across states of differing sizes (e.g., savings as a percent of retail sales and spending as a percent of revenues).

Baseline Retail Sales and Revenue Projections

An initial set of baseline retail sales and retail price projections for each state was developed by applying annual growth rate projections from the Energy Information Administration (EIA)'s April 2009 update to its Annual Energy Outlook 2009 (AEO2009) reference case forecast to actual 2007 retail sales and price data for each state, as reported on EIA's Form-860. The electricity retail sales and retail price projections in AEO2009 are specified at the Electricity Market Module (EMM) level, the regions used in EIA's National Energy Modeling System (NEMS). Thus, the EMM-level growth rates were applied to each state in the respective region. Table A - 1 summarizes the annual average growth rates (2008-2020) of retail electricity sales and retail electricity prices in each EMM region, from the April 2009 AEO2009 reference case forecast. Revenue projections were calculated by multiplying projected retail electricity prices by projected retail electricity sales, and were converted to nominal dollars using the AEO2009 reference case forecast of the GDP chain-type price index.

Table A - 1. AEO2009 Projected Growth Rates in Retail Electricity Sales and Prices

EMM Region	States	AEO2009 Average Annual Growth Rate (2009-2020)	
		Retail Electricity Sales	Retail Electricity Price (real)
East Central Area Reliability Coordination Agreement	IN, KY, MI, OH, WV	0.6%	-0.2%
Electric Reliability Council of Texas	TX	0.9%	-0.3%
Mid-Atlantic Area Council	DC, DE, ME, NJ, PA	0.7%	-0.4%
Mid-America Interconnected Network	IA, IL, MO, WI	0.7%	0.1%
Mid Continent Area Power Pool	MN, ND, NE, SD	0.8%	0.7%
Northeast Power Coordinating Council/New York	NY	0.5%	-0.1%
Northeast Power Coordinating Council/New England	CT, MA, ME, NH, RI, VT	0.7%	-0.8%
Southeastern Electric Reliability Council/Florida	FL	1.3%	0.6%
Southeastern Electric Reliability Council/ Excluding Florida	AL, AR, GA, LA, MS, NC, SC, NT, VA	0.9%	0.0%
Southwest Power Pool	KS, OK	0.9%	0.1%
Northwest Power Pool Area	ID, MT, OR, UT, WA, WY	1.0%	0.1%
Mountain Power Area, Arizona, New Mexico, and Southern Nevada	AZ, CO, NM, NV	1.5%	0.2%
California	CA	0.9%	-0.9%

State-Specific Adjustments for Each Scenario

Future retail sales and revenues in each state will depend, in part, on the amount of savings achieved from future ratepayer-funded energy efficiency programs. In order to maintain internal consistency, we adjusted the retail sales and revenue projections for each scenario in each state, to reflect the energy efficiency savings assumed for the given scenario. The adjustments consisted of increasing or decreasing the baseline sales and revenue in each year, to account for the cumulative difference between the savings assumed for the scenario and the savings assumed to be implicit in the AEO2009 forecast.

The NEMS model does not explicitly account for ratepayer-funded energy efficiency programs; however, it does model future energy efficiency improvements at the end-use level, which may be partly attributable to future ratepayer-funded energy efficiency programs. Lacking better information, we assumed that the baseline retail sales projections, derived from the AEO2009 forecasted growth rates, implicitly account for a continuation of ratepayer-funded energy efficiency programs with savings equal to 50% of historical levels, as summarized in Table 2. Historical savings at the level of each EMM region were calculated from data on actual savings achieved in each state from ratepayer-funded electric efficiency programs implemented in 2006, as compiled by ACEEE (Eldridge et al. 2008). To provide an example: if we project, under one scenario, that future savings in a given state will be equal to 0.3% of retail sales in each year, and the energy efficiency savings assumed to be implicit in the baseline retail sales forecast is 0.1%, then we would reduce the forecast in each year to account for the cumulative effect of the additional 0.2% of retail sales saved each year (i.e., reduce the retail sales projection by 0.2% in year 1, by 0.4% in year 2, and so on).

Table A - 2. Assumed Baseline Energy Efficiency Savings in AEO2009 Forecast

EMM Region	Baseline Ratepayer-Funded Energy Efficiency Program Annual Savings (% of Retail Sales)
East Central Area Reliability Coordination Agreement	0.0%
Electric Reliability Council of Texas	0.1%
Mid-Atlantic Area Council	0.0%
Mid-America Interconnected Network	0.1%
Mid Continent Area Power Pool	0.2%
Northeast Power Coordinating Council/New York	0.3%
Northeast Power Coordinating Council/New England	0.4%
Southeastern Electric Reliability Council/Florida	0.1%
Southeastern Electric Reliability Council/Excluding Florida	0.0%
Southwest Power Pool	0.0%
Northwest Power Pool Area	0.3%
Mountain Power Area, Arizona, New Mexico, and Southern Nevada	0.1%
California	0.4%

A1.2 Scenario Definitions

In order to simplify the scenario-development process, the 50 states and Washington D.C. were segmented into two groups (see Table 3). States in Tier I are those that either have a strong history of supporting ratepayer-funded energy efficiency programs (*Leaders*) or have recently enacted policies that will likely provide strong support going forward (*Up-and-Comers*). As described further below, the scenarios for these states were developed based on largely state-specific assumptions reflecting policies or plans currently in place or under consideration. For the remaining states (*Uncommitted States*), in Tier II, spending and savings projections were developed using a relatively simple, standardized approach. Spending/savings projections for municipal utilities and cooperatives in many Tier I states were developed using the same approach as used for Tier II states.

Table A - 3. Segmentation of States into Tier I and Tier II for Electric Efficiency Projections

Tier I	AZ, CA, CO, CT, DC, DE, HI, IA, ID, IL, MA, MD, ME, MI, MN, MT, NC, NH, NJ, NM, NV, NY, OH, OR, PA, RI, TX, UT, VA, VT, WA, WI
Tier II	AK, AL, AR, FL, GA, IN, KS, KY, LA, MO, MS, ND, NE, OK, SC, SD, TN, WV, WY

Tier I Scenario Definitions

Low, medium, and high case scenarios were developed individually for each Tier I state. The starting point in defining the scenarios was the set of energy efficiency policies currently in place (or under consideration). Table 4 identifies the set of policies considered, and the states for which those policies were used as an input to one or more scenario. Table 5 describes the specific assumptions underlying each scenario in each Tier I state, and indicates more specifically how the policies listed in Table 4 were applied across the scenarios.

Table A - 4. Key Policy Drivers for Tier I-State Spending and Savings Scenarios

Policy Drivers	Applicable States*
Statutory requirement that utilities acquire all cost-effective energy efficiency	CA, CT, MA, RI, WA
EEPS	CA, CO, IL, MD, MN, MI, NJ (proposed), NM, NY, OH, PA, TX, VA (provisional), WI (proposed)
Energy efficiency eligibility under state RPS	HI, NC, NV
Recently-approved IRP plan	CO, ID, OR, MT, UT
Recently-approved DSM plan or multi-year budget	AZ, CT, CO, IA, MA, ME, NJ, RI (proposed), VT
System benefit charge	DC

* The Applicable States listed for each policy represents the states for which that policy informed development of spending and savings projections; it does not necessarily represent the totality of all states with that particular policy.

Table A - 5. Scenario Descriptions for Each Tier I State

State	Case	Scenario Description*
AZ	Low	IOUs maintain savings at 0.8% of retail sales (equal to the 2010 net savings level in APS' approved 2008-2010 DSM plan).
	Medium	Same as Low Case
	High	IOUs ramp up savings from 0.8% of retail sales in 2010 to 1.5% in 2020.
CA	Low	IOU savings equal to CPUC savings goals through 2020 (consisting of the 2004-2013 goals established in 2004, and the interim 2012-2020 goals established in 2008, which supersede the old goals for the years 2011-2012). POU annual savings are equal to 75% of the average annual savings from their 2007-2016 EE plans.
	Medium	Similar to Low Case, except POUs are assumed to attain 100% of the savings in their EE plans.
	High	Similar to Medium Case, except IOU savings from 2012-2020 remain at average annual savings of original CPUC IOU goals for 2007-2013, equal to 1.1% of retail sales.
CO	Low	IOUs meet EEPS targets (for Xcel, EEPS targets established by CO PUC; and for Aquila, the minumum statutory EEPS targets).
	Medium	Same as Low Case
	High	Same as Low Case through 2010, but IOU savings rises to 1.5% of retail sales by 2020, which is slightly higher than EEPS targets.
CT	Low	IOU spending continues at 2008 budget level, 1.7% of revenues.
	Medium	IOU spending doubles from 2008 budget level, ramping up to 3.4% of revenues by 2013 and remaining at that level through 2020.
	High	IOUs meet state policy of acquiring all cost-effective EE (based on efficiency potential study results reported in CT Energy Excellence Report), subject to an assumed annual spending cap equal to 6% of revenues from retail sales.
DC	Low	Spending continues at 2011 authorized SBC rate (1.5 mills/kWh) through 2020, with an assumed 80% directed towards electric EE (and the remainder towards renewable energy).
	Medium	Savings ramp up from projected level in 2011 under Low Case (0.6% of retail sales) to 0.7% of retail sales in 2020.
	High	The same as the Medium Case, except savings ramp up to 1.2% of retail sales in 2020.
DE	Low	Statewide funding for electric EE remains at $6.5M/yr (ACEEE's estimate of authorized 2009-11 annual funding for the Deleware Sustainable Energy Utility) through 2020.
	Medium	Statewide savings ramp up from 0.3% of retail sales in 2011 (as in Low Case) to 0.7% of retail sales in 2020.
	High	The same as the Medium Case, except that statewide savings ramp up to 1.2% of retail sales in 2020.
HI	Low	Statewide savings exhaust, but do not exceed, the 50% EE allowance under state RPS.
	Medium	Same as Low Case
	High	Same as Low/Medium Cases through 2011, but savings increases from 1.2% of retail sales in 2011 to 2.0% in 2020.
IA	Low	Statewide funding (IOUs & POUs) continues indefinitely at 2008 approved budget (1.2% of retail sales, based on CEE 2007 electric EE budget data)
	Medium	For 2009-2013, IOU spending projections are based on the proposed budgets in their 2009-2013 EE plans, and POU EE spending is equal to the average annual spending in 2003-2005 (data from IUB presentation). For 2014-2020, continue funding at projected 2013 level (3.3% of revenues).
	High	All utilities (IOUs & POUs) achieve savings equal to 1.5% of retail sales by 2011 (the target that IOUs were required to evaluate in their most recent EE plans) and continue at that level thereafter.
ID	Low	IOU savings through 2020 are based on projections from each utility's IRP (Idaho Power's 2008 IRP Update, Avista's 2007 IRP, and PacifiCorp's 2007 IRP update), which decline in aggregate from 0.8% of retail sales in 2010 to 0.4% in 2020; POU savings in each year are 0.25% of retail sales lower than IOU savings.
	Medium	IOU savings through 2010 are based on projections from each utility's IRP, and remain constant at 0.8% of retail sales from 2010-2020; POU savings in each year are 0.25% of retail sales less than IOU savings.
	High	Same as Medium Case, but IOU savings ramp up to 1.5% of retail sales in 2020.

IL	Low	Savings through 2010 are based on IOU 2008-10 EE plans. From 2011-2020, savings equal EEPS targets until statutory cost caps are reached, which is projected to occur in 2012, when savings equal 0.9% of retail sales.
	Medium	Savings through 2010 are based on IOU EE plans. Statutory EEPS cost cap is assumed to be lifted or increased, and savings rise to 1.3% of retail sales in 2013, but remain at that level through 2020.
	High	Savings through 2010 are based on IOU EE plans. Statutory EEPS cost cap is assumed to be lifted or increased, and EEPS targets are assumed to be fully achieved.
MA	Low	IOU savings ramp up to 1.5% of retail electricity sales in 2020.
	Medium	IOU savings ramp up to 2.2% of retail sales in 2012, as proposed in 2010-2012 statewide electric EE plan (April 2009), and remain at that level through 2020.
	High	IOUs meet state policy of acquiring all cost-effective EE, with savings estimated based on the EE potential study conducted for CT, subject to an assumed annual spending cap equal to 8% of revenue from retail sales.
MD	Low	IOU and SMECO spending through 2013 based on their approved 2008 EE plans, but with a 2-year lag. For 2014-2020, spending remains flat at 2013 level, equal to 1.7% of revenues.
	Medium	IOU and SMECO spending through 2016 based on their approved 2008 EE plans, but with a 1-year lag. For 2017-2020, spending remains flat at the 2016 level, equal to 2.1% of revenues.
	High	IOU and SMECO spending through 2012 based on their approved 2008 EE plans. For 2012-2015, savings are based on achieving 50% of EmPower MD goals through utility programs. Savings from 2016-2020 remain flat at the 2015 level.
ME	Low	Spending from 2009-2012 based on Efficiency Maine's projected budget, and remains at 2012 level, equal to 1.0% of revenues from retail sales, through 2020.
	Medium	Savings ramp up from 0.6% of retail sales in 2010, as estimated from Efficiency Maine's proposed budget for that year, to 1.2% of retail sales in 2020.
	High	The same as the Medium, except savings ramp up to 2.0% of retail sales in 2020.
MI	Low	Statewide savings based on full compliance with statutory EEPS targets, which reach 1.0% of retail sales in 2012.
	Medium	Same as Low Case.
	High	Assumes that statewide savings ramp up from 1.0% of retail sales in 2012 to 1.2% in 2020.
MN	Low	All utilities meet the minimum 1.0% EEPS target for conservation improvement programs.
	Medium	Savings ramp up from 1.0% of retail sales in 2010 to 1.2% in 2020.
	High	Same as Medium Case, except savings ramp up to 2.0% in 2020.
MT	Low	NorthWestern savings through 2020 based on the projection identified in its 2007 Electric Supply Resource Procurement Plan, which remains flat at approximately 0.5% of retail sales per year.
	Medium	Same as Low Case
	High	NorthWestern savings based on 2007 Procurement Plan projection through 2010, but then ramps up from 0.5% of retail sales in 2020 to 1.5% in 2020.
NC	Low	IOUs exhaust, but do not exceed, the EE allowance under the state RPS; POUs first exhaust their allowable use of large hydro, and then meet 75% of remaining RPS needs (after all set-asides are met) with EE.
	Medium	Same as Low Case
	High	All utilities ramp up from annual savings levels of 0.2%of retail sales in 2010 (as projected for that year in the Low/Medium Cases) to 1.0% in 2020.
NH	Low	Spending levels through 2020 are based on a continuation of current SBC funding levels for electric EE, equal to 1.2% of revenues from statewide electricity retail sales.
	Medium	Savings ramp up from 0.6% of retail sales in 2010 (the projected savings under current funding levels) to 1.2% of retail sales in 2020.
	High	Same as the Medium Case, except savings ramp up to 2.0% of retail sales in 2020.
NJ	Low	2009-2012 spending based on NJCEP funding levels approved by NJBPU; funding from 2013-2020, a percentage of revenues, remains constant at the approved 2012 level.
	Medium	Equal to mid-point between Low and High case projections
	High	2009-2012 spending same as Low Case. From 2013-2020, annual savings are equal 1,500 GWh/yr, the average level needed to meet the 2020 savings goal in the state's draft Energy Master Plan.
NM	Low	IOUs and municipal utilities acheive full compliance with EEPS targets, which requires annual savings of approximately 0.5% of retail sales through 2014, and 0.7% of retail sales from 2015-2020.
	Medium	Same as Low Case
	High	Same as Low/Medium Cases through 2010; but savings then ramp up to 1.5% of retail sales in 2020
NV	Low	IOU savings through 2015 exhaust, but do not exceed, the maximum EE allowance under the RPS. Savings from 2016-2020 remain flat at 2015 level (0.7% of retail sales), rather than tapering off, as would be the case if savings were equal only to the RPS EE allowance in those years.
	Medium	2008-2010 savings equal 0.8% of retail sales, as indicated in Nevada Power's 2008-10 DSM plan, then rise to 1.0% in 2015 and remain at that level through 2020
	High	Same as Medium Case through 2010, but then savings rise to 1.5% in 2020.
NY	Low	Spending from 2010-2020 remains constant at 1.5% of revenues; for comparison, 2008 budget was 1.1% of revenues
	Medium	Savings from 2009-2015 are based on the portion of the state's overall EEPS target allocated by the NYPSC to ratepayer-funded programs. Spending from 2016-2020 remains constant at the average level during 2009-2015, equal to 2.8% of revenues.
	High	Same as Medium Case through 2015. Spending from 2016-2020 remains constant at 3.8% of revenues.

OH	Low	IOU savings equal to 50% of legislated EEPS targets, rising to 1.0% of retail sales by 2019; stipulated savings reflect high assumed levels of mercantile customer opt-out, reliance on T&D measures, and non-compliance.
	Medium	Same as Low Case
	High	IOU savings equal to 75% of legislated EEPS targets, rising to 1.5% of retail sales by 2019; stipulated savings reflects lower assumed levels (relative to Low/Medium Case) of mercantile customer opt-out, reliance on T&D measures, and non-compliance.
OR	Low	IOU savings through 2020 are based on projections from each utility's IRP (PGE's 2007 IRP, PacifiCorp's 2007 IRP update, and Idaho Power's 2008 IRP Update); POU savings in each year are 0.25% of retail sales lower than IOU savings.
	Medium	Same as Low Case
	High	Same as Low/Medium Cases through 2010, but IOU savings ramp up to 1.5% of retail sales in 2020.
PA	Low	IOU savings meet 2013 target and remain constant through 2020 at the average savings level achieved during 2010-2013, equal to 0.7% of retail sales.
	Medium	Same as Low Case
	High	Same as Low/Medium case through 2013, but then IOU savings increase to 1.2% of retail sales in 2020
RI	Low	Spending through 2020 remains flat at the 2009 level proposed by National Grid in its 2009 DSM Plan.
	Medium	Based on Medium Case scenario assumptions for MA IOUs
	High	Based on High Case scenario assumptions for MA IOUs
TX	Low	IOU savings meet current EEPS goal (20% of incremental peak demand); no POU savings included in scenario.
	Medium	Statewide savings (IOUs & POUs) meet current EEPS target through 2014, and higher proposed target of 30% of incremental peak demand in 2015-2020.
	High	Statewide savings (IOUs & POUs) increases from 0.1% of retail sales in 2008 to 1.0% in 2020.
UT	Low	Savings through 2020 based on PacifiCorp's 2007 IRP update.
	Medium	Savings through 2010 based on PacifiCorp's 2007 IRP update, then rise to 1.0% of retail sales in 2015 and remain at that level
	High	Same as Medium Case, except savings rise to 1.5% of retail sales in 2020
VA	Low	Statewide savings ramp up from 0% of retail sales in 2010 to 0.3% in 2020.
	Medium	Statewide savings ramp up from 0% of retail sales in 2010 to 0.5% in 2020.
	High	The proposed savings goals are formally adopted and achieved, with annual savings reaching 1.0% of retail sales in 2013, and remaining constant at that level through 2020.
VT	Low	Spending from 2009-2011 is based on Efficiency Vermont's approved 2009-2011 budget plus Burlington Electric's 2008 EE budget; spending from 2012-2020 remains constant at 2011 level, equal to 7.2% of revenues.
	Medium	Same as Low Case
	High	Savings ramp up from 2.1% of retail sales in 2011 (the projected level under the Low/Medium Cases) to 2.5% in 2020.
WA	Low	Statewide savings are based on meeting state goal of acquiring of all achievable cost-effective potential; magnitude of potential based on NWPCC potential study results and an assumed avoided cost of $45/MWh.
	Medium	Same as Low Case, except savings are based on acquiring cost-effective potential at an avoided cost of $85/MWh
	High	Savings ramp up from 1.0% of retail sales in 2010 (the level achieved in 2010-2020 under the Medium Case) to 1.5% in 2020.
WI	Low	Spending through 2020 remains constant at 2008 level of 1.2% of revenues
	Medium	Spending doubles to 2.4% of revenues over 2009-2011
	High	Savings based on achieving EEPS policy recommendation in Governor's Task Force on Global Warming.

* Where scenarios are defined in terms of assumed savings, spending levels are derived from savings. Also, unless otherwise indicated, spending and savings projections for municipal utilities and cooperatives are developed using Tier II approach.

Tier II Scenario Definitions

For Tier II states (and for municipal utilities and cooperatives in many Tier I states), spending projections were developed by employing a standardized set of assumptions about annual spending on ratepayer-funded energy efficiency, as a percentage of revenues (see Table 6). In the low-case scenario, ratepayer-funding for electric energy efficiency programs increases linearly from 0.1% of revenues in 2008 to 0.3% by 2020. In the medium case, spending increases from 0.1% of revenues in 2008 to 0.5% by 2012, and remains at that level through 2020. In the high case, spending increases linearly from 0.1% of revenues in 2008 to 0.8% by 2020 (which is slightly above the current national average of ~0.7% of revenues). The spending assumptions for Florida differ slightly from the other Tier II states, because Florida utilities currently administer electric energy efficiency programs with higher spending levels (i.e., ~0.4% of revenues) than other Tier II states. In the low case, Florida spending remains at 0.4% of revenues through 2020. The medium and high cases for Florida are the same as for the other

Tier II states, except that the initial spending level in 2008 is 0.4% of revenues (rather than 0.1%).

Table A - 6. Tier II State Spending Scenarios

Case		Ratepayer-Funded Electric EE Spending (% of Revenues from Retail Electricity Sales)												
		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Generic	Low	0.1%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.3%	0.3%
Generic	Medium	0.1%	0.2%	0.3%	0.4%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Generic	High	0.1%	0.2%	0.3%	0.4%	0.5%	0.5%	0.6%	0.6%	0.7%	0.7%	0.7%	0.8%	0.8%
FL	Low	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%	0.4%
FL	Medium	0.4%	0.4%	0.4%	0.4%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
FL	High	0.4%	0.4%	0.4%	0.4%	0.5%	0.5%	0.6%	0.6%	0.7%	0.7%	0.7%	0.8%	0.8%

A1.3 Cost of Savings Assumptions

Depending on the particular state and scenario, the spending projection may have been estimated from projected first-year savings, or vice-versa. In either case, first-year savings were translated into annual spending (or vice-versa) using an assumed cost of savings. We assume that the average cost of savings depends on the savings level achieved. To capture this relationship, we developed a generic "cost function" that relates the average cost of first-year electricity savings to the savings level expressed as a percentage of the utility (or state)'s retail sales (see Figure 1). The y-axis values in the figure are expressed on a normalized (unit-less) basis, with a cost of 1.00 at a savings level equal to 1.0% of retail sales. The rationale for this cost function is to reflect the fact that, based on our review of energy efficiency program experience, utility costs to acquire savings (on a dollar-per-MWh basis) can be somewhat higher when portfolio savings levels are low (i.e., annual savings <0.5% of retail sales), due to the effect of fixed program delivery costs and because the utility is implementing pilot programs or is ramping up the administrative and delivery infrastructure. There is also evidence to suggest that program costs increase at relatively high savings targets (i.e., annual savings >1.4% of retail sales) either because rebate levels may increase in order to achieve higher market penetration or because the utility includes more expensive energy efficiency measures in its program portfolio. The cost function was then applied to each state by "scaling" the generic cost function based on either state-specific program cost data or an assumed average cost of savings at savings equal to 1.0% of retail sales.[18] Average program costs in each year were escalated for inflation, using the AEO2009 reference case forecast of the GDP chain-type price index.

Table 7 describes the state-specific program cost data, which are derived from recent program results or recently-approved program plans. All states not listed in Table 7 were categorized as either a Low-Cost state or a High-Cost state.[19] Low-Cost states were assumed to have average program costs equal to the national average in 2006: \$200 per 1st-yr. MWh saved at a savings level of 0.2% of retail sales, derived from data compiled by ACEEE (Eldridge et al. 2008). High-Cost states were assumed to have average program costs equal to \$275 per 1st-yr. MWh

[18] For example, if data for a given state indicate that average program costs are \$200 per 1st-yr. MWh saved at savings equal to 1.0% of retail sales, then the generic cost function would yield an average cost of \$250 per 1st-yr. MWh at savings equal to 2.0% of retail sales (i.e., 1.25 times the cost at a savings level equal to 1.0% of retail sales).
[19] High-Cost states consist of: CO, HI, NH, and VT. All others (not listed in Table A - 7) are deemed Low-Cost.

saved at a savings level of 1.0% of retail sales, which is based roughly on average costs currently observed among some Northeastern states.

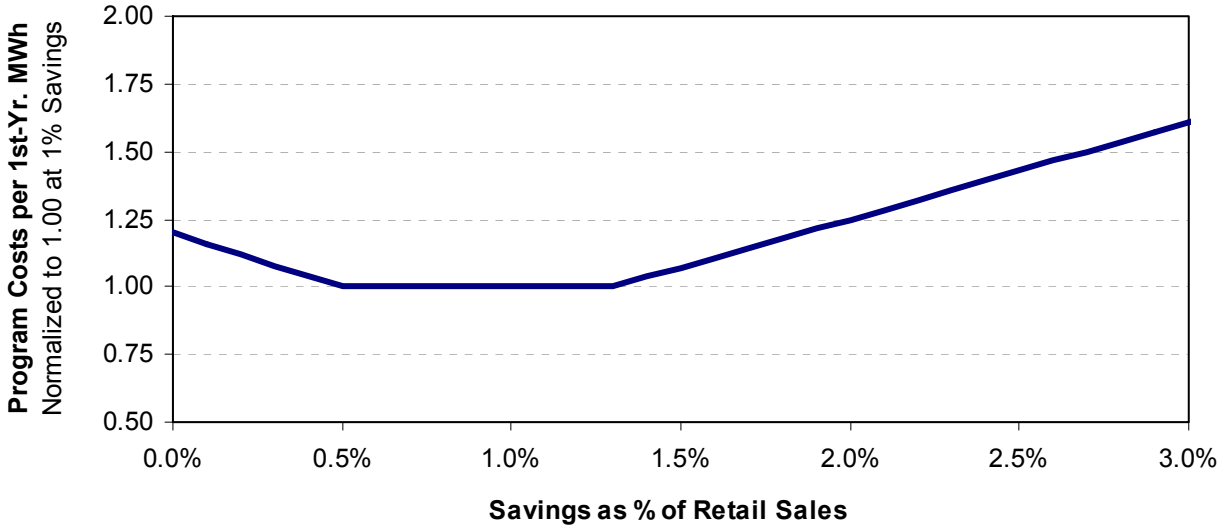

Figure A - 1. Generic Program Cost Function

Table A - 7. State Specific Program Cost Data

State	Unit Cost (2007$ per 1st-yr MWh Saved)	Savings Level (% of retail sales)	Data Source and Notes
CA	246	0.8%	Unit cost value is derived from SCE verified savings data and budget for program years 2006/2007. Savings level value is derived from PG&E, SCE, and SDG&E verified savings in program years 2006/2007.
CT	276	1.1%	Based on the IOUs' 2007 C&LM program results.
IA	166	1.1%	Based estimated savings and spending in MidAmerican's and IP&L's 2009-13 EE program plans
IL	192	0.7%	Based on estimated savings and spending in 2010 from the IOUs' 2008-2010 EE program plans, including programs administered by the DCEO
MA	266	0.9%	Based on the IOUs' 2005 EE program annual reports
MD	177	0.8%	Based on the proposed spending and savings in 2009-2011 from the IOUs' and SMECO's 2009-2015 EE program plans
NJ	168	0.7%	Based on proposed 2008 spending and savings for the NJCEP
NY	284	0.9%	Estimated from data cited in the NYPSC order adopting annual savings targets (6/23/08). The PSC order indicates that the incremental annual EE savings above current annual savings levels will cost $305/MWh and that this is 25% higher than current program costs. Given the size of the proposed savings levels relative to current annual savings, this implies an average cost of savings of $284/MWh.
TX	188	0.2%	Based on the IOUs' 2007 program results
WA	260	1.0%	Estimated from market potential and total resource cost data provided by Tom Eckman (NPCC). We estimate program spending from the TRC by assuming that programs cover 50% of the incremental measure cost, and non-incentive program costs represent 25% of total program spending.
WI	213	0.5%	Based on 2006 statewide spending and savings data reported by ACEEE.

A2. Natural Gas Energy Efficiency Spending Projections

Low, medium, and high projections of spending on ratepayer-funded natural gas energy efficiency programs through 2020 were also developed. Given that spending on natural gas programs represents a relatively small portion of total (electric plus gas) ratepayer-funded spending, we utilized a simpler, and more standardized approach to project future spending, compared to the electric energy efficiency projections.

A2.1 Revenue Projections

Projections of revenue from retail natural gas sales to residential, commercial, and industrial customers (i.e., excluding sales to electric utilities) were developed in a similar manner as the baseline projections of revenue from retail electricity sales. Retail sales and retail price projections were first developed for each state by applying annual growth rate projections from the AEO2009 reference case forecast (April 2009 update) to actual 2007 retail sales and price data for each state, as reported by EIA. Retail gas sales include sales to residential, commercial, industrial, and transportation sectors, but exclude sales to the electric power sector. Average annual retail gas prices were calculated as the average of EIA's forecast of prices for the residential, commercial, industrial, and transportation sectors, weighted by the quantity of sales to each sector. The natural gas retail sales and retail price projections in AEO2009 are specified at the census-region level. Thus, the census-level growth rates were applied to each state in the respective region. Revenue projections were calculated by multiplying projected retail gas prices by projected retail gas sales, and were converted to nominal dollars using the AEO2009 reference case forecast of the GDP chain-type price index. Unlike the electricity revenue projections, no adjustments were made to the natural gas revenue projections to account for differing levels of energy efficiency savings across scenarios.

A2.2 Scenario Definitions

States were categorized into one of two groups. Tier I states are those with 2008 natural gas efficiency budgets greater than 0.3% of revenues (approximately the national average in that year), based on CEE 2008 budget data. Tier II consists of states with funding below that level and for which 2008 budget data was unavailable. Table 8 identifies which states are in each group.

Table A - 8. Segmentation of States into Group I and Group II for Natural Gas Projections

Tier I	CA, CT, FL, IA, MA, ME, MN, NH, NJ, OR, RI, UT, VT, WA, WI
Tier II	AK, AL, AR, AZ, CO, DC, DE, GA, HI, ID, IL, IN, KS, KY, LA, MD, MI, MO, MS, MT, NC, ND, NE, NM, NV, NY, OH, OK, PA, SC, SD, TN, TX, VA, WV, WY

For most Tier I states, spending scenarios for gas energy efficiency programs were developed by simply stipulating the increase in spending, as a percentage of revenues, from 2008 to 2020, and assuming a linear ramp up to those spending levels. The stipulated spending increases, relative to 2008, are 0% of revenues for the low case, 0.2% for the medium case, and 0.4% for the medium case. There were several exceptions to this standardized approach, made for the three states with the largest natural gas efficiency budgets in 2008:

- For California, the low and medium scenarios assume statewide spending in each year is equal to ratio of the CPUC's long-term gas savings goal in that year relative to the 2008 goal, multiplied by the statewide 2008 natural gas efficiency budget (as reported by CEE). Because the CPUC's long-term natural gas savings goals decline over time, so do the projected spending levels in the low and medium cases. In the high case, we assume that spending on natural gas efficiency remains constant at the level of the 2008 budget, as a percentage of revenues.
- For New Jersey, in the high case, we assume that natural gas spending for 2009-2012 is equal to the approved budget for those years, and remains constant at the 2012 dollar amount through 2020. The low and medium cases are based on the standardized approach for Group I states.
- For Wisconsin, in the high case, we assume that natural gas spending through 2020 is equal to the level indicated in the Governor's Task Force on Global Warming: Interim Report (Feb 2008) as required to meet the proposed natural gas EEPS. The low and medium cases are based on the standardized approach for Group I states.

For Tier II states, gas efficiency spending levels were projected by stipulating the 2020 savings, as a percentage of revenue, for each scenario, and assuming a linear ramp-up from current spending levels. The stipulated 2020 spending levels were: in the low case, the greater of 0% of gas utility revenues or current spending; in the medium case, 0.3% of gas utility revenues; and in the high case, 0.5% of gas utility revenues.