Energy Efficiency Policy

Opportunities for West Virginia

Prepared for:

West Virginia Division of Energy

11/15/2012

MARSHALL UNIVERSITY
CENTER FOR BUSINESS AND ECONOMIC RESEARCH

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Acknowledgements:

Funding for this report was provided by the West Virginia Division of Energy

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List of Abbreviations Used

ACEEE- American Council for an Energy-Efficient Economy
ACP- Alternative Compliance Payments
AEP- American Electric Power
AMO- Advanced Manufacturing Office
ApCo- Appalachian Power Company
ARC- Appalachian Regional Commission
ARRA- American Recovery and Reinvestment Act
ASHRAE- American Society of Heating, Refrigeration, and Air-conditioning Engineers
BCAP- Building Codes Assistance Project
C&I- Commercial and Industrial
CFL- Compact Fluorescent Light Bulb
CHP- Combined Heat and Power
DHBC- Department of Housing, Buildings and Construction
DR- Demand Response
DSM- Demand Side Management
EE- Energy Efficiency
EERE- office of Energy Efficiency and Renewable Energy
EERS- Energy Efficiency Resource standard
EESA- Energy Efficiency Standards Act
EM&V- Evaluation, Measurement and Verification
FE- First Energy
FERC- Federal Energy Regulatory Commission
GHGs- Greenhouse Gases
GOEO- Governor's Office of Economic Opportunity
HVAC- Heating, Ventilating, and Air Conditioning
IAC- Industrial Assessment Center
IBC- International Building Code
ICC- International Code Council
IEBC- International Existing Building Code
IECC- International Energy Conservation Code
IFC- International Fire Code
IOF-WV- Industries of the Future- West Virginia
IOUs- Investor-Owned Utilities
IRC- International Residential Code
ITP- Industrial Technologies Program
KBC- Kentucky Building Code
KEEPS- Kentucky Energy Efficiency Program for Schools
KW- Kilowatt
KWh- Kilowatt Hours
LIHEAP- Low Income Energy & Heating Assistance Program
LRAM- Lost Revenue Adjustment Mechanism
M&V- Measurement and Verification
MBTU- Million British Thermal Units
Mcf- Million Cubic Feet
MEP- Manufacturing Extension Partnership
MWh- Megawatt Hours
NFPA- National Fire Protection Association
NTGR- Net-to-gross-ratio
OBC- Ohio Building Code
OMB- Office of Management and Budget
PACT- Program Administrator Cost Test
PCT- Participant Cost Test
RCO –Residential Code of Ohio
REEF- Revenue-neutral Energy Efficiency Feebates
RIM- Ratepayer Impact Measure
SBC- System Benefits Charge
SCT- Societal Cost Test
SEF- Sustainable Energy Fund
SFV- Straight Fixed Variable
T&D- Transmission and Distribution
TRC- Total Resource Cost Test
USDOE- United States Department of Energy
WAP- Weatherization Assistance Program
WVDOE- West Virginia Division of Energy
WVMEP- West Virginia Manufacturing Extension Partnership
WVU- West Virginia University

Energy Efficiency Policy: Opportunities for West Virginia

Executive Summary

Energy Efficiency (EE) is a term that encompasses multiple levels of meaning. At its simplest level, the term can be understood as "the process of doing more with less." EE is not energy conservation, which implies that one reduces or goes without a service in an effort to save energy. As an energy resource, adoption of EE can lead to overall energy demand reduction without requiring any additional actions by consumers or resource providers. EE is often achieved because of innovations in technology and better management of resources. In West Virginia, there are several actions that can be taken to make existing EE efforts more effective. This is the primary focus of this analysis.

EE should be considered a high priority resource within the West Virginia energy portfolio. Of the 13 Appalachian states, West Virginia is a leading state within the group with the second highest residential energy consumption per household. In rankings of state-level energy efficiency efforts in the region, WV comes in near the bottom. This indicates that others states have characteristics that lead to lower consumption, such as more urban populations with more people per household and more incentives to deploy efficiency programs due to higher electricity costs. EE can help alleviate the impacts of increasing energy demand and rising electricity rates if it is done cost-effectively.

Utility programs are a primary way to deploy energy efficiency initiatives. State policy and state-sponsored workshops and training provide a foundation on which to institutionalize attention to EE. Third-party administrators can also manage very effective EE initiatives, although utility programs are more common due to existing demand-supply relationships and knowledge of consumption patterns. Presently the two state utility programs, offered through Appalachian Power and First Energy, constitute the largest state-level funding for EE efforts at nearly $8 million per year. These efforts are new, having been initiated in 2011, and the programs are younger and less inclusive than similar utility programs in neighboring states.

Energy efficiency programs can confer substantial benefits to utilities and end-users when program implementation and maintenance is more cost-effective than increasing supply of energy. Future increases in investment costs can similarly be avoided for transmission and distribution infrastructure. Although demand response is not typically considered to be energy efficiency, effective EE programs also contribute to a decrease in peak demand due to the decrease in overall demand.

States play an important role in promoting EE through building energy codes. WV has made strides by adopting some of the more recent standards. However, with the exception of public buildings, ensuring code compliance is largely voluntary throughout the State and adoption thus has limited effectiveness. Enacting current and enforceable building energy codes is a vital component of sound EE policy. Structures built to outdated design and construction standards have higher energy consumption. States with the greatest prioritization of EE maintain updated building energy code standards.

In WV industrial EE has been largely supported through federal funding. Various initiatives undertaken in partnership with West Virginia University, and supported by the West Virginia Division of Energy have induced significant levels of energy savings at many manufacturing facilities throughout the state.

Quantifying energy savings and establishing baseline levels of consumption by which program effectiveness can be evaluated is a key aspect to ensuring the efficacy of EE programs. Program evaluation measures the success of utility initiatives in terms of gross versus net energy savings, taking into account variables that would have occurred without the influence of the program. Both gross and net savings are used in evaluation of regional utility programs.

Different sectors of the economy have different energy needs and usage schedules and are able to take advantage of different elements of EE programs. Furthermore, while the current utility programs are administered by electric utilities, the energy saving actions induced by the programs also translate into lower natural gas consumption for households that use gas for space and water heating. Emissions reductions and water savings are ancillary environmental benefits.

Policy recommendations are divided into two categories, those adoptable from a state government perspective and those adoptable from a utility/regulatory perspective.

Regarding State efforts, this evaluation recommends:

1. Statewide adoption of the 2009 IECC and 2007 ASHRAE standards.

   The recent adoption of the 2009 IECC and 2007 ASHRAE standards for state-funded construction and public buildings is a step in the right direction. The adoption of these updated codes on a statewide basis has been promulgated but is not yet law.

2. Keep the State no further than one series of codes behind the most recent version.

   Many states take a "lead by example" approach and set public building energy codes over and above the standards set for general residential and commercial buildings.

3. Appointment of an Energy Efficiency Ad-hoc position to the State Fire Commission.

   Within the scope of authority of the State Fire Commission is the right to establish advisory boards to encourage representative participation in the rulemaking processes on issues related to the State Building Code. Insofar the commission has chosen not to employ such advisory boards with regards to building energy code adoption. This action would help to ensure the future promulgation of updated building energy codes.

4. Conduct a study to evaluate the feasibility of making the energy code portion of the State Building Code enforceable statewide.

   Such a study would evaluate the restructuring of the Fire Commission in a similar manner to how Kentucky reorganized the entities responsible for their state building code. A second area of study could examine the potential for uniformity of the WV State Building Code so that all adopted codes stem from one class of publications.

5. Continued support of West Virginia Division of Energy (WVDOE) EE-related programs.

   The West Virginia Division of Energy has been an advocate for energy efficiency for several years. The office is well-known throughout the state for its continual efforts to promote adoption of current building energy codes via education and training. The WVDOE has also supported industrial EE by allowing for a broader range of audits.

6. Conduct a Study on Potential for Increased CHP Deployment within the State.

   Such a study would evaluate the potential for amending current standards and policies to aide in the promotion of greater CHP development. The study would also examine the effect of barriers which impede CHP deployment even with appropriate policies in place.

Regarding utility/regulatory efforts, this evaluation recommends:

1. Implement a mechanism to allow for reasonable recovery of utility lost-revenues resulting from energy efficiency programs.

   Effective utility EE programs should reduce a utility's overall revenue between rate cases due to the decrease in energy consumption resulting from greater adoption of efficiency technologies and practices. Utility under-recovery of revenue may be adjusted by decoupling or other recovery adjustment mechanisms, including shared savings or mechanisms that ensure customers are reimbursed if over-recovery occurs.

2. Establish an energy savings target for utility energy efficiency initiatives.

   Energy savings targets, legislatively mandated or financially incentivized, can help a program achieve greater savings than in the absence of such policy. Specific, measurable goals provide a standard by which progress can be based and reinforce the notion of EE as a quantifiable energy resource.

3. Establish a stakeholder working group to provide guidance on EE program elements.

   The stakeholder group would provide guidance on issues related to program evaluation, level of resource standards, potential program expansion, decoupling policies, and other relevant matters.

I. Introduction to Energy Efficiency

Energy Efficiency (EE) is a term that encompasses multiple levels of meaning. At its simplest level, the term can be understood as "the process of doing more with less."[1] From a more complex view, EE is a valuable resource derived from actions and behavior of customers whose reduced demand can lead to energy cost savings benefits for the entire system. When treated as an energy resource, adoption of EE can lead to overall energy demand reduction without requiring any additional actions by consumers or resource providers.[2] EE is often achieved because of innovations in technology, better management of resources, and improved economic conditions.[3]

Demand response (DR) is a practice related to EE but not synonymous with it. DR involves altering the consumption patterns of consumers of energy over time through long-term price changes or through incentive payments designed to induce smaller levels of electricity use during times of peak prices or peak usage.[4] DR is further distinguished from EE because it is often labeled a "dispatchable" resource. That is, it is a resource that can reduce its demand for electricity when instructed.[5] Most DR programs in effect today are event-driven in that they are designed to curtail or shift loads for short periods of time when called by the grid operator.[6] In contrast, EE involves implementing practices and technologies that permanently reduce levels of energy use and demand at any time.

EE should also not be equated with energy conservation. Conservation implies that one reduces or goes without a service in an effort to save energy. Efficiency efforts differ in that they allow consumers of energy to achieve the same or an increasing level of output but with a decreasing level of energy inputs. However, elimination of wasteful energy practices through conservation and load management via DR represent policies related to EE.

Collectively, energy efficiency, energy conservation, and demand response describe the practice of demand side management (DSM) because they involve managing consumer behavior in terms of the application and processes of energy usage. The focus of this study will be on policy and practices related to EE.

A. Energy Efficiency as a Least-cost Resource

Increasing generation capacity and transmission and distribution (T&D) capabilities has been the traditional approach for meeting increased energy demand. However, the resources utilized in building new power plants and expanding T&D are often more expensive than resources needed to fund efficiency measures.[7] Americans spend approximately $215 billion/year on the

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[1] Center for Sustainable Energy, "Define efficiency".
[2] Nexant, "Capacity Markets".
[3] World Energy Council, "Around the World".
[4] U.S. Department of Energy, "Demand Response".
[2] Nexant, "Capacity Markets".
[5] World Energy Council, "Around the World".
[3] Nexant, "Capacity Markets".
[6] U.S. Department of Energy, "Demand Response".
[4] Goldman et al., "Coordination of Energy".
[7] Blank and Gegax, "Shared Savings".
[5] Nexant, "Capacity Markets".
[8] Environmental Northeast 2009, "Economic Growth".
[6] Goldman et al., "Coordination of Energy".
[7] Blank and Gegax, "Shared Savings".

production of electricity at a price of 6 to 12 cents per kilowatt hour. Investments in efficiency only amount to approximately $2.6 billion/year at a cost of around 3 cents per kilowatt hour saved. Furthermore, natural gas efficiency costs $1 to $2 per thousand cubic feet (Mcf) saved compared with $6 to $8 per Mcf supplied.[8]

Energy efficiency is often the least-cost resource. An Environment Northeast study on the economic impact of EE in New England estimates the savings potential for investments in electric and natural gas efficiency at the program level. Their analysis concludes that for every dollar invested in electric energy efficiency, $4.70 in participant savings is generated, and for every dollar invested in natural gas energy efficiency $3.60 in participant savings is generated.[9] In Ohio, research projects that the implementation of residential energy efficiency measures could result in a levelized[10] cost of saved energy of $0.029 $/kWh during the period 2009-2025.[11] Similarly, energy efficiency was also identified as the most-cost effective resource[12] for energy savings in terms of electricity generation in North Carolina.[13] It is also important to note that over the next twenty years the Southern Region[14], of which WV is included, has the greatest potential for energy efficiency savings in absolute terms.[15]

Although efficiency as an energy option is often more cost-effective than traditional supply-side power generation, many states view efficiency and related programs as not only cost-effective alternatives, but also as an opportunity to foster future economic growth and curtail environmental degradation.[16] EE programs confer substantial benefits to utilities and end-users, the wider economy and the environment when program implementation and maintenance is more cost-effective than traditional methods for energy generation.

B. Utility and Ratepayer Benefits

A primary benefit of EE for utilities and ratepayers is the avoidance of capacity-related costs. A long-term, sustained reduction in aggregate system capacity requirements is achieved when efficiency gains are made. Increases in power rates from utilities are often attributed to large investments in capital expenditures which are made to keep pace with the increasing levels of energy demand.[17] If an increase in the demand for energy is decelerated through EE initiatives, utilities will purchase and build less power generating infrastructure. The reduction in capacity investment translates from lower fixed costs for utilities to fewer price increases for consumers over the long-run.[18]

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[8] Environment Northeast 2009, "Economic Growth".
[9] Ibid
[10] The levelized annual cost per kWh of an energy efficiency program is the levelized annual discounted payment amount for each year in the life of the program divided by the annual kWh saved
[11] ACEEE, "Shaping Ohio".
[12] EE was compared with other resources used for achieving cost savings including wind, biomass, natural gas combined cycle, pulverized coal, nuclear, and coal IGCC.
[13] ACEEE 2010, "North Carolina's Energy Future".
[14] According to the EPRI study, the Southern Region includes West Virginia, Kentucky, Virginia, North Carolina, South Carolina, Tennessee, Georgia, Alabama, Mississippi, Florida, Arkansas, Louisiana, Oklahoma, and Texas.
[15] EPRI 2009, "Achievable Potential".
[16] Grueneich, "Lecture 10".
[17] Edison Electric Institute, "Rising Electricity Costs".
[18] U.S. Department of Energy, "Demand Response".

Effective EE programs can also contribute to a deceleration in peak demand growth due to the decrease in overall demand. As less energy is consumed overall, utilities may have less need to utilize their least cost-effective sources of power generation such as older plants which are primarily employed to account for periods of peak load.[19] The increased reliance on newer, more efficient facilities leads to lower marginal costs of production for utilities over the short-run. This factor along with smaller consumption levels inherent with energy efficient technologies and practices can lead to a decrease in utility customers' bills over the short-term as well.[20]

Future increases in investment costs can similarly be postponed or avoided for transmission and distribution (T&D) infrastructure. Other things equal, vertically integrated generators and other T&D firms can invest less in T&D capabilities if EE is effective and consumption decreases.[21] Infrastructure will depreciate at a slower rate in real terms, and this leads to further decreases in T&D expenditures as energy passes more cost-effectively through the supply chain. These cost savings can be passed along to the end-users as well.

C. Economic Benefits

In terms of economy-wide impact, implementation of EE programs is closely linked with job creation. EPRI states that employment can increase "directly due to program expenditures and staffing requirements, and indirectly because program participants have additional disposable income as a result of lower energy bills."[22] Residential sector participants may foster economic growth through purchasing more goods and services, while commercial sector participants are able to designate funds previously used for energy towards hiring and business infrastructure.[23]

It is also important to note that indirect household and commercial spending may be substantial for EE-related goods and services. Energy customers who may not have been inclined to purchase upgraded equipment, appliances or EE services will engage in such activities if they see the additional spending as a viable investment. Therefore, local spending on the technologies and raw materials used in EE will increase proportionately with the number of participants in EE programs.[24] Lighting, appliances, HVAC installation services, and energy auditing are examples of EE-related goods and services which would benefit from an enhanced scope of EE programs. Although purchases may be induced by subsidization initially, these purchasing practices will become the norm once a comprehensive, enduring EE program is established within the state.

Other indirect economic effects are also notable. Savings in operational security and capacity lower the likelihood that forced outages will occur, and thus lower the financial impact on commercial and residential customers who may typically suffer productivity losses during outage periods.[25] Furthermore, work environments may be improved through enhancing lighting quality which reduces eyestrain for workers. Low-income customers represent another sector who could

[19] Ibid
[20] Environment Northeast, "Economic Growth".
[21] U.S. Department of Energy, "Demand Response".
[22] EPRI, "Guidebook".
[23] Ibid
[24] Environment Northeast, "Economic Growth".
[25] U.S. Department of Energy, "Demand Response".

garner substantial financial benefits from program participation. As homes become more efficient and bills reduced, the ability to make payments may increase, leading to "reductions in bad debt, terminations, forced mobility, and collection costs."[26] Additionally, a state's relative position in terms of economic competitiveness and trade on a domestic and even global level can ultimately increase with comprehensive EE programs.[27] EE advocates believe that when energy-related costs decrease, the state becomes a more attractive sphere of investment for commercial entities.[28]

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Participants in EE initiatives generate economic benefits through increased spending of disposable income as decreased energy-related costs and consumption result in lower energy bills. There is less certainty surrounding the correlation between EE and energy prices, however. Therefore, the issue of whether lower energy prices are a contributing factor to decreased energy costs is still unresolved. The prevailing notion within the energy community is that greater reliance on EE will put downward pressure on energy prices and demand.[29][30] A countervailing perspective suggests that EE programs force prices upward as utilities are forced to increase base rates to compensate for the effect demand reduction has on coverage of fixed costs.[31] However, decreases in peak demand can also reduce utilities' power supply costs and reduce the need for new generation capacity. To an extent, these factors offset the need to compensate for fixed costs in rate cases as growth in fixed costs decline in the long-run.[32]

D. Environmental Benefits

Energy savings directly impact the environment because of the reduction of fossil-based resources used in utilities' generation mixes. By reducing the amount of carbon-emitting fuels at the generational level, less greenhouse gases (GHGs) are emitted into the atmosphere. These avoided emissions are directly related to the savings acquired through adoption of practices like EE. The exact amount and mix of reduced GHG emissions depends on when the energy savings take place. EPRI notes:

> *At different times of the day, depending on the electric load, different fuels are used to meet customers' demand. Utility models show the type of fuel being 'dispatched' at each hour of the day. Most energy efficiency programs reduce energy use on the margin and impact 'load following' generation plants. Base load plants are less likely to be impacted by energy efficiency programs.*[33]

Therefore, the quantity of GHGs avoided depends on the nature of the carbon-emitting fuel used as a primary source in utilities' generation mixes.

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[26] EPRI, "Guidebook".
[27] Environment Northeast, "Economic Growth".
[28] ACEEE, "Shaping Ohio".
[29] Wood, "Estimating the Impact".
[30] EPRI, "Achievable Potential".
[31] American Public Power Association, "Revenue Requirements".
[32] Ibid
[33] EPRI, "Guidebook".

Water savings are another ancillary environmental benefit. As EE programs become more developed, appliance standards and incentives for water pumps, low-flow showerheads, faucet aerators, and other water-conserving technologies also become more prevalent. Energy Star, for instance, endorses energy-efficient appliances that reduce the use of domestic hot water because of the reduced energy usage required to heat water. Therefore, a derived benefit is that water conservation has been established as a relevant by-product of EE initiatives.[34]

E. Quantifying Avoided Costs and Non-energy Benefits

There is much inconsistency among states regarding how ratepayer-funded energy efficiency programs are evaluated.[35] One thing that is consistent is that all states use "utility system avoided costs" as the primary benefit quantified in program benefit-cost tests.[36] Many of the benefits previously discussed qualify as avoided costs because they are derived from an energy savings value, which often take into consideration what would have happened had the energy not been saved.

The difference between states lies in how avoided costs are defined. The results of a survey of state public service commissions performed by the American Council for an Energy-Efficient Economy (ACEEE) found that 12 states define avoided costs as fixed values based on the avoided next power plant. Another 12 define them based on market prices and 11 states base them on average or marginal system costs. The large majority of states (82 percent) include a value for avoided transmission and distribution costs.[37]

In most cases, avoided costs are defined for individual utilities as opposed to state-wide areas. This is simpler than calculating state-level costs because avoided costs are a function of a utility's generation mix. The two main categories of avoided costs are energy-related and capacity-related. Energy-related avoided costs are the costs of the marginal inputs that would have been used to produce the saved energy; these include cost of commodities, variable O&M, system losses, and may include other non-energy benefits such as reduced air emissions and water usage. Capacity-related avoided costs are capital investments in actual power plants, any purchase of capacity or capacity services, transmission and distribution lines and associated infrastructure. Environmental benefits such as reduced air emissions and avoiding the need for new transmission lines and power plants are a third category of benefits that are frequently included in avoided costs.[38]

No state considers all categories of costs. The correct level of inclusion depends on the state and available resources. Calculation of avoided costs can be short-term or long-term; if long-term, the avoided cost may be larger due to inclusion of more capacity-related variables. The long-term rate impact will depend on the level of fixed capital costs included in the avoided costs to value the energy savings.[39]

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[34] Jackson, "Hidden Benefit".
[35] Kushler, Nowak and White, "National Survey".
[36] Ibid
[37] Ibid
[38] National Action Plan for Energy Efficiency, "Cost Effectiveness".
[39] Ibid

F. Focus on EE in West Virginia

West Virginia has fallen behind its regional counterparts in terms of addressing its energy consumption through EE policy. Climate and other weather-related incidents act as key drivers for energy consumption and these factors vary among states with distinct physical geographic characteristics. It is important to note how West Virginia compares with regional states in terms of consumption and how EE policies reflect state efforts at mitigating load growth.

Table 1 indicates per household consumption figures and relative rankings for the ARC states:

Table 1: Household Energy Consumption in ARC States (2010)

ARC State	Delivered Energy to Residential Sector (MMBTUs)	Number of Households	Consumption per household (MMBTUs)	Rank
Alabama	177,612,000	1,883,791	94.28	11
Georgia	371,763,000	3,585,584	103.68	6
Kentucky	178,972,000	1,719,965	104.06	5
Maryland	219,108,000	2,156,411	101.61	8
Mississippi	109,133,000	1,115,768	97.81	10
New York	771,996,000	7,317,755	105.50	4
North Carolina	341,142,000	3,745,155	91.09	12
Ohio	534,456,000	4,603,435	116.10	1
Pennsylvania	552,369,000	5,018,904	110.06	3
South Carolina	157,338,000	1,801,181	87.35	13
Tennessee	254,474,000	2,493,552	102.05	7
Virginia	306,953,000	3,056,058	100.44	9
West Virginia	86,062,000	763,831	112.67	2
United States	11,527,426,000	116,716,292	98.76	NA

[1] U.S. Census Bureau 2010 Census and Energy Information Administration 2010 State Energy Profiles
[2] MMBTUs signify Million British Thermal Units.

Of the thirteen Appalachian states as defined by the Appalachian Regional Commission (ARC), West Virginia has the second highest residential energy consumption per household with the average household consuming 112.67 MMBTUs per year. This figure is 14.08% above the national average of 98.76 MMBTUs. Ohio is the only regional state to exceed West Virginia in terms of per household consumption with 116.10 MMBTUs of energy consumed per household annually. Pennsylvania ranks third with 110.06 MMBTUs consumed annually per household.

The three states with the least per household energy consumption among the ARC states are South Carolina, North Carolina, and Alabama. South Carolina’s annual per household consumption of just 87.35MMBTUs is the least among ARC states. North Carolina has the second lowest annual per household energy consumption with 91.09 MMBTUs, and Alabama, the third lowest, has a per household consumption of 94.28 MMBTUs per year. These three states also had a greater average number of persons per household than WV which means they were able to utilize less energy resources even though they had more people on average in a household.

Table 2 examines residential energy consumption further by taking into account the population of occupied housing units within ARC states and other relevant data:

Table 2: Per Capita Energy Consumption in ARC States and Related Data (2010)

ARC State	Delivered Energy to Residential Sector (MMBTUs)	Population in occupied housing units	Consumption Per Capita in Occupied Housing Units	Rank	Avg. Household Size (persons)	Population Density (Per Square Mile)
Alabama	177,612,000	4,663,920	38.08	10	2.48	94.4
Georgia	371,763,000	9,434,454	39.40	8	2.63	168.4
Kentucky	178,972,000	4,213,497	42.48	4	2.45	109.9
Maryland	219,108,000	5,635,177	38.88	9	2.61	174.8
Mississippi	109,133,000	2,875,333	37.95	11	2.58	63.2
New York	771,996,000	18,792,424	41.08	6	2.57	411.2
North Carolina	341,142,000	9,278,237	36.77	12	2.48	191.1
Ohio	534,456,000	11,230,238	47.59	2	2.44	282.3
Pennsylvania	552,369,000	12,276,266	44.99	3	2.45	283.9
South Carolina	157,338,000	4,486,210	35.07	13	2.49	153.9
Tennessee	254,474,000	6,192,633	41.09	5	2.48	153.9
Virginia	306,953,000	7,761,190	39.55	7	2.54	202.6
West Virginia	86,062,000	1,803,612	47.72	1	2.36	77.1
United States	11,527,426,000	300,758,215	38.33	NA	2.58	87.4

[1] U.S. Census Bureau 2010 Census and Energy Information Administration 2010 State Energy Profiles
[2] MMBTUs signify Million British Thermal Units.

WV's higher levels of consumption can be partially explained when the household variable is examined in greater depth. Beyond weather-related factors, other variables affect overall consumption levels faced by residents within a state. For instance, WV is more rural in terms of population composition than other states like NY and MD that are more urban. In states with greater population density, residents may be more apt to live in apartments and complexes that comprise less square footage than a typical house. As noted in Table 2, West Virginia has the second lowest population density of the ARC states. Additionally, West Virginia's average household size of 2.36 persons is smaller than all the other ARC states and significantly smaller than the national average of 2.58 persons.[40] Thus, more energy is required per person to maintain a household. In fact, when the household population is taken into consideration, West Virginia has the highest residential energy consumption per capita of all ARC states.

[40] U.S. Census Bureau, "2010 Census".

Despite all of the various factors affecting consumption and interpretations for why various states have higher or lower levels, the idea behind efficiency is to mitigate load growth by implementing policies that curtail consumer demand for energy. Not only did most states in the ARC have less per household and per capita consumption than WV, but they also ranked substantially higher than WV in terms of best energy efficient practices according to a national EE scorecard produced by the ACEEE. New York is one of the leading states in terms of EE practices with a scorecard ranking it 3rd out of 50, while Maryland is also a top tier state with an overall national ranking of 10th. Pennsylvania is a middle tier state according to the scorecard with a ranking of 25. Although these states had similar levels of consumption compared with WV, they are taking steps toward mitigating load growth through enacting EE policies that help their state more cost-effectively meet energy demand. On the other hand, states with lower levels of consumption such as Mississippi, Alabama, North Carolina and South Carolina have comparable or even lower rankings for EE policy. These states may not deem it necessary or urgent to enact policies when their demand for energy is already lower than the rest of the U.S. However, West Virginia has both high consumption levels and unfavorable policy for utilizing EE as a resource.

Although West Virginia has attempted to implement some measures of EE into the scope of its energy policy, it still falls behind most of the ARC states and the nation with its EE scorecard ranking of 44.[41] The low score can be contributed to the fact that West Virginia failed to realize incremental energy savings during the period in which the study was conducted.[42] The factors affecting the state's ability to save are related to the variety of efficiency programs implemented, efficiency budgets, energy savings targets, performance incentives for utilities, building energy codes, state initiatives, appliance efficiency standards, and other aspects of EE policy which will be examined further.

Table 3 shows the ACEEE scorecard ranking of the 13 ARC states:

[41] ACEEE, "Scorecard".

[42] In the 2011 scorecard, various data components were utilized from different years which resulted in data lag for inclusion of existing WV Utility programs. The scorecard utilized 2010 Program budget data for electricity and natural gas programs, 2009 electricity savings data from programs, and 2011 policy (Energy efficiency resource standards) and regulatory status of decoupling/performance incentives. Utilities and other program administrators do not report the data consistently and quickly enough on 2011 program budgets and energy savings to use in the 2011 Scorecard. This is the reason WV was not assessed as having utility energy efficiency programs.

Table 3: ACEEE Scorecard Ranking of ARC States

ARC State	Ranking
Alabama	43
Georgia	36
Kentucky	37
Maryland	10
Mississippi	49
New York	3
North Carolina	27
Ohio	24
Pennsylvania	25
South Carolina	46
Tennessee	30
Virginia	34
West Virginia	44

[1] American Council for an Energy-efficient Economy

West Virginia's last tier status in the scorecard rankings emphasizes the opportunity for the state to focus on EE as a key aspect of its overall energy policy. Other states have taken significant measures to improve their relative and overall standing with regards to EE policy. These measures have led to other states surpassing West Virginia in terms of the scope of their EE policy and the overall effectiveness. Although the previous examples illuminated issues related to residential energy consumption, comprehensive EE policy spans all sectors and requires multiple component programs which are addressed in the next section.

II. Components of Programs

Energy efficiency programs can be broken down into multiple classes based on the types of programs implemented and the energy use sector targeted. In this report, EE programs are described in terms of three different sectors: residential, commercial and industrial. The characteristics and relevant data related to each sector will be described, and the various programs that can be implemented in each sector will be discussed. However, before an examination of each sector is undertaken, it is important to first understand some relevant EE program elements. Prescriptive verses non-prescriptive programs and low-interest loans are two topics to be examined as a precursor to the discussion of EE in the different energy sectors.

A. Prescriptive vs. Non-prescriptive Program Elements

Two distinct approaches towards achieving efficiency outcomes are typical in most EE programs. The prescriptive approach refers to facilitating the adoption of new EE technologies by offering incentives for specific measures with predefined rebates or discounts.[43] Incentives may be paid directly to the customer or to the vendor. For instance, some rebate processes

[43] Xcel Energy, "Efficiency Programs".

require customers to fill out rebate forms to receive cash back on EE-related purchases. Other processes involve rebates being paid directly to vendors, and this approach allows the discounted price of EE-related goods to be more easily visible to customers within the retail location. Rebates, in general, provide trade partners with a promotional tool for EE in the marketplace.[44] Under this approach, consumers of energy are offered such incentives on technologies that meet prescribed efficiency standards in terms of lighting, HVAC, motors, building envelope, refrigeration, and other equipment.[45] A prescriptive program is typically designed to simplify the process by not requiring formal applications or pre-approval before the average user can adopt the most common energy saving measures.[46]

Generally, non-prescriptive EE programs are considered to be customizable initiatives that address more complex energy savings issues. They allow for rebates for commercial and industrial customers whose needs may not fall under the standard prescriptive measures. Examples of non-prescriptive programs include retrofitting, day lighting, building shell and glazing, free cooling, and any other measures, equipment, or technologies not covered under a prescriptive program.[47] For instance, new construction of commercial buildings may qualify for energy design assistance to ensure the building is constructed in the most energy-efficient manner. Non-prescriptive programs must typically undergo a cost/benefit analysis in order to evaluate the potential effectiveness of the initiative.[48] For example, DTE Energy commercial and industrial customers with proposals for custom efficiency projects must submit to a Total Resource Cost test to determine whether the cost-effectiveness of the efficiency measure warrants implementation.[49]

It is important to note that prescriptive and custom programs show a high level of consistency in terms of their mutual offerings within the contexts of EE programs. Both types of programs are typically offered in tandem with one another as coordination of measures, incentive levels and processing, qualification and technical standards, and other aspects of implementation and evaluation overlap.[50] Currently, no EE programs in the ApCo service territory offer non-prescriptive rebates.[51]

B. Low-interest Loan Programs

Low-interest loan programs offer loans at lower than market interest rates to customers seeking efficiency improvements. They can be administered by utilities or by third party agencies. Typically, the entity administering the efficiency program will buy down the interest rates offered from participating banks and offer a lower rate to its customer. It is common for the loan to be structured so the payback can be made mainly through the energy savings that are achieved with the efficiency investment. The Clean and Efficient Energy Program notes that more than 150 energy efficiency financing programs within the country adhere to this payback structure.

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[44] Ibid
[45] NEEP, "Best Practices".
[46] DTE Energy, "Energy Optimization".
[47] Rahe, "CORE Electric".
[48] Ibid
[49] U.S. Department of Energy, "DTE Energy".
[50] DTE Energy, "Energy Optimization"
[51] Fawcett, "Interview by Sean Pauley".

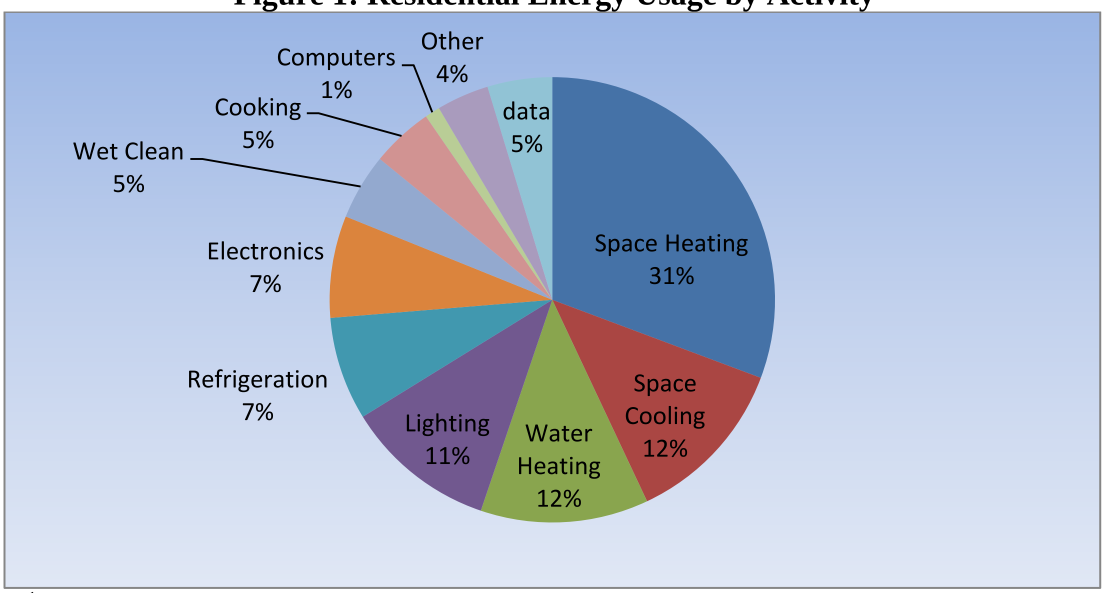
These programs do not offer one-size-fits-all solutions, and they operate with varying levels of success. However, it is important to note that low-interest loans function best when they are offered in conjunction with home audit programs.[52]

C. Residential Sector

With more than 100 million households, the residential sector in the United States uses nearly 25% of total energy consumed.[53] More specifically, the residential sector accounts for 37% of electricity consumption nationwide.[54] Furthermore, it accounts for 21% of natural gas consumption nationwide.[55] Households use energy for a variety of purposes such as heating and cooling their homes, heating water, lighting and operating a wide array of appliances such as refrigerators, stoves, televisions, and computers. Initiatives incentivizing use of energy-efficient lighting, high-efficient appliances, programmable thermostats, improved insulation, and building codes offer great opportunities in the residential sector to substantially reduce energy use.

Space heating is the activity that encompasses the largest amount of residential energy usage, accounting for 31% of the primary energy use in a typical household. Space cooling and water heating account for approximately the same proportion of use at around 12% and lighting accounts for roughly 11% of use. Figure 1 illustrates the proportion of energy usage by all activities relevant to the residential sector:

Figure 1: Residential Energy Usage by Activity



[1] Energy Information Administration and U.S. Department of Energy's EERE
[2] Data category in figure represents 1 quad of energy (5%) that is a statistical adjustment by the EIA to reconcile two divergent data source

[52] CEEP, "Low-interest".
[53] ACEEE, "Homes and Appliances".
[54] Energy Information Administration, "Electricity Explained".
[55] Energy Information Administration, "Natural Gas Consumption".

1. Residential HVAC Programs

In order to maximize their effectiveness, residential EE programs should be designed to take into account the activities which contribute to the greatest amount of energy consumption. Heating, ventilating, and air conditioning (HVAC) is one area emphasized within residential EE programs because it addresses the major activities of heating and cooling. HVAC represents the "mechanical systems that provide thermal comfort and air quality in indoor spaces."[56] Certain prescriptive measures are often adopted that offer residential customers rebates for purchasing energy-efficient equipment related to HVAC. Purchase of efficient heat pumps, boilers, furnaces, water heaters, air conditioners and even maintenance are just a few examples of HVAC equipment-related incentives. Appalachian Power Company (ApCo) offers such a program where heat pumps, water heater insulation jackets, and HVAC tune-ups are all eligible for rebates for residential households.[57]

2. Residential Lighting Programs

Lighting initiatives incentivizing the purchase and installation of compact fluorescent light bulbs (CFL) are also a common offering in residential EE programs. More than 70% of the fixtures in the residential sector that can hold CFLs remain unfilled. In states without established CFL programs, 90% of potential remains.[58] Additionally, the U.S. Department of Energy notes that 35% of electricity used for lighting purposes could be saved by switching from incandescent to CFL technology.

Typically, such programs encourage the sale and installation of CFLs through rebates or discounts on products. EE administrators and government agencies work directly with retailers to negotiate reduced prices through buying down the cost of the CFLs. In most cases, there are no coupons or forms necessary for customers to complete their purchase of the CFLs as the prices advertised within the store reflect the marked-down, subsidized price. This model is often seen as more effective method for offering rebates to customers as it uses market-oriented pricing and convenient purchasing as inducements to customers. Furthermore, the buydown process has proven to move higher volumes of products at a lower overall program cost.[59]

This form of a residential lighting program operates as an effective incentive because all parties involved benefit. Retailers have a lessened administrative burden because there is no longer a need for rebate applications and forms. Retailers, manufacturers, and utilities can collaborate through a mutual effort to market their products. Utilities are able to benefit by having a large volume of CFLs installed which reduces their overall system load. Also, energy customers receive savings in the form of price reduction of CFLs and lower energy bills.[60]

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[56] ACEEE, "Heating".
[57] Appalachian Power Company, "Residential Rebates".
[58] U.S. Department of Energy, "Market Profile".
[59] Kates and Bonanno, "Residential Market".
[60] Ibid

ApCo has taken advantage of this model with their SMART Lighting Program. They currently work with participating retailers like Wal-Mart, Home Depot, Lowes, and Sam's Club in West Virginia to offer instant rebates on qualified Energy Star CFL purchases. All ApCo/AEP residential electric customers in West Virginia are eligible for program participation, but there is a 12-bulb purchase limit per household. When CFLs are purchased with "big box retailers and home centers" the discounted price is reflected at the point of purchase. ApCo notes that the qualifying discounted bulbs will be priced "at least $1 less than the normal price at participating retail locations".[61] FirstEnergy, another relevant WV energy company, has established lighting efficiency programs within their power companies, Mon Power and Potomac Edison. However, these lighting incentives are currently only available to commercial customers.[62] These programs are described in greater detail in later sections describing WV utility rebate programs.

3. Residential Appliance Programs

Other EE programs designed for the residential sector also include elements that promote energy-efficient appliances. The increased usage of appliances and consumer electronics has led to greater electricity demand in recent years. Since 1985, the number of households in the U.S. utilizing a dishwasher has risen approximately 45%. Similarly, the number of households with personal computers has risen 170% since 1992.[63] Typical household appliances that require efficiency standards or receive efficiency rebates within EE programs include general cooking appliances, furnaces, washers and dryers, refrigerators, fans, ventilation, and more.[64]

Minimum efficiency standards for residential appliances are considered one of the most successful ways state and the federal governments have attempted to facilitate energy savings. Appliance efficiency standards ban the manufacturing and import or sale of appliances less efficient than the minimum requirements. These standards result in saved energy, but their adoption also has the added benefits of pollution reduction, improved electrical grid performance, and cost savings to consumers.[65]

In 2010, West Virginia adopted an appliance efficiency rebate program based on a federal initiative that gave rebates for Energy Star appliances which would replace residents' older, inefficient appliances. The West Virginia program was enacted on June 17, 2010 and it ended on August 24, 2011. Eligible products included within the program were refrigerators, freezers, clothes washers, dishwashers, and room air conditioners. Rebates of $25 to $100 were offered and were contingent upon proof of proper recycling of old appliances. Total program funding was approximately $1.7 million.[66]

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[61] Appalachian Power Company, "Smart Lighting".
[62] FirstEnergy, "Save Energy".
[63] Office of Energy Efficiency and Renewable Energy, "Efficiency Trends".
[64] ACEEE, "Homes and Appliances".
[65] ACEEE, "Appliance Efficiency".
[66] Office of Energy Efficiency and Renewable Energy, "West Virginia".

4. *Residential Low-Income Programs*

Another component of residential EE is low-income programs. Low-income families are particularly susceptible to variable energy costs, and these programs offer cost-effective solutions oriented towards these customers. Eligible families must typically meet some income requirement such as being a certain percentage under a State median income figure or being eligible for other low-income government programs such as food stamps, temporary assistance to needy families, Medicare, public housing, and others.[67] Programs consist of standard EE improvements that result in lower energy costs, improved comfort, and reduced energy usage. Typical measures included in a low-income program include replacing air conditioning and heating systems, maintenance of heating and cooling systems, replacing leaky ducts, installing additional insulation, replacing water heaters, weather stripping, sealing doors and windows, and other measures.[68]

Low-income programs are evaluated based on the energy savings achieved for households involved in the program. These assessments draw a comparison between energy savings or bill reductions with annual program expenditures to determine whether it is cost-effective. Non-energy benefits of low-income residential EE can also accrue to various stakeholders. These benefits include higher property values, improved community appearance, local job creation, lower school and work absenteeism, and potentially lower expenses on government or utility energy subsidies. These non-energy indirect benefits are typically noted by policy makers as a reason for justifying expenditures on these types of programs. However, they are not typically taken into account under most frameworks for program evaluation.[69]

D. Commercial Sector

Commercial buildings account for approximately 19% of total energy usage in the United States. Office and retail buildings represent two-thirds of the total commercial energy usage, and half of the total is accounted for by applications such as heating and lighting.[70] This sector is responsible for 34 percent of electricity consumption.[71] Furthermore, it accounts for 14 percent of natural gas consumption nationwide.[72] Common applications of energy usage in this sector are space heating, water heating, air conditioning, lighting, cooking, and running various types of electronic equipment. Initiatives that incentivize the use of energy-efficient lighting, heating and cooling, and adherence to building codes are all relevant to successful implementation of EE in the commercial sector.

Lighting accounts for the greatest portion of commercial energy usage with 26% of the total. Space heating accounts for 14% of total usage, and space cooling accounts for 13% of total usage. Other activities such as water heating, ventilation, and electronics account for fairly

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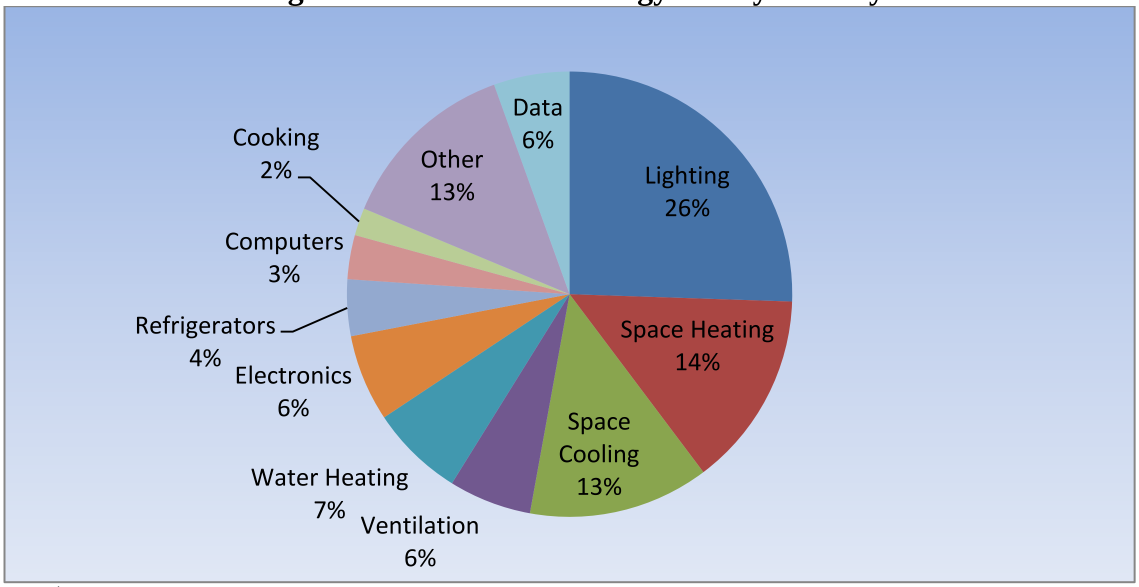
[67] The Electric Company, “Low Income”.
[68] GRU, “Low Income”.
[69] Heffner and Campbell, “co-benefits”.
[70] ACEEE, “Commercial Sector”.
[71] Energy Information Administration, “Electricity Explained”.
[72] Energy Information Administration, “Natural Gas Consumption”.

substantial amounts of energy usage in the commercial sector as well. Figure 2 depicts the proportion of energy usage by all activities relevant to the commercial sector:

Figure 2: Commercial Energy Use by Activity



[1] Energy Information Administration and U.S. Department of Energy's EERE
[2] Data category in figure represents 1 quad of energy (6%) that is a statistical adjustment by the EIA to reconcile two divergent data sources

1. Commercial Lighting Programs

Energy-efficient lighting programs in the commercial sector represent a great opportunity for savings due to the great portion of usage they represent. Commercial lighting is distinct from residential lighting due to the variation in applications of usage. Whereas residential lighting is used "indoors and out to provide ambient light and meet task-specific lighting needs, for decorative purposes, and to provide security", commercial lighting includes "indoor ambient, task, and decorative lighting, street and area lighting, traffic signals, and sign and billboard lighting, among others."[73] The principal technologies being utilized with commercial lighting applications include solid state lighting such as advanced fluorescent and high-discharge intensity systems.[74]

In general, commercial lighting initiatives address efficiency in lighting applications for small businesses whose energy consumption levels meet a given criteria. Programs frequently offer free energy assessments and a portion of the cost for the recommended upgrades as incentives. Lighting upgrades could include replacing current fluorescent fixtures with high-efficiency lamps and ballasts, and changing incandescent to compact fluorescent lights. Another common practice is to upgrade exit signs with LED technology.[75] Often times, these programs utilize outside contractors to fulfill the lighting retrofits needed by businesses. Benefits cited by

[73] ACEEE, "Lighting".
[74] Ibid
[75] NYSEG, "Small Business".

commercial lighting upgrades are lower operating costs due to reduced energy bills and improved working conditions due to the superior quality of the lighting.[76]

2. Commercial HVAC Programs

High-efficiency HVAC provides the same heating and cooling capabilities as standard devices but utilize different components and controls that increase efficiency. Upgraded components such as motors on fans and pumps, and high-efficiency chillers enable these devices to outperform standard equipment. High-efficiency chillers, for instance, can reduce energy consumption by 20% compared with standard-efficiency equivalents.[77] Measures taken to improve efficiency of heating and cooling collectively address nearly one-fourth of energy usage for typical commercial applications.[78] Typical commercial programs offer incentives for upgrading existing systems to meet new standards or for purchasing new high-efficiency systems. Customers purchasing new HVAC systems may be "building managers, developers or contractors who are either replacing failed existing units or who are constructing new spaces."[79]

Typically, administrators of these programs use contractors to facilitate the energy-efficiency upgrades needed by customers. The contractors collaborate with the customer on type of system, price, and installation details. After the project is completed, rebate applications and invoices are required to be eligible for qualifying rebates. On-site verification is also a general step needed to insure efficiency improvements were made.[80] In general, in order to facilitate successful commercial HVAC incentives programs, administrators should minimize the steps and requirements necessary for HVAC distributors and suppliers. These actors will participate in the programs if it is easy for them to engage in the project. Also, HVAC programs should be implemented with a long-term scope. If programs are only funded or enacted for one to two years it will be difficult to achieve results and most distributors and suppliers will not be interested in partnering with the program.[81]

E. Industrial Sector

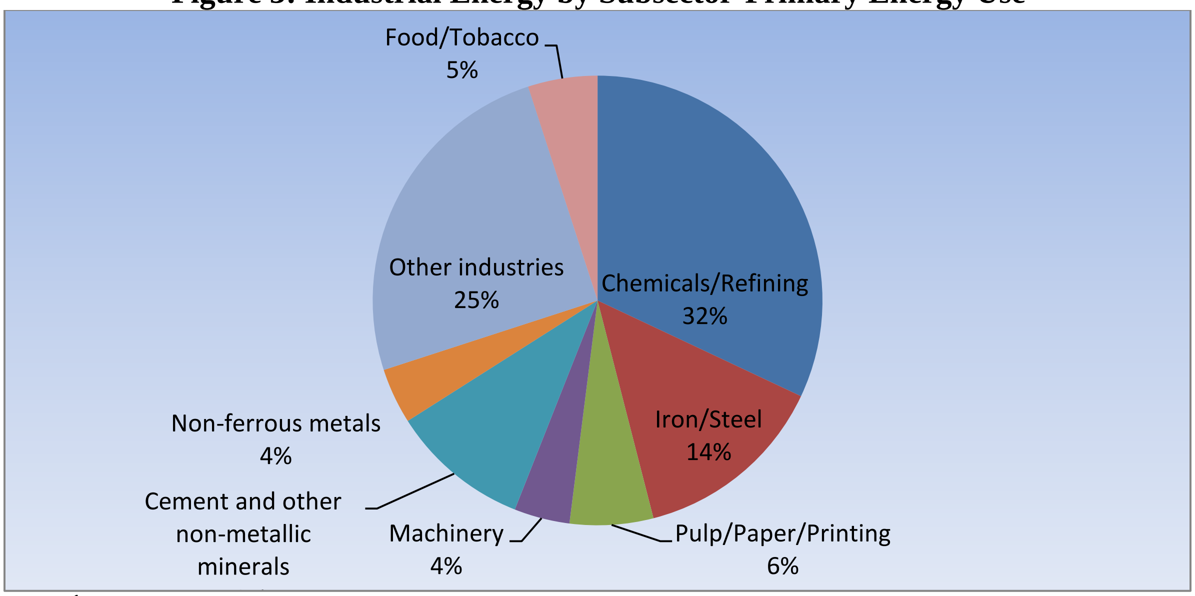
The industrial sector accounts for approximately one-third of total end-use energy consumption in the United States, which is the most of any sector.[82] The industrial sector accounts for approximately 26 percent of electricity consumption domestically.[83] It also accounts for 30 percent of natural gas consumption nationwide.[84] High frequency applications for energy usage in this sector include process heat and cooling and powering machinery. Facility heating, air conditioning, and lighting are also relevant applications to this sector.[85]In general, the industrial sector encompasses various segments such as "manufacturing, mining, construction, energy-

[76] Environment Northeast, "Economic Growth".
[77] Southwest Energy Efficiency, "Guide".
[78] Office of Energy Efficiency and Renewable Energy, "efficiency trends".
[79] Linn, Patenaude and Stasack, "Swimming Upstream".
[80] GoodCents, "Commercial HVAC".
[81] Linn, Patenaude and Stasack, "Swimming Upstream".
[82] ACEEE, "Industrial Sector".
[83] Energy Information Administration, "Electricity Explained".
[84] Energy Information Administration, "Natural Gas Consumption".
[85] Environment Northeast, "State and Utility Administered".

intensive processes, and other operations that ultimately convert raw materials into finished products."[86] The deployment of EE initiatives within this sector varies and is unique from practices associated with other sectors. It not only involves assessing the impact of EE on reduced energy consumption but also on carbon emissions. Most industries are incentivized to engage in EE programs because of the return on investment provided to shareholders and the positive effect it has on fulfillment of regulatory compliance requirements for emissions standards.[87]

The industrial energy sector is defined more specifically into various subsectors that account for different levels of energy consumption. The Chemicals/refinery subsector accounts for approximately 32% of final primary energy use within the industrial sector. Iron/steel segments account for 14%, and cement and other non-metallic materials represent 10% of usage. Figure 3 depicts final energy use by industrial subsector:

Figure 3: Industrial Energy by Subsector-Primary Energy Use



[1] Technology Action Plan

1. *Industrial Energy Audits*

In order to identify the various opportunities for industrial energy efficiency, industrial customers often receive a professional energy audit. This energy assessment can be provided at no cost for eligible[88] small and medium-sized manufacturers by U.S. DOE Industrial Assessment Centers (IAC). The centers are located in 24 universities around the country, and teams work with manufacturers to identify opportunities to "improve productivity, reduce waste, and save energy."[89] The audits are conducted by university faculty and upper-level/graduate students.

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[86] Technology Action Plan, "Industrial Sector".
[87] ACEEE, "Industrial Energy Efficiency Programs".
[88] Eligibility for assessments is dependent on various factors such as number of employees, location, gross revenues, annual energy costs, and more. For more information about eligibility, see http://www1.eere.energy.gov/manufacturing/tech_deployment/iacs.html
[89] Office of Energy Efficiency and Renewable Energy, "Industrial Assessment Centers".

According to the EERE, of the 15,000 IAC assessments which have been conducted, the average annual savings for the manufacturers audited amounts to $55,000.

West Virginia University operates the IAC within the state. This program has led to a total of 2.38 trillion Btus saved on an annual basis. The WVU IAC has also saved a total of $18.2 million since its inception with an average payback period of less than 2 years for firms implementing the recommended efficiency measures.[90] IACs represent a key opportunity for efficiency in the industrial sector because they help manufacturers become more aware of the energy-intensive processes in their operations and provide specific, cost-effective recommendations for implementing EE practices.

Industrial firms can opt-out of paying for the State's utility EE programs if they show they are participating in their own efficiency efforts, including implementing practices recommended in IAC or other industrial assessments.[91] This state policy approved by the WV Public Service Commission allows customers with demand in excess of 1MW to opt-out of state EE and DR programs. They are not held responsible for any cost recovery measures associated with State programs if they certify they are taking their own measures to adopt energy efficient practices.[92]

2. *Waste Heat Recovery*

One area especially pertinent to the industrial sector that offers opportunities for energy-efficiency is waste heat recovery. Waste heat is defined as "the energy associated with waste streams of air, exhaust gases, and/or liquids that leave the boundaries of an industrial facility and enter the environment."[93] Generally, this source of heat is not utilized in the process or for any other purpose within the facility. In fact, 20-50% of industrial energy input is lost as waste heat in the form of hot exhaust gases, cooling water, and heat lost from hot equipment surfaces and heated products.[94] Fossil fuel-fired furnaces, boilers, and process heating equipment represent the primary sources of waste heat in industrial facilities. Approximately 9% of energy used in industrial applications could be substituted by effective practices in waste heat recovery.[95] The key distinction between waste heat recovery and other energy recycling processes is that manufacturers utilize the excess heat already being emitted rather than providing all of the energy at the beginning of the process.[96]

Beyond the energy and environmental benefits, implementation of waste heat recovery practices can lead to substantial economic benefits for plants as well. The significant energy savings resulting from higher-efficiency in process heating applications leads to decreased energy costs. This may come in the form of reduced fuel consumption and/or electricity use and also fewer

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[90] Office of Energy Efficiency and Renewable Energy, "Extends the Reach".
[91] Other assessment opportunities exist for industrial customers in the state. These assessments provide similar services to IACs but may be applicable to different classes of industrial customers or with varying levels of incentives. The various industrial assessments offered in WV are outlined further in the section titled "EE Programs in West Virginia".
[92] West Virginia Public Service Commission, "Petition".
[93] Arzbaecher, Fouche and Parmenter, "Industrial Waste Heat Recovery".
[94] BCS, Incorporated, "Waste Heat Recovery".
[95] Arzbaecher, Fouche and Parmenter, "Industrial Waste Heat Recovery".
[96] Recycled Energy Development, "Understanding Combined Heat and Power".

carbon dioxide emissions. For instance, Steel of West Virginia in Huntington was able to reduce its natural gas consumption from 1,000,000 MCF annually to 800,000 MCF annually by adopting energy efficient practices including waste heat recovery.[97] Furthermore, thermal conversion devices used by plants such as boilers and furnaces can be reduced in terms of size and capacity requirements once waste heat recovery is implemented. Another potential benefit is increased productivity as more efficient practices lead to elimination of bottlenecks in industrial processes.[98]

3. Combined Heat and Power

In the traditional system of power production, up to 67% of energy can be lost as waste heat during generation, while an additional 3% of energy is abandoned through transmission line losses.[99] ACEEE notes that "recent advances in electricity-efficient, cost-effective generation technologies—in particular advanced combustion turbines and reciprocating engines—have allowed for new configurations of systems that combine heat and power production."[100] Combined Heat and Power (CHP), also known as cogeneration, is an efficient, clean, and reliable approach to generating electricity and heat energy from a single fuel source. Facilities such as manufacturing firms and other large institutions can generate energy on site through cogeneration and recycle waste heat into electricity and useful steam which can be used to heat buildings and aid industrial processes. Today's CHP systems can operate at an efficiency as high as 80%, while conventional methods of producing heat and power separately have a typical combined efficiency of 45%.[101]

a. CHP Policies

State policy can foster an environment where CHP deployment is encouraged and streamlined for industrial actors and other relevant entities pursuing cogeneration initiatives within their facilities. Interconnection standards, net-metering policies, emissions regulations, resource standards, financial incentives, and utility rates for standby power all have an impact on the level of CHP deployment within a region.

In general, standards that establish specific guidelines for the interconnection of CHP systems are an important factor for encouraging CHP. The ACEEE notes that having "multiple tiers of interconnection is important to CHP deployment because smaller systems offer a faster- and often cheaper- path toward interconnection compared with larger systems."[102] Furthermore, interconnection standards with higher size limits are preferred by CHP developers, as are applicability of standards to all utilities, not just investor-owned utilities.[103]

Standby rates are charges imposed by utilities when a distributed generation system experiences a scheduled or emergency outage and must depend on power purchased from the grid. Standby

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[97] Duke, "Steel of West Virginia".
[98] Office of Energy Efficiency and Renewable Energy, "Unlock Energy Savings".
[99] Recycled Energy Development, "Understanding Combined Heat and Power".
[100] ACEEE, "Combined Heat".
[101] Ibid
[102] ACEEE, "Scorecard".
[103] Ibid

rates are broken down into two separate components: energy charges based on actual energy provided to the CHP system; and demand charges which recover the utility's cost of providing capacity to meet the peak demand of the facility using the CHP system.[104] Regulators approve demand charges on the assumption that utilities must maintain capacity equivalent to a CHP facility's peak demand in the case of an outage.[105] However, this perspective only recognizes the costs to the utility of an unlikely emergency outage of the CHP system and does not acknowledge the underlying benefits of efficient distributed generation. Such benefits include reduced grid congestion and deferment of more expensive capacity-related investments.[106] Rates weighted towards energy charges rather than demand charges are preferable for the promotion of CHP installation and retention.[107]

Although net metering is most commonly applied to renewable energy systems, it is also relevant to CHP systems, including smaller systems under 1 to 2 MW. When CHP is included as an eligible net metering distributed technology, CHP system owners can receive credit (most often at a utility's avoided cost) for excess power produced on site.[108] This provides an incentive for system owners to install the most cost-effective, efficient CHP technologies in their facilities. Other applicable net metering policies include eligibility for all customer classes and the ability for system owners to indefinitely carry over excess generation at a utility's retail rate.[109]

Considering the effect of CHP when evaluating a facility's output-based emissions is also a vital criterion for effective policy. Many states have enacted emissions regulations on generators based on calculation of the level of emissions resulting from a given level of fuel input into a system. However, for CHP systems, electricity and useful thermal output are generated from one fuel input. If policies do not account for the additional output created from combining heat and power systems, they ignore the avoided emissions associated with the more efficient system and discourage facilities who are regulated on emissions criteria from utilizing CHP technologies.[110]

Resource standards such as EERS and RPS can also play a role in facilitating CHP use to a greater extent. These standards define a specific targeted level of EE or renewable resources that must contribute to a state or a specific utility's overall generation capacity. When CHP is listed as an eligible technology within a standard, an incentive is created to promote CHP as a system resource. Often, programs and financial incentives are put in place to facilitate the promotion of technologies eligible within the standards.[111]

Financial incentives such as tax credits, grants, bonds, rebates and loan programs are often employed within state policies encouraging the growth of CHP development. Tax credits against business and real estate taxes are often the most common measures taken and are often more permanent structures than grants or bonds.[112] States with favorable policies tend to have a

[104] ACEEE, "Scorecard".
[105] ACEEE, "Standby Rates".
[106] U.S. Environmental Protection Agency, "Partnership".
[107] ACEEE, "Standby Rates".
[108] ACEEE, "Scorecard".
[109] Ibid
[110] U.S. Environmental Protection Agency, "Handbook".
[111] ACEEE, "Scorecard".
[112] Ibid

mixture of incentives available to encourage CHP deployment. Policies available to all CHP systems are preferable, but it is important to note that some states promote CHP through lead by example government programs, biomass CHP program incentives, and strong utility CHP incentives.[113]

b. Other Barriers to CHP Deployment

Although the potential for CHP is widely known by developers and supporters, there are economic and political barriers which make it difficult for states to deploy CHP on a wide scale. Certain barriers can be removed through policies, while others result from general economic realities and historical business and regulatory practices.

The difference between the cost of fuel required to power a CHP system and the cost of purchasing power from the grid in the absence of a CHP system is termed "spark spread".[114] Poor spark spread indicates that cogeneration may not be as economically viable in a state because access to cheap electricity makes projects less cost-effective. Volatility in deregulated markets for key fuel inputs like natural gas also has potential to affect the spark spread within a region. Poor spark spread cannot be directly addressed with policy enactments, and in most cases financial incentives may be ineffective. In an ACEEE study, it was noted that stakeholders from various states said it could still be economically unviable to develop CHP even if the system was given to them for free. Access to cheap electricity rates and the cost of fuel alone can make CHP projects uneconomic to build and run.[115]

Another barrier to deployment is the lack of access for distributed generators to markets for excess power. There is often a mismatch between a facility's electric load and the electric output provided by a CHP system. In order to fully maximize the return on investment for a system, developers wish to have access to markets where this excess power can be sold. However, even in states with appropriate interconnection standards, CHP developers may only be able to sell their power at a utility's avoided cost or at wholesale rates.[116] Most CHP developers favor policies that would allow them to sell their power at higher, negotiated rates to facilities with whom they contract.[117] A new rule[118] enacted in New Jersey allows an entity to sell electricity to any facility to which it is already selling thermal energy services. This rule allows CHP systems to access existing electricity infrastructure to transport any power sold, and area utilities are only permitted to charge a standard transportation rate.

Another potential barrier to implementing CHP technologies in facilities is the aversion to perceived risk and longer payback periods. CHP competes with other capital investments for priority within a business. These investments must be justifiable to company or facility administrators on an economic basis. A payback period for a typical CHP project ranges from 4 to 6 years, while most developers and supporters note that a payback of one year or less is

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[113] Ibid
[114] ACEEE, "Challenges".
[115] Ibid
[116] U.S. Environmental Protection Agency, "Project Development".
[117] ACEEE, "Challenges".
[118] Amendments to New Jersey bills P.L.1999, c.23, and P.L.1997, c.162, see: http://www.districtenergy.org/assets/pdfs/2010CampConf/New-Jersey-Cogeneration-Bill-12.3.09.pdf

typically required by most facilities for EE-related projects.[119] A CHP project with a 4-year payback may have been viewed favorable in previous years, but the recessionary nature of the economy in recent years has caused decision makers to be more risk averse in terms of tying up capital.

State regulatory commissions can help develop incentives for utilities to be more open to CHP in their service area. For example, alternative regulatory structures can be established that delink utility revenues from volume of electricity sold. Regulatory roles could also include directing public funds toward establishing programs and incentives targeted for CHP development and congruent with other EE programs.

c. Regional Comparison of CHP Policies and Barriers

CHP policies and barriers to deployment differ among states. It is important to look at how the CHP market varies between West Virginia and the surrounding region. West Virginia and its bordering states of Kentucky, Maryland, Ohio, Pennsylvania and Virginia will be examined in terms of the favorability[120] of their CHP market.

West Virginia's market for CHP is deemed as unfavorable. From 2005-2010, there were 3 new CHP sites built which generated an additional capacity of 0.6 MW.[121] The primary barrier to deployment for CHP is considered to be the poor spark spread due to the availability of cheap power generated from the state's abundance of coal resources.[122] West Virginia's interconnection standards include CHP as an eligible technology and were recently updated in 2010 to include two levels of review and a system capacity limit of 2 MW.[123] Net metering policy was also updated concurrently with interconnection standards and CHP is considered an eligible technology under net metering standards.[124] Standby rates are not considered to be major factors for discouraging CHP as both utilities operating in the state have rates deemed as "neutral" to CHP.[125] West Virginia currently has no output-based emission standards which would affect the market for CHP.[126] However, the State has established standards within an Alternative and Renewable Energy Portfolio which allows CHP to be counted as an eligible renewable resource towards meeting the goal.[127] West Virginia has no financial incentives in place for CHP.[128]

Kentucky's market for CHP is deemed unfavorable. From 2005-2010, no new CHP sites were developed.[129] The primary barrier to CHP deployment is poor spark spread due to the abundance

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119 Ibid
120 The basis for deeming the favorability of CHP markets is supported by an ACEEE study of the challenges facing CHP developers and supporters within states. The study assesses the favorability of CHP markets by taking into account new CHP development, capacity, policies and barriers.
121 ACEEE, "Challenges".
122 Ibid
123 WV Public Service Commission General Order 258 & 258.1.
124 U.S. Environmental Protection Agency, "WV Net Metering Standards".
125 ACEEE, "West Virginia Clean Distributed Generation".
126 Ibid
127 W. Va. Code and §24-2F-1 et seq.
128 ACEEE, "West Virginia Clean Distributed Generation".
129 ACEEE, "Challenges".

of cheap, coal-powered electricity within the state.[130] In terms of policy, Kentucky's interconnection and net metering standards are only applicable to CHP systems fueled by biomass and biogas.[131] Standby rates set by utilities are deemed as neutral to unfavorable for CHP depending on the utility. Old Dominion power establishes standby service at the customer's regular rate which is considered to be neutral to CHP development, while Louisville Gas & Electric Co. establishes standby rates based primarily on demand which is considered to be unfavorable for CHP development.[132] Furthermore, Kentucky does not have either portfolio standards or emissions standards which would encourage or discourage CHP development in the state. The only financial incentives applicable to the State are the tax incentives established under the 2007 Incentives for Energy Independence Act which provide businesses and individuals with incentives for pursuing EE and renewable-powered projects. Only biomass-powered CHP would be eligible under these incentives and would require a minimum capacity of 1 MW.[133]

Maryland's market for CHP is considered to be favorable in terms of market growth. From 2005-2010, two new CHP sites were built in the state, but they accounted for a new CHP capacity of 7 MW over the five year period.[134] The biggest barrier to CHP deployment has been interconnection and net metering standards. However, a new interconnection standard effective in 2009 established four distinct tiers of interconnection for systems up to 10 MW in size.[135] In Maryland, an expansion of net metering standards would be needed to better serve large CHP installations as only micro-CHP systems (less than 30 KW in capacity) are eligible.[136] Standby rates set by utilities in Maryland are considered to be neutral towards affecting CHP development.[137] Furthermore, there are no output-based emission standards in the state which could affect perception of CHP.[138] A standard affecting CHP does exist in terms of the state's renewable energy portfolio. In 2011, the state expanded its definition of tier 1 renewable resources to include waste-to-energy systems. Effected utilities are required to meet 6.4% of their 2012 retail sales and 18% of 2022 sales with tier 1 renewable resources which include CHP technologies.[139] The Maryland Clean Energy Production Tax Credit is one state financial incentive applicable to CHP. This tax credit offers $0.85 per kWh, and the maximum incentive limit is $2.5 million over a five year time period. However, the credit is only available for CHP systems powered by renewable fuels such as biomass.[140]

Ohio's market for CHP is deemed as unfavorable although many policies in place are amenable to development. From 2005-2010, there were 8 new CHP sites developed generating 94.6 MW in new capacity.[141] The greatest barrier to development in the state is interconnection practices.[142]

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[130] Ibid
[131] ACEEE, "Kentucky Clean Distributed Generation".
[132] Ibid
[133] Ibid
[134] ACEEE, "Challenges".
[135] Code of Maryland 20.50.09
[136] Md. Public Utility Companies Code § 7-306; HB 1057
[137] ACEEE, "Maryland Clean Distributed Generation".
[138] Ibid
[139] Maryland Senate Bill 690
[140] ACEEE, "Maryland Clean Distributed Generation".
[141] ACEEE, "Challenges".
[142] Ibid

Despite new standards for interconnection which make CHP an eligible technology, the process for interconnection has been considered "unduly burdensome or expensive".[143] In an effort to streamline the process, a 2007 standard was designed to separate interconnection into three tiers depending on the size of the distributed generator. The largest classification is eligible for interconnection up to a capacity of 20 MW.[144] However, even if interconnection were to be amenable for developers because of such policy, standby rates are still seen as an impediment to CHP because power companies in the state base such rates entirely on demand charges.[145] Furthermore, net metering standards do not include CHP as an eligible technology within the state.[146] In terms of emissions standards, CHP is included in Ohio's Nitrogen Oxide budget trading program as an eligible allowance for energy efficiency and renewable energy set-asides.[147] CHP systems installed after 1997 are also counted as an eligible resource within Ohio's Alternative Energy Resource Standard.[148] The state also offers two distinct financial incentives in which CHP qualifies. The Ohio Air Quality Development Authority provides assistance in the form of tax incentives for EE technologies such as CHP that contribute to the mitigation of air pollution and contaminants.[149] CHP projects greater than 250 kW in size can also be eligible for property tax exemptions within the state through the Ohio Qualified Energy Property Tax Exemption.[150]

Pennsylvania's market for CHP is deemed as somewhat favorable on the basis of good regulations, rising electricity prices, and new goals for EE. From 2005-2010, 25 new CHP sites were developed generating 80.9 MW in new CHP capacity.[151] There are no substantial barriers to deployment in the state, but perceived risks and financial aversion due to high up-front costs remain a challenge for larger projects.[152] CHP is included within the state's interconnection standards which cover four distinct tiers of interconnection, up to what is effectively 5 MW in size.[153] Net metering standards were expanded in Pennsylvania in 2007 and include CHP as a primary technology. Investor-owned utilities must offer net metering to residential customers that generate electricity with systems up to 50 kilowatts (kW) in capacity; nonresidential customers with systems up to three megawatts (MW) in capacity; and other customers with systems greater than 3 MW but no more than 5 MW who make their systems available to the grid during emergencies.[154] Utility standby rates in the state are seen as neutral because utilities offer a balanced approach towards demand and energy use charges.[155] There are no output-based emission regulations in the state.[156] Pennsylvania's Alternative Energy Portfolio Standard was enacted in 2004 and revised in 2007. The portfolio classifies resources into three distinct tiers of which CHP is included in the tier two classification. The standard requires that 18% of electricity

[143] Ohio Revised Code 4901:1-22-02.
[144] Ibid
[145] ACEEE, "Ohio Clean Distributed Generation".
[146] U.S. Environmental Protection Agency, "Ohio Net Metering Standards".
[147] Ohio Administrative Code 3745-14
[148] Ohio State Bill 221
[149] ACEEE, "Ohio Clean Distributed Generation".
[150] Ibid
[151] ACEEE, "Challenges".
[152] Ibid
[153] Pennsylvania Administrative Code Title 52, Chapter 75, Subchapter C
[154] U.S. Environmental Protection Agency, "Pennsylvania Net Metering Standards".
[155] ACEEE, "Pennsylvania Clean Distributed Generation".
[156] Ibid

be generated through alternative sources by 2020, where tier two resources such as CHP must contribute to 10% of the cumulative goal.[157] The Alternative and Clean Energy Program offers support for alternative energy and clean energy projects in the form of loans, grants and loan guarantees. Energy systems derived from waste energy qualify for such assistance.[158]

Virginia's market for CHP development is deemed as unfavorable. From 2005-2010, the state deployed three small CHP projects which generated new CHP capacity of 0.1 MW.[159] The biggest barrier to deployment is considered to be poor spark spread although utility practices and lack of markets access also affect CHP markets in Virginia.[160] An interconnection standard was established in 2009 that allows for three tiers of interconnection ranging from systems as small as 500 kW to those 20 MW.[161] As there are no specified fuels or technologies and none that are specifically precluded in the standard, CHP would be considered eligible. Virginia's net metering policy is only applicable to those systems up to 500 kW and powered by renewable fuels.[162] Standby rates are considered unfavorable in Virginia because the state's major utilities provide standby service for CHP systems using rates designed with high demand charges.[163] Virginia has established a set-aside for EE within current emissions budgets.[164] However, the state does not have any portfolio standard established under which CHP is eligible.[165] In terms of financial incentives, the Virginia Commonwealth's Energy Leasing Program offers 12 to 15-year terms for energy projects (including CHP) with a minimum cost of $100,000.[166]

Table 4 summarizes the policies and barriers of the states previously discussed:

[157] DSIRE, "Pennsylvania Alternative".
[158] ACEEE, "Pennsylvania Clean Distributed Generation".
[159] ACEEE, "Challenges".
[160] Ibid
[161] VA Code § 56-578
[162] U.S. Environmental Protection Agency, "Virginia Net Metering Standards".
[163] ACEEE, "Virginia Clean Distributed Generation".
[164] U.S. Environmental Protection Agency, "VA CAIR EE and RE Set-Aside".
[165] ACEEE, "Virginia Clean Distributed Generation".
[166] Ibid

Table 4: Regional Comparison of CHP Policy

State	Interconnection Standards	Standby Rates	Net Metering	Output-Based Emissions	Portfolio Standards	Financial Incentives	Primary Barrier
Kentucky	CHP Eligible; biomass-powered only (up to 30 kw)	Neutral/ Unfavorable	CHP Eligible; biomass-powered, system cap (30 kW)	No Standards	No Standards	Biomass-powered CHP; min capacity 1 MW	Poor Spark Spread
Maryland	CHP Eligible (four tiers); capacity limit- 10 MW	Neutral	CHP Eligible; Micro CHP, system cap (30kW)	No Standards	CHP eligible as tier one renewable in state RPS	Clean Energy Production Tax Credit: Biomass-powered CHP	Interconnection and Net Metering Standards
Ohio	CHP Eligible (3 tiers); capacity limit- 20MW	Unfavorable	CHP Not Eligible	CHP eligible in Nox budget trading program	CHP eligible in AERS	Tax incentives for air quality improvement; property tax exemptions	Interconnection Process
Pennsylvania	CHP Eligible (4 tiers); capacity limit- 5 MW	Neutral	CHP Eligible; capacity limits vary by sector, system cap (5MW)	No Standards	CHP as Tier two Resource in AEPS	CHP eligible for financial assistance in Alt. and Clean Energy Program	Financial Aversion
Virginia	CHP Eligible (3 tiers); capacity limit- 20MW	Unfavorable	CHP Eligible; Renewable-powered systems, system cap (500 kW)	EE set asides in existing emissions budgets	No Standards	CHP eligible for financial assistance in VA Energy Leasing Program	Poor Spark Spread
West Virginia	CHP Eligible (two tiers); capacity limit- 2MW	Neutral	CHP Eligible; capacity limits vary by sector, system cap (2MW)	No Standards	CHP eligible renewable in ARES	No Incentives	Poor Spark Spread

Although West Virginia policy on CHP is not the most encouraging in terms of capacity limits and financial incentive offerings, other states in the region such as Ohio and Virginia may have comparable or even more unfavorable policies in terms of CHP deployment. Although enhancing capacity limits for interconnection and net metering standards may offer a path towards greater expansion of CHP, other barriers such as poor spark spread can affect CHP's level of deployment even if all of the right policies are in place. The economics of coal-powered electricity and uncertainty in natural gas markets makes it less viable for CHP developers to invest heavily in the state. Financial incentives could help promote the growth of CHP development if they were offered at a level able to offset this risk. However, it is important to reiterate that even in other regional states like Ohio and Virginia where an abundance of cheaper coal-powered electricity is also prevalent, financial incentives have not been effective enough to make their states' CHP markets favorable. An in-depth examination of such barriers to deployment along with the net effect of new policies would be required before further incentivizing CHP technologies.

III. EE Program Delivery

The administration and maintenance of energy efficiency programs can have a major impact on the success of program delivery. Various administrative models have been adopted to serve as a means for successful deployment of cost-effective EE. Programs can be delivered via utilities, third party independent agencies, and through state-administered programs. Regardless of the structure of delivery, effective EE initiatives require three fundamental pillars to ensure program success: clarity, consistency, and consensus.[167]

Clarity refers to the idea that the program has stated purpose at every level of deployment which includes appropriate goal-setting and evaluation metrics. Clarity of an EE program is founded in the policy justifications for pursuing EE which appear in legislative texts and regulatory mandates.

Consistency refers to how a program evolves over time and the degree by which changes in goals, design, and scope affect the program's results. Changes should not be made frequently to such factors as the program can risk becoming ineffective with a constantly changing mandate. This makes it difficult for continued public and political support as targeted efficiency results are never achieved.

Consensus refers to the level of agreement reached by key stakeholders with regards to program design, evaluation methods, and regulatory performance. Successful EE programs with greater energy savings often result from a broader consensus among key stakeholders.

A. Utility Administration

Under a utility-administered approach, planning, development, implementation, management, and assessment of EE program effectiveness are the responsibility of the utility. Other agencies

[167] Sedano, "Who Should Deliver".

or commissions may also oversee elements of the planning process and evaluate the effectiveness of utility-administered EE once implemented.[168] There are also approaches where utilities are charged with administering the program but formal management exists outside the utility typically through an external service commission or via joint agency coordination.[169] There tends to be no main distinctions in administration of electric and gas energy efficiency programs. In fact, to capture the positive benefits of economies of scope, the increasing trend is toward integration of electric and gas EE program delivery which reduces transaction costs and allows for more customizable services for customers.[170]

Regardless of the level of utility control and integration of programs, most states (41 of 50) see this form of administration as a viable option. This is logical as utilities are the entity with the greatest contact with customers. They are knowledgeable about the customer's energy usage and have already established a relationship with the customer which enables them to exploit current communication channels as promotional tools for programs.[171] Another benefit of utility administration has to do with the existing staff, infrastructure, and networks utilities already possess in the industry. Once a utility has developed a knowledgeable staff, a network of professional contacts in the energy services and distribution community, and the capabilities to deploy energy efficiency technologies it makes switching costs to another administrator that much greater.[172]

Another benefit of having utility administration of EE programs is that utilities can more easily incorporate EE into their long-run strategic plans for resource acquisition and capital investment.[173] However, it should be noted that utilities have both long and short- run incentives to increase their volume of energy sales due to the increase in profits which results. This idea is referred to as the "throughput incentive." The notion relates to the link between sales and revenue which exists for a regulated utility. Implementation of EE within the utilities business strategy would most likely be contradictory to the firm's goals unless regulatory policies like revenue adjustment mechanisms are established within the legal framework of the industry.[174] When this obstacle is overcome, utilities stand out as a key player in the industry equipped with the relevant resources and capabilities to deploy EE.

However, utilities are still held accountable for their efforts in EE if they are chosen as the administrator of the program. Generally, state commissions or governing boards oversee the activities of utilities with regards to administering an EE program. They often require documents and reports on the activities program implementers engage in to achieve energy efficiency goals. Despite the fact that program funds remain under the financial administration of utilities, there have still been issues where monies have been raided in state appropriations processes. This can be avoided if EE costs are embedded within the regulated rates rather than including them as a separate fee on ratepayer's energy bills.[175]

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[168] Goldman, "Program Administration".
[169] Sedano, "Who Should Deliver".
[170] Barbose, Goldman and Schlegal, "Shifting Landscape".
[171] Munns, "Trend Analysis".
[172] Sedano, "Who Should Deliver".
[173] Munns, "Trend Anaysis".
[174] Sedano, "Who Should Deliver".
[175] Ibid

B. Third-Party Administration

Under a third-party administrative approach, the responsibilities of EE program delivery are transferred to an independent agency that may coordinate with utilities and government but is separate from those entities. Often times, public benefit funds are established and used as a medium by which monies collected from customer charges can be transferred from utilities to these entities in order to support the administration and execution of the EE-related programs.[176] The third party agency typically operates from a broader scope than that of a utility-administered model because the entity spans across an entire region or state. The independent agency is more apt to conform to broad, statewide energy goals and maintain consistency with EE policy objectives. This is due to the fact that their organizational success is not derived from energy sales but from energy savings.[177]

The key benefit of third-party administration is that energy efficiency goals are the only focus of the organization. Because the rate base would not be an issue, an independent agency would not be induced to grow sales volume or favor supply-side capacity as a utility would.[178] Managerial cultures under utilities may reward performance related to supply-side solutions but diminish the work done by those in favor of EE policies. An independent administration would eliminate this climate of conflict as employees serving in the organization would be motivated by similar goals: enhancing energy efficiency and achieving savings.[179]

It is also important to note that the cost of implementation of EE programs may be lower under third-party administration. The recovery of lost margins would not be an issue as it would be under a utility-administered program. Also, there would be no need for additional funding to back incentive structures as is needed for utilities that operate under the throughput incentive.[180] Another key benefit to note is that independent administrators are often efficient because they operate a portfolio of programs under one organizational structure. In a utility-administered model various programs may be offered by one of the many utilities operating within a state. Each utility would have different programs and a different method of implementation and evaluation. Adoption of a third party independent model would ensure that all programs were under the umbrella of one administration, and there would therefore be uniformity across the gamut of programs offered within a state.[181]

Another relevant factor to examine is the transition costs in switching to a third-party agency. This is especially relevant to WV as adopting a statewide and independent nongovernmental organization to facilitate EE would require transitioning from the already-established utility-administered structure. One factor to consider is the startup costs related to creating an entity. Prior to collecting revenues garnered from charges to a customer base, outside financing would have to be arranged to support initial costs. Also, it is important that clear protocols are adopted that allow for the smooth transitioning of existing utility programs to the new entity. Policy

[176] Center for Climate and Energy Solutions, “Public Benefits Funds”.
[177] Sedano, “Who Should Deliver”.
[178] Munns, “Trend Analysis”.
[179] Sedano, “Who Should Deliver”.
[180] Ibid
[181] Munns, “Trend Analysis”.

makers need to establish procedures for transition and enforce them when there is delay of implementation that cannot be justified. Finally, customer awareness during a transition stage is important, and customer specific project information from a previous administrator should be provided to the new administrator.[182]

C. State Administration

State governments can play various roles with regards to administration of EE programs. They can act as overseers who regulate and monitor the actions of utilities or third party agencies or they can directly assert control over programs through establishing plans and budgets. State administers of EE are attuned to statutory goals and can focus their program on accomplishing specific targets and goals related to energy savings. Also, it is generally advisable that state-run agencies be exempt from state procurement rules to enable them the flexibility needed to successfully manage EE programs. However, the trend in EE program administration is growing away from state administration due to various historical issues.[183]

When state agencies directly administer EE programs various issues can arise which could hinder the program's effectiveness. States have historically acted as regulators of utilities who insure administrators are providing quality service to ratepayers. However, when state agencies begin to oversee broader issues such as program planning, implementation, and effectiveness, their regulatory capacity is diminished.[184] Also, with governmental control over the program's budget and resources, there is the risk that the revenue funded from ratepayers to sponsor EE initiatives could be misappropriated for other political purposes.[185] Another issue with state administration of EE programs relates to staffing.[186] The state may not be able to employ or dedicate the best staff towards EE initiatives with limited funding. The incentive also exists to divert staff from EE initiatives to other governmental matters.

Overall, exclusive state administration is not recommended as an efficient delivery method for EE programs. However, a hybrid approach that allocates resources based on function offers a viable means by which multiple actors, including state agencies, can play a role in fostering EE. Some participants in the debate argue that consumer education and low-income programs should be administered by a third party administrator or the state, while individualized programs, dependent on service territory and customer class, should be left to the utilities.[187] However, if a hybrid approach is not feasible, the utility administration and third-party administration of EE are generally accepted as the most effective methods of program delivery.

D. Federal Administration of EE

The federal government is also a key administrator of EE on a national level. The US Department of Energy has developed the office of Energy Efficiency and Renewable Energy (EERE) to act as the entity responsible for the administration and implementation of EE-related

[182] Sedano, "Who Should Deliver".
[183] Ibid
[184] Blumstein, Goldman and Barbose, "Who Should Administer".
[185] Sedano, "Who Should Deliver".
[186] Blumstein, Goldman and Barbose, "Who Should Administer".
[187] Sedano, "Who Should Deliver".

initiatives. The EERE is responsible for developing initiatives that raise awareness of EE, coordinating initiatives towards meeting specific goals, and establishing and managing programs.[188] For instance, the EERE has established the Weatherization Assistance Program (WAP) which offers energy efficient home upgrades to low-income families in an effort to permanently reduce their energy bills. Under this program, the U.S. Department of Energy (USDOE) provides funding to states and other entities that are responsible for program management. From there, these regional entities provide the funds to a network of local agencies, non-profit organizations, and local governments who administer the programs.[189]

The EERE initially developed the Industrial Technologies Program (ITP) as the leading federal program with the mandate of increasing U.S. industrial energy efficiency. The ITP partnered with industry to "research, develop, and deploy innovative technologies that companies can use to improve their energy productivity, reduce carbon emissions, and gain a competitive edge."[190] Since industrial productivity accounts for nearly one-third of total energy consumption and 12% of GDP in the United States, the federal government sees it as a necessary action to stimulate EE within an industrial context.[191] More recently, ITP has been renamed as the Advanced Manufacturing Office (AMO) although the mandate has remained relatively similar. Through the AMO, industrial plants can access thousands of rebates, grants, loans, assessments and other incentives for implementation of energy efficient materials, technologies, and practices.

IV. State Initiatives

The following section outlines key initiatives that can be implemented at the state level to further EE as an energy resource in the state. A principle area of discussion surrounds the level of energy usage resulting from design and construction standards for buildings. Building energy codes and compliance with those codes are two areas that should be addressed to facilitate EE as a prioritized resource within the West Virginia energy portfolio.

A. Building Energy Codes

Buildings account for 40 percent of energy consumption and 70 percent of electricity consumption in the nation.[192] Adopting and enforcing updated building energy codes is vital to improving efficiency in the state. Building codes represent a key asset to any successful energy policy because "they create easy-to-understand minimum requirements for all new construction" and establish baseline measures by which performance can be evaluated.[193] Two types of building energy codes are discussed: residential and commercial.

[188] Office of Energy Efficiency and Renewable Energy, "The Office of EERE".
[189] EERE, "Weatherization".
[190] Office of Energy Efficiency and Renewable Energy, "Industrial Technologies Program".
[191] Ibid
[192] NASEO, "Building Energy Codes".
[193] Ibid

1. Residential Building Energy Codes

The International Energy Conservation Code (IECC) is the most commonly used standard for residential buildings. The IECC was first published in 2000, and there have been subsequent publications in 2003, 2006, 2009, and 2012. The code establishes minimum design and construction standards for energy-efficient buildings in the residential sector. It sets standards of minimum thermal performance for buildings, walls, ceilings, floors/foundations, and windows. It also sets efficiency standards for lighting, mechanical and power systems in homes.

The IECC model has been adopted by various state and local governments throughout the United States.[194] The West Virginia State Fire Marshall has promulgated the adoption of 2009 IECC standards as an update to the 2003 code already in place.[195] Such a change could produce substantial energy savings for the State as the current residential building code offers a less stringent path for new home construction compared with other states that had adopted 2006 IECC standards and moved toward 2009 standards.[196] For instance, the transition from more rigid IECC 2006 standards to IECC 2009 standards was estimated to be a 12-15% improvement in energy efficiency.[197] It was also concluded that Ohio's adoption of the 2009 code would lead to immediate savings for households with respect to lower energy and construction costs. Savings were related to stricter requirements for windows and insulation as well as better duct sealing which results in smaller HVAC equipment.[198] Although the State Fire Marshall has promulgated the adoption of IECC 2009, it still must undergo a legislative rulemaking process before it can be adopted. The 2012 IECC code has been published, but the Home Builders Association of West Virginia[199] is in favor of only moving toward the 2009 standards.[200]

Certain states adopt IECC standards directly, while others develop residential codes based on IECC standards but with state-specific amendments. Table 5 provides data pertaining to the adoption and enforcement of the residential building energy codes of ARC states:

[194] Turner, "Energy Management Handbook".
[195] OCEAN, "IECC Update".
[196] ICF International, "Energy and Cost Savings".
[197] Cole, "Increased Inspections".
[198] MEEA, "Benefits to Ohio".
[199] The Homebuilders Association of WV has become a principal interest group relevant to the building code adoption process. Their level of approval for adoption is based on the effects codes have on increasing building design and construction costs. As codes become more stringent, buildings may become more expensive to construct. However, home builders cannot typically justify the costs of greater efficiency measures because they do not add value to the buildings during most formal appraisal processes.
[200] Bragg, Interview by Sean Pauley.

Table 5: IECC Residential Code Adoption in ARC States

ARC State	Residential Building Energy Code (IECC Equivalent)	Level of Adoption	Level of Enforcement
Alabama	N/A	Local	Local
Georgia	IECC 2009	Statewide	Local
Kentucky	IECC 2006	Statewide	Division of Building Codes Enforcement/ Local
Maryland	IECC 2012	Statewide	Local
Mississippi	N/A	Local	Local
New York	IECC 2009	Statewide	Department of State/ Local
North Carolina	IECC 2009	Statewide	Department of Insurance/ Local
Ohio	IECC 2009	Statewide	Board of Building Standards/ Local
Pennsylvania	IECC 2009	Statewide	Local/Dept. of Labor and Industry/ Third Party
South Carolina	IECC 2006	Statewide	Local
Tennessee	IECC 2006	Statewide	State Fire Marshall
Virginia	IECC 2009	Statewide	Local
West Virginia	IECC 2003	Statewide	Local

[1] International Code Council & U.S. Department of Energy's Office of EERE

[2] To maintain uniformity for comparative purposes, code information is based on states' relative IECC equivalent

2. Commercial Building Energy Codes

Building codes are also a relevant element for addressing EE within the commercial sector. The American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) is a building technology society that publishes standards concerned with design and maintenance of indoor environments.[201] ASHRAE address the energy-efficiency requirements for the "design, materials, and equipment used in nearly all new construction, additions, renovations, and construction techniques."[202] Their standards and guidelines are considered the national model for energy codes and are especially relevant to the commercial sector.[203] Implementation of ASHRAE code leads to reduced energy consumption, building owner cost savings, and reduced CO2 emissions. Standards are updated on a triennial basis through development, review, and making additions to the standard.[204]

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[201] ASHRAE, "Standards and Guidelines".

[202] Office of Energy Efficiency and Renewable Energy, "Building Energy Codes".

[203] The IECC also provides guidance for energy efficient design of commercial buildings. These guidelines are outlined in Ch.5 of the code. However, the IECC also calls out the adoption of ASHRAE standards for new commercial construction. Because ASHRAE is a more commonly used standard and is referenced within the IECC as a viable source for commercial guidance, we defer discussion of commercial building energy codes to ASHRAE standards. However, it should be noted that either standard, ch.5 of IECC or ASHRAE 90.1 can be adopted depending on the choice of the building designer and contractor.

[204] Office of Energy Efficiency and Renewable Energy, "Building Energy Codes".

ASHRAE 90.1 is a specific standard that has been adopted by many states and local entities. Although West Virginia's adoption of the 2003 IECC references ASHRAE 90.1 2001, the state is yet to adopt the ASHRAE 90.1 2007 or 2010 standards already published.[205] The US DOE notes, "the West Virginia Legislature passed companion bills directing the State Fire Commission to promulgate rules adding the 2009 IECC and ASHRAE 90.1-2007 to the state building code."[206] Therefore, pending successful movement through the legislative process, WV's commercial code would be updated to ASHRAE 90.1 2007. Governor Tomblin signed a bill on April 2, 2012 which required all state-funded construction to comply with IECC 2009 and ASHRAE 90.1 2007 effective July 1, 2012.[207]

Certain states adopt ASHRAE standards directly, while others may develop building codes or other distinctly-named codes based on ASHRAE or IECC standards but with state-specific amendments. Table 6 shows the level of adoption and enforcement for state building energy codes in the commercial sector:

Table 6: ASHRAE 90.1 Commercial Code Adoption in ARC States

ARC State	Commercial Building Energy Code (ASHRAE 90.1 equivalent)	Level of Adoption	Level of Enforcement
Alabama	N/A	Local	Local
Georgia	ASHRAE 90.1-2007	Statewide	Local
Kentucky	ASHRAE 90.1-2007	Statewide	Division of Building Codes Enforcement/ Local
Maryland	ASHRAE 90.1-2010	Statewide	Local
Mississippi	N/A	Local	Local
New York	ASHRAE 90.1-2007	Statewide	Department of State/ Local
North Carolina	ASHRAE 90.1-2007	Statewide	Department of Insurance/ Local
Ohio	ASHRAE 90.1-2007	Statewide	Board of Building Standards/ Local
Pennsylvania	ASHRAE 90.1-2007	Statewide	Dept. of Labor and Industry/ Local
South Carolina	ASHRAE 90.1-2004	Statewide	Local
Tennessee	ASHRAE 90.1-2004	Statewide	State Fire Marshall
Virginia	ASHRAE 90.1-2007	Statewide	Local
West Virginia	ASHRAE 90.1-2001	Statewide	Local

[1] Online Code Environment & Advocacy Network & U.S. Department of Energy's Office of EERE
[2] To maintain uniformity for comparative purposes, code information is based on states' ASHRAE equivalent.
[3] In Pennsylvania, municipalities have the right to either opt-in or opt-out of building code enforcement at local level. 95% of counties opt-in and provide local enforcement. The Department of Labor and Industry is responsible for code enforcement for commercial buildings in opt-out counties.

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[205] Ibid
[206] Office of Energy Efficiency and Renewable Energy, "Status of State Energy Codes".
[207] OCEAN, "IECC Update".

B. Building Energy Code Compliance and Enforcement

Although building energy codes are stressed as a key means toward enhancing EE policy and providing future energy savings through increased building standards, compliance with codes is an even more important factor. In most states, efforts to improve code compliance through training, outreach, implementation support, and enforcement are severely underfunded. Estimates put compliance in some states to be as low as 50 percent.[208] This causes most new and renovated buildings to consume more energy than they should, and billions of dollars in savings are missed.

There has been an increase in awareness of compliance efforts with the passing of the American Recovery and Reinvestment Act of 2009 (ARRA). In order to receive stimulus funding, Governors' offices of the 50 states and District of Columbia pledged to meet code stringency requirements (IECC 2009 and ASHRAE 90.1 2007) and to create plans for achieving 90 percent code compliance within an eight year timeframe.[209] Increasing the emphasis on compliance could have drastic effects on the level of energy savings as some research suggests every dollar spent on building energy code compliance yields six dollars in energy savings.[210]

Although building energy codes may be in effect at a statewide level, states typically delegate enforcement authority to local jurisdictions. The extent by which local authorities are required to enforce energy codes varies widely, with some states making it voluntary. Personnel and budget limitations are often noted as the key challenges for local enforcement.[211] Code officials often oversee both commercial and residential structures and are charged with enforcement of multiple codes beyond just the energy codes. In a 2008 Building Codes Assistance Project (BCAP) study, respondents (code officials) noted that energy codes were generally considered to be less important than other codes, and because of this, officials may neglect building energy codes when faced with budgetary constraints and deadlines.[212]

The BCAP also study stressed the importance of education and training of code officials as a primary way to increase compliance. The study found that although more than 80% of code officials received training at least once a year, nearly all officials desired further code training. Both the quantity and the quality of training materials code officials need improvement. Misuriello et al. notes:

> *Instead of simply covering the content of the code, training should include guidance on how to meet requirements, how to demonstrate compliance, and how to inspect for compliance. Increasing the amount of state-specific training will also be useful for both code officials and code users.*

Having a qualified staff with adequate training is also a way to ensure that compliance efforts are streamlined and cost-effective. As codes are constantly updated, it is important that staff stay current by having relevant training and certification. Legislative officials can promote

[208] Institute for Market Transformation, "Code Compliance".
[209] Misuriello, et al., "Lessons Learned".
[210] Institute for Market Transformation, "Code Compliance".
[211] Misuriello, et al., "Lessons Learned".
[212] Building Codes Assistance Project, "Usability and Compliance".

compliance efforts by providing funding for training and cost reimbursement for officials seeking certification requirements.[213]

In general, it is recommended that policymakers take the following steps when a high level of compliance is sought[214]:

- Enhance, or at least, maintain existing building department budgets
- Express political support for rigid and uniform enforcement of building standards
- Encourage elected officials and utilities to increase funding of compliance efforts
- Support code officials, designers, and builders through training initiatives
- Increase public awareness on the value of standards in building energy codes.

1. Code Compliance and Enforcement in West Virginia

Although WV's current IECC and ASHRAE adoption is effective statewide, local jurisdictions must adopt the statewide requirements to enforce them at the local level.[215] Therefore, the building energy code is enforced on a voluntary basis in counties and municipalities where a code official is employed within those jurisdictions. Compliance at a state level is contingent upon cost considerations to employ enough staff to facilitate inspections and assessments of building standards. The State Fire Commission promulgates energy building code adoption, but their principle area of review and enforcement concern compliance with fire codes not building energy codes. This misalignment of policy promulgation and compliance is viewed as a critical factor preventing the State of West Virginia from fully benefiting from EE policy.

The WV State Fire Commission establishes the rules and standards which are deemed necessary for the "safeguarding of life and property and to ensure compliance with the minimum standards of safe construction of all structures erected or renovated throughout this state."[216] However, their mandate as an entity with overarching authority in rule proposals for the entire state building code creates an organizational structure with a conflicting, narrowly-focused mission and limited enforcement capacity.

For example, the state building code includes standards prescribed by various entities including the National Fire Protection Association (NFPA) and the International Code Council (ICC) with reference to a wide array of areas such as fire safety, energy efficiency, plumbing, electric, mechanical aspects, fuel gas, property maintenance and more. The majority of these topic areas are covered through the adoption of codes published by the ICC. However, references to fire prevention and safety within adopted ICC publications, such as the International Building Code (IBC) and the International Existing Building Code (IEBC), are omitted and supplanted with NFPA standards outlined in the State Fire Code. Furthermore, whenever an aspect of the State Building Code is in conflict with an aspect of the State Fire Code, the Fire Commission gives precedence to the fire code.[217]

[213] Institute for Market Transformation, "Compliance Strategies".
[214] Institute for Market Transformation, "Policy Makers Fact Sheet".
[215] W.V. Code §29-3-5b.
[216] W.V. Legislative Rules Title 87 Series 4
[217] W.V. Legislative Rules Title 87 Series 4

These factors lead to a conflict in enforcement because fire marshals are predisposed to give preference to NFPA codes.[218] The portfolio of codes published by the ICC includes a code called the International Fire Code (IFC). The IFC prescribes standards on fire prevention and safety similar to the standards prescribed in the NFPA codes which WV has adopted. Because the state has already enacted a near comprehensive code set published by the ICC, supplanting the NFPA codes with the IFC would create greater uniformity for State Building Code standards. This would prevent the fire commission from having to give precedence to one code over another because the entire set of codes would be consistent and complimentary.

However, the NFPA standards have been an established standard within the State for many years. Fire marshals and other enforcing agents are familiar with its requirements and may be hesitant to change standards after such a long history of adoption. The intellectual capital lost from replacing the current fire code would require retraining officials on the new standards. This could be a complex undertaking given budgetary constraints and human resource allocation which could affect the speed of the new adoption.

These conflicting standards and practices do not indicate the fire commission is intentionally neglecting energy codes in their compliance and enforcement efforts, but that their legislative mandate requires them to give priority to other issues before energy efficiency. After all, their mission is defined as "to provide, through leadership, the best possible fire prevention and life safety for our citizens by legislation, education, training, standards and resource allocation."[219] Although legislation requires that local jurisdictions enforce building energy codes, this structure still leaves EE initiatives without a permanent representative voice on the commission.

As EE becomes a more relevant aspect to our energy resource portfolio, there will need to be actors and organizations that champion it within the code process. The WV code[220] stipulates that the commission has the

> *authority to establish advisory boards as it deems appropriate to encourage representative participation in subsequent rule-making from groups or individuals with an interest in any aspect of the State Building Code or related construction or renovation practices.*

However, the specific language, "as it deems appropriate", does not make the appointment of advisory boards mandatory but voluntary based on the judgment of the commission. Such an advisory board or even an ex oficio member of the commission could act as a relevant voice for building energy code adoption and enforcement in the short-term. This actor would ensure that policies promulgated at the commission were up to date and consistent with the general EE policies promoted at the state level.

The capacity to enforce energy codes like the IECC and others is further limited due to the lack of deployment of code officials on the local level. Most municipalities and counties have decided

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[218] W.V. Legislative Rules Title 87 Series 1

[219] West Virginia State Fire Commission, "Code Adoption".

[220] W.V. Code §29-3-5b.

not to ensure compliance with state building codes due to budgetary constraints and the voluntary nature of enforcement. Of the 232 municipalities in West Virginia, only 38 have adopted the State building code. Of the 55 counties in the state, only Greenbrier, Jefferson, Harrison, Berkeley, Hampshire, Fayette, Raleigh, and McDowell counties have adopted the state building code.[221] Enforcement is further complicated because compliance of energy building codes in state-funded construction initiatives such as public schools and other state and federal buildings may be handled by individual agencies responsible for operations and maintenance of government buildings. Based on the lack of capacity, uniformity and continuity in building energy code enforcement in WV, it is important to look to a state with a similar history of enforcement issues as an example for potential improvement.

2. A Kentucky Case Study

Kentucky offers a relevant example of a structure for code compliance and enforcement that can be more effective through specialization and a multi-level approach. The Kentucky Department of Housing, Buildings and Construction (DHBC) enforce statewide standards for building construction. The DHBC "ensures fire and life safety in existing buildings; licenses/certifies plumbers, electricians, boiler contractors, sprinkler and/or fire alarm contractors and building inspectors."[222] Housed within the DHBC are four divisions: Division of Building Code Enforcement, Division of Heating, Ventilation, and Air Conditioning, Division of Plumbing, and Division of Fire Prevention (Office of the State Fire Marshal).

The Division of Building Code Enforcement is the principal entity charged with code enforcement for new construction, major renovation, and change of use in buildings. The Division's scope and authority is clearly delineated and aligned with their mission:

> *The building codes section is responsible for reviewing, approving and inspection of buildings and structures that are under the applicability of the Kentucky Building Code (KBC) and other referenced standards. This service is done though reviewing and approving of the construction documents and follow-up field inspections to ensure that the building is constructed in accordance with the approved construction document.*[223]

Referenced standards within Kentucky codes include those relevant to the energy-efficient design and construction of new buildings. Code officials in Kentucky adhere to the Kentucky Building code to ensure commercial building energy compliance is at 2009 IECC standards. The Kentucky Residential Code has recently been updated from IECC 2006 to IECC 2009 standards for new residential construction effective October 1, 2012.

Kentucky's multi-level approach refers to how jurisdiction responsibilities are shared between state and local government. The Kentucky Building Code (KBC)[224] outlines which entities are responsible for the examination and approval of plans and specifications and the inspections

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[221] West Virginia Fire Commission, "Code Adoption".
[222] Kentucky Department of Housing, Buildings and Construction, "Department".
[223] Kentucky Division of Building Code Enforcement, "Building Codes".
[224] 2007 Kentucky Building Code Chapter 1 Section 104

necessary to determine compliance for buildings. For instance, local code officials employed by municipal or county government building departments are responsible for code enforcement in assembly occupancies, business occupancies, churches, factory or industrial occupancies, mercantile occupancies, and residential, storage, or utility occupancies. Code enforcement in assembly occupancies, business occupancies, educational, high-hazard or institutional occupancies, factory or industrial occupancies, industrialized building systems, mercantile occupancies, state-owned buildings, and any other buildings fall under the Division of Building Code Enforcement's state jurisdiction.

Jurisdictions where overlap occurs are distinguished by the overall load occupancy. Local jurisdictions manage compliance in overlapping jurisdictions where capacity is less than 100 persons, while the state jurisdiction manages compliance of those with a capacity in excess of 100 persons. Municipalities within the state can also apply for expanded jurisdiction which grants them authority to oversee compliance in all occupancies including those with capacity in excess of 100 persons. However, in municipalities with expanded jurisdiction, the Division still maintains exclusive jurisdiction in occupancies solely enforced by the State.[225]

The KBC[226] requires all local jurisdictions to provide at least one certified building inspector. However, due to budgetary constraints of smaller municipalities where code enforcement does not warrant the cost of employing an official, this aspect of the building code is rarely enforced.[227] Building code officials can enter into contracts with multiple local governments with oversight from the DHBC. This allows those municipalities with smaller populations and less building infrastructure to divide the duties and costs of one code official among multiple local governments.[228] All construction projects, except single-family dwellings, in jurisdictions without a local building inspection program, shall be submitted to the Division of Building Codes Enforcement for review and approval prior to the start of a construction project.[229] In general, funding for the Division and local building departments is provided by a plan review and inspection fee schedule as prescribed in section 121 of the KBC.

In Kentucky, the Office of the State Fire Marshal is a separate division called the Division of Fire Prevention within the DHBC. They retain traditional duties and responsibilities[230] related to eliminating and reducing the potential of loss by fire or other hazards. For instance, the State Fire Marshal performs general inspections of existing buildings to ensure compliance with state fire and life safety codes. They enforce codes such as the 2006 NFPA 1 Fire Prevention Code and other NFPA codes. They are also responsible for plan review, permitting, licensing and renewal certification of underground and above ground storage tanks. Licensing contractors for fire protection systems and certifying private fire alarm and sprinkler inspectors are also under the purview of the Fire Marshal.[231] Training on fire codes and technical assistance to local fire officials are also a part of the Division of Fire Prevention's mandate, among other duties.[232]

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[225] Kentucky Division of Building Codes Enforcement, "Jurisdiction Programs".
[226] 2007 Kentucky Building Code Chapter 1 Section 103.4
[227] McNees, Interview by Sean Pauley.
[228] Ibid
[229] Kentucky Division of Building Code Enforcement, "Building Codes".
[230] Kentucky Revised Statutes Chapter 227 Section .220
[231] Kentucky State Fire Marshal, "General Inspection".
[232] Ibid

This example shows how Kentucky has delineated the boundaries of responsibility between building code and fire code officials by making each responsible for only the codes that pertain to their principal mission. By specializing in particular code areas it ensures promulgation and training in recent codes are a top priority. However, there is little value in updating to recent code publications when adherence to the standards that save energy are not certain. This coherent structure of enforcement makes the building energy standards and others effective by guaranteeing compliance with each set of codes.

V. Utility Initiatives

This section addresses the various aspects of EE which will necessitate utility involvement. Utilities have already been noted as important actors for the successful implementation of EE programs. Establishing savings standards and lost revenue recovery are two areas where policy can affect the success of utility engagement in programs.

A. Setting Targeted Energy Savings Goals

The effectiveness of EE policy may improve with use of mandated energy savings goals. Under this structure, a legislative or regulatory requirement is established which sets a target for energy savings via efficiency initiatives within a given timeframe. These targets are often termed Energy Efficiency Resource Standards (EERS), and the general trend has been to shift away from budgetary requirements towards more emphasis on savings[233] requirements.[234]

The key concern is whether setting binding targets is an important factor for an effective EE initiative. According to a report conducted by the ACEEE, "having a strong legislative requirement" is the second highest rated factor for current importance in EE, and it will be the top factor for progress in EE for the future.[235] Targeted savings levels often help a program achieve greater savings than they would have without the policy enactment.[236] A similar conclusion is reached by a U.S. DOE study that states when a binding goal is implemented with specific, measurable targets utilities and other entities responsible for EE will often surpass initial savings requirements.[237] A study conducted by Resources for the Future notes that it is important to design an EERS or utility-specific goals with incentives for those entities responsible for deploying the efficiency initiatives. The incentives can be based on a reward for achieving a desired savings target or a monetary penalty for not successfully reaching established goals. A hybrid approach of rewarding and penalizing can also be used, but the key is to design a measurable and verifiable standard by which progress can be based.[238] Established targets

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[233] Savings are typically expressed as a percentage of total utility sales but can also be expressed as a specific amount of savings of an energy resource.
[234] York, Kushler and White, "State Goals".
[235] Ibid
[236] Sciortino, et al., "Progress report".
[237] Glatt and Schwentker, "Resource Standards Anaylsis".
[238] Palmer, et al., "Energy Savings".

reinforce the idea that EE is a utility resource that can be quantified, and this makes planning for utility system loads and resource needs an easier task.[239]

Savings targets typically take the form of requiring a certain percentage reduction of sales or sales growth of electricity and natural gas. Some states require annual reduction goals, while others require cumulative savings targets be met within a long-term timeframe. Other states use interim goals in combination with cumulative goals to ensure adequate progress is made throughout the established timeframe. The ACEEE defines three distinct policy approaches toward setting binding, long-term savings targets for utility efficiency programs.[240] One approach is to mandate a statewide EERS which is set by state legislators and codified by regulatory bodies which requires all eligible utilities to meet a deemed level of savings. A second approach is more customized in that it requires utility commissions to establish specific annual and long-term goals tailored to each utility. A third approach is to include EE as an eligible, quantifiable resource within a state RPS. This approach is milder in that it does not measure EE savings on an annual basis but rather within a cumulative assessment of the overall impact of alternative energy. West Virginia policy is most closely related to the third approach.

The Alternative and Renewable Energy Portfolio Act of 2009[241] establishes goals for WV investor-owned utilities (IOUs) in reducing reliance on traditional forms of energy generation. The legislation requires that IOUs with more than 30,000 residential customers supply 25% of retail sales from applicable alternative and renewable energy sources by 2025.[242] Under the statute, demand-side responses and EE initiatives are eligible for credits to count towards meeting the standard if initiatives are certified by the WV Public Service Commission. However, there is no mandated portion of EE that must contribute to the fulfillment of the savings target, and this is why WV is considered as having a non-binding efficiency goal.[243] In 2011, the West Virginia State Legislature proposed adoption of a statewide binding EERS, but the bill did not pass in the House Judiciary Committee.[244] However, in order to elevate the importance of EE as a unique utility resource, approval of legislation tying EE to specific, measureable targets may be necessary rather than maintaining EE as an eligible resource within a broader renewable policy.

EE program savings standards and goals are established by state legislatures and state utility regulators depending on how programs are mandated within each state. The Federal Energy Regulatory Commission (FERC) notes that there are 22 states in the U.S. with EERS and 9 states with non-binding efficiency goals as of September 2009. Table 7 shows the EERS and efficiency goals established by other states with mandated and voluntary energy savings targets:

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[239] Sciortino, et al., "Progress Report".
[240] Sciortino, et al., "Progress Report".
[241] WV Code §24-2F
[242] The legislation also establishes goals at other set intervals prior to 2025. From 2015-2019, 10% of retails sales should be generated from these alternative and renewable sources.
[243] DSIRE, "West Virginia Incentives".
[244] ACEEE, "West Virginia Utility Policies".

Table 7: Examples of EERS and EE Goals by State

State	Type	Goals
Arizona	EERS	22% cumulative savings by 2020; peak credits
Arkansas	Non-binding EE Goal	0.75% electric savings by 2012
California	EERS	Save 1,500 MW, 7,000 GWh; reduce peak 1,537 MW: 2010-2012
Colorado	EERS	Save 3,984 GWh, 2012-2020; reduce peak 5% by 2018
Connecticut	EERS	1.5% annual savings, 2008-11
Delaware	EERS	Cut electricity use and peak 15% from 2007 by 2015
Florida	Non-binding EE Goal	3.5% savings; summer and winter peak reduction by 2019
Hawaii	EERS	4,300 GWh electricity reduction (40% of 2007 sales) by 2030
Iowa	EERS	1.5% annual, 5.4% cumulative savings by 2020
Illinois	EERS	2% energy reduction by 2015; 1.1% from 2008 peak by 2018
Indiana	EERS	2% annual electricity savings by 2019
Massachusetts	EERS	2.4% annual electric savings by 2012
Maine	Non-binding EE Goal	30% electric sales reduction and 100 MW peak by 2013
Maryland*	EERS	15% per capita energy reduction and peak demand by 2015
Michigan	EERS	1% annual savings by 2012
Minnesota	EERS	1.5% annual savings to 2015
Nevada	EERS	0.6% annual savings (~5%) to 2015; EE to 25% of RPS
New Mexico	EERS	10% electric savings by 2020
New York*	EERS	15% reduction from projected electric use by 2015
North Carolina*	EERS	EE up to 25% of RPS to 2011
Ohio*	EERS	22% energy savings by 2025; 7% peak reduction by 2018
Oklahoma	Non-binding EE Goal	EE to 25% of renewable goal
Oregon	Non-binding EE Goal	1% annual savings, 2013-14
Pennsylvania*	EERS	3% cut from projected electric use and 4.5% peak by 2013
Rhode Island	EERS	Cut consumption 10% by 2022
Texas	Non-binding EE Goal	Reduce 30% annual growth; 0.4% winter and summer peaks beginning 2013
Virginia*	Non-binding EE Goal	Reduce electric use 10% by 2022
Vermont	Non-binding EE Goal	~6.75% cumulative savings, 2009-11; summer and winter peak reduction targets
Washington	EERS	All cost-effective conservation (~10%) by 2025
West Virginia*	Non-binding EE Goal	EE & DR earn credits in Alternative & Renewable Energy std.
Wisconsin	EERS	1.5% electric savings and peak reduction by 2014

[1] Table adapted from Federal Energy Regulatory Commission
[2] States with asterisk represent ARC States

The EERS approach is a relatively new model in the energy industry. West Virginia has taken an initial step by including EE within its alternative and renewable energy standard. A resource standard can ensure EE programs reach a targeted savings level each year and would allow EE to be viewed as a more viable resource in the state's energy portfolio. This is based on the notion that the future impact of EERS will most likely be substantial as many experts in energy believe it will be “a leading policy tool used to secure large utility-sector energy efficiency accomplishments in the future.”[245]

B. Utility Recovery Policies

Analyzing the ways EE can impact a utilities established revenue levels is a pertinent issue because it directly relates to aligning energy supply and demand. Cost recovery mechanisms affect the motivations of key actors in terms of their disposition to fully engage in EE programs. This portion of the report focuses on utility incentives and disincentives with regards to implementing EE programs. Potential mechanisms for lost revenue and cost recovery are identified and evaluated, and a comparison of various states’ policies for recovery is also made.

1. Decoupling as a Lost-revenue Recovery Mechanism

Revenue decoupling is considered to be a key mechanism relevant to neutralizing a utility’s disincentive to support energy efficiency programs.[246] Decoupling removes the link between a utility’s sales and the volume of energy that is actually generated or distributed. When utilities operate based on the revenues established through rate cases, there is an incentive to increase sales of energy between rate cases because of the positive effect it may have on their profitability. This is typically referred to as the throughput incentive. When there is an incentive to increase sales of energy, there is a disincentive to promote energy efficiency.

With demand fluctuations due to changes in ratepayers’ consumption habits, a utility could receive either greater than or less than expected revenues between rate cases. Theoretically, a utility’s overall revenue would decrease between rate cases if EE programs were effective and ratepayers reduced their overall energy consumption. However, during initial phases of EE program implementation, the adoption levels may be not be large enough to have an impact on a utility’s overall revenue generation. Although some ratepayers would adopt the practices and technologies at an early stage, the utility could still potentially increase sales as other consumers continue normal consumption patterns. Revenue over-recovery could also result following a base rate increase. If utilities seek to increase rates on the basis of decreased consumption levels, subsequent periods between rate cases could result in over-recovery if the forecasted consumption levels overcompensate for the effect of EE adoption. Alternative revenue adjustment mechanisms (discussed further in the next section) can help adjust for cases where demand diminishes or mild weather conditions persist. However, often these policies only address situations where established revenues are not met, and they do not remove the incentive for increased energy sales.

Decoupling true up plans “use periodical, mechanistic true ups (adjustments) to cause actual revenue to track more closely the revenue sanctioned by the regulator”.[247] This type of decoupling adjusts for both possible scenarios by giving customers a credit when established revenue levels are exceeded or by adding a surcharge to customer accounts when established revenue levels are not met. True ups can be made monthly, quarterly, or annually and can be

[245] York, Kushler and White, “State Goals”.
[246] ACEEE, “Decoupling Utility Profits”.
[247] Lowry, Getachew and Makos, “Commonwealth Edison”.

applied selectively to certain customer classes. By removing the incentive to increase sales, the utilities can secure revenues while still promoting EE policy. Customers are also incentivized to engage in EE initiatives due to the savings that results with their decreased consumption.[248] Arkansas, California, Idaho, Indiana, Maryland, Massachusetts, Michigan, New Jersey, New York, North Carolina, Oregon, Vermont, Virginia, and Washington are examples of states who have implemented pilot decoupling true up programs and went on to approve decoupling as a more permanent fixture of their overall rate-making policies.[249]

Decoupling offers two alternative ways for rates to be set: deferral decoupling and current period decoupling. With deferral decoupling, the utility uses a balance account to hold any over or under collected revenue. The positive or negative balance can be distributed in subsequent periods as eligible revenue to the utility or the customer in the form of lower or higher per-unit prices. With current period decoupling, there is no balance account as rates are adjusted each billing cycle to insure the utility collects their allotted revenue. With this form of rate adjustment the utility would divide the allowed revenue levels (established in the last rate case) by actual units of consumption to determine the per unit price of electricity.[250]

Decoupling initiatives are not free from criticism. Customers in one consumer class may be forced to absorb the impact of demand downturns by another class.[251] For instance, a reduction in demand by the industrial sector could lead to a situation where overall revenues for the generating company fall short of expected levels. This would cause residential and commercial customers to have to subsidize the shortfall through increased customer bills on their part as well. In order to allocate the usage more efficiently, the demand and required revenue levels should be broken down into customer classes so one sector is not subsidizing another.

Another disadvantage is that decoupling reduces the responsiveness of the utility to market functions. The utility faces a lessened degree of financial risk because the reduced energy consumption will not adversely affect revenues. However, their operating costs may be reduced with decreased strain on system capital, and established revenues should be adjusted to reflect this change in the utilities' cost structure.[252]

Utilities also run the risk of losing industrial customers if they adopt decoupling policies that threaten their terms of service. Large volume customers could adopt self-generation capabilities or move their operations to alternative services areas. This could result in a decreased load in the region and possibly be a detriment to the local economy.[253] West Virginia has already taken measures to insure retention of large-scale energy consumers through allowing an opt-out policy for industrial customers who do not wish to engage in EE programs.

Finally, and importantly, decoupling weakens the price signal for reduced energy usage. It is possible that in the short-run ratepayers could see a slight increase in the per-unit cost of energy

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[248] Center for Climate and Energy Solutions, "Decoupling in Detail".
[249] Lowry, Getachew and Makos, "Commonwealth Edison
[250] National Renewable Energy Laboratory, "Decoupling Policies".
[251] Lowry, Getachew and Makos, "Commonwealth Edison".
[252] Lowry, Getachew and Makos, "Commonwealth Edison".
[253] Ibid

with decoupling policies. Since a utility's revenue requirement remains fixed, each kWh will have to cover a greater portion of the cost of service and will be subsequently priced higher. Although this increase may be relatively small considering the system-wide benefits related to EE, it could still be perceived negatively. Consumers who participate in EE initiatives should experience less volatility and lower bills as they consume less energy due to implementing EE measures. However, those customers who do not initially engage in EE could see higher bills as they consume a similar volume but initially pay higher per-unit costs. This could be of particular concern to low-income customers least able to respond to changes in bills. On the other hand, it could be perceived as an incentive to encourage those not participating to adopt the relevant EE measures. However, if utility fixed costs decrease due to EE and subsequent rate cases adjust for this, per-unit costs will then reflect decreased revenue requirements.[254]

2. Alternative Recovery Mechanisms

Alternative mechanisms beyond true up style decoupling also exist which act as viable methods for lost-revenue and cost recovery for EE program implementers:

<u>Straight Fixed Variable (SFV)</u> pricing is an approach to rate design that uses variable charges to recover short run system costs. Utilities recover lost revenues through "moving fixed costs previously recovered through usage charges to customers or some kind of reservation charges that vary with expected future usage."[255] By aligning fixed costs more closely with fixed charges, it allows the utility to recover fixed costs without relying on sales volume.[256] Therefore, SFV pricing causes long-term rates to correlate more closely to fixed costs rather than energy demand.[257] However, customers' benefits to conservation are diminished because the charges absorbed to recover equipment, plants, and other capital expenditures remain fixed. The customers who consume the least amount of energy will see less benefit in their energy conservation as variable usage charges are low. This approach could be useful for EE programs in the long-term if growth in fixed costs decrease as there is a lessened need for expanded capacity. However, SFV pricing could weaken customer incentives to fully engage in EE programs in the short-run due to the negligible effect implementation of EE technology and practices would have on lowering customer bills. SFV is used by gas utilities in four states: Georgia, Missouri, North Dakota, and Oklahoma. There are no states using SFV to recover electric utility costs.[258]

<u>Lost-Revenue Adjustment Mechanisms (LRAM)</u> are an adjustment system that allows utilities to be compensated for the under-recovered revenues which result from energy savings of EE programs. Typically, an evaluation is needed to quantify the energy savings directly attributable to the program in order to establish the amount of sales foregone. This figure is then multiplied by an established amount of fixed cost per kWh to determine the amount of additional revenue the utility is entitled to collect. Customer bills often include a rate adjustment in the form of a

[254] National Association of Regulatory Utility Commissioners, "Decoupling".
[255] Lowry, Getachew and Makos, "Commonwealth Edison".
[256] Center for Climate and Energy Solutions, "Decoupling in Detail".
[257] National Action Plan for Energy Efficiency, "Customer Incentives".
[258] AEP, "Straight Fixed Variable".

rider to compensate utilities for the under-recovered amount.[259] LRAMs are not needed in states where EE programs are independently administered. When LRAMs are utilized, they tend to have high administrative costs due to their reliance on evaluations to produce savings estimates.[260] Also, this system does not take into account utility over-recovery when actual revenues exceed the established revenues. Therefore, the throughput incentive is not addressed, and the incentive for utilities to increase sales of energy remains.[261] Arizona, Arkansas, Georgia, Kentucky, Louisiana, Montana, Nevada, New Mexico, North Carolina, Ohio, Virginia, and Wyoming all have initiated LRAM mechanisms for electric utilities within their states.[262]

DSM Performance Incentives adjust rates mechanistically to "strengthen utility incentives to develop large, efficient programs."[263] While decoupling removes a utility's disincentive in engaging in EE, it is not designed to incentivize EE practices.[264] Some DSM incentives mechanisms reward or penalize based on differences between targeted values and a utility's actual values for key performance indicators, while others share a portion of estimated program savings. Another feature of most DSM mechanisms involves capitalizing a portion of EE expenses so shareholders receive a return on investment for utility-sponsored EE programs. DSM performance incentives are not intended to recover lost revenues but to act as a way to "mitigate financial attrition."[265] However, it is important to note that decoupling and DSM performance incentives are not mutually exclusive. Many proponents believe that offering the two mechanisms jointly provide for a sound policy for lost revenue recovery. Arizona, California, Colorado, Connecticut, Georgia, Hawaii, Kentucky, Massachusetts, Michigan, Minnesota, New Hampshire, New Mexico, Ohio, Oklahoma, North Carolina, Rhode Island, South Carolina, South Dakota, Texas, and Wisconsin are states who offer electric utilities incentives meeting DSM performance criteria.[266]

Revenue-neutral Energy Efficiency Feebates (REEF) offers another viable means for cost recovery within EE programs. Under this arrangement, a limit is set on the level of energy that can be consumed by customers. If a customer's consumption goes beyond the allotted amount, a fee will be assessed based on their overage.[267] Targeted usage levels are often set based on meeting specific policy goals. Potential REEF targets include on peak usage, off peak usage, and demand. However, a common method for establishing a size and design of the fees is to base them on the long -term marginal costs or avoidable costs in the individual cases.[268] More than one fee can be assessed depending on the goals of the energy conservation initiatives. Customers who do not exceed their consumption levels will receive a rebate which is funded by the fees paid by customers who went over their limits. A disadvantage of feebates is that they could be considered as a tax on energy customers who consume more than others. Also, by setting a limit on consumption, the energy initiative would be limiting the liberties of customers. The fees and

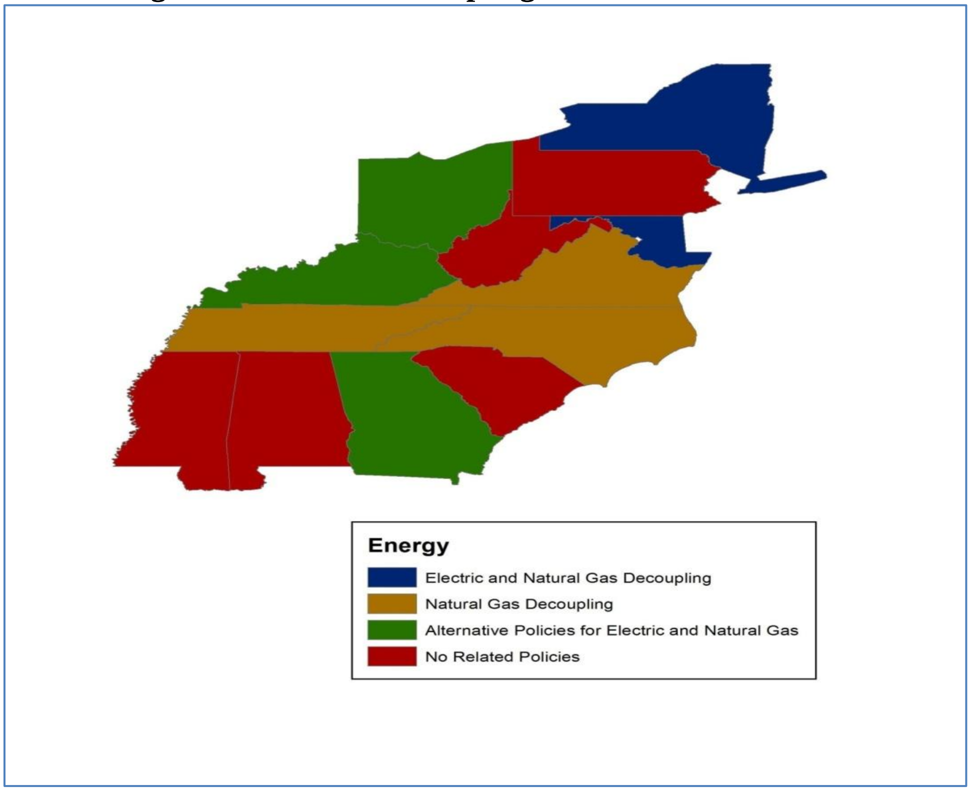
[259] Hayes, et al., "Balancing Interests".
[260] Lowry, Getachew and Makos, "Commonwealth Edison".
[261] Center for Climate and Energy Solutions, "Decoupling in Detail".
[262] Hayes, et al., "Balancing Interests".
[263] Lowry, Getachew and Makos, "Commonwealth Edison".
[264] National Association of Regulatory Utility Commissioners, "Decoupling".
[265] Lowry, Getachew and Makos, "Commonwealth Edison".
[266] Ibid
[267] Center for Climate and Energy Solutions, "Decoupling in Detail".
[268] Boonin, "A Rate Design"

rebates would have to be structured around energy usage by classes with consumers of a comparable size and consumption level (i.e. commercial, schools, residential, etc.). Most research has shown that in order for the feebates to be effective in controlling consumption the fees must be set at a high rate in order to discourage consumption.[269] Currently, no states have adopted policies establishing REEF. However, it is important to note that implementing REEF is typically discussed in tandem with SFV initiatives as the two mechanisms are complimentary.[270]

C. State Policies on Lost-revenue and Cost Recovery

Of the thirteen states considered to be within the Appalachian region as identified by the ARC, Maryland and New York are the only two states that have adopted decoupling for both natural gas and electric utilities in an effort to address revenue recovery issues. Three states have enacted decoupling mechanisms for addressing lost revenue recovery for their gas utilities but not for the electric utilities. These states include Tennessee, North Carolina and Virginia. Ohio, Kentucky, and Georgia are three states who have alternative cost-recovery mechanisms in place for their natural gas and electric utilities. West Virginia is among the five states that have not enacted any policy towards addressing lost revenues by utilities. The other states within the classification are Alabama, South Carolina, Mississippi and Pennsylvania.[271] Figure 4 illustrates revenue decoupling policies enacted in ARC States:

Figure 4: Revenue Decoupling Policies in ARC States



[1] Energy Information Administration

[269] Boonin, "Revenue Neutral"
[270] Boonin, "A Rate Design".
[271] Energy Information Administration, "Decoupling Treatment".

VI. EE Program Evaluation

Transforming EE into a viable energy resource for the State necessitates validation of the effectiveness of EE programs. Policy makers, utilities, ratepayers and other stakeholders are interested in evaluating whether program benefits outweigh their costs. Such evaluation is used to justify the retention of existing programs and potential expansion of programs into other areas. Legislative bodies and regulatory agencies desire third party verification of program results, process transparency, and clear, measurable objectives that are consistent with public goals when overseeing EE implementation. Utilities have a strong interest in accurate verification of program effectiveness because it provides the evidence needed to allow for program cost recovery and lost revenues. Furthermore, ratepayers are more likely to support their investment in programs when they see EE initiatives are resulting in lower energy bills.

Evaluation confirms or disproves the effectiveness of EE initiatives through real time and/or retrospective assessments of the performance and implementation of a program. It is important to note the distinction between evaluation and measurement and verification (M&V). M&V refers to data collection, monitoring, and analysis used to calculate gross energy and demand savings from individual sites or projects. The two terms are often combined into one concept labeled Evaluation, Measurement and Verification (EM&V) when referencing analysis of EE activities. Generally, the difference between evaluation and M&V is that the former is more broadly associated with programs and the latter relates directly to individual projects or facilities. M&V can be a subset of a program impact evaluation which is discussed in later sections.[272]

A. Benefits of EE Evaluations

Evaluation of the impacts of EE programs is a vital component to any utility-sector EE policy.[273] Benefits of evaluation often take the form of intellectual capital gained on the functionality and efficacy of programs. According to the Electric Power Research Institute, successful EE evaluations lead to various benefits:

- Evaluation measures what progress programs have made towards accomplishing stated goals through quantifying its effects and determining its impact.
- Evaluation leads to determination and/or adjustment of goals to conform to revised performance estimates for current and future programs
- Evaluation proves whether the model for program design functioned as expected
- Evaluation highlights the value of promoting EE as the lowest cost approach to energy reduction
- Evaluation identifies whether EE programs are meeting regulatory requirements.

Therefore, a key aspect of program evaluation is the identification of areas of improvement that can make EE initiatives more effective. The well-known maxim, “things that are measured tend

[272] National Action Plan for Energy Efficiency, “Impact Evaluation Guide”.
[273] Kushler, Nowak and White, “National Survey”.

to improve", is highly applicable in the case of EE. Specific improvements that can be made based on the outcome of evaluations include[274]:

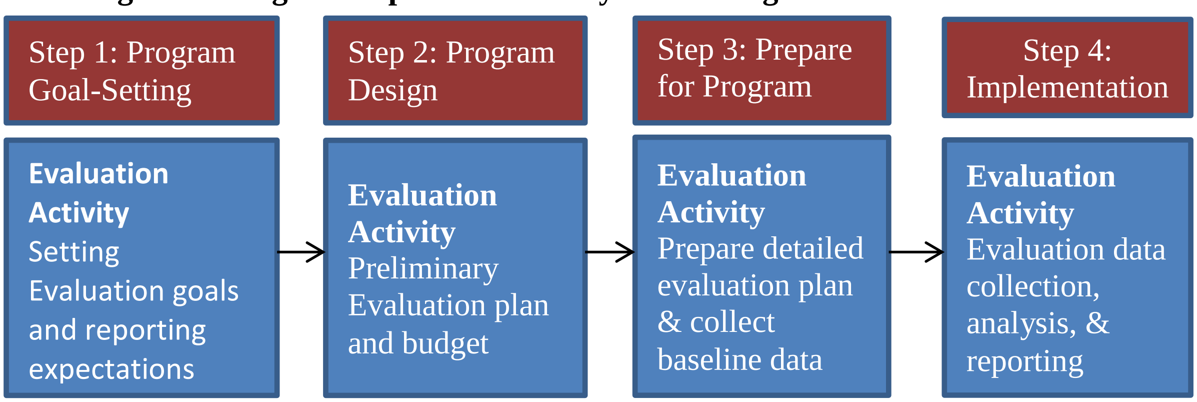
- Reestablishing regulatory performance metrics
- Adopting improvements and new strategies for program delivery
- Adapting programs to meet evolving market conditions
- Modifying incentive criteria
- Conforming service packages to promote desired market activity
- Capturing economies of scope through program integration
- Improving program design and administrative processes

Furthermore, evaluation leads to more accountable practices within EE programs. The reliability of efficiency as a resource can be determined through metrics and process assessments that identify internal and external uses of program resources. By identifying which program elements are most and least effective, officials are held accountable for their approach towards program implementation.[275]

B. Evaluation Planning

In traditional models of EE program design, evaluation began following the implementation process, and there was no interaction with program planning or design. In recent years, there has been a shift towards integrating evaluation with the design and planning process so that the programs produce more substantial evaluation findings on the basis of the improved information provided by implementers.[276] This early coordination allows evaluation processes to support implementation throughout the phases of the program. Figure 5 shows the relationship between program activities and evaluation activities during various steps of the program cycle:

Figure 5: Program implementation Cycle with High-level Evaluation Activities



[1] National Action Plan for Energy Efficiency

It is important to note that program goals, regulations, evaluation quality expectations, uses of results, and other factors can vary across regions and program portfolios. Therefore, the depth of

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[274] EPRI, 'Guidebook".
[275] National Action Plan for Energy Efficiency, "Impact Evaluation Guide".
[276] EPRI, "Guidebook".

integration between evaluation and implementation planning will also vary. However, there are key evaluation planning issues that should be addressed regardless of the level of early coordination between the two activities. The National Action Plan for Energy Efficiency defines seven key areas:

- Defining evaluation goals and scale such as deciding which program benefits to evaluate.
- Setting a time frame for evaluation and reporting expectations.
- Setting a spatial boundary[277] for evaluation
- Defining a program baseline, baseline adjustments, and data collection requirements.
- Establishing a budget in the context of expectations for the quality of reported results.
- Selecting impact approaches for calculating gross and net savings and avoided emissions.
- Selecting the individual or organization that will conduct the evaluation.

Although all seven areas are aspects of planning necessary for successful evaluations, defining data requirements is most important, especially when quantifiable results are needed. For example, it is necessary to consider at the outset what data should be tracked in order to verify the results of initiatives launched. If a commercial lighting program is undertaken, then measures need to be established to acquire related data such as pre- and post- wattage and hours of use. Beyond programmatic data, a solid evaluation will also require the analysis of the impact of external events such as weather, demographic composition, and behavioral patterns. During the evaluation planning phase, securing such raw data needs to be considered as a vital part of establishing program baselines and possible adjustments.[278]

By planning evaluation activities early in the program cycle and integrating them with other processes, implementers are provided with timely feedback. This allows them to take corrective actions for existing programs and make recommendations for the design of future programs. Programs change over time to reflect more accurate design and planning processes on the basis of accurate and relevant information garnered from previous experiences. Therefore, program evolution is not only dependent on shifting policy goals, but also on the effectiveness of past initiatives.[279] When policy and program objectives are identified during the evaluation processes, it allows for more accurate assessment of program performance, and this may give rise to program expansion if results demonstrate attained objectives.

C. Types of EE Program Evaluations

The three most common evaluative methods taken to measure the effectiveness of EE programs are impact evaluations, process evaluations, and market effects evaluations. These classes of evaluations are deemed “ex post” because they analyze what has already happened. However, each assessment is different because they measure a distinct component of program performance.

Impact evaluations are quantitative in nature because they determine a program’s impacts through measuring the amount of energy and demand saved as well as the levels of indirect benefits. Specific methodologies are established to quantify how much energy consumption (i.e.

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[277] Spatial boundary refers to what energy uses, emission sources, data collection, etc., the analyses will include
[278] National Action Plan for Energy Efficiency, “Impact Evaluation Guide”.
[279] Gilligan, “Program Planning Workbook”.

(MWh) was avoided and how much demand (KW) was deferred through program influence. Indirect benefits such as avoided GHG emissions, improved health, enhanced energy security, job creation, more efficient T&D, and water savings are also calculated or taken into account through the completion of impact evaluations.[280] In addition, impact evaluations also provide information related to the analysis of a program's cost effectiveness.[281]

Process evaluations examine program delivery, including design and implementation, in an effort to identify bottlenecks, inefficiencies, constraints, and potential improvements. Issues commonly inspected are administration, promotional practices, delivery methods, incentive levels, market barriers, and data tracking. Process evaluations "revolve around the execution of a series of interviews, surveys, and document reviews in order to assess the performance of the energy efficiency program in question."[282] These evaluations take into account all relevant actors throughout the process including utility staff, trade allies, implementers and ratepayers. Identifying appropriate opportunities for process improvements during evaluation is essential to continual program enhancement.[283]

Market effects evaluations are designed to estimate a program's influence on future EE projects because of changes in the marketplace for energy technologies. The evaluations are most relevant to programs with an emphasis on developing and transforming the energy market to conform to EE as a resource.[284] An example of such a study would be an examination of the increased availability of energy-efficient HVAC units following the implementation of a rebate program within a utility's service territory.[285]

The primary focus of this report will be to understand the components and objectives associated with an impact evaluation. These studies directly quantify energy and capacity (demand) savings. However, the three types of evaluations mentioned are not mutually exclusive, and there are benefits in undertaking multiple studies simultaneously. In fact, aspects of process evaluation and market effects evaluations are often integrated either implicitly or explicitly within impact evaluation studies.

D. Objectives of an Impact Evaluation

A principal challenge inherent with evaluation of EE programs is measuring a non-existent resource. The term "savings" cannot be directly measured since it refers to the absence of energy or demand. Specifically savings refers to the reduced level of energy use or demand following the installation of energy-efficient technologies.[286] Energy savings, for instance, would be calculated by measuring the difference between the actual post-installation energy consumption and what energy consumption would have occurred during the same period had the efficiency measures not been installed.[287] The latter denotes a baseline energy use which is often just the

[280] EPRI, "Guidebook".
[281] National Action Plan for Energy Efficiency, "Impact Evaluation Guide".
[282] EPRI, "Guidebook".
[283] National Action Plan for Energy Efficiency, "Impact Evaluation Guide".
[284] Ibid
[285] EPRI, "Guidebook".
[286] Ibid
[287] National Action Plan for Energy Efficiency, "Impact Evaluation Guide".

pre-installation level. However, adjustments can be made to this approach to take into account conditions like weather, production, usage, square footage, and occupancy that exist following the EE technology upgrade.[288] More simply put, the role of an impact evaluation is to estimate what would have been consumed over a given time frame but was not.

The National Action Plan for Energy Efficiency notes that it is most relevant to conduct impact studies when evaluation objectives are based on three criteria:

- Determining, quantifying, and documenting energy and demand savings and avoided emissions that are directly attributable to EE program impact
- Conducting a cost-benefit analysis to determine program cost effectiveness
- Apprising current and future program administrators of the savings actually achieved from specific measures or program strategies

By quantifying the impact of EE programs, the above objectives can be met. Not all aspects of an impact study will be relevant to all EE programs. Program implementers must determine which criteria are most important to measure given the scope, interests of stakeholders and cost considerations.

E. Components of an Impact Evaluation

The process of calculating energy and demand savings via an impact evaluation can be broken down into four key components:

- Estimation of gross energy and demand savings including adjustments to key external factors not attributable to the program
- Estimation of net energy and demand savings via adjusting gross savings for variances in application, usage, and behavior
- Calculation of avoided emissions based on net energy savings
- Additional co-benefits are determined as appropriate

Typically, evaluations are formally structured around annual reporting cycles so that the above steps can be viewed as an annual process.[289]

Estimation of gross savings is determined through calculating the change in energy use or demand by program participants before and after their participation in the program.[290] This component of change should reflect the elimination of some portion of prior energy use after implementation of an EE program. It is typically expressed in terms of kWh of energy saved. Gross impact savings can be determined through various approaches such as measurement and verification, deemed savings, or large scale data analysis. However, it is important to make corrections for external factors beyond the scope of the initiative or control of the ratepayer when estimating gross savings. Factors can include adjustments for variances in installation rates,

[288] EPRI, “Guidebook”.
[289] National Action Plan for Energy Efficiency, “Impact Evaluation Guide”.
[290] Kaufman and Palmer, “Program Evaluations”.

failure rates, baseline assumptions, leakage[291], weather, building hours and occupancy levels, and production levels in industrial facilities. Adjustments are made to "align energy use in the pre- and post-program time periods to the same set of conditions in order to neither understate nor overstate the impact of the program."[292] The equation used to estimate gross savings is:

[Adjusted] Gross savings = (baseline use) - (reporting period use) ± [adjustments]

Net energy savings refers to the total change in load or consumption that can be attributed directly to program efforts. It takes into account variables that would have occurred without the influence of the program.[293] Variables that can substantially change the realized savings include free ridership, spillover, and rebound effects. Free ridership refers to program participants who would have purchased EE upgrades on their own even in the absence of a program. Net savings cannot take into account such customers because they would have made the desired change without the inducement, and the program's impact is irrelevant to their behavior.[294] Spillover is the adoption of EE measures by participants and non-participants who are influenced by the program but "do not claim financial or technical assistance for additional installations of measures supported by the program."[295] Rebound effects describe "changes in consumer behavior resulting from the installation of energy efficiency measures that diminish expected energy savings associated with the original installation."[296] An example would be the increased use of an HVAC unit because of the reduced cost associated with the EE technology. As the effects of free riders, spillover and the rebound effect are difficult to quantify, a variety of approaches are used to estimate these effects. Self-reporting surveys, qualitative choice models, econometrics, and stipulated net-to-gross ratios are some methods used by evaluators to determine the effects of the aforementioned variances.[297] The National Action Plan for Energy Efficiency defines a standard net-to-gross ratio (NTGR) as follows:

NTGR= (1- Free ridership + Spillover)

Appraising the levels of non-energy benefits also represent key drivers behind successful evaluation studies. An example of a non-energy benefit derived from EE is the avoidance of air emissions such as Greenhouse Gases. By reducing generation or capacity growth, the level of carbon-related fuel used for generation is also reduced. Therefore, the emissions that would have been associated with those generation resources are not expended.[298] Similar to the calculation of energy savings, determination of reduced air emissions must take into account a baseline factor. Evaluators are charged with comparing levels of actual emissions following the implementation of an efficiency program with an estimate of the level of emissions that would have occurred

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[291] Leakage refers the diversion of impact for EE incentives to areas outside of the service territory. For example a customer may purchase a subsidized CFL in one location and transport it to another area. Sales data suggests a local savings impact because of the purchase, but energy savings are actually being accrued in another locale.
[292] EPRI, "Guidebook".
[293] Barnes, "EERE guide".
[294] EPRI, "Guidebook".
[295] National Action Plan for Energy Efficiency, "Impact Evaluation Guide".
[296] EPRI, "Guidebook".
[297] Ibid
[298] Ibid

absent the program.[299] In terms of quantifying the impact of emissions avoidance, EPRI notes that various approaches can be taken:

> *Some states have created a conservation 'advantage' by increasing all avoided cost annually by a fixed percentage (usually 10 percent). Others have attempted to place a value on carbon reductions in their cost-benefit tests. Not doing anything attributes zero value on environmental benefits*.

Placing a specific value on carbon reductions can be achieved through two approaches: the emission factor approach and the scenario analysis approach.[300] It is important to note that the exact values and mix of reduced GHG emissions also depends on when the energy savings takes place since generators use an assortment of fuels to meet customer demand at different times of the day. Approaches used to calculate reduction values should take into account such demand load variables.

Co-benefits represent the fourth component of an impact evaluation study. Co-benefits refer to other categories of benefits that may be derived from EE programs. They include such factors as improved health, enhanced energy security, job creation, avoided T&D capital costs and line losses, and even better payment behavior and debt reduction for low-income customers.[301] A subcategory of EE co-benefits are participant non-energy benefits like water savings, comfort and safety, reduced operation and maintenance costs, reduced eyestrain due to improved lighting quality, and potentially higher resale values associated with EE upgrades. Generally, the most important types of benefits should be quantified when conducting impact evaluations for cost-effectiveness purposes. A wide range of practices from economic modeling to simple assessment of historical trends can be used to quantify co-benefits. However, participant non-energy benefits are usually listed rather than quantified due to the lack of agreed upon methodology for quantifying them and due to their high associated costs as well.[302]

F. Evaluation Costs

A relevant aspect of evaluation of EE programs is determining the level of resources dedicated to the evaluation process. In general, state regulatory agencies are charged with defining the proportion of program budgets allocated to evaluation costs. Some jurisdictions allocate around 2-3% of estimated savings to cover costs of evaluations. Smaller percentages of allocated funds yield results with a greater level of uncertainty and lack of program-specific detail.[303] Other entities allocating a greater percentage (2-5%) cite greater detail and accuracy, reduced uncertainty, enhanced validation of programs, increased revenue recovery for utilities, higher program performance, more reliable demand projections, and other factors as key benefits

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[299] National Action Plan for Energy Efficiency, "Impact Evaluation Guide".
[300] The specific framework for calculating emission avoidance through either approach is beyond the scope of this report. However, it is important to highlight what best practices are utilized for future reference when impact evaluation studies may be considered.
[301] EPRI, "Guidebook".
[302] National Action Plan for Energy Efficiency, "Impact Evaluation Guide".
[303] EPRI, "Guidebook".

derived from greater investment in the evaluation process. On the upper end of the spectrum, entities have allocated as much as 8 percent of program budgets toward evaluation purposes.[304]

Many factors affect the costs of evaluations such as the type of evaluation chosen, the scope of the information requirement, and the validity required for the information results.[305] Evaluation should be prioritized by identifying the program elements with the largest savings potential for the least amount of cost. When the most effective programs are given priority in the evaluation process, it ensures the greatest cost recovery for the utility and provides the most convincing validation of the overall efficacy of EE programs for regulators and the public. EPRI summarizes the nature of evaluation costs by distinguishing between consumption and demand data requirements:

> *In general, programs that attempt to suppress overall energy use are easier to evaluate because gaining information on total energy consumption of users is easier to obtain than information about when they use energy. The latter information is necessary if the measure's purpose is to reduce or shift demand away from periods of peak usage. In short, evaluating programs that measure demand will be more costly than those measuring energy uses.*

Ultimately, an optimal evaluation will balance evaluation costs with the value of the evaluation information while minimizing uncertainty.[306]

G. Cost-Effectiveness

EE program cost-effectiveness is measured by comparing the benefits of an investment in EE with its associated costs. A program should be considered cost-effective when the benefits exceed the costs. However, it should be noted that the perspective of whether an EE program is beneficial depends on what stakeholder is being considered. Various actors such as EE program participants, the EE program administrator, non-participating ratepayers, and the general society have different viewpoints and all should be considered when EE is assessed. Another relevant factor is to determine which key benefits and costs should be included in the evaluation. For instance, does the analysis take into account avoided energy use, EE incentives, avoided and/or deferred capacity investment, avoided and /or deferred T&D investment, and environmental impacts among others? The baseline against which the costs and benefits are measured is another important consideration. Had there been no investment in EE programs what would have been the net result? Furthermore, cost-effectiveness tests are influenced by factors such as discount rates, non-energy benefits, GHG emissions, established goals, and many other areas. All these factors should be taken into consideration in order to facilitate an accurate and thorough cost-effective analysis.[307]

Multiple tests exist to determine the cost-effectiveness of EE programs. The National Action Plan for Energy Efficiency identifies five distinct tests as most relevant: participant cost test

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[304] Ibid

[305] Barnes, "EERE Guide".

[306] National Action Plan for Energy Efficiency 2007

[307] National Action Plan for Energy Efficiency, "Best Practices".

(PCT), program administrator cost test (PACT), ratepayer impact measure test (RIM), total resource cost test (TRC), and the societal cost test (SCT). Each test has its own distinct advantages and disadvantages. The PCT is concerned with the overall welfare of participants as a result of the program, but it does not consider the impact the program will have on utilities. The PACT analyzes how utilities (often the program administrators) will be affected in terms of revenue requirements. However, it does not take into account the impact on customers. The RIM test is similar to the PACT in terms of addressing cost-effectiveness from a utility perspective. However, it addresses whether rates will increase as a result of the program. The TRC test is a commonly used measure which includes all the costs and benefits to the utilities and its ratepayers as a whole. In general, this test should address the issue of whether it is cheaper to meet energy demand by conserving energy through efficiency or by supplying it through enhanced generation capacity. The SCT is similar in scope to the TRC but it includes the effects of externalities.[308]

It is important to note that cost-effectiveness analysis requires quantifiable information on gross savings, net savings, emissions avoidance, and other potentially measurable co-benefits. Therefore, cost-effectiveness tests and impact evaluations are mutually inclusive. Furthermore, use of cost-effectiveness test requires the monetization of the most important types of benefits and costs. Valuing costs and benefits in monetary terms is necessary to facilitate a comparison of whether program benefits outweigh its costs.[309]

There is no single best test used to identify the cost-effectiveness of EE.[310] A comprehensive approach that utilizes all major tests is most effective because it takes into account the impacts associated with EE from all vantage points. However, it is noted that if jurisdictions seek increased levels of EE implementation, the PACT may be the most useful to emphasize as it "compares energy efficiency as a utility investment on a par with other resources".[311] Various jurisdictions calculate and define savings differently, use different savings and baseline values, vary in their assessment of uncertainty, and apply different forms of independent review. Because of this, the credibility of EE cost-effectiveness can be negatively affected as meaningful comparisons become more difficult to achieve. In order to overcome this downfall, it is important the entities charged with the evaluation, measurement and verification of energy savings stress an increase in the "accuracy and transparency of reported savings by improving the accuracy of measuring and verifying savings, and standardizing the reporting of energy savings."[312]

H. Approaches to EE Program Evaluation among ARC States

Regulation of retail electric and natural gas utilities has historically been the responsibility assigned to governing agencies in individual states. A result of this structure is that each state has

[308] EPRI, "Guidebook".
[309] National Action Plan for Energy Efficiency, "Impat Evaluation Guide".
[310] Although no single test is definitively used as a determinant of effectiveness, industry best practices use some general rules of thumb to insure program continuity. For example, programs should always pass the PCT or else it will not be attractive to customers. Similarly, programs that pass the RIM and TRC test should be implemented because they represent a cheaper solution than the supply-side alternatives.
[311] National Action Plan for Energy Efficiency, "Best Practices".
[312] Woolf and Oshie, "Working Group".

adopted its own approach to not only implementing various EE programs, but also evaluating them. The inconsistencies in approaches to evaluation cover a wide array of topics such as differences in legal framework, administration, methodologies, and assumptions. Because of this lack of uniformity some have called for a national standard in terms of EE evaluation so comparisons can be more meaningful among different states' programs.[313]

However, this does not mean that evaluations and cost-effectiveness tests are not valid in their justification for retention of elimination of EE programs. It simply points out the difficulty in making comparisons of effectiveness across state borders. It can still be useful though to examine the methods used by various states in terms of evaluation practices. States with greater experience and more robust programs may offer exceptional insight into evaluation practices. After all, their practices are resulting in expansive EE policy and a contributing factor most certainly would be having successful evaluations which prove a program's overall efficacy.

In a survey conducted by ACEEE where 44 states were asked about their evaluation policies and practices, the wide spread diversity of evaluation practices were confirmed. In terms of which entities administered the evaluation function, the results showed that 37% of respondents employ a utility administration, 36% employ administration by the regulatory agency or a combination of the regulatory agency and the utility, and 27% rely on administration by another government body or a third-party entity. The study did show some conformity in terms of who actually conducts the evaluations. 79% of respondents utilize independent consultants or contractors, while only 21% use utility or government staff.[314]

Furthermore, the ACEEE study showed differences in terms of the legal foundation for evaluations. 45% of states have legislative mandates, 45% rely solely on orders from regulatory bodies, and 10% reported no framework for mandating an evaluation.

Finally, the ways states approach quantifying benefits and using them in cost-effectiveness tests also varies. 26% of respondents reported quantifying savings through gross savings, 53% used net savings, and 21% used a combination of both.[315] Furthermore, the survey showed that most states used one or more of the five standard cost-effectiveness tests previously mentioned. The primary test used for decision-making purposed was less variable with 71% of states using the TRC test, 15% using the SCT, 12% using the PACT, and 2% (one state) using the RIM test.

Although these general trends present useful information in terms of evaluation practices, it is also beneficial to examine the individual practices of states that are most similar to West Virginia. The following table examines the practices of the surveyed ARC States with regards to 6 key variables related to evaluation:

[313] Kushler, "Programs by the States".
[314] Kushler, Nowak and White, "National Survey".
[315] Ibid

Table 8: Summary of Surveyed ARC States Evaluation Policies & Practices

ARC State	Administration of Evaluation	Legal Framework for Evaluation	Report Gross or Net program savings or Both?	Adjust for Effects of Free Riders?	Adjust for effects of Free-Drivers/ Spillover?	Primary Cost-effectiveness Test
Georgia	NA	NA	Both	NA	NA	NA
Kentucky	Utilities	Reg.	Gross	No	No	TRC
Maryland	Utilities/ PUC	Leg./ Reg.	Gross	No	No	TRC
New York	Utilities/ NYSERDA	Reg.	Net	Yes	Yes	TRC
North Carolina	Utilities	Reg.	Net	Yes	No	TRC
Ohio	Utilities/ PUC	Reg.	Gross	No	No	TRC
Pennsylvania	PUC	Leg./ Reg.	Gross	No	No	TRC
South Carolina	PUC/SCORS	Leg./ Reg.	NA	NA	NA	NA
Tennessee	TVA	NA	Both	Yes	Yes	TRC
Virginia	PUC	Leg.	Net	Yes	Yes	RIM

[1] Kushler, Nowak and White. "National Survey".

[2] Abbreviations used in table: NA- Not Available; PUC- Public Utility Commission; NYSERDA- New York State Energy and Research Development Authority; SCORS- South Carolina Office of Regulatory Staff; TVA- Tennessee Valley Authority; Reg.- Regulatory mandate; Leg.- Legislative Mandate; TRC- Total Resource Cost test; RIM-Ratepayer Impact Test.

VII. EE Programs in West Virginia

EE already has a presence in various aspects of state policy. Although it is recognized that there is significant room for advancement for EE policy in West Virginia, it is important to acknowledge those areas where the state has already taken strides. Rebate programs, EE promotion and training, low-income assistance, and industrial initiatives are all actions that have been taken in WV to encourage EE.

A. State Utility Rebate Programs

There are three existing utility rebate programs in West Virginia. Two of the programs are facilitated by AEP, and one program is facilitated by FirstEnergy[316]:

AEP and its subsidiaries, ApCo and Wheeling Power, provide residential electric customers in West Virginia with incentives to engage in measures that improve EE within their household. The EE improvements are funded through the ApCo HomeSmart Program. The program began on March 11, 2011, and it applies to household improvements in lighting, heat pumps, insulation, HVAC maintenance, and other EE technologies. Measures can be installed by a licensed contractor participating in the program, or they can be installed by the customer and inspected at

[316] This evaluation excludes comment on electric cooperatives in the state because consumption resulting from their distribution comprises such a small portion of the state's total consumption. Nearly all consumption in the state is derived from power generated and distributed by West Virginia's two major utilities.

a later date. Following completion of the work, inspection, and submission of necessary documentation, a rebate check will be sent to customer in under 45 days.[317]

Another key element of ApCo's residential program design is the home energy audit/retrofit which allows customers the opportunity for a free in-home energy assessment. ApCo has contracted with GoodCents, an energy consulting company, to examine customers' homes, produce an audit report, and install low-cost efficiency improvements. Improvements that can be performed along with the audit are installation of up to six compact fluorescent light bulbs, aerators for kitchen and bathroom, up to three low-flow showerheads, LED nightlights, two water heater temperature adjustments, water heater pipe insulation, refrigerator thermometer, refrigerator coil cleaning brush, and basic air sealing.[318] As of July 24, 2012, the program had contributed to approximately 3,000 home audits.[319]

ApCo also provides EE incentives to non-residential electric energy customers through their Commercial and Industrial (C&I) Prescriptive Program. This program began on March 11, 2011.[320] Eligible participants include commercial and industrial electric customers who pay into the EE and DR cost recovery riders. The projects must "involve a new facility improvement that results in a permanent reduction in electrical energy usage", and "any measures installed at a facility must be sustainable and provide 100% of the energy benefits as stated in the Application for a period of at least five years or for the life of the product.[321] Applicable EE technologies include lighting, lighting controls/sensors, chillers , heat pumps, central air conditioners, programmable thermostats, motor VFDs, led exit signs, commercial refrigeration equipment, and LED lighting.[322] Initiatives can be installed by a participating contractor in the program network or can be self-installed. However, self-installation measures taken in excess of $1000 in rebate value are subject to inspection, and all applications with a rebate value of $20,000 are automatically inspected.[323] Once the work has been completed, inspected, and all required documents submitted, a rebate check is sent to the customer within 45 days.[324]

FirstEnergy's utilities, Mon Power and Potomac Edison, also have a utility program within the state that offers incentives for adoption of EE technologies. The Business Lighting Incentive Program was designed in accordance with the WV Public Service Commission's December 30, 2011 order[325] directing the companies to begin offering EE initiatives to commercial customers. Eligible participants include commercial, industrial, and government customers of Mon Power and Potomac Edison. The incentive program is scheduled to last either until December 31, 2014 or when program funds run out.[326] The program provides a performance-based rebate for energy efficient lighting equipment and controls that save energy. The incentives are based on kWh

[317] DSIRE, "West Virginia Incentives".
[318] Appalachian Power Company, "Home Energy Audit".
[319] Fawcett, interview by Christine Risch and Sean Pauley.
[320] DSIRE, "Commercial and Industrial Rebate".
[321] Appalachian Power Company, "C&I Prescriptive Plan".
[322] DSIRE, "Commercial and Industrial Rebate".
[323] Appalachian Power Company, "Prescriptive Program".
[324] DSIRE, "Commercial and Industrial Rebate".
[325] See WV PSC Case 11-0452-E-P-T
[326] First Energy, "Frequently Asked"

saved and are independent of what lighting products or technologies are implemented.[327] The program offers participants an incentive of $0.05/kWh of first year savings. Both existing buildings and new construction projects are eligible for incentives, but "all equipment must be code compliant and in accordance with FirstEnergy Standards."[328]

B. Efforts to Promote Efficiency by the West Virginia Division of Energy

The WVDOE has played a role in fostering EE efforts in the state through initiating specific programs and facilitating available funding. For instance, the DOE has sponsored residential and commercial energy code training in an effort to keep architects, engineers, code officials, and contractors up to date with current codes. They have prepared trainees on residential codes by sponsoring seminars that highlight the distinction between the IECC 2003 and IECC 2009 .They have also initiated training on the commercial side by supporting training events for architects, engineers and contractors on the ASHRAE 90.1 2007 standards which will be required for all new state-funded construction. These initiatives have been supported through a combination of state and SEP-carryover funds.[329]

The WVDOE has also advocated for new efficiency opportunities in governmental facilities through use of Energy Star tools like the Portfolio Manager. During the FY 2011-12 program year, WVDOE promoted Portfolio Manager to all of the state agencies and units of local government funded with ARRA dollars. As a result, eight West Virginia towns provided data on government-operated buildings, and more than 200 buildings in West Virginia received ARRA support for energy efficiency and renewable energy upgrades. Furthermore, the DOE's sponsorship of the Portfolio Manager service has assisted West Virginia county school systems in increasing their awareness of energy use and efficiency. This assistance includes $40,000 in stripper-M funds for Portfolio Manager training for school administrators, Portfolio Manager assessments, and student training in building energy audits.[330]

WVDOE will also provide five grants up to $10,000 to West Virginia communities planning commercial or residential energy efficiency programs. Competitive grant selection criteria will include projected level of community involvement, expertise of local organizations and local match. Points will be awarded for collaboration with the community's electric or natural gas utility, partnership with community and technical colleges and local businesses including commercial or residential building contractors. Communities may use the funds for energy assessments or education activities. No funds will be spent on equipment. Applications will be accepted from Oct. 1-Dec. 31, 2012, with program activities occurring from Jan. 1-Sept. 30, 2013. The program will be supported with $50,000 from SEP funds.[331]

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[327] Ibid
[328] DSIRE, "First Energy (Mon Power and Potomac Edison).
[329] West Virginia Division of Energy, "Buildings".
[330] Ibid
[331] Ibid

C. Low-income Weatherization Assistance Program

The West Virginia Governor's Office of Economic Opportunity (GOEO) manages the state's WAP program. GOEO has established contracts with 12 regional agencies that employ trained weatherization crews to install energy efficiency and conservation measures in low-income homes based on energy audits and diagnostic testing. Examples of such improvements include "installing insulation, reducing air-infiltration, performing heating and cooling tune-ups and modifications, and when appropriate, replacing heating units for energy efficiency and safety."[332] Applicants meet basic eligibility requirements when their annual gross income from all sources is at 200% of the Office of Management and Budget's (OMB) poverty guidelines for a given family size and if they have previously received cash assistance payments under Title IV of XVI of the Social Security Act during the preceding twelve months.[333] The U.S. DOE-sponsored program was funded through 2011 by specific federal backing from the ARRA. USDOE appropriations, Low Income Energy & Heating Assistance Program (LIHEAP) fuel assistance funds, and utility partnership funding are all continuing contributing sources for the low-income WAP. By utilizing these varied funding sources, the program had weatherized more than 3,300 WV low-income homes by December 2010.[334]

D. Relevant Federal and State Industrial EE Initiatives in WV

West Virginia was one of the 12 states awarded federal funding for the Save Energy Now program in 2009. The state received $9 million in funding to deliver industrial energy efficiency programs within the regional project area of West Virginia, southwestern Pennsylvania, eastern Ohio, central and eastern Tennessee, central and eastern Kentucky, and south western Virginia. The resources granted were eligible to be used in such activities as "energy assessments, training in ITP software tools, technology demonstrations, and energy management certification pilot programs."[335] West Virginia University (WVU) is responsible for overall project management and coordination. WVU also conducts energy assessments in West Virginia and eastern Ohio, while they contract with EE partners to fulfill the energy assessment obligations in other regional states.[336] As of March 2011, 12 enhanced energy assessments have been delivered throughout the region, resulting in the identification of potential energy savings of 2,035,333(MMBtu/yr) and financial savings of $15,801,361 per year.[337]

The WV project team is responsible for developing a comprehensive package of services that includes energy assessments via the IACs and energy management technical resources. For instance, an internet-based knowledge center is being planned to provide specific information to plants concerning the results of their assessment and educational resources pertaining to energy efficiency improvements. The team is also developing a Regional Industrial Energy Efficiency Marketing and Outreach Center to "promote the participation in the Regional Partnership, showcase success stories, provide information to the media, and serve as the central point of

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[332] West Virginia Governor's Office of Economic Opportunity, "Weatherization".
[333] Ibid
[334] Ibid
[335] Advanced Manufacturing Office, "Software Tools".
[336] Cullen, Crowe, et al., "Save Now".
[337] Ibid

contact for inquiries about industrial energy efficiency tools, services, and resources."[338] The development of a sustainable energy management system is also a relevant part of the Save Energy Now mandate.

The Manufacturing Extension Partnership (MEP) is another federally-funded source that aids industrial manufacturers in their EE efforts. MEP acts as a non-profit organization to consult small and medium-sized manufacturers on issues related to "lean manufacturing, strategic management, quality initiatives and systems, growth planning, HR and environmental issues among others."[339].The organization operates as a nationwide network with programs in each state funded from the U.S. Department of Commerce. The West Virginia Manufacturing Extension Partnership (WVMEP) is located in Morgantown. It offers a service package for the industrial sector titled E3 which is aimed at utilizing "specific tools to address process, energy, and environmental issues."[340] The E3 service delivers comprehensive assessments which identify opportunities to reduce energy bills, cut waste, and improve process efficiency. The WVDOE partners with this program by providing $30,000 from SEP funds which are used in performing the carbon footprint evaluations relevant to the environmental assessments.[341]

It is important to note that West Virginia also has a federally-funded, state-administered program titled Industries of the Future-West Virginia (IOF-WV) that offers full plant assessments at manufacturing facilities within the state. In 1997, West Virginia became the first state to launch a state-IOF program.[342] The key distinction between the IOF-WV program and the IACs previously discussed is that the IOF program provides a no-cost assessment to industrial manufacturers who do not meet the energy expenditure criteria established under the IAC programs.[343] The WVDOE contracts with WVU's IAC to complete the assessments. The WVDOE plans to continue this partnership by providing a total annual budgeted amount of $50,000 in stripper-M funds to meet a goal of 10 annual assessments.[344] From its inception in 1997 to 2011, the IOF-WV program has facilitated research and development projects, assessments, and workshops related to industrial EE. Over the years, the program has consulted over 250 companies, trained over 500 people in EE best practices, and produced more than $18.4 million annually in energy savings.[345]

VIII. Comparison of WV Utility Rebate Incentives

West Virginia's only form of financial incentives for implementation of EE in the state comes in the form of utility rebate programs. Other neighboring states such as Ohio, Pennsylvania, and Maryland have utility rebate programs offered by the same utilities as West Virginia. Those utilities are American Electric Power (AEP) and FirstEnergy. It is important to note how West Virginia's programs compare to similar programs offered by the same utilities in different states

338 Office of Energy Efficiency and Renewable Energy, "Regional Assessment".
339 Source Authority, "Manufacturing Extension Partnerships".
340 WVEMP, "E3".
341 West Virginia Division of Energy, "Industry".
342 Irwin, "Industries of the Future".
343 National Research Center for Coal and Energy, "Assessment Programs".
344 West Virginia Division of Energy, "Industry".
345 Cullen, "National Recognition".

A. Maryland

FirstEnergy's (FE) Potomac Edison power company operates a residential EE program in the state of Maryland as well. The program is geared towards offering residential electric customers incentives for upgrading their appliances and HVAC equipment to more energy efficient technologies. Eligible EE technologies include clothes washers, refrigerators, dehumidifiers, lighting, heat pumps, central air conditioners, duct/air sealing, building insulation, comprehensive measures/whole building, room air conditioners, appliance recycling, and electronically commutated motors.[346] All appliances are limited to one rebate per customer per year except for room air conditioning units which are eligible for 3 units per customer.[347] Customers upgrading building insulation are eligible for rebates of 15% of the cost.[348] The FE program in Maryland offers incentives for a wider array of EE technologies than the WV ApCo residential program. Residential programs in both states offer free installation of lighting and other similar upgrades through an in-home energy audit. Through Maryland's FE Quick Home Energy Check-up an energy auditor will evaluate a home's efficiency and can install upgrades such as CFLs, faucet aerators, and low-flow showerheads.[349]

The Potomac Edison Commercial and Industrial Efficiency Rebate Program is available to FE electric customers in the Maryland service territory. Commercial, industrial, governmental, and non-profit customers are eligible for rebate incentives related to EE equipment upgrades. Authorized rebates include lighting, controls, sensors, traffic signals, exit signs, heat pumps, air conditioners, chillers, variable frequency drives, food service equipment and other non-prescriptive measures. Custom projects must meet a minimum energy savings target of 50,000 kWh/yr, while custom buildings must meet a minimum energy savings goal of 20,000 kWh/yr.[350] Similar to the FE residential program, the FE commercial rebate initiative in Maryland is more expansive than similar WV AEP and FE programs in terms of rebate offerings. This FE program also differs from WV's ApCo and FE programs in that energy audits are made available to commercial customers. Potomac Edison offers a no-cost assessment to commercial customers with an annual demand of 60 KW or less.[351]

B. Ohio

AEP's Ohio Electric Residential Energy Efficiency Rebate Program is similar to West Virginia's AEP (ApCo) residential program in that in-home energy assessments and audits are used as distinct means to identify and implement energy savings measures in residential customers' homes. The Ohio program does not include these measures as free initiatives, however. The energy assessment costs $25 but includes approximately $100 of energy saving equipment installed by a qualified auditor. This includes installation of up to 12 CFLs, two low-flow faucet aerators, one low-flow shower head, one LED night light, 5' of pipe wrap and a programmable thermostat.[352] The in-home energy audit is a more comprehensive assessment which includes the

[346] DSIRE, "First Energy (Potomac Edison)".
[347] JACO Environmental, "Rebate Program".
[348] DSIRE, "First Energy (Potomac Edison)".
[349] Potomac Edison, "Energy Check-up".
[350] DSIRE, "First Energy (Potomac Edison)".
[351] energysaveMD, "Audit Program".
[352] DSIRE, "AEP Ohio (Electric)".

same services as the energy assessment in addition to comprehensive diagnostic tests such as a blower door test to discover air infiltration and a combustion efficiency test to measure appliances. This service costs $50 dollars for AEP's Ohio residential customers.[353] Similar to West Virginia, a number of efficiency technologies are available for rebates for residents once they are made aware of the possible efficiency upgrades. However, the Ohio rebate program includes a more comprehensive list of available technologies. AEP Ohio also has a residential energy efficiency incentive for gas-powered residences with similar provisions to that of the AEP electric incentives.[354]

AEP's Ohio Commercial Energy Efficiency Rebate Program is applicable to all non-residential sectors and includes incentives to upgrade to more energy efficient lighting in facilities. Nonresidential customers must apply for preapproval to insure funds availability. Eligible projects include screw-in compact fluorescents, hardwired compact fluorescents, conversion of T12 to T8 lamps, LED fixtures and lamps, LED exit sign retrofits, and lighting occupancy sensors among others.[355] For small businesses with annual consumption less than 200,000 k/Wh, AEP also provides rebates for recommended equipment, retrofits, occupancy sensors, refrigeration controls and other technologies following the results of an energy assessment.[356] West Virginia's C&I program offers similar technologies and lighting retrofit options. However, the lighting initiative within AEP's Ohio program contains a higher maximum incentive level than West Virginia's program. In Ohio, the lighting incentive is generally 50% of the project cost or $300,000.[357] In West Virginia, a similar incentive has a $150,000 cap per account per year.[358] Also, it is important to note that relevant sectors for West Virginia's program are commercial and industrial only. Ohio's program is relevant to all nonresidential sectors which include commercial and industrial, but also nonprofit, schools, local government, state government, federal government, and institutional organizations.[359]

The FE Ohio Commercial Energy Efficiency Program offer rebates for the installation of certain EE improvements for commercial, industrial, nonprofit, schools, local government, state government, agricultural, and institutional customers. Incentives help cover the cost of energy efficiency upgrades involving HVAC equipment, commercial cooking equipment, motors, variable frequency drives, lighting measures, and custom measures.[360] The FE High-Efficiency Audit Program offers partial rebates to commercial customers for completion of facility audits to identify feasible energy saving measures[361] The West Virginia program offered by FirstEnergy is applicable to the same nonresidential sectors, but the eligible technologies are related to lighting measures only. The Ohio program requires preapproval due to the variety of measures available to nonresidential customers, while the WV program is prescriptive with a maximum incentive of $0.05/kWh of first year savings for lighting applications.

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[353] AEP Ohio, "In-home Energy Programs".
[354] DSIRE, "AEP Ohio (Gas)".
[355] DSIRE, "AEP Ohio, Commercial Energy".
[356] AEP Ohio, "Express Program".
[357] AEP Ohio, "Incentives for Common Energy".
[358] Appalachian Power Company, "C&I Prescriptive Program".
[359] DSIRE, "AEP Ohio, Commercial Energy".
[360] Ibid
[361] FirstEnergy, "Audit Program".

C. Pennsylvania

FE's utility company, West Pennsylvania Power, offers a Residential EE rebate program with incentives for adoption of various efficiency technologies. Eligible efficiency technologies include washers, dryers, dish washers, CFL bulbs, room ac units, water heaters, central AC units, heat pumps, programmable thermostats and other appliances.[362] Most incentives have a limit of one rebate per customer per year except for room AC units which have a maximum incentive of 2 per customer.[363] Similar to the program offered to ApCo's WV residential customers, an in-home energy audit including installation of $50 of EE improvement products is available to residential customers of West Penn Power. However, the West Penn program applies a $50 fee for the cost of audit, whereas the WV program includes the audit and energy saving measures as complementary.[364]

The West Pennsylvania Power Commercial and Industrial Energy Efficiency Rebate Program offers various rebates to eligible customers adopting EE measures and equipment. Qualifying technologies include lighting, lighting controls/sensors, chillers, heat pumps, central air conditioners, custom/others pending approval, and led exit signs.[365] The program also allows for non-prescriptive measures to be installed upon approval from program administrators and passing of a Total Resource Cost test.[366] The ApCo program offers similar incentives for commercial and industrial customers. However, the West Penn program offers the incentives to a broader range of applicants including nonprofits, schools, local and state governments and other institutions.[367] Furthermore, the FE commercial program offered in WV is less comprehensive in terms of the scope of efficiency offerings. The WV program limits rebates to lighting initiatives, while the West Penn program offers incentives in most segments of EE improvements.

FirstEnergy operates another residential EE rebate program for its Pennsylvania Electric Company, Metropolitan Edison Company, and Pennsylvania Power Company. Qualifying technologies include washers, refrigerators, dehumidifiers, water heaters, lighting, heat pumps, central and room air conditioners, programmable thermostats, weatherization, windows, comprehensive measures/whole building, custom measures, and personal computing equipment.[368] These Pennsylvania FE programs facilitate a home energy audit program with installation of EE upgrades as well. The audit is $50 to FE residential customers, and it includes the installation of up to $50 of energy-saving products.[369] Another interesting aspect of this FE rebate program is the Appliance Turn In component. This aspect allows customers to recycle their old refrigerator/freezer and/or air conditioning unit in order to receive a $50 and $25 check, respectively. A contracted company will pick up the appliances from the customers' homes.[370] Compared to the WV ApCo and FE residential programs, the Pennsylvania FE program is more comprehensive in terms of the scope of rebates offered. Also, the WV program does not offer

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362 DSIRE, "First Energy (West Penn Power)".
363 JACO Environmental, "Appliance Turn-in Program".
364 FirstEnergy, "Walk Through Energy Audit Program".
365 DSIRE, "First Energy (West Penn Power)".
366 EnergysavePA, "Custom Incentive Program".
367 DSIRE, "First Energy (West Penn Power)".
368 DSIRE, "FirstEnergy (MetEdison, Penelec, Penn Power)".
369 FirstEnergy, "Walk Through Energy Audit Program".
370 JACO Environmental, "Appliance Turn-in Program".

any appliance turn in component to customers. However, the home energy audit for Pennsylvania's FirstEnergy companies is fee-based for customers, while the ApCo audit is free of charge to residential customers.

The FirstEnergy Commercial and Industrial program for the Pennsylvania Electric Company, Metropolitan Edison Company, and Pennsylvania Power Company is similar in scope to the program offered by the West Penn power company. The program offers EE incentives to sectors with commercial, industrial, government, schools, and institutional applications. Qualifying technologies include washers, refrigerators, water heaters, lighting, lighting controls/sensors, chillers, heat pumps, central air conditioners, motors, motor VFDs, custom measures pending approval, LED exit signs, vending machine controls, commercial refrigeration equipment, personal computing equipment, food service equipment, audit program, and LED Lighting.[371] This FirstEnergy utility rebate program offers a wider array of eligible technologies than what is offered through the WV ApCo and FE Potomac Edison programs. Similar to the West Penn program, this initiative allows for non-prescriptive incentives for commercial customers. The West Virginia programs available to commercial customers offer prescriptive rebates only. Table 9 summarizes the eligibility of various categories of incentives for each of the regional utilities:

Table 9: Summary of Regional Utility Rebate Eligibility

		Eligible Efficiency Technology Rebates							
Utility Program	**State**	**HVAC**	**App.**	**Light**	**Weath.**	**Non-pre**	**Mnt.**	**Maj Renov.**	**Audit**
FE (P. Edison) Res.	MD	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes (No Cost)
FE (P. Edison) C&I	MD	Yes	Yes	Yes	No	Yes	No	Yes	Yes (No Cost)
AEP Ohio Res.	OH	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes (Fee-based)
AEP Ohio Com.	OH	Yes	Yes	Yes	No	Yes	No	Yes	Yes (No Cost)
FE Ohio Com.	OH	Yes	Yes	Yes	No	Yes	No	Yes	Yes (Partial cost)
FE (W Penn) Res.	PA	Yes	Yes	Yes	Yes	No	Yes	No	Yes (Partial Cost)
FE (W Penn) C&I	PA	Yes	No	Yes	No	Yes	Yes	Yes	Yes (No Cost)
FE (M. Edison) Res.	PA	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes (Partial cost)
FE (M. Edison) C&I	PA	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes (Partial cost)
AEP (ApCo) Res.	WV	Yes	No	Yes	Yes	No	Yes	No	Yes (No Cost)
AEP (ApCo) C&I	WV	Yes	Yes	Yes	No	No	No	No	No
FE (P. Edison[2]) Com.	WV	No	No	Yes	No	No	No	No	No

[1] HVAC= Heating Ventilation and Air Conditioning-related; App. =Appliances (i.e. dishwashers, clothes washers, refrigerators, freezers, etc.); Weath. =Weatherization measures (i.e. duct/air insulation or building insulation); Non-pre= non-prescriptive or custom incentives; Mnt. = Maintenance (i.e. HVAC tune-up); Maj Renov. = Major renovation/whole building; Audit: "Fee-based" indicates total consumer cost burden, while "partial" indicates a consumer bearing only a portion of cost of incentive because of availability of partial rebate.
[2] The rebates offered to First Energy Potomac Edison customers in West Virginia are the same rebates offered to First Energy Mon Power customers. For this reason, Mon Power's eligible rebates are not listed in the table.

[371] DSIRE 2012, "FirstEnergy (MetEdison, Penelec, Penn Power)".

IX. A Regional Comparison of EE Initiatives

West Virginia's placement among other states in terms of their EE program development has been noted in many cases already. However, a closer look will now be given to comparing[372] the scope of WV's programs to other ARC states. Points of comparison will be made in terms of financial incentives such as tax incentives, rebate programs, grant programs, and loan programs applicable to residential, commercial and industrial sectors. Additionally, the rules, regulations, and policies for EE will also be examined regionally from a comparative perspective. It is important to note that local initiatives are excluded in the summation.

A. West Virginia

Of the various opportunities for financial incentives in EE, West Virginia has only adopted one area of incentives: rebate programs. Specifically, the state has three utility rebate programs that are operated by Appalachian Power and FirstEnergy.

In terms of rules, regulations, and policies for EE, West Virginia has adopted building energy standards for public buildings that comply with IECC 2009 referencing ASHRAE 90.1 2007. The statewide adoption for construction of private residential and commercial buildings is consistent with IECC 2003 and ASHRAE 90.1 2001 standards, respectively.

B. Alabama

In Alabama there are eight utility rebate programs related to the adoption of EE technologies. The state has eight EE loan programs: six are sponsored by utilities and two are sponsored by the state government.

New Alabama State buildings must comply with standards as prescribed in the IECC 2006 building code. Effective October of 2012, construction of new residential buildings must comply with 2009 International Residential Code (IRC)[373] standards with some amendments, and construction of new commercial buildings must comply with 2009 IECC standards.

C. Georgia

The Clean Energy Tax Credit in Georgia is the one tax incentive related to EE adoption in Georgia. The state hosts 20 utility rebate programs and 8 loan programs relevant to EE technologies. Of the eight loan programs, one is sponsored at the state level and the remaining seven are utility-sponsored.

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[372] Sources of comparison are derived principally from information gathered from the DSIRE Summary tables. See http://www.dsireusa.org/summarytables/finee.cfm & http://www.dsireusa.org/summarytables/rrpee.cfm

[373] IRC is a code published by the International Code Council that establishes residential standards in terms of building, plumbing, mechanical, fuel gas and electrical requirements for one- and two-family dwellings in one code.

Georgia public building standards are upheld to achieving efficiency standards 30% above ASHRAE 90.1 2004. Residential standards are based on IECC 2009, and commercial buildings must meet ASHRAE 90.1 2007 as referenced in IECC 2009.

D. Kentucky

There are two EE tax incentives in the Commonwealth of Kentucky. They are called "Energy Efficiency Tax Credits" and are applicable to both personal and income taxes. Furthermore, Kentucky hosts 23 rebate programs: 22 are utility-sponsored and one is state-sponsored. There is one EE grant program under Kentucky's Office of Agricultural Policy which applies to both the commercial and agricultural sector. In addition, there are five loan programs related to EE in Kentucky of which three are utility-sponsored and two are state-sponsored.

Kentucky maintains two energy standards for public buildings. One standard is applicable to general public buildings, and it requires that construction and major renovation meet building certifications depending on a life-cycle cost analysis. The Kentucky Energy Efficiency Program for Schools (KEEPS) is a voluntary standard and is applicable specifically to construction and major renovations in public schools. The program encourages schools to report energy use reduction and energy savings. It also provides assistance to school districts that renovate or construct new buildings and choose to adopt EE technologies. The building code established for non-government buildings in Kentucky is based on the adoption of IECC 2006 and IECC 2009 standards for residential and commercial applications, respectively.

E. Maryland

There are three tax incentives in the state of Maryland related to EE. One incentive is a sales tax holiday related to the purchase of EE technologies. The other two are property tax credits[374] related to the construction and/or renovation of high performance buildings and the installation of energy conservation devices. Maryland also has 18 rebate programs for efficiency of which 17 are utility-sponsored and one is state-sponsored. Eight EE loan programs also exist at the state-level.

Maryland had initially established minimum efficiency appliance standards in 2004 with their Energy Efficiency Standards Act (EESA). However, despite subsequent amendments and additions, Federal guidelines for appliance standards have since preempted state-issued standards. In terms of energy standards for public buildings, Maryland previously required energy use reduction in state buildings of 5% by 2009 and 10% by 2010 relative to a 2005 baseline, Similarly, LEED[375] Silver or a comparable rating was required for new state construction, renovations, and new schools that receive state funding. Maryland is the only state

[374] It should be noted that the property tax credits for EE are applicable statewide but adopted on a local level based on Maryland's opt-in and opt-out policy for county enforcement.

[375] Developed by the U.S. Green Building Council (USGBC), Leadership in Energy and Environmental Design (LEED) is a framework for identifying and implementing practical and measurable green building design, construction, operations and maintenance solutions. LEED certification provides independent, third-party verification that a building, home or community was designed and built using strategies aimed at achieving high performance in key areas of human and environmental health: sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality.

in the ARC to have already adopted IECC 2012 and ASHRAE 90.1 2010 standards for residential and commercial buildings.

F. Mississippi

Within the state of Mississippi there are 12 utility rebate programs related to EE. There are also two utility-sponsored loan programs applicable to the residential sector. A state-sponsored loan program for commercial and industrial energy consumers is also available in Mississippi.

Standards related to the building energy code in Mississippi are implemented on a voluntary basis within the residential and commercial sectors. ASHRAE 90.1-1975 is the voluntary code within both sectors. However, the code is mandatory for public buildings, state-owned buildings, and high-rise buildings constructed within the state.

G. New York

The state of New York has a property tax incentive related to energy conservation improvements on residential property. The incentive is a property tax exemption, and it applies to 100% of the value added to the residence by the improvement. In terms of rebate programs, New York has 42 which are related to EE. Seven are state-sponsored rebate programs, while 35 are utility programs. New York has also implemented three state loan programs and three state grant programs concerning the adoption of EE measures within residential, commercial, industrial, low-income, and other relevant sectors.

New York has appliance efficiency standards for consumer audio and video products and digital television adapters. Furthermore, energy-consuming equipment used in state buildings must adhere to EnergyStar specifications. Construction of new state buildings and substantial renovations must meet LEED guidelines in New York. However, the general building code for residential and commercial buildings follows standards of IECC 2009 and ASHRAE 90.1 2007, respectively. New York also supports energy efficiency education, outreach, research and development, and low-income energy assistance though a system benefits charge (SBC) program. The state's six investor-owned electric utilities support the program through collection of a surcharge on utility customers’ bills.

H. North Carolina

There is one tax incentive for adoption of EE technologies in North Carolina. The state offers a 100% sales tax exemption for qualifying Energy Star appliances during a one-day “sales tax holiday” that occurs annually. North Carolina’s rebate programs are substantial in that they have 26 utility-sponsored and 2 state-sponsored rebate programs. There are also eight EE loan programs implemented within the state. Seven are utility loan programs and one is a state loan initiative that grants cities and counties the right to establish revolving loan programs to finance renewable energy and energy efficiency projects that are permanently affixed to residential, commercial or other real property.

Construction of new state buildings in North Carolina must surpass energy building code standards as defined in ASHRAE 90.1 2004 by 30%. Major renovations of public buildings must exceed the same code by 20%. The IRC 2009 and IECC 2009 are the basis for the state-developed 2012 North Carolina Energy Conservation Code which applies to both residential and commercial sectors.

I. Ohio

Ohio has no tax incentives in place to promote EE adoption within the state. However, there are 25 utility rebate programs offered by a variety of utilities and applicable to all sectors. There are also five loan programs offered in Ohio that promote EE initiatives, two state-sponsored and three utility-sponsored.

Ohio has various rules related to energy standards for public buildings. All new public school construction must achieve LEED Silver certification, with a goal of gold certification. Other public buildings meeting a certain size requirement will undergo a necessary life-cycle cost analysis and energy consumption analysis prior to construction. Furthermore, Ohio requires that State institutions of higher education develop efficiency guidelines for capital improvement projects and leasing of buildings.

In terms of general building energy code standards, Ohio has developed two codes, the 2011 Residential Code of Ohio (RCO) and the 2011 Ohio Building Code (OBC). The 2011 RCO is based on the 2009 IECC and 2009 IRC standards, and it will become effective beginning 2013. The 2011 OBC is Ohio's commercial code, and it is based on standards established within the 2009 IBC, 2009 IECC, and ASHRAE 90.1 2007.

Ohio's Advanced Energy Fund is a public benefits fund used to provide grants for EE and renewable projects to different economic sectors. Previously the fund was supported by a uniform fee placed on customers of the state's investor-owned utilities. However, the collection of these fees expired at the end of 2010, and additional funds are now only accrued based on the imposition of alternative compliance payments.[376]

J. Pennsylvania

There are 15 utility rebate programs in effect in Pennsylvania which relate to the adoption of EE measures and technologies. One utility also sponsors an EE loan program in the commonwealth, while the other five EE loan programs are enacted at the state-level. Pennsylvania also maintains four state-sponsored grant programs relevant to the adoption of EE.

Executive order 2004-12 requires state agencies to develop energy conservation methods for new construction and building renovations consistent with the oversight and coordination from the state's Department of General Services. Pennsylvania's general building energy code for the residential sector is the 2009 Uniform Construction Code. It is based on standards established by the 2009 IECC, but alternative compliance paths are offered through the 2009 IRC and 2009

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[376] Alternative Compliance Payments (ACPs) are penalties imposed on investor-owned utilities and retail suppliers within the state for not meeting specified benchmarks in terms of energy efficiency and renewable standards.

Pennsylvania Alternative Residential Energy Provisions. On the commercial side, the 2009 Uniform Construction Code also applies. Standards are based on IECC 2009 referencing ASHRAE 90.1 2007. In Pennsylvania, Sustainable Energy Funds (SEFs) have been developed on a regional basis. These funds act as public benefits programs to promote the development of sustainable and renewable energy. They are maintained by utilities within the state through the utilities' distribution rates.

K. South Carolina

There are two tax incentives offered in the state of South Carolina related to the adoption of EE. One is a personal income tax credit offered to residential sector to incentivize consumers to purchase energy efficient manufactured homes. The other is a 100% sales tax exemption on energy efficient manufactured homes purchased in the state between July 1, 2009 and July 1, 2019. In addition, the state has 18 EE rebate programs which are sponsored at the utility level. There are also four utility loan programs along with one loan program sponsored by the state which act as incentives for implementation of EE measures.

South Carolina has also implemented energy standards for public buildings which require that all major facility projects in the state must be designed, constructed, and receive at least two globes using the Green Globes[377] Rating System or receive the LEED Silver standard. For the building energy code for residential and commercial sectors, South Carolina has implemented IECC 2006 standards.

L. Tennessee

In Tennessee there are 14 utility rebate programs relevant to implementing EE initiatives in residential, commercial, and industrial sectors. There was one state-sponsored grant program that addressed EE initiatives within public schools, but it expired in June of 2010. There are a total of five EE loan programs in Tennessee. Three are administered at a utility level, and two are administered on a state level.

Although there are no specific building standards for public building construction in Tennessee, there are requirements related to purchase of equipment used by state agencies within public buildings. Tennessee requires that all State agencies purchase EnergyStar qualified equipment, appliances, lighting, and heating and cooling systems. The building code for new residential and commercial construction in the state is set at IECC 2006 standards.

M. Virginia

Virginia offers three tax incentives for EE. A personal income tax deduction of 20% of the sales tax paid by an individual for the purchase of a qualifying EnergyStar appliance is available until July 2012. Within the Commonwealth, there is also a four-day sales tax holiday where qualifying EnergyStar products can be purchased with a 100% sales and use tax exemption. Furthermore, a

[377] Green Globes is a building environmental design and management tool. It delivers an online assessment protocol, rating system and guidance for green building design, operation and management. It provides market recognition of a building's environmental attributes through third-party verification.

property tax incentive is offered to all sectors with buildings that exceed the statewide building code energy efficiency standards by 30% or that meet other criteria such as LEED and other certifications. This state incentive enables local jurisdictions to assess the property tax of such energy efficient buildings at a lower rate. Virginia also hosts 11 utility-sponsored rebate programs which apply to EE technologies. There is also one utility-sponsored EE loan program and two state-sponsored EE loan programs.

Virginia has also enacted requirements for public building energy standards. It is required that new buildings and major renovations be built to LEED Silver or Green Globes Two Globes Standards. Furthermore, agencies and institutions are instructed to purchase or lease EnergyStar-rated appliances and equipment. For residential and commercial building energy standards the IECC 2009 rules are mandatory statewide.

Table 10 and Table 11 summarize the scope of financial incentives and rules, regulations, and policies for each ARC State:

Table 10: Summary of EE Financial Incentives for ARC states

ARC State	EE Tax Incentives				EE Programs		
	Personal Tax	Corporate tax	Sales Tax	Property Tax	Rebate	Grant	Loan
Alabama	N/A	N/A	N/A	N/A	8U	N/A	2S; 6U
Georgia	N/A	1S	N/A	N/A	20U	N/A	1S; 7U
Kentucky	1S	1S	N/A	N/A	1S; 22U	1S	2S; 2U
Maryland	N/A	N/A	1S	2S	1S; 17U	N/A	8S
Mississippi	N/A	N/A	N/A	N/A	12U	N/A	1S; 2U
New York	N/A	N/A	N/A	1S	7S; 35U	3S	3S
North Carolina	N/A	N/A	1S	N/A	2S; 26U	N/A	2S; 7U
Ohio	N/A	N/A	N/A	N/A	25U	N/A	3S; 2U
Pennsylvania	N/A	N/A	N/A	N/A	15U	4S	5S; 1U
South Carolina	1S	N/A	1S	N/A	18U	N/A	1S; 4U
Tennessee	N/A	N/A	N/A	N/A	14U	1S	2S; 3U
Virginia	1S	N/A	1S	1S	11U	N/A	2S; 1U
West Virginia	N/A	N/A	N/A	N/A	3U	N/A	N/A

[1] DSIRE Financial Incentives for Energy Efficiency
[2] S= State-sponsored initiative; U= Utility-sponsored initiative; N/A= Not Applicable

Table 11: Summary of EE Rules, Regulations, and Policies for ARC States

ARC State	Appliance/Equipment Efficiency Standards	Energy Standards for Public Buildings	Public benefits Funds
Alabama	1S	IECC 2006	N/A
Georgia	N/A	30% above ASHRAE 90.1-2004	N/A
Kentucky	N/A	Life-cycle cost analysis/KEEPS	N/A
Maryland	1S	Energy use reduction goals/ LEED	N/A
Mississippi	N/A	ASHRAE 90.1-1975	N/A
New York	1S	LEED Guidelines	1S
North Carolina	N/A	30% above ASHRAE 90.1-2004	N/A
Ohio	N/A	life-cycle analysis/LEED (schools)	1S
Pennsylvania	N/A	Executive order 2004-12	1S
South Carolina	N/A	LEED Silver or Green Globes 2 globes	N/A
Tennessee	N/A	No public building standards; Energy Star equipment purchases	N/A
Virginia	N/A	LEED Silver or Green Globes 2 globes	N/A
West Virginia	N/A	ASHRAE 90.1-2007	N/A

[1] DSIRE Rules, Regulations, & Policies for Energy Efficiency
[2] S= State-sponsored initiative; N/A= Not Applicable
[3] Although discussed within this section, the General building energy codes are not listed in the tables as they are already summarized in Table 4 and Table 5 under the building code sections previously discussed.

X. Conclusions

EE should be considered a high priority resource within the West Virginia energy portfolio. EE programs can help alleviate the impacts of increasing energy demand, rising electricity rates, and above-average per capita energy consumption in West Virginia. There are also substantial ratepayer, utility, economic, and environmental benefits derived from greater reliance on EE as an energy resource. Additionally, EE complements traditional forms of generation by allowing utilities to use their generation assets more cost-effectively. The following outlines various conclusions reached about EE in terms of the objectives of the Energy Opportunities Document and its relative importance in West Virginia:

- Above average household energy consumption and lack of expansive programs increases the potential for West Virginia to reap substantial energy savings via enhanced EE policy
- Saving energy through EE is a more cost-effective option than traditional means of power generation. By reducing a utility's reliance on capacity expansion to meet greater energy demand, EE allows use of a least cost resource.
- Utility programs in West Virginia are less extensive than similar programs in surrounding states. Of the two utilities offering programs in WV, the ApCo residential and commercial program is more comprehensive.

- Methods for quantifying benefits and “avoided costs” vary by state and make direct utility program comparisons difficult.
- Utility administration of EE programs is regarded as the most effective approach for program administration given appropriate decoupling and/or incentive policies remove the throughput incentive. Utilities have the greatest level of interaction with customers, and they can more easily incorporate EE into their long-term integrated resource planning. Third party administration is seen as another viable means for program delivery because independent agencies do not face regulatory incentives discouraging the promotion of EE.
- Effective utility EE programs should reduce a utility’s overall revenue between rate cases due to the decrease in energy consumption resulting from greater adoption of efficiency technologies and practices. Utility under-recovery of revenue may be adjusted by decoupling and other recovery adjustment mechanisms. True-up decoupling is unique from other mechanisms because it provides a framework that insures customers are reimbursed if utility over-recovery should take place.
- Establishing binding energy savings goals through EERS can help a program achieve greater savings than in the absence of a legislative mandate. Specific, measurable goals provide a standard by which progress can be based and reinforce the notion of EE as a quantifiable energy resource.
- Updating building energy codes is a vital component to a sound EE policy. Both residential and non-residential structures account for large proportions of energy use due to outdated design and construction standards. States with the greatest prioritization of EE maintain updated building energy code standards.
- Adoption of a consistent family of building codes enhances uniformity and streamline enforcement processes
- The nature of code promulgation in WV does not automatically lend to adopting the most recent and effective codes for building energy efficiency. The State Fire Commission proposes a series of codes for adoption but there is little opportunity within the commission to champion the causes of EE. Although some members of the commission are proponents of building energy codes, the principal mission of the commission is the adoption of a set of codes related to fire prevention and lifestyle safety.
- There is a high degree of discontinuity in terms of the enforcement of building energy codes within the state. The current structure misaligns the responsibilities of the promulgating agency with its mission since the enforceability of the series of codes adopted under their authority is limited mainly to fire codes. Limited local enforcement also makes updating building energy codes more of a symbolic act rather than a practical measure. Enforcing building energy code compliance of state-funded construction is also discontinuous as no specific entity has overarching authority to oversee all public building construction.
- Training on updated standards and practices is one of the most effective ways to sell EE to architects, engineers, and building owners. Courses and presentations from regional code experts are effective ways to communicate the benefits of building energy codes.
- Municipalities in the FirstEnergy service territory may receive the most benefit from EE community grants because there is no residential program or substantial commercial program where ratepayers can be educated on EE or receive an energy audit.

- State-administered industrial programs like the WVMEP E3 service and the IOFWV program are important because they offer consulting opportunities and energy assessments to small and mid-sized industrial firms who may not meet the eligibility requirements for IAC assessments.
- Quantifying energy benefits and establishing baseline levels of consumption by which program effectiveness can be evaluated is a key aspect to ensuring the efficacy of both state and utility EE programs.

XI. Recommendations

The following targeted recommendations are actions that can be taken to further advance EE as a State energy resource. The level of reliance placed on EE within the State is minimal compared with the level of adoption of EE practices in most surrounding states. There are specific policies and practices in place which prevent EE from being an effective resource in West Virginia. There are also policies and practices which have not been implemented in the State which prevent EE from reaching its full potential. Practices currently in place that should be continued are also acknowledged. These policy recommendations are divided into two categories: those adoptable from a state government perspective and those adoptable from a utility/public service commission perspective.

A. Recommendations for State Government

- **Adopt the 2009 IECC and 2007 ASHRAE Building Energy Codes Statewide:**

  The recent adoption of the 2009 IECC and 2007 ASHRAE standards for state-funded construction and public buildings is a step in the right direction toward fostering greater reliance on EE. Although the adoption of these updated codes on a statewide basis has already been promulgated and moved to the legislative rulemaking process, it is important to stress their place as a permanent fixture within West Virginia's energy policy. The updated rules should be approved and the new codes should be passed in the appropriate legislative sessions.

  Responsible Entities: WV State Fire Commission, WV State Legislature

- **Foster Continual Adoption of Updated Building Energy Codes**

  Until the adoption of the 2009 energy code, West Virginia was three series of codes behind the most recent publication. The agency with promulgation authority should keep the State no further than one series of codes behind the most recently version, with the preferred goal of being fully up-to-date. Although the process may not be immediate, the State can take interim steps towards updating. Most states have public building energy codes over and above the standards set for general residential and commercial buildings in the state. By taking a "lead by example" approach, the State government can foster greater reliance on EE by showing their commitment to updating their energy efficiency practices. In addition, the residential and commercial codes need not be updated simultaneously if it is deemed politically infeasible to upgrade codes due to opposition from interested organizations. Some states, like Kentucky, have adopted a "divide and conquer" methodology where commercial code publications are given first priority. Following a period of commercial code acceptance and practice by architects, designers, and engineers, steps can be made to pass updated residential building energy codes.

Responsible Entities: WV State Fire Commission, WV State Legislature

- **Appoint an Energy Efficiency Ad-hoc Position to the State Fire Commission**

  In the short-term, it is recommended that there be an advocate for EE working in some capacity either on or with the fire commission. Within the scope of authority of the commission is the right to establish advisory boards to encourage representative participation in the rulemaking processes on issues related to the State Building Code. Insofar the commission has chosen not to employ such advisory boards with regards to building energy code adoption. However, the mandatory inclusion of interested parties in the rule-making process is a minimum step that should be taken to ensure the future promulgation of updated building energy codes.

  We foresee three scenarios by which this could be effective:

  - Change the language in the state code to make the inclusion of advisory boards a mandatory aspect of the fire commission's rulemaking procedures.
  - Appoint an energy management specialist, engineer, architect, or similarly qualified individual with related EE and building energy code experience as an ex officio member to the West Virginia State Fire Commission.
  - Appoint an energy management specialist, engineer, architect, or similarly qualified individual with related EE and building energy code experience as a voting member to the West Virginia State Fire Commission.

  Responsible Entities: West Virginia Governor's Office, WV Legislature, relevant professional organizations (recommend for appointment)

- **Conduct a Study to Evaluate the Feasibility of Making the Energy Code Portion of the State Building Code Enforceable Statewide**

  Due to the limited scope of this report, we recommend that a targeted study be conducted to evaluate the potential for making the energy portion of the state building code enforceable on a statewide basis. One topic area that should be evaluated further is the restructuring of the fire commission in a similar manner to how Kentucky reorganized the entities responsible for their state building code. A second area of study could examine the potential for uniformity of the WV State Building Code so that all adopted codes stem from one class of publications. The two areas are independent but not mutually exclusive.

These issues could be considered politically unviable in West Virginia within a five year timeframe due to budget constraints, legislative processes, and political opposition because of the general history of code enforcement. However, these issues are highly important due to their impact on the efficacy of the state's overall EE program. This is the reason a study to further assess the issue has been recommended.

Responsible Entity: West Virginia Legislature

- **Continue WVDOE Funding of EE-related Programs**

  WVDOE programs build awareness around EE in our state and foster a culture of acceptance towards alternative means of energy generation. Code training seminars demonstrate how EE building practices are more cost-effective than previous methods and give evidence that proves updating to new standards is not a matter of incurring additional cost but of creating additional value through return on EE investment. DOE's funding of Portfolio Manager in both state agencies and public schools should be continued as a part of a growing effort to raise awareness on building energy usage, train users in energy management tools, and develop a comprehensive EE policy spanning all sectors. Continuing WVDOE-sponsored industrial programs ensures no cost or low cost energy assessments are available to all classes of industrial customers. The WVDOE's community grant programs allow municipalities to provide EE education and energy assessments granting opportunities for EE engagement in areas where there are no established programs.

  Responsible Entity: West Virginia Division of Energy

- **Conduct a Study on Potential for Increased CHP Deployment within the State**

  It is recommended that a study be conducted to analyze the impact of further incentivizing Combined Heat and Power technologies with state and utility initiatives. Such a study would evaluate the effectiveness of state policy while comparing it with policies of other pertinent states who lead the nation in CHP development. An assessment of other barriers that may affect local CHP markets such as poor spark spread would also need addressed in order to weigh the potential effectiveness of enhancing policies to favor CHP development.

  Responsible Entity: West Virginia Division of Energy

B. Recommendations for Utilities and Regulatory Actors

- **Implement a Mechanism to Allow for Reasonable Recovery of Utility Lost-Revenues Resulting from Energy Efficiency Programs**

  Because utilities are a vital component of both effective implementation and administration of EE, it is necessary to provide a framework for lost revenue recovery that, at a minimum, removes their disincentive to engage in EE programs. Decoupling a utility's revenue from sales is less disruptive in states like West Virginia where deregulation has not occurred. However, choosing the right decoupling or alternative lost-revenue mechanisms, or a combination of those mechanisms with performance incentives necessitates an analysis of other factors as well. Considerations for administrative costs, regulatory efficiency, earnings attrition, and promotion of EE should also be taken to ensure the appropriate mechanism is selected.

  Furthermore, accompanying the recommendation to implement a mechanism for lost-revenue recovery is the notion that potential "off ramps" or transitioning features should be examined before departing from traditional rate-making processes. Balancing accounts, rate banding, shared earnings, and course corrections for single events are all relevant factors that should all be examined to insure the transition from traditional rate-making procedures is fluid. Ensuring the change in structure has the intended effects and avoids harmful unintended consequences is a necessary component for designing an effective regulatory policy complimentary to EE.

  Responsible Entity: WV Public Service Commission

- **Establish an Energy Savings Target for Utility Energy Efficiency Initiatives**

  State support for energy efficiency initiatives is important and can make these efforts more effective. The State can show support for energy efficiency by setting energy savings targets for utilities. Targets can be binding, via a resource carve-out, or can be incentivized through return on investment provisions. Initiatives with measurable performance are more transparent, and can facilitate analysis of the effectiveness of the programs.

  Establishing a binding standard or actionable investment incentives allows EE to be viewed as a priority resource and capitalizes on the established customer/utility relationships. Additionally, use of the Alternative and Renewable Portfolio designation of energy efficiency as an eligible resource incentives utilities to deliver cost effective programs.

  Effective EE efforts allow a number of short-term economic benefits to West Virginia, including economic diversification through new jobs in EE services, reduced electricity bills for participating customers, as well as more efficient use of underlying resources.

Longer-term benefits may include improved housing values and reduced off-system purchases of electricity.

It is recommended that the State establish an energy savings target for the utility EE initiatives of one half of a percent per year, for customers using less than one MW of capacity. This target can be set within the existing Alternative and Renewable Energy Portfolio Standard or a separate standard, and should be accompanied by appropriate regulated investment incentives. Stand-alone investment incentives can also meet the savings objectives and targets can be tailored to each utility's unique initiative. During the 2013 to 2017 time period the State should study options for increasing the target and incorporate that information into the next five-year plan.

Responsible Entities: WV Public Service Commission, WV Legislature

- **Establish a Stakeholder Working Group to Provide Guidance on EE Program Elements:**

  The stakeholder group[378] should provide guidance on issues related to levels of resource standards, utility incentives for achieving goals, potential program expansion, lost-revenue recovery policies, program evaluation and other relevant matters. Representatives of organizations to be included within the stakeholder group include the EE utility program managers, the WV Division of Energy, the WV Energy Users Group, the Consumer Advocate Division of the PSC, Energy Efficient West Virginia, and industrial stakeholders such as members of WVU Industrial Assessment Center and other relevant industrial groups.

  Responsible Entity: WV Public Service Commission

[378] Since the initial publication of this report, a stakeholder group has been formed by Appalachian Power Company to deal with issues noted within the recommendation. The stakeholder group's first meeting was held on October 26, 2012 with representatives from the various organizations mentioned.

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