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Executive Summary

Policymakers have used a variety of approaches to achieve greater implementation and reporting of energy efficiency. Among these are approaches that create or expand opportunities for voluntary, market-based transactions involving energy efficiency byenabling public agencies to enter into long-term energy savings performance contracts; providing financing or tax incentives for energy efficiency investments; permitting energy efficiency resources to compete in and receive compensation via forward capacity markets; allowing energy efficiency resources to receive tradable credits for reducing the emissions of greenhouse gases under an emissions trading program; or allowing energy efficiency resources to receive tradable credits under a resource portfolio standard, among other strategies. In this report, we consider how markets for energy efficiency might incentivize the implementation and reporting of energy efficiency in Kentucky, and the strategies that the Commonwealth might employ in order to promote participation in these markets. We focus specifically on the PJM capacity market, the market for CO_2 offset allowances under the Regional Greenhouse Gas Initiative (RGGI), and the market for energy efficiency credits that may be traded and used towards compliance with state portfolio standards. Based on our review of these opportunities, we make the following recommendations for the Commonwealth of Kentucky:

- Create awareness among Kentucky energy efficiency providers on the process for participation of energy efficiency resources in the PJM capacity market.
- Monitor the RGGI CO_2 offset allowance market, and seek feedback from utilities and PSC on market participation if a realistic monetization opportunity arises.
- Monitor the Tier II credit market under the Pennsylvania AEPS, and seek feedback from utilities and the PSC on market participation if a realistic monetization opportunity arises.
- Consult the Kentucky TRM Roadmap where future monetization opportunities requiring statewide standardized EM&V and reporting arise.

Glossary

Capacity market: A market organized by Regional Transmission Organizations, where commitments to provide electric capacity in the future are offered and purchased in order to ensure long-term grid reliability.[1]

Capacity Obligation: A Load Serving Entity's assignment of electric capacity that it must purchase from PJM, calculated as a portion of the total electric capacity cleared through the PJM Capacity Market on behalf of Load Serving Entities for a particular Deliver Year and PJM Zone.[2]

CO_2 Offset Allowance: A Regional Greenhouse Gas Initiative (RGGI) CO_2 Offset Allowance is a tradable instrument that represents a project-based greenhouse gas emission reduction outside of the capped electric power generation sector.[3]

Delivery Year: 12 months beginning June 1 and extending through May 31 of the following year, for which capacity is procured through the PJM Reliability Pricing Model.[4]

Energy efficiency credit (EEC): Generic term used in this report to refer to a tradable instrument issued to an energy efficiency project. Several terms are used to describe credits issued to energy efficiency projects depending on the particular compliance or voluntary purpose that the credit is used towards, including: "Energy Savings Certificate", "Energy Efficiency Certificate" and "White Tag®".

Final Zonal Capacity Price: The price charged to a Load Serving Entity for their capacity obligation based on the results of RPM Auctions for a particular Delivery Year.[5]

Load Serving Entity: An entity such as an electric utility that secures energy and transmission service to serve the electrical demand and energy requirements of its end-use customers.[6]

Locational Reliability Charge: Fee applied to each Load Serving Entity that serves load in PJM during the Delivery Year – based on the Load Serving Entity's capacity obligation and the Final Zonal Capacity Price.[7]

PJM Zone: A transmission owner's area within the PJM Region.[8]

Portfolio standard: A regulatory mandate requiring utility companies to source a certain amount of the energy they generate or sell from a particular source or set of sources.[9]

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[1] PJM. Capacity Market (RPM). November 28, 2016. Webpage: https://learn.pjm.com/three-priorities/buying-and-selling-energy/capacity-markets.aspx.
[2] PJM. Glossary. November 28, 2016. Webpage: www.pjm.com/en/Glossary
[3] Regional Greenhouse Gas Initiative. CO_2 Offsets. November 28, 2016. Webpage: https://www.rggi.org/market/offsets.
[4] Id.
[5] PJM. Glossary. November 28, 2016. Webpage: www.pjm.com/en/Glossary
[6] U.S. Energy Information Administration (EIA). Glossary. November 28, 2016. Webpage: https://www.eia.gov/tools/glossary/index.cfm?id=L
[7] PJM. Glossary. November 28, 2016. Webpage: www.pjm.com/en/Glossary
[8] See Appendix 2, Map of PJM Zones.
[9] Solar Energy Industries Association (SEIA). Renewable Energy Standards. November 14, 2016. Webpage: http://www.seia.org/policy/renewable-energy-deployment/renewable-energy-standards

Regional Greenhouse Gas Initiative (RGGI): The first mandatory cap-and-trade program in the United States to limit carbon dioxide from the power sector, consisting of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont.[10]

Regional Transmission Organization (RTO): Serves as a third-party independent operator of the transmission system, and in some cases organizes markets for electrical energy and capacity.[11] PJM is an example of an RTO.

Reliability Pricing Model (RPM): PJM's capacity market design that includes a series of auctions to satisfy the reliability requirements of the PJM region for a particular Delivery Year.[12]

[10] Center for Climate and Energy Solutions. Regional Greenhouse Gas Initiative (RGGI). November 28, 2016. Webpage: http://www.c2es.org/us-states-regions/regional-climate-initiatives/rggi
[11] Electric Power Supply Association (EPSA). What are RTOs and Organized Markets? November 28, 2016. Webpage: https://www.epsa.org/industry/primer/?fa=rto
[12] PJM. Glossary. November 28, 2016. Webpage: www.pjm.com/en/Glossary

Introduction

Policymakers have used a variety of approaches to achieve greater implementation and reporting of energy efficiency.[13] Among these are approaches that create or expand opportunities for voluntary, market-based transactions involving energy efficiency byenabling public agencies to enter into long-term energy savings performance contracts; providing financing or tax incentives for energy efficiency investments; permitting energy efficiency compete in and receive compensation via forward capacity markets[14]; or allowing energy efficiency resources to receive tradable credits for reducing the emissions of greenhouse gases under an emissions trading program or resource portfolio standard.[15]

Kentucky may apply several of these approaches in order to incentivize the implementation and reporting of energy efficiency in the Commonwealth. This report reviews existing and future markets in which energy efficiency occurring in Kentucky may participate. It builds off of a year-long examination of energy efficiency evaluation, measurement and verification (EM&V) practices in Kentucky, and compares prevailing practices to the requirements associated with participation in energy efficiency markets. The report concludes with a series of implementation strategies that the Commonwealth might employ in order to leverage these markets.

Background on Energy Efficiency in Kentucky

The energy efficiency landscape in the Commonwealth of Kentucky is complex and involves numerous stakeholders including state agencies, investor-owned utilities and electric cooperatives, energy service companies, large manufacturers, residential and commercial customers, and Community Action Agencies, among others.

The Kentucky Public Service Commission (PSC) regulates energy efficiency programs implemented by two categories of retail electric suppliers: investor-owned utilities (IOUs) and rural electric cooperative companies (RECCs).[16] The IOUs regulated by the PSC are: Louisville Gas and Electric Company (LG&E), Kentucky Utilities Company (KU), Kentucky Power Company (a unit of American Electric Power or AEP) and Duke Energy Company. The PSC regulates the nineteen RECCs that jointly own and purchase power from one of two generation and transmission cooperatives (G&T): East Kentucky Power Cooperative (EKPC) and Big Rivers Electric Corporation (Big Rivers).[17] The IOUs and RECCs regulated by the PSC are not required to meet energy savings targets under Kentucky law; however, each IOU and G&T regulated by the PSC regularly develops multi-year energy efficiency plans and implements energy efficiency programs. These plans and programs are reviewed and approved by the PSC, and generally

[13] See Wasserman, N., Sleeping Lion Consulting and Neme, C., Energy Futures Group. "Policies to Achieve Greater Energy Efficiency." October 2012.
[14] For a definition of "capacity market" and other terms used in this report, please see the Glossary.
[15] See generally, Wasserman, N., Sleeping Lion Consulting and Neme, C., Energy Futures Group. "Policies to Achieve Greater Energy Efficiency." October 2012; National Association of Clean Air Agencies (NACAA). Implementing EPA's Clean Power Plan: A Menu of Options. May 21, 2015.
[16] Energy and Environment Cabinet, Kentucky Department for Energy Development and Independence. Kentucky Energy Profile 2015. 5th ed. 2015.
[17] See Appendix for a map of electric service areas in Kentucky.

contain projections of savings impacts from energy efficiency programs. [18] Under Kentucky law, the PSC may approve full cost recovery, recovery of lost revenues, and utility incentives for energy efficiency programs.[19]

Energy efficiency projects in the Commonwealth are also implemented outside of utility programs. The Kentucky chapter of the Energy Services Coalition estimates that more than $1 billion in projects have been completed statewide through energy service performance contracting (ESPC) from the time that enabling legislation[20] was passed in 1996 through the end of 2016.[21] ESPC has been used by state government buildings, municipalities, public schools and universities.[22] Energy service companies (ESCOs) contracted to carry out ESPCs also implement privately-funded energy efficiency projects for residential, commercial, institutional and industrial customers in Kentucky. Large industrial customers, for example, use energy efficiency to meet internal sustainability goals.[23] Energy efficiency and weatherization projects are also implemented in low-income households in Kentucky. Community Action Kentucky in partnership with the Kentucky Housing Corporation, for example, administers a number of energy assistance and energy efficiency programs in Kentucky through its network of 23 Community Action Agencies with offices located in all 120 counties in Kentucky.[24] These programs include home weatherization under DOE's Weatherization Assistance Program (WAP). Through WAP, eligible low-income households receive energy efficiency measures such as insulation, duct repair and air sealing to reduce their home's energy consumption and lower their household utility bills.[25]

While a robust energy efficiency landscape exists in the Commonwealth of Kentucky, the savings generated by energy efficiency measures implemented in the state do not, in general, currently benefit from markets for the capacity, carbon reduction, or energy efficiency credit value associated with those savings. In the following section, we explore each of these markets in turn.

Energy Efficiency Markets

When an energy efficiency measure is installed or implemented, it generates energy (kWh) and demand (kW) savings for the customer, as well as dollar savings on utility energy bills. Beyond these energy, demand and bill savings, energy efficiency produces a number of other benefits for the customer, for other ratepayers, for the electric grid, and for society[26]. Residential and commercial energy efficiency measures, for example, create health and safety benefits for

[18] Gardner, James; Greenwell, Aaron; Russell, Bob; Raff, Richard. Kentucky Public Service Commission. Personal interview. October 13, 2015.
[19] Ky. Rev. Stat. § 278.285
[20] Ky. Rev. Stat. § 56.770-784, 45A.343-460.
[21] Colten, Lee. State and Local Energy Report. Energy Savings Performance Contracting in Kentucky's Local Governments. July 30, 2014. Webpage: http://stateenergyreport.com/2014/07/30/energy-savings-performance-contracting-in-kentuckys-local-governments/.
[22] Id.
[23] Klocke, Jeff; Greene, Dee. Toyota Motor Corporation. Personal interview. October 16, 2015.
[24] Community Action Kentucky. Weatherization. November 6, 2016. Webpage: http://www.communityactionky.org/weatherization.html.
[25] Kentucky Housing Corporation. Weatherization Assistance Program. November 15, 2016. Webpage: http://www.kyhousing.org/Development/Single-Family/Pages/Weatherization-Assistance-Program.aspx.
[26] Lazar, J. and Colburn, K. Regulatory Assistance Project. Recognizing the Full Value of Energy Efficiency. September 2013.

occupants, and improve occupancy rates and increase market values for building owners.[27] Industrial energy efficiency measures, for example, can improve labor productivity; reduce operating costs, and free up capital for other needs.[28] While several of these non-energy benefits are not easily monetized or traded, markets for other benefits produced by energy efficiency have been established. As such, energy efficiency measures can, in some cases, deliver streams of payments to a customer or energy efficiency provider. We review below three of these energy efficiency markets: capacity markets, carbon offset markets, and energy efficiency credit markets. For each market, we identify and evaluate:

- The policy and regulatory drivers behind its establishment;
- Market design;
- Measurement, verification and reporting requirements associated with market participation and whether standardized M&V or reporting are required,
- Costs of and barriers to market participation,
- Potential revenues from market participation, and
- Considerations for Kentucky.

Capacity Market

In most electric markets, a large portion of the total system generation capacity is needed to meet load during a relatively small number of hours each year.[29] In response to concerns that high wholesale prices might not be enough to guarantee that sufficient capacity is available during those peak hours to meet system load and reliability requirements), most U.S. Regional Transmission Organizations (RTOs)[30] have created what are commonly called "capacity markets." Under the basic capacity market structure, load serving entities (LSE) make payments in return for commitments by generators and other resource providers (such as energy efficiency providers) to deliver specific amounts of electric capacity to meet demand, including during future system peaks.[31] The forward pricing signal provided by capacity markets is intended to encourage generators and other electric resource providers to retain existing electric resources and develop new resources in order to meet future demand.[32] Two of these capacity markets – one administered by the New England Independent System Operator (ISO-NE) and the other administered by PJM (the RTO serving all or parts of 13 mid-Atlantic and Midwestern states) – allow energy efficiency resource providers to participate and compete with electric generators. We focus here on the PJM-administered capacity market, as Kentucky falls within the PJM footprint and certain energy efficiency providers in Kentucky may, in theory, participate in the PJM capacity market.

[27] Id.
[28] Id.
[29] Neme, C., Energy Futures Group, and Cowart, R., Regulatory Assistance Project (RAP). Energy Efficiency Participation in Electric Capacity Markets – The U.S. Experience. March 2014.
[30] See Appendix 1 for a map of territories covered by Regional Transmission Organizations.
[31] Neme, C., and Cowart, R.
[32] Id.

Market Design

The original design of markets organized by PJM did not include a formal capacity market.[33] PJM initially imposed a capacity requirement on LSEs and permitted the bilateral sale and purchase of electric capacity towards fulfillment of that requirement.[34] A "capacity credit market" became effective only on January 1, 1999 as a result of a series of FERC filings by the Pennsylvania Public Utilities Commission, emphasizing the need for competition and describing the barriers to market entry for new retailers under the previous system.[35] The daily market required LSEs to purchase capacity equal to their capacity obligation, subject to a penalty payment.[36] In 2007, PJM developed and implemented a new capacity market design known as the Reliability Pricing Model (RPM).[37] The new design was intended to improve the sustainability of the capacity market in the long-term and the incentives that the capacity market provided by including elements such as three-year forward procurement, locational market definitions, and market power mitigation rules.[38]

The Reliability Pricing Model (RPM) consists of a series of auctions designed to help ensure that LSEs secure sufficient capacity to meet reliability requirements for a particular year in the future, known as the "Delivery Year".[39] Under RPM, every LSE that will serve load within a zone in PJM (PJM Zone)[40] during the Delivery Year is required to pay a "Locational Reliability Charge."[41] The Locational Reliability Charge is a fee that LSEs are required to pay for capacity resources, and is calculated by multiplying the final clearing price of capacity resources in a particular PJM zone by the LSE's capacity obligation[42] for that zone.[43]

PJM purchases capacity on behalf of LSEs from resource providers with existing or planned generation capacity resources, existing or planned demand resources, energy efficiency resources, or qualifying transmission upgrades.[44] PJM secures capacity from resource providers for the PJM region and for a particular Delivery Year through RPM auctions. The first auction is known as the Base Residual Auction (BRA), and is held during the month of May three years prior to the start of the Delivery Year. Following the BRA, at least three Incremental Auctions are conducted to procure additional resource commitments and satisfy any changes in market dynamics that come to light prior to the start of the Delivery Year.[45] Incremental auctions provide an opportunity for PJM to procure additional capacity or release excess capacity if the updated peak load forecast increases or decreases respectively.[46] Finally, resource providers

[33] Bowring, J. Economics of Energy & Environmental Policy, Vol. 2, No. 2. Capacity Markets in PJM. 2013.
[34] Id.
[35] Bowring, J.
[36] Id.
[37] Id.
[38] Id.
[39] PJM Forward Market Operations. PJM Manual 18: PJM Capacity Market. Rev. 34. July 28, 2016.
[40] A PJM Zone is a transmission owner's area within the PJM Region. For a map of PJM Zones, see Appendix 2.
[41] PJM Manual 18.
[42] Each LSE in PJM is subject to a capacity obligation. This represents the capacity that an LSE must procure for a zone in order to meet its load requirements and required reserve margin.
[43] PJM Manual 18.
[44] Id.
[45] Id.
[46] Id.

have an opportunity to commit additional capacity resources through the bilateral market, which also provides LSEs the opportunity to hedge against their Locational Reliability Charge.[47]

In 2015, FERC approved market rule revisions that enhance the resource performance requirements in order to encourage capacity resources that are capable of sustained, predictable operation providing energy and reserves throughout the Delivery Year. These changes are often referred to as "Capacity Performance."[48] The new rules were established in response to a rapid shift from coal to natural gas-fired generation, as well as a "polar vortex" weather event in the winter of 2014 which revealed that stronger incentives were necessary in order to encourage adequate investment in generation resources.[49] Under the new rules, the most reliable capacity resources are expected to receive larger capacity payments, while non-performers are expected to be subject to higher penalties.[50] PJM started phasing in the Capacity Performance market for Delivery Year 2018/2019, and approximately 80% of the capacity resources acquired in the May 2015 BRA were Capacity Performance resources. The transition will be completed by Delivery Year 2020/2021, when PJM expects 100% of capacity resources to be Capacity Performance resources.[51]

Participation of Energy Efficiency

Starting with the 2011/12 Delivery Year, most types of energy efficiency resources have been allowed to bid in to the PJM RPM, including efficient lighting products, appliances, motors, heating or cooling equipment, and thermal envelope improvements to buildings.[52] Behavioral programs, however, may not be bid into PJM's capacity market.[53] In order for an energy efficiency resource to qualify for participation in the RPM, it must satisfy the following requirements:

- Resources must achieve a continuous, permanent reduction in electric energy consumption at the end-use customer's site, during the defined energy efficiency performance summer hours (3 p.m. to 6 p.m. EPT from June 1 to August 31 inclusive). If the resource is a Capacity Performance resource, it must also achieve reductions during a winter performance period (8 a.m. to 9 a.m. EPT and 7 p.m. to 8 p.m. EPT from January 1 through February 28 inclusive).[54]
- Resource must be scheduled for installation before the Delivery Year, and fully implemented at all times during the Delivery Year.[55]
- Resource must not be reflected in the bidder's Peak Load Forecast used for the auction in which the measure is offered.[56]

[47] Id.
[48] Foster, D. PJM. Electronic communication. November 4, 2016.
[49] PJM. Capacity Performance at a glance. November 21, 2016. Webpage: http://www.pjm.com/~/media/library/reports-notices/capacity-performance/20150720-capacity-performance-at-a-glance.ashx.
[50] Id.
[51] Id.
[52] PJM Forward Market Operations. PJM Manual 18B: Energy Efficiency Measurement & Verification. Rev. 2. December 17, 2015.
[53] Neme, C. and Cowart, R.
[54] Foster, D. PJM. These hours represent peak periods of demand on the system. By procuring commitments from energy efficiency resources during those peak periods, PJM helps ensure that sufficient capacity will be available to meet reliability requirements.
[55] PJM Manual 18B.

- Resource must reduce demand without needing notice, operator intervention or dispatch (in other words, this does not include demand response resources).[57]
- Resource must be 100 kW at minimum.[58] Energy efficiency resources may be aggregated to meet the 100 kW minimum; however, in order to be aggregated, resources must be located within the same PJM Zone.[59]
- Resources provider must comply with all M&V requirements in PJM Manual 18B.[60]

Bidders do not however need to demonstrate that the energy efficiency measures being bid into the market would *not* have been installed absent the capacity market. In other words, PJM's capacity market is concerned with gross demand reductions produced by participating energy efficiency measures, and not net reductions.[61]

Membership in PJM is a pre-requisite for participation in the PJM capacity market. Members of PJM include transmission owners, generation owners, LSEs, electric distributors, other electric suppliers or resource providers, or end-use customers.[62] A resource provider seeking to bid an energy efficiency resource into RPM must contact PJM at rpm_hotline@pjm.com at least two weeks before the relevant auction in order to establish the name of the energy efficiency resource and request PJM to model the resource in the RPM system database.[63] Once the resource is modeled in the RPM system database, the resource may be offered in RPM auctions.[64]

Resource providers submitting bids that clear an RPM auction are paid the clearing price for the relevant zone and Delivery Year, provided that those resource providers deliver on their commitments.[65] PJM imposes a penalty for failing to deliver on capacity commitments, equal to the market clearing price plus the greater of 20 percent of the market clearing price or $20/MW-day.[66] Whereas energy efficiency resources in the ISO-NE market are compensated for the full expected useful life of an efficiency resource, PJM in contrast only allows efficiency measures to receive capacity payments for a maximum of four years, regardless of how long the measure is expected to generate demand reductions.[67]

Since energy efficiency was first permitted to participate in PJM's capacity market, the amount of capacity from energy efficiency resources that has cleared the market has increased from

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[56] Energy efficiency resources are generally reflected in the peak load forecast for a Delivery Year for which an auction is being conducted. As a result, the auction parameters are adjusted to avoid double-counting these energy efficiency measures. PJM Manual 18B.
[57] PJM Manual 18B.
[58] This is roughly equivalent to the peak savings of approximately 20,000 CFLs or between 500 and 1000 annual MWh of energy savings.
[59] Neme, C. and Cowart, R.
[60] See M&V Requirements, below.
[61] "Net reductions" account for and net out any demand savings from energy efficiency measures that would have occurred anyways even in the absence of the incentive provided by the capacity market.
[62] PJM Interconnection, LLC. Operating Agreement. November 23, 2016. PDF File: http://pjm.com/media/documents/merged-tariffs/oa.pdf.
[63] PJM Manual 18B.
[64] PJM Manual 18.
[65] Resources clearing the market enter into a one-year contract. Resources can clear the market again in the following year, and receive the new clearing price applicable to that Delivery Year. PJM's clearing prices are defined in terms of dollars/MW-day; however, payments are made on a weekly basis. Drake, S. East Kentucky Power Cooperative. Phone interview. September 19, 2016.
[66] Neme, C. and Cowart, R.
[67] Id.

569 MW in delivery year 2012-2013 to 1515 MW in delivery year 2019/2020 (see Figures 1 & 2). More than 90% of all efficiency resources qualified to bid in PJM's capacity market in the BRA for Delivery Year 2019/2020 cleared the market, with a clearing price of $100/MW-day for Capacity Performance resources, and a clearing price of $80/MW-day for Base Generation resources.

Figure 1: *Energy Efficiency Savings by Region in the PJM Capacity Market. Non-MAAC, MAAC and EMAAC refer to zones within the PJM region. Kentucky is in the Non-MAAC zone.*[68]

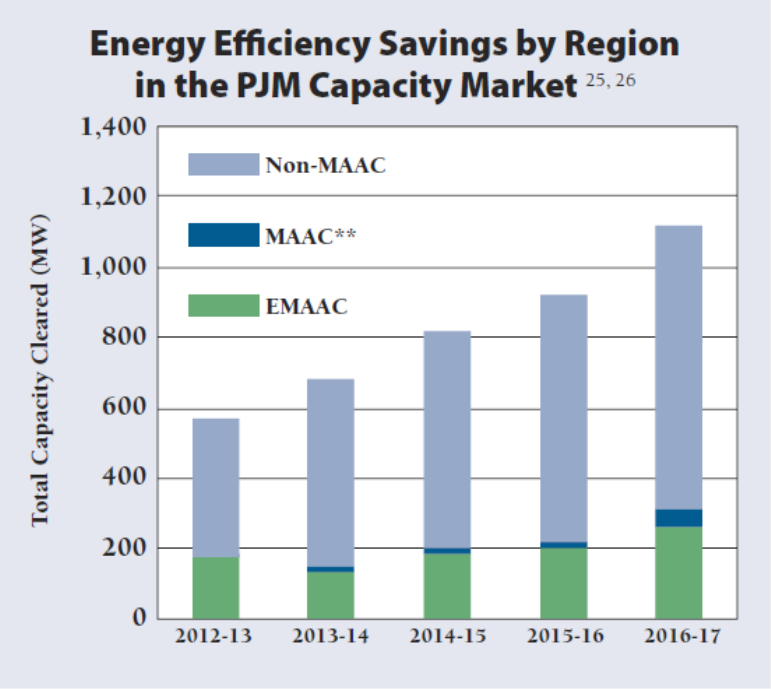
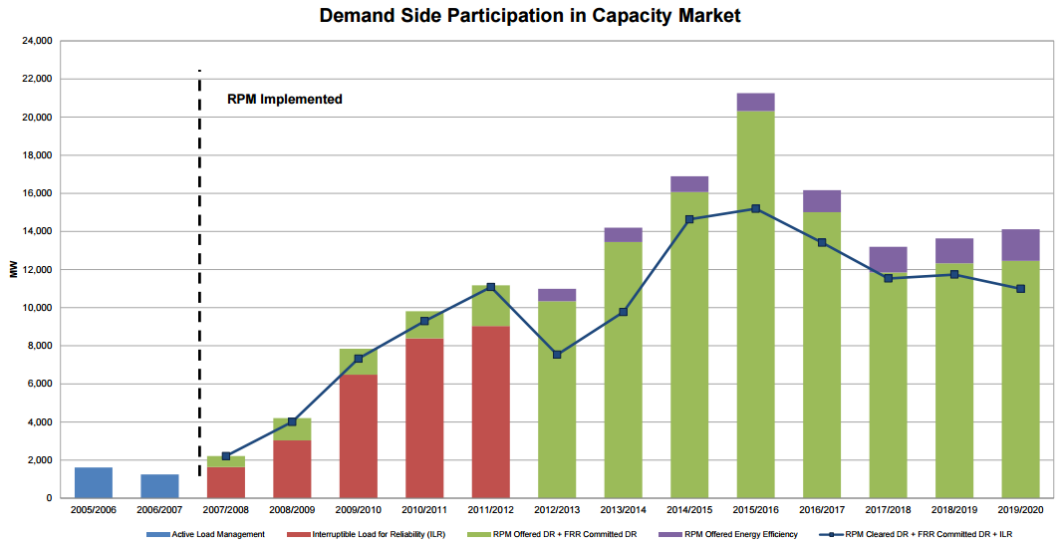


Figure 2: *Participation of Demand Side Resources in RPM. PJM, 2016.*

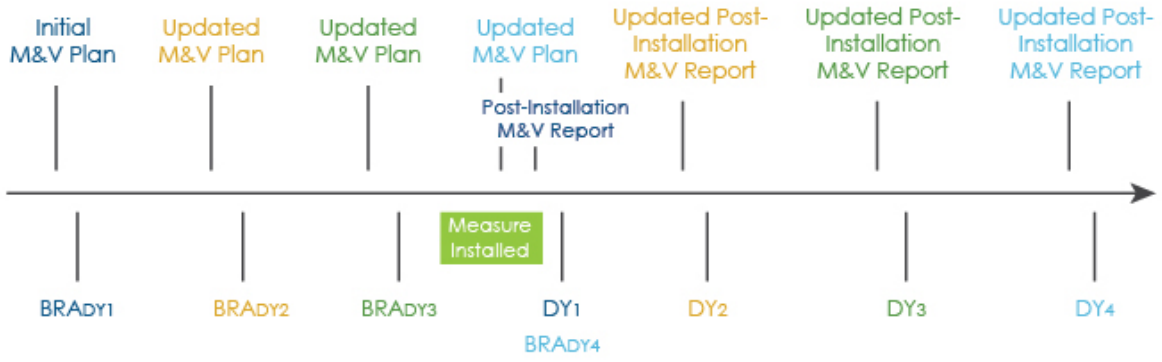


[68] Id.

Measurement, Verification and Reporting Requirements

In order for an energy efficiency resource to participate in PJM's capacity market, the provider of the resource must comply with PJM's measurement, verification and reporting requirements as laid out in PJM Manual 18B. Energy efficiency resources must submit an initial measurement and verification (M&V) plan no later than 30 days prior to the RPM auction in which the EE resource is initially offered.[69] This plan defines the project-specific M&V methods and techniques that will be used to determine and verify the demand reduction resulting from the energy efficiency resource. If the resource is eligible and participates in a subsequent RPM auction, the resource must submit an updated M&V plan no later than 30 days prior to that subsequent RPM auction.[70] A post-installation M&V Report must be submitted no later than 15 business days prior to the first delivery year that the resource is committed, and updated post-installation M&V reports must be submitted no later than 15 business days prior to each subsequent delivery year for which the resource is committed.[71] Finally, the EE resource must permit post-installation M&V audits by PJM or an independent third party. Figure 3 below illustrates the scheduling of M&V in PJM.[72]

Figure 3: *M&V Scheduling Timeline*[73]



PJM's Manual 18B specifies the M&V methodologies (listed A-D below) that efficiency resource providers must follow in order to demonstrate that their capacity resources will reliably deliver savings during peak hours. The rules are generally consistent with the standards specified in International Performance Measurement and Verification Protocols (IPMVP), and allow for the following four broad M&V methods:

A. Partially Measured Retrofit Isolation/Stipulated Measurement: the measurement of a variable other than electric demand, and using that variable in a standard engineering algorithm.
B. Retrofit Isolation/Metered Equipment: the spot- or short-term measurement of changes in electric demand at the component level, usually by interval electric demand meters.

[69] PJM Manual 18B.
[70] Id.
[71] Id.
[72] Id.
[73] Note that M&V plans and reports typically include some resources for which an initial M&V plan/report was submitted as well as new resources which need an initial M&V plan/report; as such, M&V plans and reports are generally combined as "Initial/Updated". Foster, D. PJM.

C. Whole Facility/Regression: analyzing the overall energy use in a facility and identifying the impact of measures on energy use patterns.
D. Calibrated Simulation: Computer simulation models of component or whole-building demand and energy consumption to determine measure-level demand and energy savings.

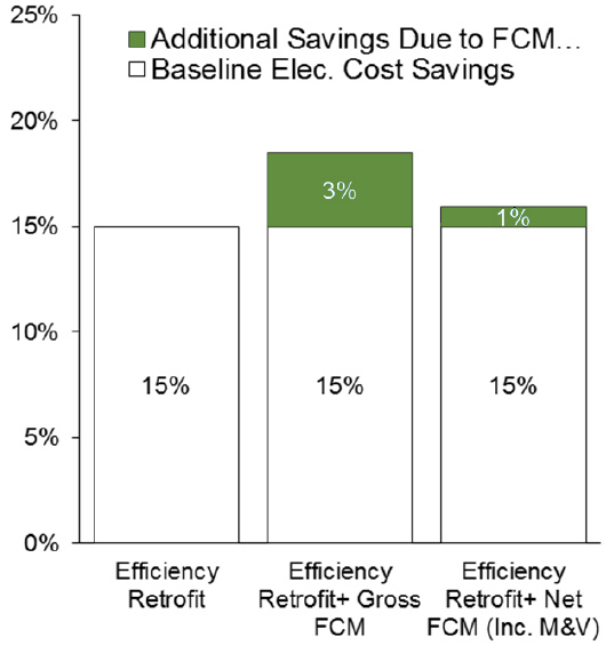
Costs and Revenues from PJM Capacity Market Participation

Participation in a capacity market can represent a source of revenue for energy efficiency providers. Utilities such as the Commonwealth Edison Company, for example, have bid their energy efficiency programs in the PJM capacity market since Delivery Year 2012-2013, and have seen revenues from capacity market participation grow to $25 million in 2015 with $60 million in capacity market revenue expected in Delivery Year 2017-18.[74] One study surveying utility program administrators currently bidding their energy efficiency programs into capacity markets found that an investment of roughly $100,000 - $200,000 in staff salaries and consulting fees to participate in a capacity market can in turn generate $1 million or more in revenues.[75] In general, providers considering participation in PJM's capacity market may compare potential revenues from capacity market participation against the costs they might incur from bidding measures in RPM, including the cost of conducting M&V as required by PJM Manual 18B. The cost of conducting M&V on an energy efficiency program can range from 2-10% of program costs.[76]

Figure 4 (page 15) demonstrates how participation PJM's capacity market can increase the gross benefits that accrue from an energy efficiency project, and how the costs of participating in the capacity market can cut into these gross benefits. The analysis in Figure 4 is based on a cash flow scenario analysis of an energy efficiency retrofit at a hypothetical 150,000 ft^2 commercial building, yielding 0.1 MW peak savings, a capacity clearing price of $172.67/MW-day, and a 6% M&V cost (all other assumptions documented in Figure 4). In this example, the hypothetical commercial building owner could realize revenues equivalent to an additional 3% of gross electric cost savings (beyond the 15% in savings accruing from the energy efficiency retrofit itself) by bidding the energy efficiency project into PJM's capacity market. Factoring in the cost of conducting M&V reduced these revenues by roughly 66%, leaving the building owner with a net benefit equivalent to 1% of electric cost savings.

[74] Fay, Jim. ComEd Energy Efficiency Portfolio & PJM Capacity Markets. MEEA's Ohio Thought Leadership Roundtable. April 13, 2016.
[75] Utility commissions have, in general, mandated that utility revenues from capacity market participation be used to augment energy efficiency portfolios or to lower customer surcharges. Fetter J., et al. Booz Allen Hamilton. Energy Efficiency in the Forward Capacity Market: Evaluating the Business Case for Building Energy Efficiency as a Resource for the Electric Grid.
[76] Fetter J., et al. Booz Allen Hamilton. Energy Efficiency in the Forward Capacity Market: Evaluating the Business Case for Building Energy Efficiency as a Resource for the Electric Grid. 2012.

Figure 4: *Cash Flow Analysis, EE Retrofit and Capacity Market (FCM) Participation at Hypothetical Commercial Building*[77]



Assumption	Value	Source
Building Characteristics		
Size	150,000[2] ft.	Assumption
Electricity Usage Intensity	18.5 kWh/sq. ft.	Based on an ineffeicint building and the DOE CBI Commercial Reference Buildings
Building Load Factor	47%	Good Energy
Annual Operating Hours	8,760 hours/year	Assumption
Efficiency Measure		
Electricity Reduction	15%	Assumption
Cost	$.81/kWh	DEER Average
PJM Market		
Electricity Cost	$.0954/kWh	EIA Electric Sales, Retail and Average Price 2009
PJM FCM Efficiency Sale Price	$172.67/mW-Day	3-year average of PJM efficiency clearing price
Minimum Project Size	0.1 MW	PJM minimum requirement
M&V Plan (Pre-Sale)	$10,000	Authors' expertise augmented by market research
M&V Plan (Subsequent)	$2,000	
M&V Report	$2,000	
M&V Verification (1st Year)	$1,000	
M&V Verification (Subsequent Years)	$500	

[77] Fetter J., et al.

Considerations for Kentucky

In Kentucky, only utilities may bid energy efficiency resources into PJM's capacity market or any other RTO-organized market.[78] Non-utility energy efficiency providers or third-party aggregators must go through their regulated utility in order to bid into the PJM capacity market, and must confirm with the end-use customer that the customer does not have an explicit agreement with another provider to offer the relevant energy efficiency measures into the capacity market.[79] At least one aggregator has expressed interest in bidding energy efficiency occurring in Kentucky into the RPM.[80]

In general, utilities administering energy efficiency portfolios can be well-positioned to benefit from capacity markets. Utilities tend to be familiar with RTOs due to resource planning, procurement and market settlement activities.[81] Utilities also have the ability to offer entire portfolios of energy efficiency measures (as compared to individual energy efficiency projects) into the capacity market, and thus benefit from scale.[82] In Kentucky, however, although EKPC, Duke Energy and Kentucky Power Company are within the PJM footprint, these utilities do not currently bid their energy efficiency projects or programs into the RPM.[83] The cost of conducting M&V consistent with PJM's standards is a barrier to utilities in Kentucky.[84]

In contrast with states where utilities are required to conduct measurement and verification on their energy efficiency programs under state regulation or legislation, and therefore may not face a significant incremental cost from bidding these programs into PJM's capacity market, Kentucky does not impose M&V requirements on its utilities. Currently, several Kentucky utilities use deemed savings documented in Technical Reference Manuals (TRMs) in order to quantify estimated savings impacts of their energy efficiency programs.[85] In limited cases, utilities engage in more rigorous measurement and verification of their energy efficiency programs.[86] Utilities do not, in general, prepare M&V plans or regular post-installation M&V reports for their energy efficiency programs; where M&V is conducted, its cost generally ranges between 2 and 5% of program cost.[87]

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[78] Mathews, T. Kentucky Public Service Commission. Electronic communication with Kenya Stump, Kentucky Energy and Environment Cabinet. October 18, 2016. See also Kentucky Public Service Commission, Final Order In the Matter of Application of Duke Energy Kentucky, Inc. for Approval to Transfer Functional Control of its Transmission Assets from the Midwest Independent Transmission System Operator to the PJM Interconnection Regional Transmission Organization and Request for Expedited Treatment, Case No. 2010-00203 (granting approval to Duke Kentucky to transfer its transmission assets conditional on PSC approval for any retail customer participation in any PJM demand-response program. The PSC issued similar orders for Kentucky Power and EKPC. The PSC has indicated that it views non-utility participation in PJM's capacity market in a similar manner).

[79] PJM. RPM Energy Efficiency (EE) FAQs. December 15, 2016. Webpage: https://pjm.com/~/media/markets-ops/rpm/rpm-auction-info/rpm-energy-efficiency-faqs.ashx.

[80] Colten, L. Kentucky Department for Energy Development and Independence. Personal communication with third party aggregator representative.

[81] Fetter J., et al.

[82] Id.

[83] East Kentucky Power Cooperative (EKPC) currently bids its demand response resources into RPM via direct load control switches installed on residential air conditioners and water heaters as well as its interruptible industrial customers and has considered bidding its energy efficiency programs into the capacity market. Drake, S. East Kentucky Power Cooperative.

[84] Id.

[85] Friedman, J. and Vijaykar, N.

[86] Id.

[87] Stoeckle, R. Duke Energy. Phone interview. October 15, 2015.

CO_2 Offset Allowance Market

In the United States, both California as well as the Regional Greenhouse Gas Initiative (a cooperative effort among the states of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhodes Island and Vermont) have used mandatory carbon emissions trading programs (otherwise known as "cap and trade") as a market-based means of reducing carbon dioxide (CO_2) emissions from the power sector. Carbon emissions trading programs generally include a limit on total carbon that can be released by covered entities, otherwise known as a cap; and tradable instruments (often known as "allowances") permitting the release of a unit of carbon emissions, distributed to and traded among covered entities.[88] California and RGGI carbon emissions trading programs both allow covered entities to use CO_2 offset allowances[89] – a project-based greenhouse gas emission reduction occurring outside the capped electrical power generation sector – in order to meet a portion of their compliance requirements. Here, we examine the eligibility of energy efficiency projects for CO_2 offset allowances under the RGGI carbon emissions trading program.

RGGI CO_2 Offset Allowance Market

The Regional Greenhouse Gas Initiative (RGGI) is a mandatory, market-based program developed in 2005 to reduce greenhouse gas emissions in several north-eastern states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont.[90] States in RGGI face greenhouse gas emission budgets (in short tons of CO_2) that decline over time.[91] Fossil-fuel fired electric generators in these states are required to hold allowances equal to their greenhouse gas emissions over three-year "control periods".[92] These allowances are allocated to regulated entities via auctions, and the proceeds from these auctions are used towards consumer benefit programs.[93] Once the initial allowance allocation occurs, regulated entities may trade allowances – either selling excess allowances or acquiring allowances equivalent to their emissions.[94] Regulated entities may also meet their compliance requirement by acquiring CO_2 offset allowances: instruments that represent units of carbon reduction or avoidance from particular enumerated project types. These project types are:

- Landfill methane capture and destruction;
- Reduction in emissions of sulfur hexafluoride (SF_6) in the electric power sector;
- Sequestration of carbon due to U.S. forest projects (reforestation, improved forest management, avoided conversion) or afforestation (for CT and NY only);
- Avoided methane emissions from agricultural manure management operations; and,
- Reduction or avoidance of CO_2 emissions from natural gas, oil, or propane end-use combustion due to end-use energy efficiency in the building sector.

[88] Center for Climate and Energy Solutions. Climate Change 101. PDF File: http://www.c2es.org/docUploads/climate101-captrade.pdf
[89] While RGGI uses the term CO_2 offset allowance, California uses the term "carbon offset credit" to refer to a similar program feature.
[90] Regional Greenhouse Gas Initiative. Program Overview. November 28, 2016. Webpage: https://www.rggi.org/design/overview
[91] Id.
[92] Id.
[93] Id.
[94] Id.

Participation of Energy Efficiency

Unlike the case of PJM's capacity market described above, only a handful of types of energy efficiency projects are eligible to receive RGGI CO_2 offset allowances. In general, energy efficiency projects eligible for RGGI CO_2 offset allowances must reduce on-site combustion of natural gas, oil, or propane in existing or new commercial or residential buildings. Specific energy efficiency measures that may be eligible for CO_2 offset allowances are:

- Improvements in the energy efficiency of combustion equipment that provide space heating and hot water, including a reduction in fossil fuel consumption through the use of solar and geothermal energy;
- Improvements in the efficiency of heating distribution systems, including proper sizing and commissioning of heating systems;
- Installation or improvement of energy management systems;
- Improvement in the efficiency of hot water distribution systems and reduction in demand for hot water;
- Measures that improve the thermal performance of the building envelope and/or reduce building envelope air leakage;
- Measures that improve the passive solar performance of buildings and utilization of active heating systems using renewable energy; and,
- Fuel switching to a less carbon intensive fuel for use in combustion systems, including the use of liquid or gaseous eligible biomass, provided that conversions to electricity are not eligible.[95]

Under the RGGI CO_2 offset allowance program, offset project sponsors must first open an account in the RGGI CO_2 Allowance Tracking System (COATS). The project sponsor must then register the proposed offset project in RGGI COATS and obtain a project ID code. Following this, the sponsor may submit a Consistency Application to the applicable state regulatory agency where the offset project is located to allow the state to evaluate whether the project is eligible in accordance with that state's particular regulations. Consistency applications must include a signed verification statement and verification report from a state-accredited independent verifier. Projects located in states outside of RGGI may be eligible to receive CO_2 offset allowances if a regulatory agency in that state has entered into a memorandum of understanding with the regulatory agencies of all RGGI states, binding that state agency to carry out certain obligations relative to offset projects in that state (including the obligation to perform audits and report violations).[96]

Measurement, Verification and Reporting Requirements

In general, projects seeking CO_2 offset allowances must demonstrate "additionality." This means that the offset project must not already be required pursuant to any local, state or federal law, regulation, or administrative or judicial order.[97] Furthermore, any project seeking CO_2 offset allowances must surrender legal rights to any credits they might have received for use towards

[95] RGGI Model Rule Revised December 31 2008.
[96] Id.
[97] Id.

compliance with a state portfolio standard.[98] Projects receiving funding or incentives from a system benefits fund, and projects receiving credit under any other mandatory or voluntary greenhouse gas program are not considered "additional" and are not eligible to receive CO_2 offset allowances.[99]

Measurement, verification, and reporting requirements for energy efficiency projects seeking CO_2 offset allowances are established by each state participating in RGGI, based on the RGGI Model Rule. The RGGI Model Rule provides formulas for calculating the baseline and post-installation energy use associated with an energy efficiency measure, as well as emission factors to allow conversion from energy savings to CO_2 reductions. Project providers are required to provide a monitoring and verification plan certified by an independent verifier, along with annual monitoring and verification reports.

Monetization Opportunity

Although energy efficiency projects are in theory eligible to receive RGGI CO_2 offsets, to date, the development of offset projects – including energy efficiency projects – has not occurred.[100] In general, an oversupply of RGGI allowances and a lengthy three-year compliance period has depressed RGGI allowances prices since RGGI's inception in 2008, which in turn has dampened the incentive to develop RGGI offset projects.[101] RGGI allowance prices have climbed since 2012,[102] potentially creating a signal for greater RGGI carbon offset project development in the future. [103]

Considerations for Kentucky

In order to monetize energy efficiency occurring in the Commonwealth of Kentucky through the RGGI CO_2 offset allowance market, Kentucky would need to enter into a memorandum of agreement with the appropriate regulatory agencies of all participating RGGI states.[104] This memorandum of understanding would commit Kentucky to carry out certain obligations relative to CO_2 offset projects in Kentucky, including but not limited to the obligation to perform audits of offset project sites and report violations.

In general, the measurement and verification required by the RGGI Model Rule is more stringent than the measurement and verification currently carried out by energy efficiency providers in Kentucky.[105] The RGGI model rule, for instance, requires that the determination of baseline energy use in commercial buildings be consistent with IPMVP Option B or Option D, while baseline energy use in residential buildings must be determined in a manner consistent with RESNET National Home Energy Rating Technical Guidelines, 2006. In calculating both energy use and energy savings, the impacts of each measure must be isolated through direct metering or

[98] Id.
[99] Id.
[100] RGGI. CO_2 Allowance Tracking System. November 26, 2016. Webpage: https://rggi-coats.org/eats/rggi/index.cfm?fuseaction=search.project_offset&clearfuseattribs=true.
[101] Farnsworth, D. Regulatory Assistance Project. Phone communication. November 1, 2016.
[102] U.S. Energy Information Administration (EIA). Regional Greenhouse Gas Initiative auction prices decline. June 24, 2016.
[103] See Gonzales, G. Ecosystem Marketplace. RGGI Roars Back to Life with Record Carbon Prices. March 13, 2014. Note, however, that since a stay on the Clean Power Plan in late 2015, RGGI allowance prices have declined to $4.53 per short ton of CO_2.
[104] See RGGI Model Rule Revised December 31, 2008.
[105] See Capacity Market, *supra*.

energy simulation modeling. Reductions in energy use must be based on actual energy usage data, and energy simulation modeling can only be used to determine the relative percentage contribution to total fuel usage. Where these requirements surpass current practice, energy efficiency providers in Kentucky seeking RGGI CO_2 offset allowances would need to institute more rigorous measurement and verification practices.

Energy Efficiency Credit Market

Several states in the US have established portfolio standards, regulatory mandates requiring utility companies to source a certain amount of the energy they generate or sell from a particular source or set of sources. Portfolio standards include Energy Efficiency Resource Standards (EERS), which specifically establish long-term targets for energy savings that utilities or non-utility program administrators must meet through energy efficiency programs.[106] Certain jurisdictions permit or require regulated entities to use tradable instruments to demonstrate compliance with portfolio standards.[107] Renewable energy certificates (RECs) are an example of a tradable instrument: a REC represents contractual rights to the environmental benefits[108] of one megawatt-hour of generation from renewable resources.[109] RECs are used to track renewable electricity from the point of generation to the consumer, and can, in general, be bundled with or unbundled from the underlying electricity.[110] Similarly; energy efficiency credits (EEC)[111] represent the environmental benefits of one megawatt-hour (MWh) of energy savings from an energy efficiency project.[112] Tradable instruments (such as EECs) may also be bought and used by voluntary market participants, who seek to substantiate voluntary targets or marketing claims.[113] EECs were introduced as a method of bringing market-based flexibility to energy efficiency, much in the same way as Renewable Energy Credits (RECs) brought flexibility to renewable energy. EECs also offer a tool to reduce payback periods and thereby encourage more energy efficiency projects.

In the US, Connecticut, Nevada, North Carolina and Pennsylvania have experience issuing EECs; however, these states have seen varying levels of activity with regard to EEC issuance and trading. Nevada, for example, no longer allows compliance entities to use energy efficiency

[106] American Council for an Energy-Efficient Economy (ACEEE). Energy Efficiency Resource Standard. November 11, 2016. Webpage: http://aceee.org/topics/energy-efficiency-resource-standard-eers.
[107] Midwest Energy Efficiency Alliance Policy Tracking.
[108] These "environmental benefits" are sometimes referred to as "attributes": the characteristics of electricity supply such as the energy source and emissions from a generator. Holt, E. and Wiser, R. Lawrence Berkeley National Laboratory. The Treatment of Renewable Energy Certificates, Emissions Allowances, and Green Power Programs in State Renewables Portfolio Standards. April 2007.
[109] National Renewable Energy Laboratory (NREL). Renewable Electricity: How do you know you are using it? NREL/FS-6A-20-64558. August 2015. PDF File: http://www.nrel.gov/docs/fy15osti/64558.pdf.
[110] National Renewable Energy Laboratory (NREL). Renewable Electricity: How do you know you are using it? NREL/FS-6A-20-64558. August 2015. PDF File: http://www.nrel.gov/docs/fy15osti/64558.pdf. While a majority of states allow electricity to be "unbundled" from its attributes, a minority of states require that attributes be conveyed with the underlying electricity ("bundled RECs"). Holt, E. and Wiser, R. Lawrence Berkeley National Laboratory. The Treatment of Renewable Energy Certificates, Emissions Allowances, and Green Power Programs in State Renewables Portfolio Standards. April 2007.
[111] EECs are also known as energy efficiency certificates, energy savings certificates, white certificates, tradable white certificates, or White Tags®. World Resource Institute. The Bottom Line on Energy Savings Certificates. Issue 10. October 2008. PDF File. http://www.wri.org/sites/default/files/pdf/bottom_line_energy_savings_certificates.pdf
[112] World Resource Institute. The Bottom Line On Energy Savings Certificates. Issue 10. October 2008. PDF File.
[113] Under FTC regulation, for example, a marketer may not represent that a product or package is made with renewable energy if fossil fuel, or electricity derived from fossil fuel, is used to manufacture any part of the advertised item - unless the marketer has matched such non-renewable energy use with the purchase of RECs. 16 C.F.R. § 260.15(a). See also National Renewable Energy Laboratory (NREL). Renewable Electricity: How do you know you are using it? NREL/FS-6A-20-64558. August 2015. PDF File: http://www.nrel.gov/docs/fy15osti/64558.pdf.

towards the state renewable portfolio standard. Although Nevada used to utilize a renewable energy tracking system – Nevada Tracks Renewable Energy Credits – to issue credits to energy efficiency resources, the state no longer allows regulated entities to use energy efficiency towards the state renewable portfolio standard.[114] The value of Portfolio Energy Credits, the instruments used to show compliance with the state renewable portfolio standard, has fallen extremely low and trading activity has come to a standstill.[115] In contrast, North Carolina, which issues Energy Efficiency Credits through a tracking system known as the North Carolina Renewable Energy Tracking System, has issued a total of a total of 7,598,087 EECs to energy efficiency projects as of December 2015.[116]

Here, we describe in greater detail the monetization opportunity presented by the EEC market in Pennsylvania. Pennsylvania utilities are required to supply 18% of their electricity using "alternative energy resources" by 2020 – 8% by "Tier I resources" and the remaining 10% by "Tier II resources" as designated by Pennsylvania's Alternative Energy Portfolio Standard (AEPS).[117] Energy efficiency is included as a Tier II resource, and thus eligible for "Tier II credits" under the state AEPS. Eligibility guidelines for the participation of energy efficiency resources in the AEPS are established by the Pennsylvania Public Utilities Commission (PUC).[118] A Program Administrator, designated by the Pennsylvania Public Utilities Commission, manages the credit application and issuance process consistent with rules established by the PUC. Applicants eligible to receive credits from the Pennsylvania Program Administrator include retail customers who have undertaken energy efficiency measures or utilities and other efficiency providers who have acquired the right to any credits resulting from the energy efficiency measures they install or implement.[119] Credits issued to projects are registered and tracked in the PJM Generation Attribute Tracking System (PJM-GATS).[120]

Measurement, Verification and Reporting Requirements

While Nevada and North Carolina have not required stringent measurement and verification of energy efficiency resources seeking credit towards the state renewable portfolio standard, Pennsylvania has established more restrictive guidelines. The Pennsylvania PUC distinguishes "standard measures" and "custom measures", and delineates requirements for each. Standard measures are listed in the state Technical Reference Manual (TRM), and include measures that are available to a large number of retail customers through retail consumer-products such as energy efficient appliances, light bulbs, and HVAC equipment.[121] Custom measures include those measures that are too complex or unique to include in the state TRM.[122] Savings from "standard measures" must be calculated using the state TRM, which provides a framework for calculating deemed savings using supported algorithms and customer data as input values in

[114] Dalessio, D. Nevada Pub. Util. Comm'n. Phone interview. July 18, 2016.
[115] Id.
[116] North Carolina Utilities Commission, http://www.ncuc.commerce.state.nc.us/reports/repsreport2016.pdf, p. 37.
[117] Pa. Act 213.
[118] Pa. Pub. Util. Comm'n, Final Order, Docket No. M-00051865. Implementation of the Alternative Energy Portfolio Standards Act of 2004; Standards for the Participation of Demand-Side Management Resources. Sept. 29, 2005.
[119] Pa. Pub. Util. Comm'n, Final Order, Docket No. M-00051865.
[120] PJM-GATS is a registry administered by PJM that tracks the output of generators throughout the PJM footprint, and issues certificates representing the environmental attributes of generation. PJM-GATS also has the functionality to issue certificates representing savings from energy efficiency measures; at this time, it only issues these energy savings certificates to applicants claiming eligibility for the Pennsylvania Alternative Energy Portfolio Standard.
[121] Pa. Pub. Util. Comm'n, Final Order, Docket No. M-00051865.
[122] Id.

industry-accepted algorithms.[123] The PUC does not establish specific guidelines for the M&V of custom measures; however, applicants must include in their application a proposed evaluation plan, which is evaluated by the PUC on a case-by-case basis.[124] Applications must include a proposed evaluation plan, and all assumptions contained in the proposed evaluation plan must be identified, explained and supported by documentation.

Monetization Opportunity

Energy efficiency providers outside the state of Pennsylvania may apply to the Pennsylvania Program Administrator for Tier II credits. In order to receive credits, the provider must adhere to measurement and verification requirements as described above. Energy efficiency providers may note, however, that Tier II credits in Pennsylvania currently trade for less than $1. As a result, very few energy efficiency projects are registered through PJM-GATS.[125]

Considerations for Kentucky

In order for Kentucky energy efficiency providers to receive Tier II credits, they must submit an application to the Pennsylvania Program Administrator including a measurement and verification plan. Where providers seek credits for energy efficiency projects that consist of "standard measures" as found in the Pennsylvania TRM, the savings from these projects may be quantified as per the deemed savings values and algorithms in the TRM.

Energy efficiency providers in Kentucky do not currently use the Pennsylvania TRM, and in many cases, do not prepare evaluation, measurement and verification plans for their energy efficiency programs. Submitting an application for Tier II credits to the Pennsylvania Program Administrator will therefore likely represent an incremental cost to energy efficiency providers. At this time, given the trading value of Tier II credits, it is unlikely that the value of these credits will outweigh the cost to providers.

Future Monetization Opportunities for Energy Efficiency

Carbon Regulation

In August 2015, the U.S. Environmental Protection Agency (EPA) finalized carbon dioxide emission standards for existing fossil fuel-fired electric generating units, known otherwise as the Clean Power Plan (CPP).[126] The CPP creates interim and final carbon emission targets for each state based on the state's mix of coal-fired and combined cycle natural gas-fired power plants (affected units).[127] Energy efficiency can play a role in helping states and affected units meet their compliance targets under a federal air quality program that regulates carbon emissions from the power sector, such as the CPP. Although the CPP is currently stayed by the Supreme

[123] Id.
[124] Id.
[125] Schulyer, K. PJM Environmental Information Services (PJM EIS). Phone interview. September 20, 2016.
[126] U.S. Environmental Protection Agency. Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units. (CPP) 80 Fed. Reg. 64,662-64,964.
[127] Id.

Court, [128] the design of the CPP, as published in the Federal Register in October 2015, provides an example of the manner in which energy efficiency might be monetized under a federal carbon regulatory program.

The CPP allows states to elect a carbon emissions target either in the form of a rate or mass of carbon emissions. In states that elect a rate-based target, energy efficiency can help affected units achieve compliance by reducing the demand for electricity generated by those units, and thereby reducing the effective rate of carbon emissions from the power sector in that state. These states may issue "Emission Rate Credits" or "ERCs" to energy efficiency resources for megawatt-hours of electric savings. ERCs may then be traded to and used by affected units in order to reduce their effective rate of emissions. States that choose a mass-based emissions target are allocated a limited number of "allowances", [129] declining over time. Regulated entities must acquire allowances equivalent to their total carbon emissions. States may choose to award a portion of these allowances to clean energy resources such as energy efficiency.[130] These allowances may then be traded to entities seeking to demonstrate compliance.

The Clean Energy Incentive Program (CEIP) provides an additional monetization opportunity for energy efficiency under the CPP. The CEIP is a voluntary, early-action component of the CPP, which rewards particular renewable energy and energy efficiency resources with state and federal incentives for the energy they generate or save in the years 2020 and 2021 (prior to the start of compliance periods under the CPP, which commence in 2022).[131] The CEIP is currently in the form of a proposed regulation, and is yet to be finalized by the EPA. In its proposed form, states that voluntarily opt in to the CEIP may award ERCs or allowances to energy efficiency projects benefiting low-income communities. These projects would also receive a matching federal incentive for every MWh they save, from a state-specific allotment of matching federal incentives established by the EPA.

In order for energy efficiency resources to receive ERCs or allowances under the CPP, providers must adhere to measurement and verification requirements as established by their respective states, consistent with minimum requirements established by the EPA in the final CPP. [132] As

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[128] The EPA cannot enforce the requirements of the CPP while it is stayed by the Supreme Court. The merits of the CPP are currently being considered by the U.S. Court of Appeals for the D.C. Circuit. There is a possibility that the rule will be invalidated by the D.C. Circuit, or by the U.S. Supreme Court if appealed. Furthermore, following the 2016 U.S. presidential election, it is expected that the incoming administration will seek to scale back the Clean Power Plan from its current form, based on statements made by President-elect Donald Trump. Under *Massaschusetts v. EPA*, 549 U.S. 497 (2007) however, the EPA is still required to regulate carbon dioxide as a pollutant under the Clean Air Act. This section therefore predicts pathways to the monetization of energy efficiency under a future carbon emissions regulatory program, using the Clean Power Plan as a model for the design of future regulation.

[129] Unlike ERCs, which represent MWh of non-emitting generation or savings, allowances represent the emission of one ton of CO_2.

[130] States may "award" allowances to energy efficiency resources in a number of different ways. They may choose to set-aside a portion of their allowance allocation specifically for energy efficiency projects. They may alternatively adopt an allowance allocation methodology that allows energy efficiency to compete on a level playing field with generation resources.

[131] EPA. Clean Energy Incentive Program Design Details. 81 Fed Reg. 42940.

[132] Concurrent with its publication of the final CPP, the EPA also proposed a draft Model Trading Rule and Federal Plan as well as draft Evaluation, Measurement and Verification Guidance for Demand-side Energy Efficiency (EM&V Guidance).See EPA. Evaluation Measurement and Verification (EM&V) Guidance for Demand-Side Energy Efficiency (EE). Draft for Public Input. August 3, 2015; Federal Plan Requirements for Greenhouse Gas Emissions from Electric Utility Generating Units Constructed on or Before January 8, 2014. 80 Fed. Reg. 64966. These documents contained presumptively approvable standards for the evaluation, measurement and verification of energy efficiency. In December 2016, the EPA withdrew these draft documents and indicated that it would not be publishing final versions of these documents in the Federal Register. The EPA released working drafts of these documents in order to help states that

described above, Kentucky does not currently impose M&V requirements on its utilities. Several Kentucky utilities use deemed savings documented in Technical Reference Manuals (TRMs) developed by other states in order to quantify estimated savings impacts of their energy efficiency programs. In limited cases, utilities engage in more rigorous measurement and verification of their energy efficiency programs. Utilities do not, in general, prepare M&V plans or regular post-installation M&V reports for their energy efficiency programs, as required under the CPP.[133] Kentucky might consider the development of a statewide TRM in order to facilitate the monetization of its energy efficiency resources through the CPP should the CPP be restored to full legal effect, or in anticipation of and preparation for future federal carbon regulation. If stakeholders in Kentucky decide to pursue this option, they may consult MEEA's Kentucky TRM Roadmap,[134] a document that establishes guiding principles around the design, maintenance and use of a Kentucky-specific statewide TRM.

Implementation Strategies for Kentucky

1. Create awareness among Kentucky energy efficiency providers on the process for participation of energy efficiency resources in the PJM capacity market.

As discussed in this report, the PJM capacity market has not experienced significant participation from energy efficiency providers in Kentucky to date. Energy efficiency programs and projects currently implemented by utilities in Kentucky may however be eligible to participate in the PJM capacity market. The PJM capacity market provides an opportunity for utilities in Kentucky to realize an additional revenue stream from the energy efficiency programs they implement, provided that these programs meet PJM's eligibility requirements. Kentucky may enhance participation of energy efficiency resources in the PJM capacity market by increasing awareness of the process for capacity market participation among energy efficiency providers. Kentucky may also convene utilities to identify legal, regulatory, technical and market barriers to capacity market participation, and explore strategies that other states with regulated energy markets in PJM (or ISO-NE) have implemented in order to navigate these barriers.

2. Monitor the RGGI CO_2 offset allowance market, and seek feedback from utilities and PSC on market participation if a realistic monetization opportunity arises.

The RGGI CO_2 offset allowance market does not currently provide a valuable monetization opportunity for Kentucky. In a future scenario where the price of RGGI carbon allowances is higher, signaling greater demand for RGGI CO_2 offset allowances, Kentucky may consider formalizing a memorandum of understanding with RGGI states in order to allow energy efficiency occurring in Kentucky to participate in the RGGI CO_2 offset allowance market. At this time, Kentucky might monitor the RGGI CO2 offset allowance market, and seek feedback from utilities and PSC on market participation if a realistic monetization opportunity arises.

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are continuing to look for EPA support in developing or expanding programs and strategies to cut carbon pollution. See McCabe J. EPA. EPA Connect. Update on EPA's Clean Power Plan Model Rules. December 19, 2016.

[133] See Friedman, J., and Vijaykar, N. Midwest Energy Efficiency Alliance. Considerations for a Statewide Framework for the Evaluation, Measurement and Verification of Energy Efficiency in Kentucky. October 2015.

[134] Midwest Energy Efficiency Alliance. Kentucky TRM Roadmap.

Energy efficiency providers must consider that where savings from energy efficiency projects are used to claim RGGI CO2 offset allowances, these savings may not be used to show compliance with any other local, state, or federal legal, regulatory or administrative requirement.[135] In Kentucky, utilities regulated by the PSC voluntarily implement energy efficiency programs; however, energy efficiency program plans are reviewed and approved by the PSC. It is therefore uncertain whether savings occurring as a result of the implementation of PSC-approved programs would be considered "additional" for the purposes of receiving RGGI CO_2 offset allowances. Should Kentucky energy efficiency providers seek to pursue RGGI CO_2 offset allowances as a monetization opportunity, this legal issue will require resolution.

3. Monitor the Tier II credit market under the Pennsylvania AEPS, and seek feedback from utilities and the PSC on market participation if a realistic monetization opportunity arises.

Energy efficiency projects implemented in Kentucky may be eligible to receive Pennsylvania Tier II credits; however, these credits currently trade for less than $1. Given the low price of Pennsylvania Tier II credits, it is unlikely that the value of these credits would outweigh the cost that providers would incur from undergoing the process of applying for credits under current market conditions.

In a future scenario where the price of Pennsylvania Tier II credits rises, these credits may provide a monetization opportunity for energy efficiency occurring in Kentucky. At this time, Kentucky might monitor the Tier II credit market in Pennsylvania, and seek feedback from utilities and the PSC on market participation if a realistic monetization opportunity arises.

4. Consult the Kentucky TRM Roadmap where future monetization opportunities requiring statewide standardized EM&V and reporting arise.

Although the future of the CPP in its current form is uncertain, future federal air quality regulation may present a monetization opportunity for energy efficiency, particularly if that regulation takes the form of an emissions trading program allowing for the participation of energy efficiency resources. In order to benefit from a monetization opportunity of this nature, it is likely that energy efficiency providers in Kentucky will be required to conduct evaluation, measurement, verification and reporting consistent with EPA minimum requirements. Should such a monetization opportunity arise, Kentucky may consult the Kentucky TRM Roadmap.[136] The Kentucky TRM Roadmap reflects several rounds of input from Kentucky energy efficiency stakeholders, and guides the development, use and maintenance of a statewide technical reference manual.

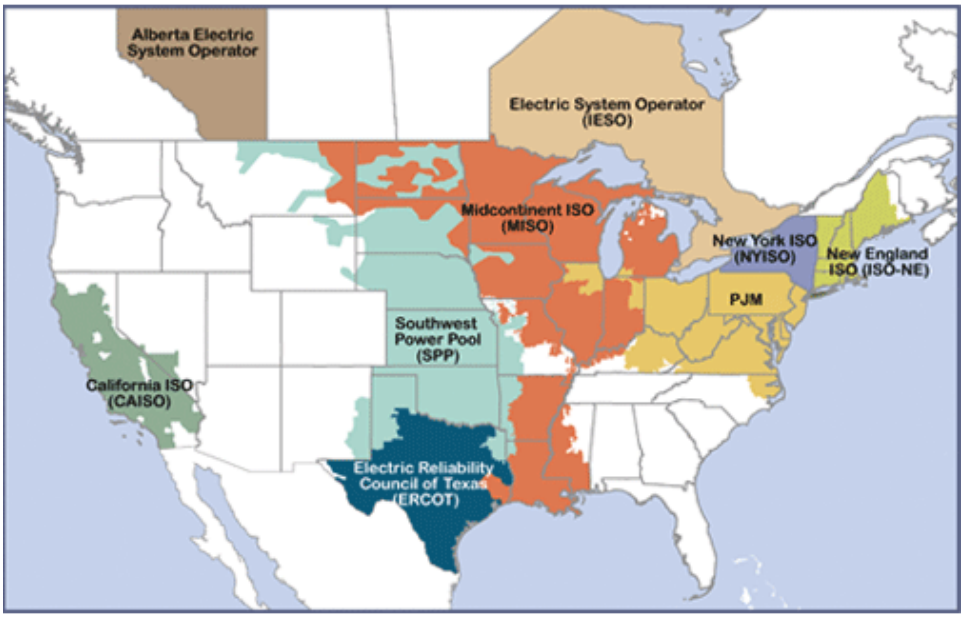
The Commonwealth of Kentucky may choose to pursue one or more of these implementation strategies in order to leverage existing and future markets for energy efficiency. By taking advantage of monetization opportunities, Kentucky may spur the implementation and reporting of energy efficiency in the Commonwealth.

[135] RGGI Model Rule.
[136] Midwest Energy Efficiency Alliance. Kentucky TRM Roadmap.

Appendices

Appendix 1: Map of Regional Transmission Organizations

Figure 5: *Map of RTOs. Source: Federal Energy Regulatory Commission.*



Appendix 2: Map of PJM Zones

Figure 6: *Map of PJM Zones. PJM Open Access Transmission Tariff Attachment J.*