EmPOWERing Maryland: Estimating the Economic Impacts of Energy Efficiency Investments on Maryland's Economy

James Barrett and Brendon Baatz

March 2017

An ACEEE White Paper

529 14th Street NW, Suite 600, Washington, DC 20045

Phone: (202) 507-4000 • Twitter: @ACEEEDC

Facebook.com/myACEEE • aceee.org

Contents

About the Authors

James Barrett concentrates on the nexus of climate change, energy efficiency, and economics and has written extensively on the role of efficiency in achieving environmental and economic goals. Prior to joining ACEEE, Jim was executive director of Redefining Progress, a public policy think tank dedicated to promoting a healthy environment, a strong economy, and social justice. Before that he was an economist at the Economic Policy Institute, a senior economist on the Democratic staff of the Joint Economic Committee, and a staff economist at the Institute for Biological Energy Alternatives. Jim earned his bachelor of arts in economics from Bucknell University and his master of arts and PhD in economics from the University of Connecticut.

Brendon Baatz conducts research on state energy efficiency policy, utility regulation, energy markets, utility resource planning, and utility sector efficiency programs. Prior to joining ACEEE, he worked for the Federal Energy Regulatory Commission, Maryland Public Service Commission, and Indiana Office of Utility Consumer Counselor. Brendon holds a master of public affairs in policy analysis from Indiana University and a bachelor of science in political science from Arizona State University.

Acknowledgments

This report was made possible through the generous support of the Town Creek Foundation. The authors gratefully acknowledge internal reviewers, colleagues, and sponsors who supported this report. Internal reviewers included R. Neal Elliott and Lowell Ungar. The authors also gratefully acknowledge the assistance of Brian Stickles and Eric Schwass. Last, we would like to thank Fred Grossberg for managing the editorial process, Elise Marton and Sean O'Brien for copy editing, and Wendy Koch, Patrick Kiker, and Maxine Chikumbo for their help in launching this report.

Abstract

The General Assembly of Maryland is considering legislation that would extend the EmPOWER Maryland energy efficiency program. In the first phase of EmPOWER, from 2008 to 2015, Maryland utilities met their goal of reducing per-capita electricity consumption by 10%. The legislation currently under consideration would set targets for each utility to achieve annual incremental savings of 2% of sales by 2020. In this paper, we estimate the economic impacts on the state of Maryland of meeting those targets and maintaining them through 2026. We find that the efficiency measures deployed over this 10-year period would create 68,000 net new jobs and increase state gross domestic product by $3.75 billion. The efficiency investments would reduce electricity consumption by approximately 130 billion kilowatt-hours and generate gross savings of nearly $12 billion for Maryland homes and businesses.

Background

The 2008 Empower Maryland Energy Efficiency Act (EmPOWER) established a statewide goal of reducing per capita electricity consumption by 10% below 2007 levels by 2015. This goal was to be carried out by the state's five major utilities with oversight by the Maryland Public Service Commission (PSC).[1] At the end of the program, state utilities achieved 99% of the electricity usage reduction goal (Maryland PSC 2015b). We define this period of EmPOWER, between 2008 and 2015, as Phase 1.

Phase 1 of EmPOWER was a success by several measures. In meeting the Phase 1 targets, Maryland utilities saved their customers more than 51 million megawatt-hours and more than $4 billion in energy costs over the lifetime of the installed measures. These benefits were delivered with a benefit-cost ratio of 1.81.[2] At 3.2 cents per kilowatt-hour (kWh), the levelized cost of savings generated through Phase 1 was far below the cost of electricity, which averaged 12 cents per kWh in December 2015 (EIA 2017). Largely because of this disparity, we estimated in a recent paper that the measures installed in 2011 alone were responsible for creating more than 2,000 new jobs in the state and $80 million in state GDP (Baatz and Barrett 2017).

In a 2015 order, the Maryland PSC established new savings targets requiring all five utilities to achieve annual incremental savings of 2% of gross sales by 2020 (Maryland PSC 2015a).[3] Unlike the per-capita goals of Phase 1, the new targets represent an absolute reduction in electricity consumption, regardless of changes in population. The order did not specify an end date to the requirement.

In this white paper, we use ACEEE's DEEPER model to evaluate economic impacts on the state based on the 2% savings goal.[4] Without a specified end date, we limit our analysis to include the impacts of energy efficiency measures put in place during the first 10 years of the program, from 2017 through 2026.

Results

We estimate that energy efficiency measures installed in the first 10 years of Phase 2 would create enough economic activity to support more than 68,000 net jobs in Maryland during the installation and over the life of the measures installed.[5] State GDP would increase by approximately $3.75 billion as a result of meeting the Phase 2 targets over the life of the measures. This increase would be driven by a combination of the efficiency investments and the customer bill savings they generate. Before accounting for costs, Maryland families and

---

[1] The utilities are Baltimore Gas and Electric, Delmarva Power, Potomac Edison, Potomac Electric Power Company, and Southern Maryland Electric Company.

[2] In other words, for every dollar spent on EmPOWER Maryland, the state saved $1.81.

[3] The 2% target is determined using a rolling baseline relying on the year prior to the current three-year plan. For example, for the 2020 savings target of 2%, the baseline would be retail sales in 2016, the year prior to the submission of three-year plans.

[4] See the appendix for a description of the DEEPER model.

[5] As explained below, the term *job* in this context means one full-time-equivalent job for one year.

businesses would save about 130 million megawatt-hours (MWh) and about $11.7 billion over the life of the installed measures.

The job creation would be spread throughout the Maryland economy, with the great majority occurring in the service sector and in construction and related sectors. These two sectors would see the largest inflow of revenue. The demand for services would increase in large part as a result of increased disposable income for Maryland families due to reduced energy expenditures. This increase in disposable income would create 53,000 net new jobs. Increases in revenue and employment in construction and related sectors would be due largely to the demand for construction services to implement the energy efficiency measures to meet the Phase 2 targets. As of this writing, employment in the construction sector in Maryland remains about 15% below pre-recession levels (BLS 2017). These targets will help to revitalize two sectors still recovering from the 2009 recession.

We estimate that about 29,000 (or 40%) of these jobs would result from implementation of the efficiency measures during the first 10 years of Phase 2. These jobs would be strictly related to implementing the measures, performing energy assessments, and installing high-efficiency equipment in homes and businesses. After accounting for the cost of installing the measures, the spending of increased disposable income mentioned above would generate almost 53,000 jobs. These savings-generated jobs would be spread out over time, following a pattern similar to the energy savings pattern shown in figure 1. Our model predicts that the reduced demand for electricity would result in a loss of about 14,000 jobs in electricity generation in the state. The total net job creation of about 68,000 is the sum of the 29,000 implementation jobs and the 53,000 savings jobs, minus the 14,000 reduction in generation jobs.

In this context, a *created job* is defined as one year of full-time-equivalent employment. One job could be a single person employed full time for one year, or two people employed half time for a year, or one person employed half time for two years, and so on. The term *full-time job year equivalent* is unwieldy, but the definition is important to note. Additionally, we report results in terms of jobs created. A created job can be either a new job generated or a job not lost. The DEEPER model, like most others of its kind, calculates the number of full-time-job equivalents that would be supported by the activities under consideration, but it cannot tell whether these are newly created jobs or ones that would otherwise disappear.

Methodology

The above results estimate the economic impacts of meeting Maryland's Phase 2 targets using our DEEPER modeling framework, described below. These estimates account for the savings the targets would achieve, the investments utilities would need to undertake to achieve them, the costs of those investments, and any changes in revenue to Maryland utilities. The DEEPER model tracks all of the associated economic flows through the Maryland economy and generates estimates of the impacts on employment as well as on state GDP (also called *value added*).

The savings targets in Phase 2 are based on a 2% gross incremental annual reduction in electricity sales by 2020. PSC order 87082, which details the EmPOWER targets, gives no indication of whether or how much the savings should change after 2020, nor does it identify an end date for the program (Maryland PSC 2015a). For our projections, we assume that the utilities would all reach their 2% incremental savings target by 2020 and continue achieving the same level of new savings each year thereafter. Rather than model these savings in perpetuity, we assess only the 10-year window from 2017 to 2026. Limiting the analysis to 10 years is admittedly arbitrary, but given limited guidance on an end date for Phase 2, we had to choose one, and 10 years seems as reasonable as any other. It is likely that if the Phase 2 targets remain in place, the PSC will revisit the question of appropriate long-term targets within the next decade. Our analysis is not intended to assume or support the possibility that the targets would fall to zero after the 10-year period that we analyze, but with no indication of what those long-term targets might be, we chose to consider only those savings that would be attributable to the efficiency measures deployed during the first 10 years.

To calculate the projected electricity savings, we created a baseline sales scenario based on data from the PSC on utility-specific historic and projected sales. We then calculated the reductions in sales from those baselines that would be required to meet the Phase 2 targets (Maryland PSC 2014). Figure 1 shows the total annual energy savings that all five utilities together would achieve from 2017 to 2049 based on the 10-year incremental savings targets.

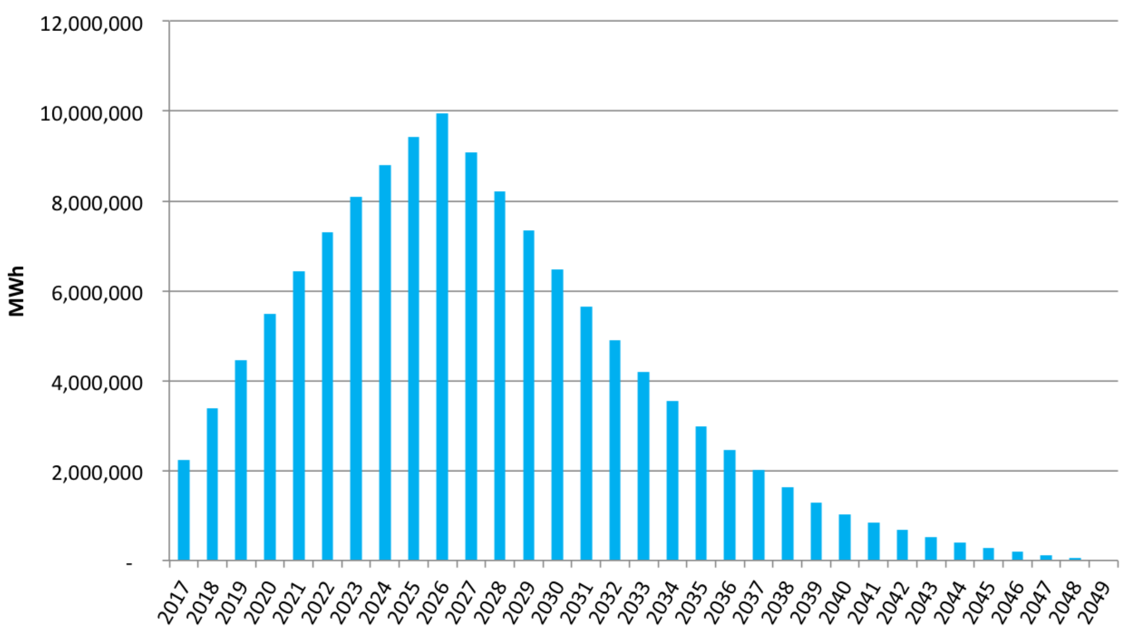

Figure 1. Total energy savings from the first 10 years of EmPOWER Phase 2. *Source:* Maryland PSC 2014, 2015a.

As Figure 1 shows, the savings from the Phase 2 targets last far beyond the 10-year window we examine. These savings occur because efficiency measures typically continue to save energy years after they are put in place, so that those installed during the 10-year window continue returning some savings through 2049. Our analysis includes those ongoing savings, as described below, but does not include savings from any measures deployed after 2026.

Figure 1 shows that savings increase rapidly throughout this 10-year window. Energy efficiency investments initially ramp up to achieve their target level in 2020. Savings continue to increase after the 2% targets are met in 2020, as the utilities continue to add efficiency measures to achieve an additional 2% savings every year. Starting in 2027, the savings begin to decline as the gains from the measures previously put in place begin to decay, and because we exclude from our analysis any new efficiency measures installed beyond 2026.

The decline in savings beginning in 2027 reflects our assumption that the performance of efficiency measures decreases over time. We model this decline as a straight-line reduction in performance beginning in the year after the measures are put in place until they reach their maximum expected life. In general, we expect residential efficiency measures to have average useful lives of about 7 years and commercial and industrial measures, about 12 years. This means that while half the industrial measures may need to be replaced in 12 years, we expect half to last longer than 12 years and a small share of them to be functioning for 24 years.

To model the investment required to reach the Phase 2 targets, we use the most recent assessment of the levelized cost of saved energy under the EmPOWER rule as reported by the Maryland PSC: 3.2 cents per kWh in 2015 (Maryland PSC 2016a). We allocate this across the economy according to plans submitted by the utilities that detail the various efficiency programs used to meet their targets (BGE 2014; Delmarva 2014; PEPCO 2014; Potomac Edison 2014; SMECO 2014). The plans cover only 2015–2017, so we use an average expenditure by program type for each utility and assume the utilities would allocate their future investments accordingly on a pro-rata basis. Utility efficiency programs vary but normally include rebates for energy-efficient appliance purchases, small-business energy programs that feature on-site energy use analysis and upgrade recommendations, financial incentives, and low-interest financing.[6]

To determine the cost savings for customers and revenue losses for in-state generators, we use the most recent standard offer service (SOS) price for each utility and customer class in December 2016 (Maryland PSC 2016b). We assume that neither the cost of saved energy nor the SOS would increase over time. Under EmPOWER, utilities are allowed to recoup the costs of implementing EmPOWER Maryland programs through a surcharge on electric bills. We model cost recovery by customer class according to the expenditures utilities make on programs serving each class. Table 1 shows the projected incremental first-year savings and utility efficiency investments by year as modeled.

[6] For examples of utility-run programs, see bgesmartenergy.com/business/small-business-energy-solutions.

Table 1. Incremental first-year savings and utility expenditures by year

Year	Incremental first-year savings (MWh)	Utility efficiency program costs ($)
2017	1,212,200	383,254,712
2018	1,286,355	406,699,960
2019	1,305,201	412,658,347
2020	1,328,600	420,056,380
2021	1,328,600	420,056,380
2022	1,328,600	420,056,380
2023	1,328,600	420,056,380
2024	1,328,600	420,056,380
2025	1,328,600	420,056,380
2026	1,328,600	420,056,380

Finally, Maryland imports a substantial share of the electricity it consumes. Maryland is a member of the PJM interstate electricity market, which allows electricity to flow freely across states in the region, with utilities having little control over these flows. On average, Maryland produces enough electricity to meet only about 55% of its electricity needs (EIA 2017). This means that at least 45% of all of the electricity consumed in Maryland is produced in another state. To the extent that demand reductions are met by reductions in this out-of-state generation, the reduction will not impact the Maryland economy. Our results are based on the assumption that the reduction in electricity generation will follow the same pattern as overall generation, i.e., that 45% of savings comes from reductions at out-of-state generators. Therefore we assume that 45% of the revenue reductions for generators does not impact Maryland's economy.

References

Baatz, B., and J. Barrett. 2017. *Maryland Benefits: Examining the Results of EmPOWER Maryland through 2015*. Washington, DC: ACEEE. aceee.org/research-report/u1701.

BGE (Baltimore Gas and Electric Company). 2014. *Errata to BGE's EmPOWER Maryland Program Plan*. Case 9154. Baltimore: Maryland PSC (Public Service Commission). webapp.psc.state.md.us/intranet/Casenum/NewIndex3_VOpenFile.cfm?ServerFilePath=C:\Casenum\9100-9199\9154\\535.pdf.

BLS (US Bureau of Labor Statistics). 2017. "Employment, Hours, and Earnings—State and Metro Area (Current Employment Statistics—CES)." Accessed February. www.bls.gov/sae/ - data.

Delmarva (Delmarva Power & Light Company). 2014. *Energy Efficiency and Conservation Portfolio: EmPOWER Maryland 2015-2017*. Case 9156. Baltimore: Maryland PSC. webapp.psc.state.md.us/intranet/Casenum/NewIndex3_VOpenFile.cfm?ServerFilePath=C:\Casenum\9100-9199\9156\\554.pdf.

EIA (Energy Information Administration). 2017. "Maryland Electricity Profile 2015." www.eia.gov/electricity/state/maryland/.

Maryland PSC. 2014. *Ten-Year Plan (2014–2023) of Electric Companies in Maryland*. Baltimore: Maryland PSC. hwebapp.psc.state.md.us/intranet/Reports/2014 - 2023 TYP Final.pdf.

———. 2015a. *Order No. 87082 – Case Nos. 9153-9157, 9362 – EmPOWER MD – Energy Efficiency Goal Allocating and Cost Effectiveness*. Baltimore: Maryland PSC. www.psc.state.md.us/order-no-87082-case-nos-9153-9157-9362-empower-md-energy-efficiency-goal-allocating-and-cost-effectiveness/.

———. 2015b. *Public Service Commission of Maryland 2015 Annual Report.* Baltimore: Maryland PSC. www.psc.state.md.us/wp-content/uploads/2015-MD-PSC-Annual-Report-1.pdf.

———. 2016a. *The EmPOWER Maryland Energy Efficiency Act Standard Report of 2016 with Data for Compliance Year 2015*. Baltimore: Maryland PSC. www.psc.state.md.us/wp-content/uploads/2016-EmPOWER-Maryland-Energy-Efficiency-Act-Standard-Report.pdf.

———. 2016b. "Standard Offer Service." Accessed December. www.psc.state.md.us/electricity/standard-offer-service/.

PEPCO (Potomac Electric Power Company). 2014. *Energy Efficiency and Conservation Portfolio: EmPOWER Maryland 2015–2017 Plan*. Case 9155. Baltimore: Maryland PSC. webapp.psc.state.md.us/intranet/Casenum/NewIndex3_VOpenFile.cfm?ServerFilePath=C:\Casenum\9100-9199\9155\\607.pdf.

Potomac Edison. 2014. *Energy Efficiency and Conservation Plan (January 1, 2015–December 31, 2017)*. Case 9153. Baltimore: Maryland PSC.

webapp.psc.state.md.us/intranet/Casenum/NewIndex3_VOpenFile.cfm?ServerFilePath=C:\Casenum\9100-9199\9153\\503.pdf.

SMECO (Southern Maryland Electric Cooperative). 2014. Southern Maryland Electric Cooperative (SMECO) Demand-Side Management 2015–2017 Filing. Case 9157. Baltimore: Maryland PSC. webapp.psc.state.md.us/intranet/Casenum/NewIndex3_VOpenFile.cfm?ServerFilePath=C:\Casenum\9100-9199\9157\\462.pdf.

Appendix A. ACEEE's DEEPER Model

We have used ACEEE's DEEPER modeling framework to conduct this assessment. DEEPER employs principles of input-output (I/O) modeling to evaluate the economic impacts of various policy alternatives. Simply put, the model tracks changes in demand for goods and services across the Maryland economy and determines how much output from each economic sector is required to meet that demand. It then asks how much labor is required to produce that output and how much state GDP (or value added) is associated with that change in demand.

The core of the DEEPER model is the A matrix, or "Direct Requirements" matrix. This relates industries to one another, detailing how much input from one industry is required to make a dollar's worth of output from another industry. Combining this information with a final demand vector, which represents changes in demand for goods and services for final consumption, returns the amount of output from each industry that is required to support that level of final demand. For any given increase in final demand of goods and services, it is conceptually straightforward to determine how much additional output each industry would have to create to meet this increase.

A second critical component of DEEPER is a set of multipliers that convert the resulting increases in output into the amount of employment needed to generate that increase in output, how much income that would generate for workers, and how much GDP that would create. DEEPER uses data from the IMPLAN Group for its national and state-level A matrices and multipliers.

We calculate changes in final demand using data on expenditures on energy efficiency, the lifetime energy savings they generate, and the associated avoided energy costs as described above. We account for the cost of the efficiency investments as well as the lost revenues to utilities that result from reduced energy consumption. We also account for interstate and international trade by using regional purchase coefficients that indicate how much of each type of good and service consumed in Maryland is also produced there. The model allocates changes in final demand among in-state and out-of-state producers accordingly, so that only changes in Maryland-based producers contribute to state employment and value added.

We aggregate all of these state-level impacts to calculate the net change in Maryland final demand across 14 economic sectors. The DEEPER model translates these net changes into changes in output and calculates the changes in employment and value added associated with it. It includes employment and value added associated with the changes in demand, changes in production along the supply chain required to meet that demand, and the increased economic activity generated by workers spending their increased income. The model accounts for this both for the energy efficiency investments themselves and for the shifts in economic activity associated with the energy savings they generate.