Rate Design Impacts for Customers of Maryland's Electric Cooperatives

Impacts on SMECO and Choptank Customers

Maryland Public Service Commission

December 30, 2016

AUTHORS

Melissa Whited
Erin Malone
Thomas Vitolo, PhD

Synapse Energy Economics, Inc.

485 Massachusetts Avenue, Suite 2
Cambridge, Massachusetts 02139

617.661.3248 | www.synapse-energy.com

CONTENTS

1. INTRODUCTION

Senate Bill 1131 was introduced on February 29, 2016, and would have authorized Maryland electric cooperatives to propose a revised fixed monthly electricity charge levied on customers in order to align the collection of fixed and usage charges with actual system costs, with "fixed costs" being defined as all costs that do not vary by kilowatt-hour. The Maryland Public Service Commission (PSC or Commission) would have been required to approve the proposed increase to the fixed charge, with the restriction that the increase should be no more than 25 percent higher than the fixed charge in effect one year prior to the effective date of the revised charge, and that the fixed charge be applied in a non-discriminatory manner to both net metered and non-net metered customers.[1] The electric cooperatives would have been directed to present their proposals in the context of either a base rate proceeding or a revenue-neutral rate design filing, along with appropriate supporting cost of service data and information pertaining to the reasonableness of the revised charge in light of the different costs associated with serving small and large retail electric customers.

This approach would deviate from the Maryland Public Service Commission's historic and current approach to ratemaking, which tends to emphasize revenue recovery through volumetric rates for customers in order to avoid rate shock, promote energy efficiency, and maintain customer control.[2]

For this reason, the Senate Finance Committee Chairman Middleton and House Economic Matters Committee Vice-Chair Jameson requested that the Commission study the implications of the cooperatives' proposal. In particular, it was requested that the study investigate the implications of an increased fixed charge on low-income customers, on potential subsidies created by distributed energy resources and community solar customers, on potential subsidies received by low-usage customers (particularly customers who have boat lifts, sheds, and hunting cabins), the potential implications for energy efficiency goals, and whether the principles of gradualism require slower adjustments than those proposed by Senate Bill 1131. Further, the Commission was asked to assess the implication of rate design options on the cooperatives' ability to fairly recover their fixed costs from customers.

---

[1] Senator Middleton, *An Act Concerning Electric Cooperatives – Rate Regulation – Fixed Charges for Distribution System Costs*, *Annotated Code of Maryland, Article – Public Utilities*, 2016, secs. 4–307.

[2] See, for example, Maryland Public Service Commission, "Order No. 85374, In the Matter of the Application of Potomac Electric Power Company for an Increase in Its Retail Rates for the Delivery of Electric Energy," Case 9217, August 6, 2010; Maryland Public Service Commission, "Order No. 85374, In the Matter of the Application of Baltimore Gas and Electric Company for Adjustment in Its Electric and Gas Base Rates," Case 9299, February 22, 2013.

2. RATE DESIGN

Rate design does not determine the utility's allowed revenue. Instead, following the determination of allowed revenue and approval by the Public Service Commission, rate design determines the method for collecting that revenue. Rates are typically composed of two or more of the following elements:

- **Fixed charge** (also called a "consumer charge" or "facilities charge"): Dollars per customer per month. Generally used to recover customer-related costs that do not vary with usage (such as metering and billing costs);
- **Kilowatt-hour charge:** Dollars per kilowatt-hour (kWh) of energy consumed. For residential customers, this type of charge typically recovers both generation supply and distribution costs, as well as various riders, taxes, and other costs; and
- **Demand charge**: Dollars per kilowatt (kW) of maximum power used during the month over a short interval (e.g., over a 15-minute or 1-hour period). Typically used to recover a portion of distribution system and generation costs for large commercial and industrial customers.

SMECO and Choptank currently bill most residential customers using a combination of fixed monthly charges and kilowatt-hour charges. SMECO's fixed charge is $9.50 per month, while Choptank's fixed charge is $11.25 per month. Numerous components of a residential customer's bill are billed based on energy usage, including supply costs, distribution costs, and various riders and taxes. The total kilowatt-hour charges are $0.133 for SMECO and $0.143 for Choptank, but less than half of that amount covers distribution-related costs. Current rates as shown in the table below.

Table 1. SMECO and Choptank Current Rate Structure

	Unit	SMECO	Choptank
Fixed Charge	$/month	$9.50	$11.25
Supply and Transmission	$/kWh	$0.081	$0.087
Distribution Rate	$/kWh	$0.043	$0.048
Riders and Taxes	$/kWh	$0.008	$0.008
USP Recovery Rider	$/month	$0.36	$0.36

Notes: Rates as of November 2016. Actual supply rates change frequently, and Power Cost Adjustments are excluded from table. Distribution rates exclude SMECO's Bill Stabilization Adjustment (which fluctuates on a monthly basis).

Both SMECO and Choptank have begun to install advanced meters in their service territories, which will allow the cooperatives to implement more advanced rate structures in the future.

2.1. Principles of Rate Design

In his seminal work, *Principles of Public Utility Rates*, Professor James Bonbright enumerated eight guiding principles for rate design. These principles are reproduced below:

1. The related, "practical" attributes of simplicity, understandability, public acceptability, and feasibility of application.
2. Freedom from controversies as to proper interpretation.
3. Effectiveness in yielding total revenue requirements under the fair-return standard.
4. Revenue stability from year to year.
5. Stability of the rates themselves, with a minimum of unexpected changes seriously adverse to existing customers.
6. Fairness of the specific rates in the apportionment of total costs of service among the different consumers.
7. Avoidance of "undue discrimination" in rate relationships.
8. Efficiency of the rate classes and rate blocks in discouraging wasteful use of service while promoting all justified types and amounts of use.

According to Professor Bonbright, the three most important principles are revenue sufficiency, fair apportionment of costs, and efficiency of use. The principle of gradualism (as described in principle number 5, regarding minimization of unexpected adverse changes) is also often emphasized by regulators.

Although widely recognized as characterizing a sound rate structure, there is often disagreement regarding how to interpret and apply these principles. Rates are designed to satisfy numerous objectives, some of which may be in tension with others. It is the Commission's role to strike an appropriate balance among these objectives.

The sections below describe how the process of ratemaking serves to meet each of these objectives.

2.2. Revenue Sufficiency

Prior to designing rates, the utility's revenue requirement must be determined through a rate case based on costs incurred in the test year (including any known and measurable changes to such costs). In Maryland, a historical test year is used.[3] Rates are then developed to allow the utility to recover its approved revenue requirement.

Under traditional cost-of-service regulation, once new rates are put into effect, there is no guarantee that the utility's revenues will continue to match its costs. Instead, the utility's revenues will fluctuate based on electricity sales, and costs may vary for many reasons. If costs grow faster than revenues, the

[3] The historical test year must include at least eight historical months when filed. Values for the remaining four months may be updated during the rate case.

utility will experience a revenue shortfall. On the other hand, if revenues grow faster than costs, the utility will earn excess revenues.

Decoupling

In recent years, growth in electricity sales has slowed due to a confluence of macroeconomic factors, energy efficiency investments, and increasing adoption of behind-the-meter generation. Because such a slowdown in growth can affect the ability of utilities to recover their allowed revenues, utilities are increasingly seeking rate design changes that reduce the proportion of revenues recovered through energy charges and increase the proportion of revenues recovered through fixed charges or less-volatile demand charges. In the extreme, the fixed charge can be set to fully recover the portion of costs that are fixed, which is known as "straight-fixed variable" rate design.

Straight-fixed variable rate design is a form of decoupling, whereby the link between a utility's electricity sales and revenues is relaxed. An alternative to straight-fixed variable rates is full revenue decoupling, which uses frequent true-ups to ensure that a utility's revenues equal its revenue requirement (and no more or less). In Maryland, revenue decoupling has been implemented for most utilities through a "Bill Stabilization Adjustment" (BSA), which allows rates to be trued up each month in order to achieve monthly revenue targets (as set in the most recent rate case) – subject to approved limits (i.e. within 10 percent of the average test year rate per kWh) and conditions (e.g., no recovery for lost sales incurred during a Major Outage Event).

2.3. Fairness

The concept of fairness in rates is captured by two of Professor Bonbright's principles, which state that a desirable rate structure should fairly apportion costs among the different consumers and avoid "undue discrimination" in rate relationships.[4]

Fairness in Cost Allocation

A primary purpose of the cost-of-service study is to ensure that costs are apportioned fairly across rate classes. A cost-of-service study divides the revenue requirement among all of the utility's customers according to the relative cost of serving each class of customers. Costs are first functionalized according to their primary function such as production, transmission, distribution, customer service and facilities, and administrative and general.[5] Costs are then classified as energy, demand, or customer-related. As described by the NARUC *Electric Utility Cost Allocation Manual*, demand-related costs are typically allocated among customer classes based on "demands (kW) imposed on the system during specific peak hours," while energy-related costs are based on class consumption of kilowatt-hours, and customer-

---

[4] James Bonbright, *Principles of Public Utility Rates* (New York: Columbia University Press, 1961), 291.

[5] In addition, costs that are exclusively used to provide service to a specific customer may be directly assigned.

related costs are allocated based on the number of customers in each class.[6] Finally, costs are allocated to customer classes based on their respective use of the system.

Despite this straight-forward description of the methodology, cost-of-service studies are often the center of significant dispute during rate cases. There are numerous costing methodologies, each with its own strengths and weaknesses, which can result in significant variation in how costs are classified and then allocated to the various classes. The NARUC manual notes that "no single costing methodology will be superior to any other, and the choice of methodology will depend on the unique circumstances of each utility."[7]

Fairness in Rate Relationships

Fairness in rate relationships implies that rates should be cost-reflective. As explained by the DC Circuit Court, cost causation requires that "rates reflect to some degree the costs actually caused by the customer who must pay them."[8]

Utility system costs are driven by three primary drivers: the number of customers, the peak demands imposed on the systems, and the quantity and time of energy consumed. However, rates often only roughly approximate cost causation for a number of reasons, including concerns regarding feasibility and the desire to ensure that rates are simple and understandable. For example, the typical combination of flat energy rates and a customer charge for residential customers does not reflect the timing of energy consumption, or the extent to which the customer contributes to peak demand.

Because current rate structures only roughly approximate the costs imposed by each customer, some degree of cross-subsidization within a rate class is unavoidable. However, the rapid increase in rooftop solar has fueled concerns by some parties that costs are being unfairly shifted from net metered customers to non-net metered customers.

Concerns regarding cost-shifting are typically focused on net metered customers' ability to reduce their electric bills in whole or in part, and whether these customers are paying for their fair share of historical investments in the grid. These historical investments are sunk costs – that is, they cannot be reduced by distributed generation. However, distributed generation may be able to avoid a certain amount of future investments in grid infrastructure (which would otherwise have been added to the sunk costs). Many jurisdictions have therefore recognized that the cost responsibility of net metered customers should account for any avoided costs.

To determine whether any cost shifting is occurring, one can compare the compensation received by net metered customers (typically equal to the retail rate), to the costs avoided by net metered customers. If

---

[6] NARUC, *Electric Utility Cost Allocation Manual* (Washington, DC: National Association of Regulatory Utility Commissioners, 1992), 22.

[7] Ibid.

[8] K N Energy, Inc. v. FERC, 968 F.2d 1295, 1300 (D.C. Cir. 1992)

net metering costs are being compensated at a rate higher than the avoided cost, then the remaining costs will be shifted to non-net metered customers.

Ideally, a cost-shifting analysis is performed on both an annual basis and a long-term average basis in order to understand how cost shifting may change from year-to-year, and whether the long-term impact on rates is positive or negative. Further, it is important to understand the magnitude of these impacts in order to determine whether policy changes or rate design changes are warranted.

2.4. Efficient Price Signals

In economic theory, price plays an important role in allocating resources through guiding investment decisions and consumption decisions. Economists have long recognized that an efficient market outcome results in prices converging at marginal cost.[9] Approximating market efficiency in the public utility realm entails setting rates at long-run marginal cost, which includes long-run capacity costs.[10]

The long-run marginal cost helps to convey to customers the cost of producing and delivering additional electricity to meet additional demand. Increases in electricity consumption (particularly during peak hours) may require a utility to increase its distribution infrastructure and procure additional capacity, imposing additional costs on the system. Prices play a role in communicating such additional costs to customers. Likewise, customers cost-effectively reducing their energy needs through investments in energy efficiency or distributed generation is a theoretically efficient outcome. Thus electricity prices have a role in minimizing *future* costs, rather than simply recovering historical costs.

---

[9] To be truly efficient, such costs must include externalities.

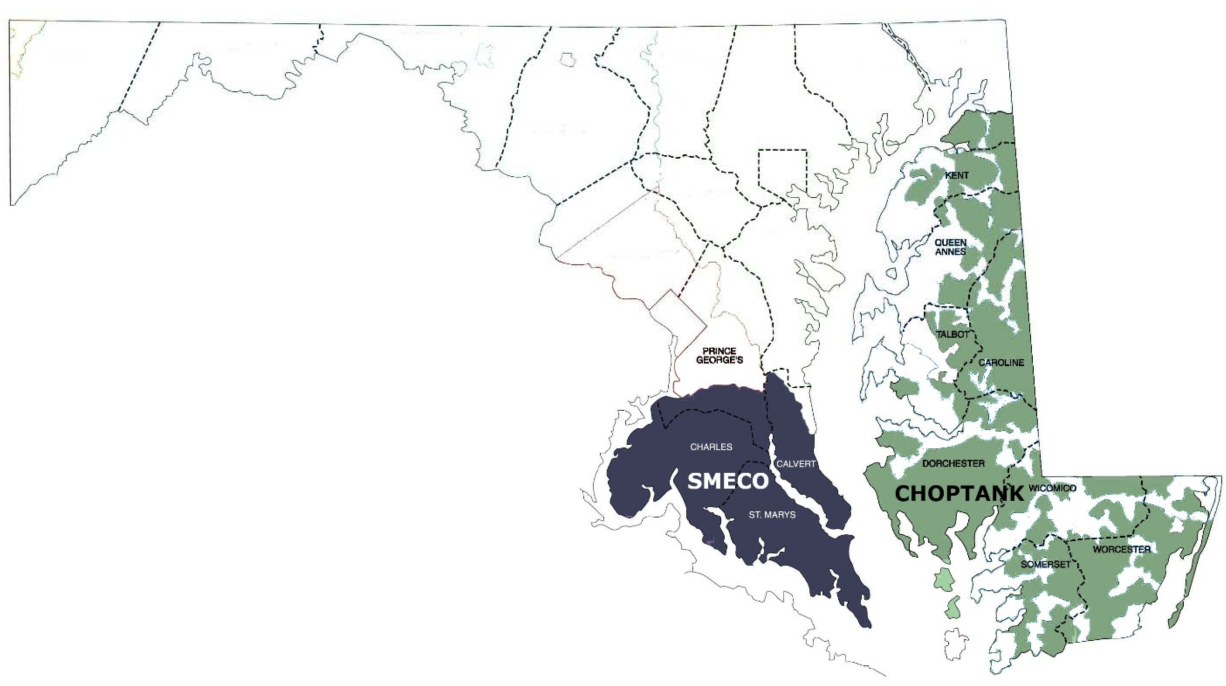
[10] Although it is often debated whether efficient rates should be set equal to long-run or short-run marginal costs, many public utility economists, including Alfred Kahn and James Bonbright, have recognized that only long-run marginal costs are applicable to public utilities. For example, in *The Economics of Regulation,* Alfred Kahn writes, "…the practically achievable benchmark for efficient pricing is more likely to be a type of average long-run incremental cost, computed for a large, expected incremental block of sales, instead of SRMC [Short Run Marginal Cost], estimated for a single additional sale." Alfred Kahn, *The Economics of Regulation: Principles and Institutions*, 1991st ed., vol. I (Cambridge, MA: MIT Press, 1988), 85.

Likewise, Professor Bonbright writes, "I conclude this chapter with the opinion, which would probably represent the majority position among economists, that, as setting a general basis of minimum public utility rates and of rate relationships, the more significant marginal or incremental costs are those of a relatively long-run variety – of a variety which treats even capital costs or "capacity costs" as variable costs." Bonbright, *Principles of Public Utility Rates*, 336.

3. ISSUES FACING SMECO AND CHOPTANK

SMECO and Choptank operate as not-for-profit corporations under Maryland's Electric Cooperative Act. Both cooperatives serve rural populations in southeastern Maryland, as shown in Figure 1 below.

Figure 1. SMECO and Choptank Service Territories



Source: Maryland Office of People's Counsel

As of 2015, SMECO served approximately 148,000 residential customers in four counties (Charles, St. Mary's, Prince George's, and Calvert counties), while Choptank served approximately 48,000 residential customers in nine counties (Caroline, Cecil, Dorchester, Kent, Queen Anne's, Somerset, Talbot, Wicomico, and Worcester counties).

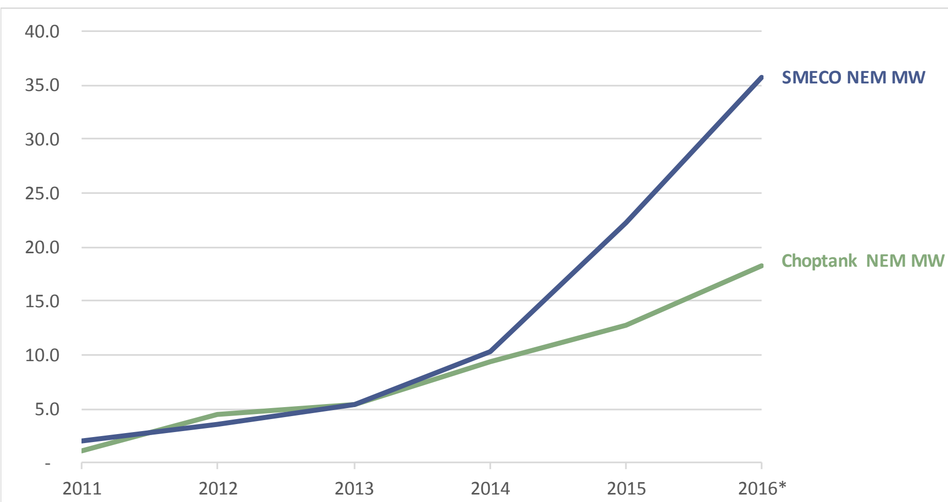
Because the cooperatives are customer-owned not-for-profit entities, they face a somewhat different set of incentives and financial constraints than investor-owned utilities. For example, the cooperatives do not have retained earnings. Rather, any amounts paid by cooperative members above the cost to provide electric service are referred to as operating margins, and must be maintained at predetermined levels in order to satisfy their financial obligations under existing agreements with banks. In addition, at the end of the year, members of the cooperatives are credited for any amount paid over and above the cost of furnishing service.[11]

3.1. Net Energy Metering

In Maryland, net energy metering (NEM) is authorized for eligible customer-generators less than 2 MW under Public Utilities Article §7-306(g). Net metering allows customers to offset their electricity consumption from the grid with their system's generation. Customers must still pay the monthly fixed charge, but are able to offset the variable rate on a one-to-one basis. Monthly net excess generation can be rolled over from month-to-month, for a period of one year. The customer is then credited for any remaining excess generation at the commodity (supply) rate.[12]

SMECO and Choptank have both experienced considerable growth in net metering capacity and customers since 2011, as shown in Figure 2, below. As of November 2016, SMECO had more than 3,800 net metered customers with a cumulative capacity of 36 MW, equivalent to approximately 4 percent of the utility's peak load.[13] Choptank reports that it had 631 net metered customers with 18 MW of capacity in November 2016, which is equivalent to nearly 6 percent of its peak load.[14]

Figure 2. Net Energy Metered Capacity 2011- November 2016



[11] Austin J. Slater, "Prepared Direct Testimony," *Application of Southern Maryland Electric Cooperative, Inc. for Authority to Revise Its Rates and Charges for Electric Service and Certain Rate Design Changes*, Case 9396, September 18, 2015.

[12] Public Utilities Article §7-306(f), *Annotated Code of Maryland*

[13] Estimated based on responses to discovery request PSC-SM-3-6 and PSC-1-4. These values include all net metered customers, not only rooftop solar customers.

[14] Estimated based on responses to discovery request PSC-CH-3-4 and PSC-1-4.

In terms of the residential class, it was estimated that nearly 1.5 percent of SMECO's residential customers were net metered in 2015, while approximately 0.41 percent of Choptank's residential customers were net metered.[15]

In Maryland, net energy metering is permitted by law for certain distributed energy resources including solar, wind, biomass, micro combined heat and power, fuel cells, and closed conduit hydro electric generators. While distributed energy resources such as rooftop solar, can provide benefits to all customers they can also result in revenue under-recovery and cost-shifting. Cost-shifting from net metered customers to non-net metered customers occurs largely due to the reduction in the utility's energy sales, although some or all of this effect may be offset by the benefits provided by the distributed energy resources.

In their most simplified form, electricity rates are set by dividing the utility's revenue requirement (in millions of dollars) over its sales (typically measured in kilowatt-hours).

$$Rates = \frac{Revenue\ Requirement}{Sales}$$

Rates increase or decrease to reflect changes in electricity sales levels, changes in costs, or both:

1. **Changes in costs:** Holding all else constant, if a utility's revenue requirement decreases, rates will decrease. Conversely, if a utility's revenue requirement increases, rates will increase. Distributed energy resources can avoid many future utility costs, which can reduce utility revenue requirements going forward. Costs incurred in the past, however, must still be recovered. In addition, distributed energy resources may also impose costs on the utility system (such as interconnection and distribution system upgrade costs).

2. **Changes in electricity sales:** If a utility must recover its revenues over fewer sales, rates will increase. This is commonly referred to as recovering "lost revenues" and is an artifact of the decrease in sales, not any change in actual costs incurred by the utility. Rather, the rate increase is due solely to the *distribution* of costs among net metered and non-net metered utility customers.

Whether distributed energy resources increase or decrease rates will depend on the magnitude and direction of each of these factors. Further, the timing of any avoided costs is important to consider. Even if the future costs avoided by distributed energy resources will eventually reduce the utility's revenue requirement, this impact is not likely to occur immediately due to the need to recover historical investments.[16] However, a decrease in sales *will* impact utility revenue immediately, and will translate

[15] SMECO reports that it had 2,129 residential NEM customers in 2015, while Choptank had 197 in 2015. Responses to PSC-1-1 and PSC-1-4.

[16] Historical investments are "sunk costs"—the investments that the utility made in the past and amortized over many years. These sunk costs will not be reduced by distributed energy resources, but will continue to be recovered through the utility's revenue requirement until they have been fully depreciated.

into higher rates at the next rate adjustment. For this reason, distributed energy resources may result in short-term rate increases, although in the long-term rates may decrease, depending on the magnitude of avoided costs.

Any impact that distributed energy resources have on rates will be felt by all customers in the rate class. Thus, to the extent that the decrease in sales resulting from distributed energy resources is not offset by avoided costs, cost shifting may occur. To determine whether mitigating actions should be taken, it is important to analyze the magnitude of such cost shifting, and whether such cost-shifting is likely to dissipate or increase over time. Cost shifting impacts are analyzed in Chapter 7, below.

3.2. Energy Efficiency

The EmPOWER Maryland Energy Efficiency Act of 2008 created an Energy Efficiency Resource Standard that set a statewide goal of reducing per capita electricity use by 15 percent by 2015 and per capita peak demand by 15 percent by 2015.[17] In July 2015, the Commission set post-2015 electric energy efficiency goals that require Program Administrators to ramp up savings by 0.2 percent of sales per year starting in 2016, until each Program Administrator reaches annual incremental savings equivalent to two percent of weather-normalized gross retail sales (using a pre-determined baseline).[18]

As directed by the Commission, municipal electric utilities and electric cooperatives with fewer than 250,000 customers are to include energy efficiency and conservation programs or services as part of their service to their customers. While Choptank does not participate in the EmPOWER Maryland programs, it has historically offered limited energy efficiency programs, such as water heater rebates and LED lighting coupons. The savings from these programs amount to approximately 0.02 percent of Choptank's sales on an annual basis.

The Commission directed SMECO, as one of the five largest electric utilities in Maryland, to offer energy efficiency programs as part of EmPOWER Maryland. SMECO's energy efficiency program savings made up more than four percent of statewide net wholesale level annual MWh savings in 2012 through 2015, as shown in Table 2 below.[19]

---

[17] Public Service Commission of Maryland, "Order No. 82344, Conservation and Demand Response Programs Pursuant to the EmPOWER Maryland Energy Efficiency Act of 2008," January 30, 2009.

Department of Energy, "EmPOWER Maryland Efficiency Act," accessed December 9, 2016, http://www.energy.gov/savings/empower-maryland-efficiency-act.

[18] Public Service Commission of Maryland, "Order No. 87082, Conservation and Demand Response Programs Pursuant to the EmPOWER Maryland Energy Efficiency Act of 2008," July 16, 2015.

[19] Maryland Public Service Commission Staff, Energy Analysis & Planning Division, "Comments of the Public Service Commission Staff 2015 Semi-Annual EmPOWER Maryland Programmatic Report For the Third and Fourth Quarters," April 15, 2016.

Table 2. SMECO's Energy Efficiency Annual MWh Savings

Year	Maryland Total	SMECO	SMECO's Portion of Maryland
2012	600,000	26,000	4.3%
2013	670,000	40,000	6.0%
2014	850,000	39,000	4.6%
2015	989,500	33,000	3.3%
Total	**3,109,500**	**138,000**	**4.4%**

For the 2015-2017 EmPOWER Maryland program cycle, SMECO proposes to save 2.2 percent of 2013 weather normalized sales in 2017, for a total of 225 GWh saved over the three-year term.

While energy efficiency programs help to reduce system costs and achieve policy goals, they can also impact utilities' ability to recover their allowed revenues, particularly when revenue recovery is highly dependent upon energy sales.

4. Policies to Address Revenue Recovery and Fairness

4.1. Fixed Charges

Sales declines and volatility can create financial difficulties for a utility, and net metering can lead to cost-shifting to non-net metered customers. For this reason, both SMECO and Choptank have proposed to significantly increase the fixed charge for customers, including residential customers, in their recent rate cases. Senate Bill 1131 would have allowed the cooperatives to increase the fixed charge by up to 25 percent annually, in order to recover costs not driven by energy usage.

Fixed charge increases would provide the cooperatives with greater assurance that they would recover their historical investments (primarily sunk costs), even if sales continue to decline due to net metering, energy efficiency, or macroeconomic factors. Higher fixed charges would also ensure that net metered customers contribute to the recovery of past utility system investments.

However, the PSC has generally declined to increase fixed charges significantly, as fixed charges are widely viewed as conflicting with many rate design goals. In particular, the Commission has cited the following goals as reasons for rejecting steep increases in the fixed charge:

- gradualism (avoidance of rate shock),
- promotion of energy efficiency and conservation, and
- customer control.

For example, in Case 9217, the Commission declined to increase the fixed charge for residential customers in part because “increased customer charges do not encourage energy conservation, as such fixed charges would be unavoidable by Pepco’s customers. By placing all increases in this case in volumetric rates, the Commission provides the opportunity for customers to reduce their electric bills by conserving energy, thereby helping to achieve the energy conservation goals of the EmPOWER Maryland Energy Efficiency Act of 2008 as well.”[20]

4.2. Revenue Decoupling

As an alternative, the Commission has approved revenue decoupling measures for most of Maryland’s electric utilities. In November 2010, revenue decoupling in the form of a “Bill Stabilization Adjustment”

---

[20] Maryland Public Service Commission, “Order No. 85374, In the Matter of the Application of Potomac Electric Power Company for an Increase in Its Retail Rates for the Delivery of Electric Energy,” 73.

(BSA) was implemented for SMECO.[21] The BSA adjusts revenues on a monthly basis for each class with the Company calculating a normalized class customer count and average class test year billing month revenue. The allowed revenue is compared to the actual revenue, and any variance becomes an adjustment for the next billing month (within a 10 percent band). SMECO noted in its last rate case that the BSA has been effective in mitigating the effects of weather, energy efficiency, and distributed generation on its ability to recover fixed costs, although it must still obtain short-term financing to cover its fixed costs.[22]

Choptank's revenues continue to be directly linked to its sales. The utility reported in its most recent rate case that approximately 80 percent of its distribution costs are recovered through variable rates.[23]

4.3. Alternative Policies

While revenue decoupling substantially alleviates revenue sufficiency concerns, it does not mitigate any cost shifting that may be occurring. Where cost-shifting is a concern, some jurisdictions have implemented changes to net metering, distributed generation capacity fees, or alternative rate designs.

Distributed Generation Policy Options

- **System size limits:** In many states, state law limits net metering to customers with relatively small systems, such as under 500 kW.
- **Treatment of excess generation:** Programs vary in excess generation compensation (i.e., when total generation exceeds consumption for the month), and whether bill credits can be rolled over to the next month. Some jurisdictions credit monthly excess generation at the wholesale energy price, while others do not provide any compensation for monthly excess generation.
- **Capacity fees:** Some jurisdictions have implemented a monthly capacity fee for net metered systems. For example, Arizona Public Service charges a monthly capacity fee of approximately $0.70 per installed kW.[24]
- **Value of Solar:** Value-of-solar tariffs are an alternative to net metering that is based on the estimated net value provided by solar generation. This net value can be estimated in many different ways, but the key elements typically include loss savings, energy savings, generation

[21] Maryland Public Service Commission, "Order 83737, In the Matter of the Application of Southern Maryland Electric Cooperative, Inc. for Authority to Revise Its Rates and Charges for Electric Service and for Certain Rate Design Changes," December 11, 2010.

[22] Slater, "Prepared Direct Testimony," 20–21.

[23] Cecil Criss, "Direct Testimony," *Application of Southern Maryland Electric Cooperative, Inc. for Authority to Revise Its Rates and Charges for Electric Service and Certain Rate Design Changes*, Case 9368, October 28, 2014, 6.

[24] Arizona Corporation Commission, Decision No. 74202, Docket No. E-01345A-13-0248, December 3, 2013.

capacity savings, fuel price hedge value, transmission and distribution capacity savings, and environmental benefits. An example of a jurisdiction that uses a value-of-solar tariff is Austin Energy. The value-of-solar rate is set on an annual basis through Austin Energy's budget process and fluctuates from year-to-year.[25]

Rate Design Options

Fixed charges are not the only form of rate design that can mitigate cost-shifting. Other rate designs include:

- **Demand charges:** A demand charge is typically based on a customer's highest demand during any one period (e.g., hour or 15-minute period) of the month. A demand charge often reduces the ability of net metered customers to reduce their bills, since solar generation generally reduces customer peak demand by much less than it reduces energy consumption.[26] However, many jurisdictions have concluded that demand charges are inappropriate for residential customers, as their complexity makes customer response difficult.[27]

- **Minimum bills:** A minimum bill is similar in appearance to a fixed charge, but only applies if the customer's bill would otherwise be lower than the minimum threshold. While a minimum bill ensures that all customers contribute a certain amount to the system each month, it does not distort the variable rate.

- **Time-of-use rates:** Time-of-use rates are a simple form of time-varying rate that has been used for decades. A time-of-use rate assigns each hour of the day to either a peak, off-peak, or shoulder period. The energy rate is then set to be highest during the peak hours and lowest during off-peak hours to better reflect the actual underlying costs of providing electricity during those hours. A time-of-use rate can be designed in many ways. The particular design of the rate can either increase or reduce the bill credits received by a net metered customer.

---

[25] Karl Rabago et al., "Designing Austin Energy's Solar Tariff Using a Distributed PV Value Calculator" (Austin Energy and Clean Power Research), accessed July 6, 2016, http://www.cleanpower.com/wp-content/uploads/090_DesigningAustinEnergysSolarTariff.pdf.

[26] Solar customers frequently have high usage during non-daylight hours when solar panels are not producing energy. In addition, an hour of cloud cover during daylight hours can cause a solar customers' usage from the grid to spike temporarily.

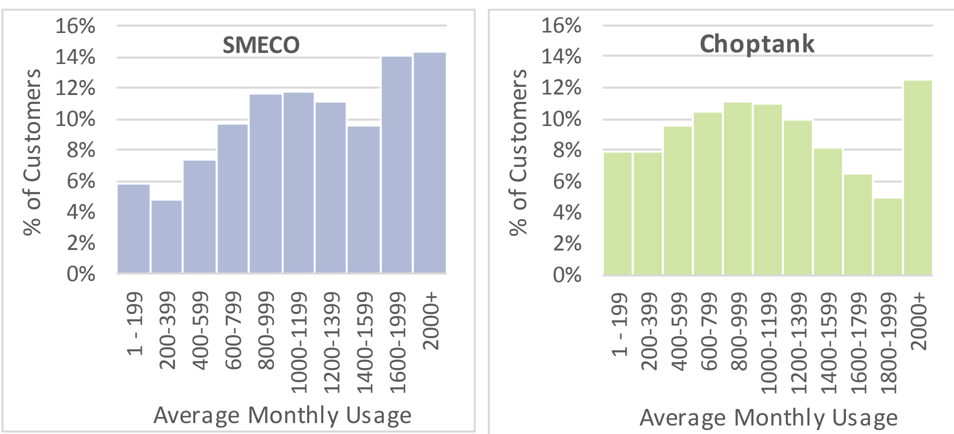
[27] See, for example, Paul Chernick et al., "Charge Without a Cause? Assessing Utility Demand Charges on Small Consumers," *Electricity Policy*, August 2016, https://electricitypolicy.com/images/2016/August/10Aug2016/Chernick/Chernick2016Aug10final.pdf.

5. IMPACTS ON LOW USAGE CUSTOMERS

5.1. Increased Fixed Charges

Rate designs impact various types of customers differently, depending on their usage patterns. Because an increased fixed charge raises the fixed portion of the bill but reduces the cost per kilowatt-hour, higher fixed charges result in smaller bills for high energy users, and larger bills for low-usage customers. The bills of customers with average usage are unchanged by an increase in the fixed charge and corresponding decrease in the distribution rate. Figure 3 shows histograms of customer average monthly usage for SMECO and Choptank, excluding accounts with no usage. The average monthly usage for both SMECO and Choptank is approximately 1,200 kWh, but slightly more than half of customers use less than this amount for both utilities. Approximately 51 percent of SMECO customers use less than 1,200 kWh per month, while nearly 58 percent of Choptank's customers use less than 1,200 kWh per month.[28]

Figure 3. Distribution of SMECO and Choptank Average Monthly Usage



Under SB 1131, each cooperative could increase its fixed charge by up to 25 percent each year. Assuming continuation of 2015 revenue requirements, sales levels, and customers, three iterations of a hypothetical revenue-neutral increase in the fixed charge were developed. [29] These hypothetical rates are shown in the tables below, along with corresponding decreases in the distribution rate.

[28] Data based on the most recent year for SMECO, and on the average of 2012-2015 for Choptank. Data are not weather-normalized.

[29] SB 1131 did not, however, limit the cooperatives' ability to propose revised fixed charges to a pre-determined number of iterations; rather, the restrictions that would have been imposed by the bill were on the *amount* of the annual increase and the criteria for justification of the proposed increase.

Table 3. SMECO – Hypothetical Increases in Residential Fixed Charge

Rate Component	Units	Current	Increase 1	Increase 2	Increase 3
Fixed Charge	$/Month	$9.50	$11.88	$14.84	$18.55
Other fixed rider (USP)	$/Month	$0.36	$0.36	$0.36	$0.36
Distribution Rate	$/kWh	$0.052	$0.050	$0.047	$0.044
Supply Rate	$/kWh	$0.081	$0.081	$0.081	$0.081

Assumes an average consumption level of 1,223 kWh/month based on an analysis of 2011-2015 weather normalized data.

Table 4. Choptank - Hypothetical Increases in Residential Fixed Charge

Rate Component	Units	Current	Increase 1	Increase 2	Increase 3
Fixed Charge	$/Month	$11.25	$14.06	$17.58	$21.97
Other fixed rider (USP)	$/Month	$0.36	$0.36	$0.36	$0.36
Distribution Rate	$/kWh	$0.056	$0.053	$0.051	$0.047
Supply Rate	$/kWh	$0.087	$0.087	$0.087	$0.087

Assumes an average consumption level of 1,196 kWh/month based on an analysis of 2011-2015 weather normalized data.

5.2. Magnitude of Impacts

A one-time increase in the fixed charge of 25 percent from current levels would increase bills by approximately $2.00 to $3.00 per month for very low usage (under 200 kWh per month) SMECO and Choptank customers. However, three increases to the fixed charge, each of 25 percent, would result in much greater increases in total bills for those low usage customers. For SMECO, these increases would range from approximately $7.50 per month to $9.00, while for Choptank the increase would range from $9.00 to nearly $11.00 per month.

The ranges of bill impacts for customers of various monthly usage levels are shown in Table 5 below for SMECO. The ranges for Choptank are slightly higher, as shown in Table 6.

Table 5. Bill Impacts for SMECO Residential Customers

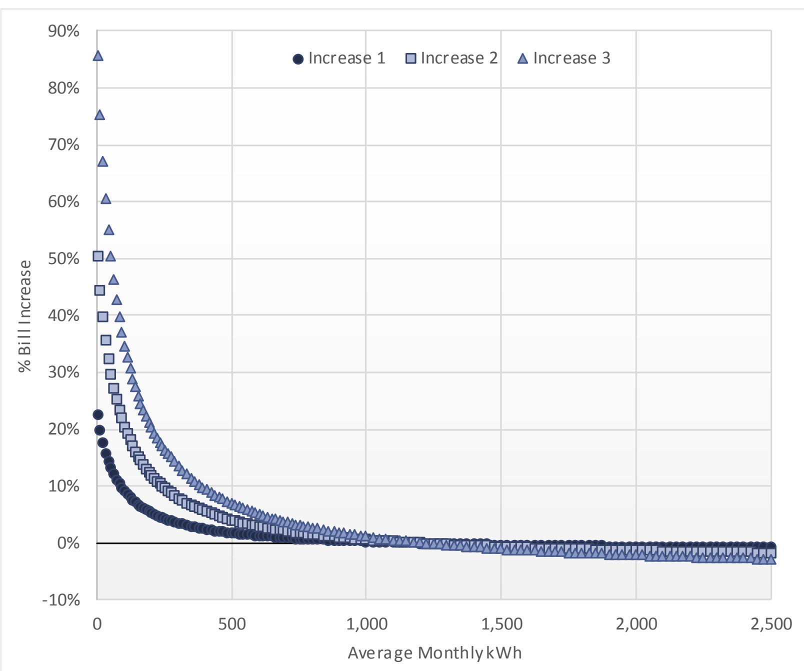
Usage Bin	Increase 1			Increase 2			Increase 3		
1 - 200	$1.99	–	$2.37	$4.47	–	$5.34	$7.58	–	$9.05
201 - 400	$1.60	–	$1.99	$3.60	–	$4.47	$6.10	–	$7.57
401 - 600	$1.21	–	$1.60	$2.73	–	$3.59	$4.62	–	$6.09
601 - 800	$0.82	–	$1.21	$1.85	–	$2.72	$3.14	–	$4.61
801 - 1000	$0.44	–	$0.82	$0.98	–	$1.85	$1.66	–	$3.13
1001 - 1200	$0.05	–	$0.43	$0.11	–	$0.98	$0.19	–	$1.66
1201 - 1400	($0.34)	–	$0.05	($0.76)	–	$0.11	($1.29)	–	$0.18
1401 - 1600	($0.73)	–	($0.34)	($1.63)	–	($0.77)	($2.77)	–	($1.30)
1601 - 1800	($1.11)	–	($0.73)	($2.51)	–	($1.64)	($4.25)	–	($2.78)
1801 - 2500+	($2.47)	–	($1.12)	($5.56)	–	($2.51)	($9.42)	–	($4.26)

Table 6. Bill Impacts for Choptank Residential Customers

Usage Bin	Increase 1			Increase 2			Increase 3		
1 - 200	$2.36	–	$2.81	$5.32	–	$6.32	$9.01	–	$10.71
201 - 400	$1.92	–	$2.36	$4.31	–	$5.31	$7.30	–	$9.01
401 - 600	$1.47	–	$1.91	$3.30	–	$4.31	$5.60	–	$7.30
601 - 800	$1.02	–	$1.47	$2.29	–	$3.30	$3.89	–	$5.59
801 - 1000	$0.57	–	$1.02	$1.28	–	$2.29	$2.18	–	$3.88
1001 - 1200	$0.12	–	$0.57	$0.28	–	$1.28	$0.47	–	$2.17
1201 - 1400	($0.33)	–	$0.12	($0.73)	–	$0.27	($1.24)	–	$0.46
1401 - 1600	($0.77)	–	($0.33)	($1.74)	–	($0.74)	($2.95)	–	($1.25)
1601 - 1800	($1.22)	–	($0.78)	($2.75)	–	($1.75)	($4.66)	–	($2.96)
1801 - 2500+	($2.79)	–	($1.22)	($6.28)	–	($2.75)	($10.64)	–	($4.67)

While the absolute magnitude of such bill increases is not exceptionally large, the percentage impacts are particularly pronounced for low usage customers. This effect is illustrated in the chart below for each of three 25 percent increases in the fixed charge. The vertical axis indicates the average monthly increase in a customer's bill, based on average monthly energy consumption (shown on the horizontal axis). For customers with very low usage (toward the left side of the chart), incremental bill impacts are very high in percentage terms, reaching over 80 percent for customers with extremely low usage (such as some net metering customers). In contrast, customers with higher than average electricity usage (i.e. greater than 1,223 kWh per month) will generally see small bill decreases.

Figure 4. Percentage Bill Impacts and Energy Usage for SMECO



6. IMPACTS ON LOW INCOME CUSTOMERS

Approximately 10 percent of Maryland residents are classified as having incomes less than the federal poverty threshold.[30] Poverty rates in SMECO's territory are slightly lower, at 8.7 percent, while poverty is more widespread in the counties in Choptank's territory, averaging 12.5 percent.[31] Low-income customers are particularly vulnerable to rate increases, as their energy bill burden is disproportionately high, and even small bill increases may hinder their ability to pay their bills.

6.1. Customer Characteristics

Neither cooperative tracks member income levels. To determine the impacts of higher fixed charges on low-income customers, one must rely on an alternative metric. The Electric Universal Service Program (EUSP) was established under Section 7-512.1 of the Public Utilities Article, *Annotated Code of Maryland* to assist low-income customers with making utility bill payments, and accessing home weatherization. The bill assistance and arrearage retirement components of the EUSP are overseen by the Maryland PSC and administered by the Office of Home Energy Programs (OHEP).

Approximately 4 percent of SMECO's residential customers receive assistance through the EUSP, while 3 percent of Choptank's residential customers do.[32] A comparison of these values to the percent of low-income customers in each utility's territories (approximately 9 percent and 13 percent, respectively), indicates that it is likely that not all eligible low-income customers receive energy assistance. Additionally, those who do receive assistance may be customers who tend to have the highest bills, and thus the greatest difficulty in paying them.

Despite the inability of the EUSP data set to capture all eligible low-income customers and the possibility that it over-represents high-usage customers, an analysis of EUSP data is helpful in understanding the potential impacts on low-income customers stemming from the cooperatives' proposal. Further, an alternative data set was not readily available to assist in the identification of low-income customers in the cooperatives' service territories.

---

[30] Maryland.gov, Maryland Manual On-Line, "Maryland At A Glance." http://msa.maryland.gov/msa/mdmanual/01glance/economy/html/income.html#poverty

[31] Maryland Alliance for the Poor, "Maryland Poverty Profiles," 2016, http://familyleague.org/wp-content/uploads/2016/01/Maryland-Povery-Profiles-2016.pdf.

[32] Average of 2011-2015. Analysis based on data provided in response to discovery request PSC-1-4.

Using weather-normalized[33] monthly energy consumption data for 2011 through 2015, we analyzed the energy consumption of standard residential customers relative to customers receiving energy assistance (e.g., EUSP participants):

- For SMECO, non-EUSP customers consume an average of 1,221 kWh per month, while EUSP customers consume an average of 1,284 kWh per month, approximately 5 percent more. However, it is likely that the data for non-EUSP customers includes vacation homes and other structures that are not used regularly, thereby reducing the non-EUSP average (as discussed more below).

- For Choptank, the difference in monthly usage between EUSP and non-EUSP customers was relatively minor. Non-EUSP customers consume 1,193 kWh per month (when zero usage observations are included) or 1,217 kWh per month (when zero usage observations are excluded). In comparison, EUSP customers consume an average of 1,238 kWh per month, 2 percent more than non-EUSP customers (when zeros are excluded) or 4 percent more when zero usage observations are included, as shown in the table below.

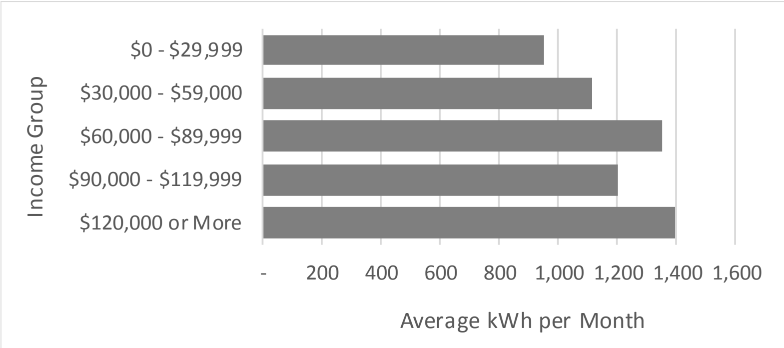
Table 7. Average Monthly Energy Usage for EUSP and Non-EUSP Customers

	Average kWh per Month			
	EUSP Customer Usage	Non-EUSP Usage (Including zeros)	Non-EUSP Usage (Excluding zeros)	% Difference
SMECO	1,284	1,221	Not available	5%
Choptank	1,238	1,193	1,217	4%, 2%

Although these values indicate that low-income customers may have slightly higher usage levels than standard residential customers, they contrast with estimates of energy consumption by income group, as reported by the U.S. Energy Information Administration's survey data for the states of Maryland, Delaware, West Virginia, and Washington DC. The chart below illustrates the average monthly usage levels of customers in different income brackets. The lowest-income customers (at the top) have the lowest average usage. Energy consumption generally increases as income increases, according to the survey results.

[33] Heating degree day and cooling degree day data were provided in response to discovery request PSC-CH-3-4, monthly energy consumption was provided in responses PSC-SM-3-7 and PSC-SM-3-9, and typical meteorological data were sourced from the National Renewable Energy Laboratory, available at http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/by_state_and_city.html.

Figure 5. Regional Energy Consumption by Income Group



Source: Energy Information Administration Residential Energy Consumption Survey, 2009 http://www.eia.gov/consumption/residential/data/2009.

Such data indicate that low-income customers are likely to have lower usage on average, although they may not be receiving energy assistance.

Conclusions Regarding Low-Income Usage

There are at least two possible reasons that the data regarding EUSP recipients' usage is inconsistent with the data provided by the Energy Information Administration's survey.

First, a relatively large number of unoccupied buildings may be included in the data for standard residential customers. For example, vacation homes often sit unused for much of the year, but the owners may not cancel utility service when the home is not in use. Thus electric usage for many months will show up as zero kilowatt-hours, and will have the effect of reducing the average consumption of the residential class. This effect is likely to be particularly pronounced in the counties served by Choptank, where approximately 13 percent of houses are classified as "seasonal" according to the U.S. Census Bureau. This contrasts with an average of 2 percent seasonal houses for Maryland as a whole.[34] When zero usage entries were removed from Choptank's data set, the average usage levels of EUSP and non-EUSP customers were found to be quite similar.[35] Second, it is possible that low-income customers who are low-usage customers are better able to afford their electricity service, and thus are less likely to seek out energy assistance. For this reason, the average usage for EUSP customers may skew upwards.

6.2. Bill Impact Analysis

While average usage information provides a rough indication of how low-income customers would be impacted by fixed charges, it does not indicate how many customers would experience bill increases or

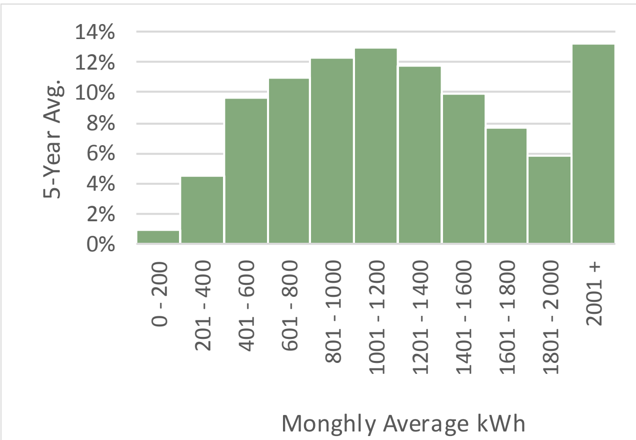
---

[34] U.S. Census Bureau, *2010 Census*, 2010, https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=DEC_10_DP_DPDP1&prodType=table.

[35] Equivalent data were not available for SMECO, and thus we were unable to determine what proportion of customers had zero usage during one or more months.

decreases. A useful metric in this regard is the distribution of EUSP customers by energy consumption level. An analysis of the 5-year monthly consumption data for Choptank indicates that slightly more than half (52.3 percent) of customers receiving EUSP assistance fall below the overall residential class average usage level of 1,212 kWh. This implies that slightly more than half of Choptank's EUSP customers would experience higher bills as a result of higher fixed charges. Similarly, approximately 54 percent of SMECO's customers receiving EUSP assistance fall below the class average.[36]

Figure 6. Five-Year Average Usage Distribution for Choptank EUSP Customers



[36] According to SMECO's most recent year of data for low income customer usage levels, provided in response to PSC-1-7 and PSC-1-8. Additional years of data were not available.

7. ANALYSIS OF COST SHIFTING

Cost shifting can occur if the magnitude of avoided costs fails to offset the lost revenues due to net metering. To calculate the magnitude of cost shifting, both the reduction in revenues from net metering and the avoided cost values must be calculated. As discussed above, lost revenues occur when a utility's revenue requirement must be recovered over fewer sales, leading to higher rates. Customers who cannot offset their consumption through net metering are then faced with higher bills.

7.1. Reduced Revenues from Net Metering

While Maryland law permits a wide variety of distributed energy resources to be net metered, to date the vast majority of these customers have installed distributed solar.[37] For this reason, our analysis focuses on cost shifting from customers with solar to customers without solar.

SMECO

As of 2015, approximately 2,100 residential customers (1.4 percent) had installed a total of 18.4 MW of distributed solar in SMECO's territory. Based on Maryland solar insolation data and standard performance of photovoltaics,[38] we estimate that the average SMECO residential net metered customer generated approximately 770 kWh per month, enough to reduce his or her consumption from the grid by nearly two-thirds.[39] Under current rates, the average net metered solar customer is able to reduce his or her bill by approximately $100 per month. At 2015 penetration levels, this results in a decrease in sales of nearly 33,000 MWh per year, and a reduction in revenues of approximately $4 million (including electricity supply revenues).[40]

Choptank

As of July 2015, nearly 200 residential Choptank customers had installed distributed solar systems, with an average capacity of more than 11 kW. Each of these customers generates an estimated average of 1,011 kWh per month, allowing them to reduce their average monthly bill by approximately $145. At current penetration levels, this results in a reduction of revenues collected by Choptank of $0.3 million per year (including supply revenues).

---

[37] SMECO reports that as of 2015, 98.4 percent of its net metered capacity was from solar, with the remainder from wind and biomass (response to discovery request PSC-1-1). Similarly, Choptank reports that 99.4 percent of its net metered capacity was solar in 2015. *See:* Public Service Commission of Maryland, "Report on the Status of Net Energy Metering in the State of Maryland," January 2016.

[38] Data obtained through the National Renewable Energy Laboratory's "PVWatts" calculator.

[39] Assuming average residential customer consumption levels prior to installing solar.

[40] The portion of these revenues that are distribution-related is approximately $1.5 million.

7.2. Avoided Costs

A conservative estimate of avoided costs – one that underestimates the cost-reducing impacts of distributed solar – would only credit distributed solar for its wholesale value, i.e., its ability to avoid wholesale market energy purchases, wholesale market capacity costs, and line losses. To calculate the value of avoided energy, one must take into account the hourly price of energy and how such prices correspond to hourly solar generation. To estimate the capacity value of solar, it is necessary to calculate the capacity contribution of solar during peak load hours. Avoided cost estimates for generation and energy were provided by Daymark Energy Advisors, the PSC's consultant for estimating the value of solar in Maryland's electric cooperative service territories. No avoided cost values were estimated for distribution-related costs.

SMECO

For SMECO, the initial year energy and capacity avoided costs were estimated to be $0.052 per kilowatt-hour. When multiplied by estimated annual net metered generation, this equates to $1.7 million in avoided costs.

Although the avoided energy and capacity costs are significant, they are less than the current standard offer supply cost.[41] To the extent that SMECO is the solar customer's energy supplier, this difference implies that some cost shifting may be occurring from solar to non-solar customers on the generation portion of the bill. Because no avoided cost value was estimated for distribution-related costs, it was assumed that the full value of the distribution rate collected through kilowatt-hour charges would be shifted to non-solar customers.[42]

Choptank

The avoided costs for Choptank were estimated to be similar to those of SMECO, with the initial year avoided costs estimated to be $0.053 per kilowatt-hour. When multiplied by generation, this yields more than $0.1 million in avoided costs.

7.3. Current Cost Shifting

SMECO

Under the assumption that the only costs avoided by distributed solar are wholesale energy and capacity costs (including losses), each kilowatt-hour of net metered generation results in cost-shifting to

---

[41] This can occur for many reasons. For example, if the solar generation profile is not well-aligned with peak demand, the avoided cost will be relatively low. Further, the avoided costs estimated above may not fully account for other impacts of solar generation, such as demand reduction induced price effects.

[42] Although a small portion of distribution costs vary with energy and can be assumed to be automatically avoided by solar generation, these avoided costs were not subtracted from the distribution rate for simplicity.

non-solar customers. At current solar penetration levels, this cost shift leads to an increase of 0.9 percent in customer bills. In terms of bill impacts, the average non-solar residential customer would experience an increase of $1.50 per month (assuming that all supply-related costs are passed on to customers, rather than borne by third-party energy suppliers). The distribution portion of this cost-shift is $0.96 per month per residential customer. To the extent that there are more avoided costs associated with distributed solar than wholesale energy and capacity costs, this cost-shift would be smaller or non-existent.

Choptank

The estimated average monthly cost-shift from Choptank solar customers to non-solar customers is $0.37 per month per residential customer at current penetration levels. The distribution portion of this amount is $0.23 per month per residential customer. Similar to SMECO, a methodology determining a higher avoided cost results in a smaller cost-shift.

7.4. Fixed Charge Impacts on Cost Shifting

Although it would not comport with the principle of gradualism and may distort efficient price signals, implementing a much higher fixed charge would mitigate some cost shifting from residential solar to non-solar customers. The additional revenues yielded from a higher fixed charge would be directly dependent upon the number of net metered customers. A utility with many small-capacity customer-sited installations would experience a much greater percentage increase in revenues as a result of higher fixed charges than a utility with only a few, relatively large net metered solar installations.

Under current net metering penetration levels, if SMECO were to implement a fixed charge of $18.55 per month,[43] it would recover more than $200,000 in additional revenues from residential solar customers each year. This would reduce the average cost-shift impact on each non-solar residential customer from $1.50 per month to $0.82 per month.

For Choptank, increasing the fixed charge to $21.97 per month[44] would increase revenues from residential solar customers by approximately $20,000 and reduce the average cost-shifting impact from $0.37 per month to $0.34 per month per residential customer. The relatively small change in cost-shifting is due to Choptank's current low number of residential net metered customers.

[43] To reach a fixed charge of $18.55 per month, SMECO would have to propose three subsequent increases of 25 percent, beginning with its current customer charge of $9.50 per month.

[44] To reach a fixed charge of $21.97 per month, Choptank would have to propose three subsequent increases of 25 percent, beginning with its current customer charge of $11.25 per month.

8. IMPACTS ON ENERGY EFFICIENCY

The EmPOWER Maryland Energy Efficiency Act of 2008 was highly successful in reducing per capita electricity use by 15 percent by 2015 and per capita peak demand by 15 percent by 2015.[45] Collectively, the Maryland Program Administrators[46] achieved 99 percent of the EmPOWER 2015 energy savings goal and 100 percent of the EmPOWER 2015 demand reduction goal.[47]

In the fall of 2015, each Program Administrator filed savings goals for the 2015-2017 program cycle. Goals are set at the gross wholesale level, and are based on weather normalized sales for a particular year (i.e., 2013 weather normalized sales are used for the 2015-2017 plan savings goals).

By the end of 2017, the Maryland Program Administrators are expected to achieve incremental energy savings of 2.3 million MWh and demand savings of 1,666 MW at a cost of $965 million.[48] At the end of the second quarter 2016, half-way through the plan term, the Program Administrators were still on target to meet their goals for the state as a whole, with some Program Administrators over-achieving their plan goals and others underperforming.[49]

Table 8 below summarizes SMECO's annual savings goals for each year of the 2015-2017 cycle.[50] At the end of the second quarter 2016, SMECO was falling short of reaching its savings goals, although its quarterly performance was not significantly lower than its performance in previous quarters.[51]

---

45 Public Service Commission of Maryland, "Order No. 82344, Conservation and Demand Response Programs Pursuant to the EmPOWER Maryland Energy Efficiency Act of 2008."

Department of Energy, "EmPOWER Maryland Efficiency Act."

46 The five Program Administrators in Maryland are BGE, Pepco, Delmarva Power, Potomac Edison, and SMECO. In addition, the Maryland Department of Housing and Community Development implements efficiency programs for limited income customers.

47 Public Service Commission of Maryland, "Order No. 87575, Conservation and Demand Response Programs Pursuant to the EmPOWER Maryland Energy Efficiency Act of 2008," May 26, 2016.

American Council for an Energy-Efficient Economy, "State and Local Policy Database - Maryland," accessed November 28, 2016, http://database.aceee.org/state/maryland.

48 MD PSC, "The EmPOWER Maryland Energy Efficiency Act Standard Report of 2015" (Public Service Commission of Maryland, April 2015).

49 Maryland Public Service Commission Staff, Energy Analysis & Planning Division, "Comments of the Public Service Commission Staff 2016 Semi-Annual EmPOWER Maryland Programmatic Report for the First and Second Quarters," October 7, 2016.

50 "Case No. 9157 – Order No. 87082, Southern Maryland Electric Cooperative, Inc.'s Energy Savings as a Percentage of Retail Sales," September 11, 2015.

51 Maryland Public Service Commission Staff, Energy Analysis & Planning Division, "Comments of the Public Service Commission Staff 2016 Semi-Annual EmPOWER Maryland Programmatic Report For the First and Second Quarters."

Table 8. SMECO's 2015-2017 Savings Goals

Year	2013 Weather Normalized Sales (MWh)	Savings Goals (MWh)	Savings as Percent of Sales
2015	3,610,882	70,878	1.96%
2016	3,610,882	75,900	2.10%
2017	3,610,882	78,284	2.17%

8.1. Rate Design's Impact on Energy Efficiency

Price Elasticity

When utility rates or rate designs change, customers may respond by changing their consumption levels and/or usage patterns. This concept is known in economic theory as price elasticity. Price elasticity is a useful tool for determining how changes in price influence changes in usage. In general, an increase in the price of a resource such as electricity will cause users to use less of that resource, switch to a different resource, or use the resource in a different way (such as during off-peak times). Similarly, a decrease in the price of a resource will induce customers to increase their consumption of that resource and less of comparable resources.

Consumers respond to price changes differently in the short run and in the long run. Short run responses are typically more temporary adjustments in behavior, such as lowering the thermostat or turning off lights. In the long run, customers can reduce their usage by changing their light bulbs to LEDs, installing more insulation, upgrading their heating system, or making other efficiency improvements to their home or business.

For electricity, elasticity rates indicate the percent change in usage for a one percent increase in price. For this analysis, we researched price elasticity studies and compiled short run price elasticity values.[52] When averaged across the studies, the short run residential price elasticity for electricity is estimated to be -0.265. This means that for a one percent decrease in electricity rates, customers will increase their usage by about 0.3 percent.

Fixed Charges

If SMECO or Choptank were to increase its fixed customer charge and reduce its variable energy rates such that the company remained revenue neutral overall, then customer usage is expected to increase because price elasticity indicates that a decrease in the marginal price of a resource – in this case, the

---

[52] "Price Elasticities for Energy Use in Buildings of the United States" (U.S. Energy Information Administration, October 2014).
"Price Elasticity of Demand for Electricity: A Primer and Synthesis" (Electric Power Research Institute, January 2008).
Dr. Agustin J. Ros, "An Econometric Assessment of Electricity Demand in the United States Using Panel Data and the Impact of Retail Competition on Prices" (NERA Economic Consulting, June 9, 2015).

energy rates – will lead customers to increase their use of that resource. Over time, customers will continue to increase their electricity consumption as fixed charges increase, leading to increased electricity generation. Taken to the extreme, where all costs are recovered through a fixed charge and no costs are recovered through energy rates, a customer would have very little incentive to turn off their lights, purchase energy-efficient technologies, or otherwise strive to reduce his or her energy usage, since such actions would have no impact on the customer's bill.

Because a lower energy rate reduces the incentive for conservation or energy efficiency investments, customers are likely to consume more energy than they would otherwise. Consequently, the average customer's electricity bill is likely to increase, as the customer now faces a higher fixed charge and is consuming more electricity than previously. (As discussed previously, the bill impacts will vary according to customer usage level, but on average bills are expected to increase.)

To illustrate this point, we provide an example using SMECO's 2015 rates, sales, and customer data in Table 9 below. With SMECO's 2015 fixed charge of $9.50 per month[53] and a distribution rate of 5.16 cents per kWh, residential customers use on average 1,225 kWh per month. If SMECO increased the fixed charge 25 percent each year and decreased the distribution rate so that it remained revenue neutral to 2015 revenue levels, the distribution rate would decrease by 14 percent to 4.4 cents per kWh by 2017.

Using the average short-term elasticity from our literature review, the decrease in the distribution charge of 14 percent is projected to lead to an average increase in consumption of 18 kWh per month. At the class level, this implies that sales to the residential class would increase by 1.5 percent in just three years.

[53] This fixed charge amount includes the $0.36 per month USP recovery rider.

Table 9. SMECO Change in Fixed Charges Analysis

SMECO Data	Units	Current, 2015	Adjusted, 2015	Adjusted, 2016	Adjusted, 2017
Customers	customers	147,775	147,775	147,775	147,775
Sales	MWh	2,172,605	2,180,988	2,191,466	2,204,564
Changes in Sales from Current	%	-	0.39%	0.87%	1.47%
Customer Monthly Usage	kWh/month	1,225	1,230	1,236	1,243
Fixed Charge	$/month	$ 9.50	$ 11.88	$ 14.84	$ 18.55
Distribution Rate	¢/kWh	5.16	4.97	4.72	4.42
Supply Rate	¢/kWh	8.13	8.13	8.13	8.13
Total Bill	**$/month**	**$ 172.34**	**$ 172.96**	**$ 173.71**	**$ 174.60**
Change in Total Bill from Current	%		0.36%	0.79%	1.31%

Note: Fixed charge includes USP recovery rider of $0.36/month. Bill Stabilization Adjustment and Power Cost Adjustment are excluded, as these vary from month-to-month.

The resulting increase in energy consumption from increasing the fixed charge is likely to make it more difficult for SMECO to achieve its EmPOWER Maryland goals of reducing electricity generation through increased energy efficiency efforts. Because a higher fixed charge directly reduces the incentive that customers have to invest in energy efficiency resources, SMECO may have to offer greater incentives to induce customers to conserve energy and purchase energy efficient equipment. Customers who have already made investments in energy efficiency measures will experience a sudden increase in the length of the payback period over which they can expect to recoup their initial investment. If the increase in then fixed charge is large enough, the payback period may exceed the measure life and lead to the customer being unable to ever break even on their investment.

9. ANALYSIS OF ALTERNATIVE RATE DESIGN OPTIONS

As discussed in Chapter 4, many options are available for addressing the cooperatives' revenue recovery issues and cost-shifting among customers. While some options can be implemented in a traditional rate case, other options may not be available until advanced meters have been fully rolled out, or may even require legislation to allow certain changes to net metering. We explore two alternatives to an increased fixed charge: minimum bills and time-of-use rates.

9.1. Minimum Bills

Minimum bills are similar to fixed charges, but with one important distinction: minimum bills only apply when a customer's usage is so low that his or her total monthly bill would otherwise be less than this minimum amount. The threshold that triggers the minimum bill is typically set well below the average electricity usage level, and thus most customers will not be assessed a minimum bill but will instead only see the energy charge (cents per kilowatt-hour).

Minimum bills serve primarily to allow a utility to recover a certain amount of revenue from each customer, without significantly distorting price signals for the majority of customers. This is in contrast to an increased fixed charge, which would reduce the kilowatt-hour charge for all customers, thereby reducing incentives for energy efficiency.

Minimum bills may be especially useful where there are many customers that have low usage on average, but that actually impose substantial costs on the system. For example, many boat lifts and vacation homes in SMECO and Choptank's service territories may have high energy usage and demand during peak summer hours, but low consumption during the rest of the year. Because distribution system costs are primarily driven by peak demands (particularly at the circuit level), these customers may impose much greater costs on the system than indicated by their average annual energy consumption levels. A minimum bill would help to more fairly allocate costs to these types of customers.

Unfortunately, minimum bills do not distinguish customers with high peak period usage from those who have low energy consumption and low peak demand and who thereby impose lower costs on the system.[54] Further, minimum bills may also have negative financial impacts on low-income customers whose usage falls below the threshold.

[54] In the short run, there is likely to be little difference in the infrastructure investments required to serve customers with high peak demands and those with low peak demands. However, in the long run, customers with higher peak demands will drive additional investments in generation, transmission, and distribution, thereby imposing greater costs on the system. A theoretically efficient price signal would reflect these different marginal costs in some manner in order to encourage customers to reduce the long-run costs they impose on the system.

Impacts on Low Usage and Low Income Customers

To analyze the impacts of minimum bills for SMECO and Choptank, we constructed a hypothetical minimum bill for each utility that would only impact customers with usage below approximately 200 kWh per month. Set at this level, the minimum bill would be assessed for approximately 6 percent of SMECO's customers and 9 percent of Choptank's customers.[55]

The hypothetical minimum bill was set to $36.50 per month for SMECO and $40.00 per month for Choptank. With a minimum bill set at this level, customers using less than 200 kWh per month would face higher bills and contribute more to utility revenues. For SMECO, the minimum bill would recover nearly $1.8 million in utility revenues, while for Choptank it would recover approximately $1 million in revenues. In order to be revenue neutral, the revenues recovered through the minimum bill would be offset by slightly lower kilowatt-hour rates for all customers.

Because the hypothetical minimum bill only applies to very low usage customers who consume less than 200 kWh per month, these are the only customers that would experience bill increases. The average monthly consumption level for these very low usage customers was calculated to be 77 kWh.[56]

For SMECO, a very low usage customer consuming an average of 77 kWh per month would see his or her monthly bills increase from approximately $20.00 per month to $36.50, an increase of more than 80 percent. These impacts are shown in Figure 7 below. The dollar impact on a customer's bill is shown by the blue bars, while the percentage impact is shown by a white diamond. The highest impacts in percentage and dollar terms would be for customers using the least amount of energy per month (on the left side of the chart), while customers with higher usage experience slight bill decreases.[57]

While approximately 6 percent of SMECO's customers would see increased bills under this hypothetical minimum bill rate design, fewer than 1 percent of customers receiving EUSP assistance would see bill increases.[58]

---

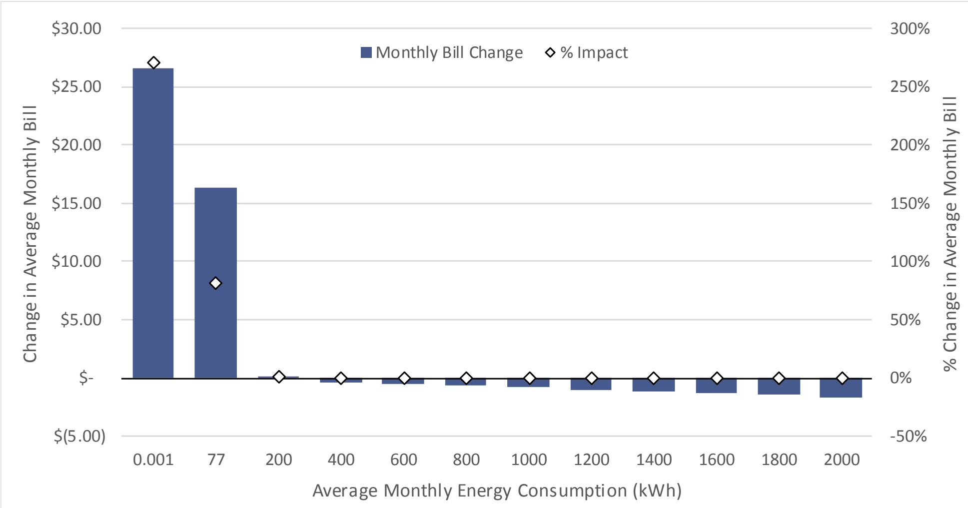
[55] Based on responses to PSC-1-7 and PSC-1-8.

[56] Load research data from SMECO contained very few customers with average usage less than 200 kWh. For this reason, we assumed the average consumption value calculated for Choptank applies to SMECO as well.

[57] The revenue-neutral aspect of the rate results in very slight decreases to the kilowatt-hour charge.

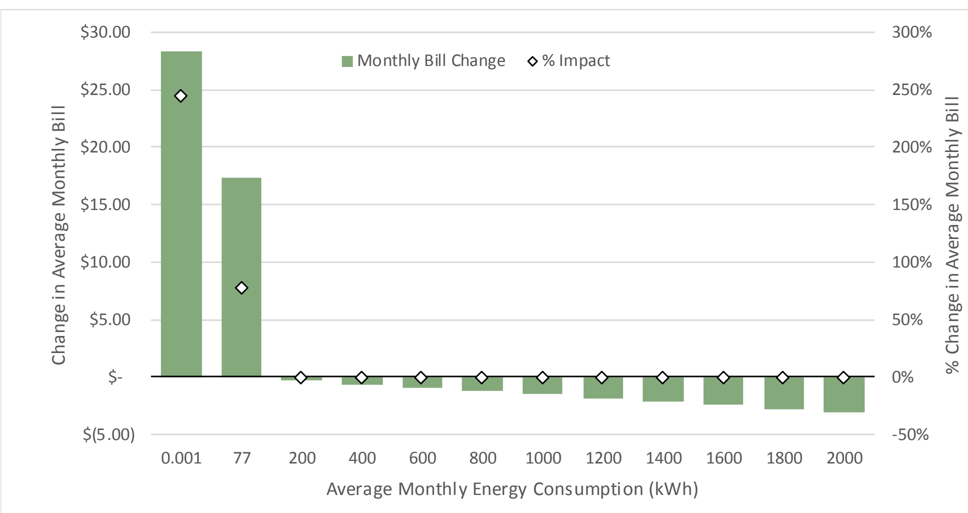
[58] Based on responses to PSC-1-7 and PSC-1-8.

Figure 7. Minimum Bill Impacts for SMECO Customers



The impacts for Choptank customers are expected to be similar. A very low usage customer consuming an average of 77 kWh per month would see monthly bills increase from approximately $22.50 per month to $40.00, an increase of more than 75 percent. While approximately 9 percent of Choptank's customers would see increased bills, fewer than 2 percent of customers receiving EUSP assistance would see bill increases.[59]

Figure 8. Minimum Bill Impacts for Choptank Customers



[59] Based on responses to PSC-1-7 and PSC-1-8.

Impacts on Cost Shifting

A minimum bill of $36.50 for SMECO is projected to cut the amount of net lost revenues from net metered customers in half, from $2.6 million per year to $1.3 million per year. This would reduce cost shifting from $1.50 per month per residential customer to $0.76 per month.

For Choptank, a minimum bill of $40.00 is projected to reduce cost shifting from $0.37 per month to $0.31 per month per residential customer.

9.2. Time-of-Use Rates

Time-of-use (TOU) rates allow electricity prices to vary during the day according to a set schedule, which is designed to roughly represent the costs of providing electricity during different hours. A simple TOU rate would have separate rates for peak and off-peak periods, but intermediate periods may also have their own rates. TOU rates may also vary by season, with summer rates typically set higher than winter rates.

In 2014, SMECO proposed residential TOU rates in connection with its advanced metering infrastructure initiative.[60] We analyzed SMECO's "Option 1" TOU rate proposal for standard offer service (supply) rates. This proposal contained on-peak and off-peak rates which varied by season. The summer season would run from May through September, with a peak period from 12 noon until 8 pm, and a winter season from October through April, with a morning peak period from 6 am to 10 am, and an evening peak period from 5 pm to 9 pm. All other hours would be off-peak. The rates proposed by SMECO in its 2014 filing were adjusted slightly to reflect current fixed charges and yield the same revenues as current rates.

The TOU rates modeled are as follows:

	Summer	**Winter**
Fixed Charge ($/Month)	9.86	9.86
Flat Distribution Rate ($/kWh)	.0510	.0510
On-Peak ($/kWh)	.1177	.0935
Off-Peak ($/kWh)	.0669	.0677

Impacts on Low Income Customers

The impacts of TOU rates on various types of customers will depend on how customer hourly load shapes vary, and how the peak and off-peak periods correspond to these load shapes. Unfortunately, no data on hourly usage patterns of low income customers of SMECO or Choptank are available. However, monthly usage data for EUSP customers and non-EUSP customers were available for each cooperative. An analysis of these data reveal that EUSP recipients tend to use more electricity in the winter and less

[60] SMECO TOU Rate Proposal, Case 9294, In the Matter of the Request of Southern Maryland Electric Cooperative, Inc. for Authorization to Proceed with Implementation of an Advanced Metering Infrastructure System, March 28, 2014.

electricity in the summer than non-EUSP customers. This is demonstrated by the charts below, which show average monthly usage for EUSP customers in the dark lines. EUSP customer winter usage may be higher than non-EUSP customers partially due to the fact that customers receiving energy assistance are more likely to have electric heat.[61] This trend may reverse in the future if non-EUSP customers increasingly adopt heat pumps.

Figure 9. SMECO Average Monthly Usage for Standard Residential and EUSP Recipients

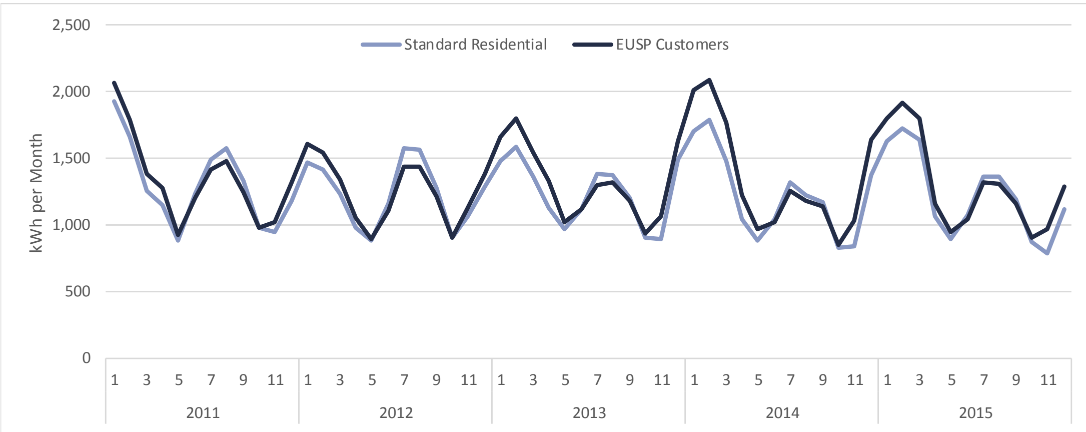
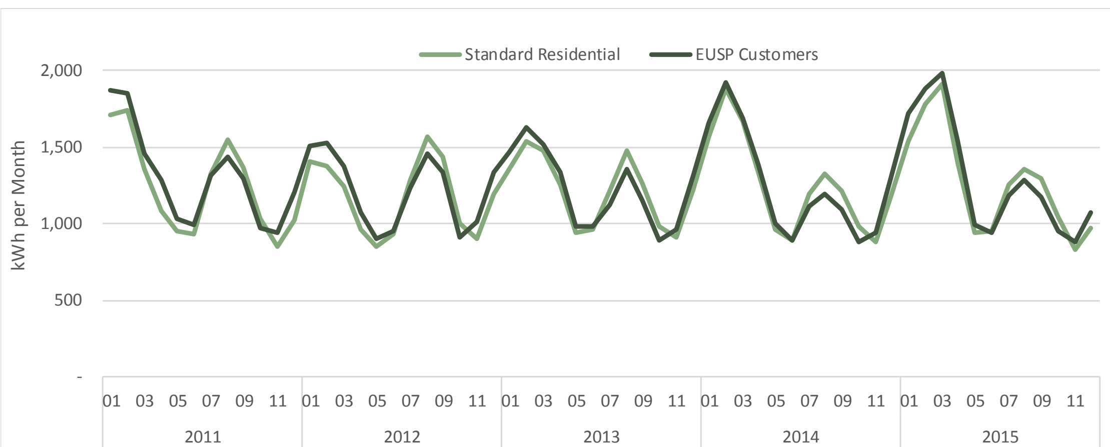


Figure 10. Choptank Average Monthly Usage for Standard Residential and EUSP Recipients



These monthly usage patterns suggest that EUSP customers may benefit from seasonal TOU rates that charge the highest rates in the summer, such as SMECO's TOU proposal. However, such benefits would depend on the extent to which hourly usage patterns for EUSP and non-EUSP customers are otherwise

[61] Less than 40 percent of Maryland households use electricity for heating, but 43 percent of households in the Maryland Energy Assistance Program use electricity for heating. *See:* U.S. Energy Information Administration, https://www.eia.gov/state/data.cfm?sid=MD, and Maryland Department of Human Resources, Office of Home Energy Programs, "FY 2015 Electric Universal Service Program Annual Report to the Maryland Public Service Commission," January 2016, 22.

similar. More research is needed to determine the hourly load shapes of low-income customers, who may be more likely to work non-standard hours and thus have load shapes that differ from the average residential customer.

Impacts on Low Usage Customers

To determine how low usage customers would be impacted by a time-of-use rate, we analyzed hourly load research data from SMECO for customers with varying average monthly usage levels. We present three of these load shapes in the charts below, together with SMECO's proposed peak periods (gray shaded areas).

Figure 11. Summer Load Shapes by Average Usage Level - SMECO

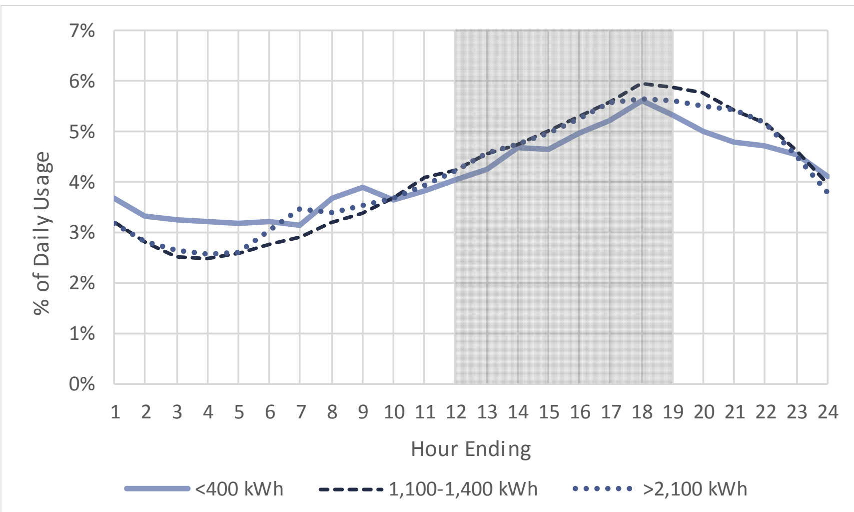


Figure 12. Winter Load Shapes by Average Usage Level - SMECO

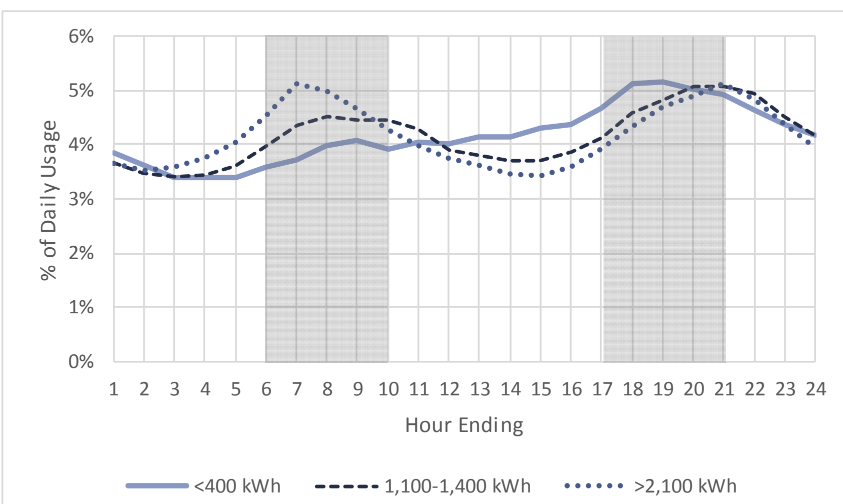


Figure 11 indicates that each customer's load shape is proportionately very similar in the summer, but Figure 12 indicates that low usage customers (those who consume less than 400 kWh per month on average) tend to have lower usage in the morning hours and higher usage in the middle of the day relative to high usage customers (those who consume more than 2,100 kWh per month on average) or moderate usage customers (those who consume between 1,100 and 1,400 kWh per month on average).

Although customers' load shapes differ by usage level, the overall affect is slight when the TOU rate structure is applied, with all three customer types expected to experience bill changes of less than 1 percent under the proposed TOU rate structure (assuming no change in load patterns).

Impacts on Cost Shifting

For SMECO, its proposed TOU rates would be expected to reduce the amount of net lost revenues from net metered customers from $2.6 million per year to $1.6 million per year. This would reduce cost shifting from $1.50 per month per residential customer (under current flat rates) to $0.91 per month (under TOU rates). No analysis was performed for Choptank due to a lack of hourly usage data.

Impacts on Energy Efficiency

Much of the literature on the load impacts from TOU rates focuses on whether customers reduce their peak usage and how their pattern of consumption changes in response to the rate variations. The studies find that well-designed TOU rates result in peak load reductions by incentivizing customers to shift energy consuming activities to off-peak periods. For example, customers may wait to run their clothes dryer or dishwasher until the late evening rather than in the mid-afternoon or early evening. A literature review reveals that reductions in peak usage could range between less than one percent to ten percent, with average reductions between three and six percent.[62]

Some TOU studies also investigate how a customer's overall load is impacted by TOU rates. In the above clothes dryer example, the customer still uses the same amount of energy, just at a different time. But do customers also decrease their total consumption? For example, a customer may lower his or her thermostat during the peak period, and may not need to increase it again during the off-peak period. The few studies that address this question of total load impacts found that the data is limited and that

[62] Stephen George et al., "Dynamic Pricing: PECO Smart Time Pricing Pilot Enrollment Report" (Nexant, June 24, 2014).

Ahmad Faruqui, Sanem Sergici, and Neil Lessem, "Impact Evaluation of Ontario's Time-of-Use Rates: First Year Analysis" (The Brattle Group, November 26, 2013).

Marlies C. Patton and Daniel G. Hansen, "2015 Load Impact Evaluation of Pacific Gas and Electric Company's Mandatory Time-of-Use Rates for Small, Medium, and Agricultural Non-Residential Customers: Ex-Post and Ex-Ante Report" (Christensen Associates Energy Consulting, Mach 2016).

Iris Sulyma et al., "Experimental Evidence: A Residential Time of Use Pilot" (ACEEE Summer Study on Energy Efficiency in Buildings, 2008).

impacts vary by customer. In general, there tends to be a modest reduction in total usage. The studies reviewed indicate that customers could reduce their overall usage from zero to almost six percent.[63]

Such results indicate that TOU rates could potentially reduce total load and contribute to energy efficiency savings goals, although the impacts are uncertain. If nothing else, TOU rates and similar rate structures typically serve to educate customers on energy markets, their electricity usage, and how their usage is related to the cost of supplying electricity. As customers learn how their actions impact their usage and bill, they begin taking steps to reduce their bill. Such actions could include both load shifting (from peak to off-peak hours) and reducing energy consumption. Thus TOU rates could help to reduce system costs (by shifting energy use to off-peak periods), while also offering a means for helping to achieve EmPOWER Maryland goals. [64,65]

---

[63] Ahmad Faruqui, Ryan Hledik, and Jennifer Palmer, "Time-Varying and Dynamic Rate Design" (RAP, The Brattle Group, July 2012).

Ahmad Faruqui, Sanem Sergici, and Neil Lessem, "Impact Evaluation of Ontario's Time-of-Use Rates: First Year Analysis."

Iris Sulyma et al., "Experimental Evidence: A Residential Time of Use Pilot."

[64] Public Service Commission of Maryland, "Report on the Status of Net Energy Metering in the State of Maryland."

[65] Ibid.

10. CONCLUSIONS

Senate Bill 1131 would have allowed Maryland electric cooperatives to implement higher fixed charges for their customers. While such charges would enhance revenue stability for the cooperatives and potentially reduce cost shifting from net metered customers, higher fixed charges run counter to Commission practice. The Commission has been generally reluctant to approve significant increases to the fixed charge in order to avoid rate shock, promote energy efficiency, and maintain customer control.[66] Concerns have also been raised regarding potential negative impacts on low income customers, and the potential for fixed charges to distort efficient price signals.[67]

The analysis summarized in this report finds that higher fixed charges are one of many options available to the cooperatives for addressing concerns regarding revenue recovery and cost shifting. Other alternatives include revenue decoupling, minimum bills, and time-of-use rates.

Our analysis found that the impacts of a higher fixed charge would be similar for both Choptank and SMECO. For low-income customers, impacts would likely be mixed. Based on data available from each cooperative, the average electricity usage for customers receiving energy assistance is slightly higher than the average for standard residential customers, implying that, on average, low-income customers would see slightly lower bills under a higher fixed charge. However, data from the Energy Information Administration contradicts these findings, showing instead that average electricity consumption tends to increase with income, which implies that low-income customers are more likely to have lower usage, thereby experiencing higher bills under a fixed charge. This apparent contradiction may be due to higher-usage low-income customers being more likely to seek out energy assistance than lower-usage low-income customers.

Despite having higher usage *on average*, more than half of customers receiving energy assistance fall below the average usage threshold (as indicated by the median). This indicates that more than half of customers receiving energy assistance are likely to see bill increases under higher fixed charges.

In terms of cost-shifting, our analysis found that higher fixed charges will increase revenues from low-usage customers and reduce the potential for cost shifting from net metered customers. However, minimum bills and TOU rates were found to be similarly effective at reducing potential cost shifting, depending upon their design.

---

[66] See, for example, Maryland Public Service Commission, "Order No. 85374, In the Matter of the Application of Potomac Electric Power Company for an Increase in Its Retail Rates for the Delivery of Electric Energy," Case 9217, August 6, 2010; Maryland Public Service Commission, "Order No. 85374, In the Matter of the Application of Baltimore Gas and Electric Company for Adjustment in Its Electric and Gas Base Rates," Case 9299, February 22, 2013.

[67] As noted in Section 2.4, there is debate regarding whether prices should reflect long-run or short-run marginal costs. However, many public utility economists have noted that only long-run marginal costs are relevant for public utilities. See footnote 10.

Energy efficiency impacts from higher fixed charges will depend on the magnitude of the fixed charge and customer elasticity of demand. Using elasticities from the literature, our analysis found that three subsequent increases in the fixed charge would result in a 1.6 percent increase in electricity consumption for the residential class.