Exhibit No.:	
Issue:	Subscription Pricing Program
Witness:	Ryan Hledik
Type of Exhibit:	Direct Testimony
Sponsoring Party:	Evergy Missouri Metro
Case No.:	ER-2022-0129
Date Testimony Prepared:	January 7, 2022

MISSOURI PUBLIC SERVICE COMMISSION

CASE NO.: ER-2022-0129

DIRECT TESTIMONY

OF

RYAN HLEDIK

ON BEHALF OF

EVERGY MISSOURI METRO

Kansas City, Missouri
January 2022

DIRECT TESTIMONY

OF

RYAN HLEDIK

Case No. ER-2022-0129

Section I: Introduction

Q. Please state your name and business address.

A. My name is Ryan Hledik. I am a Principal of The Brattle Group. My business address is 415 Mission Street, Suite 5010, San Francisco, CA 94105.

Q. On whose behalf are you submitting testimony?

A. I am submitting testimony on behalf of Evergy Metro, Inc. d/ b/a Evergy Missouri Metro and Evergy Missouri West, Inc. d/b/a Evergy Missouri West (together as "Evergy" or "Company").

Q. What are your qualifications as they pertain to this testimony?

A. My consulting practice is focused on regulatory, planning, and economic matters related to emerging energy technologies. My areas of expertise include retail rate design, distributed generation, load flexibility, electrification, energy efficiency, energy storage, and grid modernization.

I have led studies and authored papers, articles, and regulatory filings on rate design issues such as the benefits of time-varying pricing, strategies for transitioning customers to innovative rate designs, the efficient pricing of electricity for customers with distributed generation, rate design practices for public electric vehicle ("EV") charging, designing pilots to test innovative retail rate concepts, rate designs for promoting the efficient use of battery storage, and the energy efficiency impacts of inclining block rates.

My clients have included electric and gas utilities, state and federal regulatory commissions, power developers, independent system operators, government agencies, industry trade associations, technology firms, research institutions, and law firms. I have published 30 articles on electricity industry matters and have presented at industry events throughout the United States as well as in Brazil, Belgium, Canada, Germany, Poland, South Korea, Saudi Arabia, the United Kingdom, and Vietnam. My research has been cited in *National Geographic*, *The New York Times* and *The Washington Post*, and in trade press such as *GreenTech Media*, *Utility Dive*, and *Vox*.

I received my M.S. in Management Science and Engineering from Stanford University, where I concentrated in Energy Economics and Policy. I received my B.S. in Applied Science from the University of Pennsylvania, with minors in Economics and Mathematics.

More details regarding my professional background and education are included in my Statement of Qualifications, which is provided in **Schedule RH-1**.

Q. What is the purpose of your testimony?

A. I have assisted Evergy in developing a pilot for an innovative new customer program offering called "subscription pricing". The purpose of my testimony is to summarize Evergy's subscription pricing pilot.

Q. Please summarize your testimony.

A. Evergy's subscription pricing pilot will provide residential customers with an entirely fixed monthly electricity bill. In this sense, Evergy's proposal is similar to the way customers pay for subscription-based services and club memberships. Based on the experience of utilities in other jurisdictions with similar offers, I expect the simplicity, transparency, and predictability of this design to appeal to a subset of Evergy's customers.

Evergy's subscription pricing pilot proposal includes several innovative features that will align with the Missouri Public Service Commission's ("MPSC") broader policy goals. The subscription pricing offering includes a simple, no-risk financial incentive that rewards residential customers for limiting their energy use when enrolled in the offering. It also includes two optional add-ons, which are designed to encourage adoption of smart thermostats and the purchase of renewable energy credits.

Several elements of the subscription pricing pilot minimize any potential risk to customers. Initially, it will be introduced as a pilot with an enrollment cap so that the initial experience with subscription pricing can be understood by Evergy and stakeholders before extending its availability to all customers. Additionally, subscription pricing will be offered to customers on a voluntary, opt-in basis. The fixed bill amount will be known in advance to all participants, meaning there is no risk to participants of an unexpected bill increase. Further, non-participants will be virtually unaffected by the subscription pricing pilot because any net changes in revenues (positive or negative) resulting from the subscription pricing pilot will be borne by Evergy's shareholders.

There is a rising trend toward the introduction of subscription pricing offerings across the electricity industry. Evergy's proposal positions the company and Missouri to advance a progressive and innovative development in residential customer offerings.

Q. How is the remainder of your testimony organized?

A. The remainder of my testimony is organized into the following sections:

- Section II provides background on subscription pricing, including experience with subscription pricing in other jurisdictions.
- Section III provides an overview of Evergy's proposed subscription pricing pilot offering and its benefits to customers.

- Section IV discusses design details of Evergy's subscription pricing offering
- Section V discusses the pilot's objectives and key subscription pricing pilot implementation details
- Section VI summarizes the conclusions of my testimony.

Section II: Subscription Pricing Background

Q. What is subscription pricing?

A. Subscription pricing provides customers with a tailored and entirely fixed bill for their electricity service. Customers are offered a monthly fixed bill amount that is based on their historical usage and that monthly bill remains unchanged for a one-year term. At the end of the one-year term, customers do not face any true-ups or adjustment charges for that year. In this sense, it is similar to the simple form of billing that consumers have become familiar with for services such as television and music streaming, gym memberships, and cell phone data plans.

Q. What are the benefits of subscription pricing to customers?

A. Subscription pricing provides several benefits to customers:

- Simplicity and transparency: Subscription pricing is the simplest way for customers to pay for electricity as it does not require an understanding of detailed bill line items or complex rate structures. Customers know exactly what they will pay every month, with no surprises.
- Predictability: By removing month-to-month variation in customer bills, and by making the bill amount known in advance, subscription pricing improves customers' ability to budget for household expenses each month. Customers do not

have to worry about unanticipated spikes in their monthly bill due to extreme weather, or a true-up at the end of the term.

- Choice: Subscription pricing offers customers a unique value proposition. It will appeal to a subset of customers who are attracted to its simplicity and predictability. The inclusion of subscription pricing as a voluntary option in a diverse portfolio of attractive products is a customer-centric approach to rate design. The Direct Testimony of Kim Winslow further discusses how subscription pricing fits into the suite of rate choices included in Evergy's Rate Modernization Plan.

Q. Is subscription pricing consistent with the utility industry's and Evergy's clean energy goals?

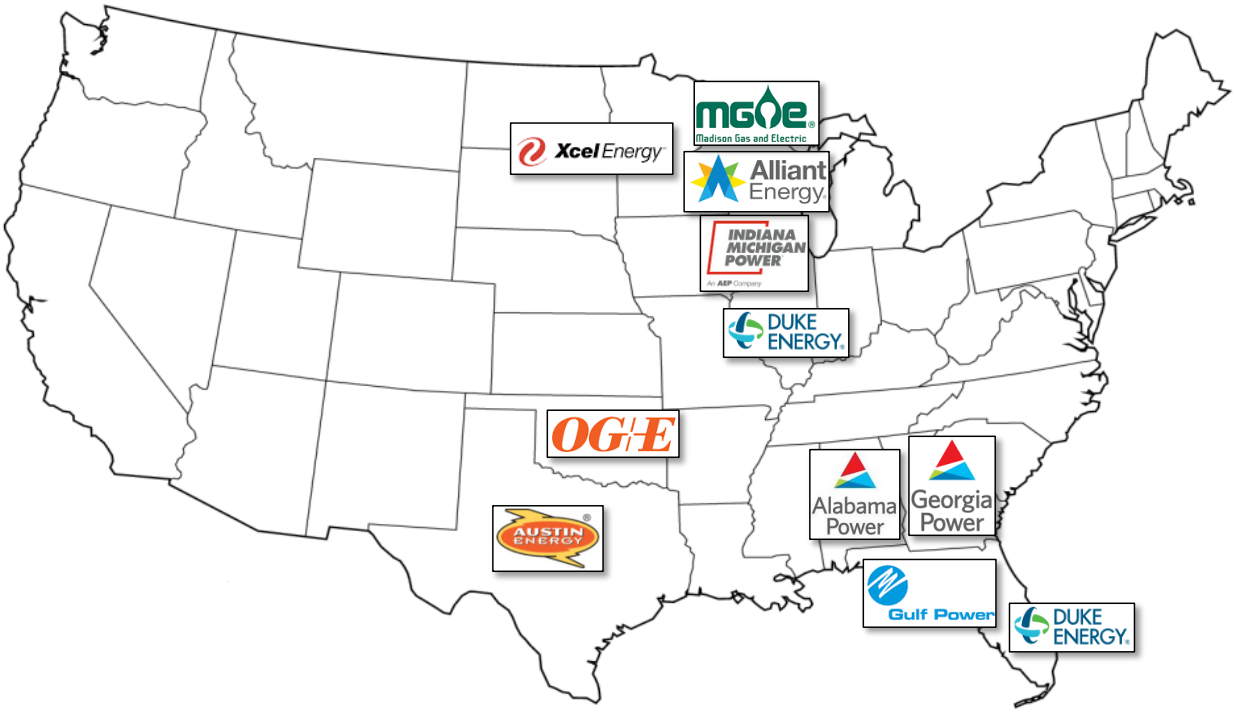
A. Yes, subscription pricing can be consistent with goals to decarbonize the power sector and improve efficiency and flexibility in grid operations. Subscription pricing can facilitate achievement of these goals by packaging the fixed bill offer with other customer offers, such as energy efficiency and demand response incentives, green pricing offers, or EV charging services. The attractiveness of the fixed bill can be used to draw customers to these other beneficial offerings. This concept of coupling fixed bills with other offers is receiving increasing industry attention and was most recently explored in a paper that I co-authored, titled "Fixed Bill Plus: Making Rate Design Innovation Work for Consumers, Electricity Providers, and the Environment."[1]

[1] Peter Fox-Penner, Ryan Hledik, and Andy Lubershane, "Fixed Bill Plus: Making Rate Design Innovation Work for Consumers, Electricity Providers, and the Environment," Working Paper, June 2020. See: https://brattlefiles.blob.core.windows.net/files/19251_fixedbill_working_paper_brattle_june_2020.pdf.

Q. Do any utilities currently offer subscription pricing?

A. Yes. In the U.S., I am aware of 11 electric utilities that offer subscription pricing on a full-scale or pilot basis.[2] Figure 1 and **Schedule RH-2** summarize these subscription pricing offers. Several competitive electricity retailers offer subscription pricing as well.[3]

FIGURE 1: ELECTRICITY SUBSCRIPTION PRICING OFFERINGS IN THE U.S.



Q. Do any of the utility subscription pricing offers include features that facilitate achievement of clean energy goals?

A. Yes. While standard fixed bills have been offered for decades in some cases[4], recently I have observed a number of utilities that have begun to test the concept of coupling fixed bills with other services that will advance progress toward clean energy goals:

[2] In these instances, "flat bill" is a common term used to refer to the rate design construct.
[3] For example, in Texas, Real Simple Energy (https://intercom.help/real-simple-energy/en/articles/3504686-how-does-fixed-bill-work) and Reliant (https://www.reliant.com/en/public/predictable-bill-plan.jsp) both offer fixed bill options.
[4] For example, Georgia Power introduced its FlatBill offer in 2000.

- Duke Energy: In its Florida service territory, Duke Energy recently received approval to pilot the inclusion of demand response in its subscription pricing offer.[5] Subscription pricing participants with an eligible smart thermostat will receive a gift card in return for allowing the utility to manage the thermostat year-round (subject to limitations) to reduce system costs.
- Xcel Energy: In its Minnesota service territory, Xcel Energy offers an EV subscription charging pilot rate. For a fixed monthly fee, participants lease a home charger and can charge their EV at no additional cost between the hours of 9 pm and 9 am on weekdays, or all day on weekends and holidays.[6] Participants also have the option to combine the offer with participation in Xcel Energy's Windsource program and match their expected EV charging load with clean energy.
- Austin Energy: Similar to Xcel Energy, Austin Energy offers a fixed fee for unlimited off-peak home charging. The fee also includes access to designated charging stations around the city.[7]
- Madison Gas & Electric ("MGE"): MGE offers a fixed bill which includes an adder that matches the customer's usage with clean energy from MGE-owned wind and solar projects.[8]
- AES Indiana: AES Indiana has proposed to pilot subscription pricing bundled with a clean energy offer.[9]

[5] Florida PSC Docket No. 20200222-El. http://www.psc.state.fl.us/library/filings/2021/01449-2021/01449-2021.pdf.
[6] Xcel Energy tariff. See Section No. 5, Sheet No. 8.1-8.3: https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Me_Section_5.pdf.
[7] Austin Energy Tariff, pages 34-35. https://austinenergy.com/wcm/connect/bca7e254-aaf2-4f4c-ae38-070288f4e94e/Residential-PilotPrograms.pdf?MOD=AJPERES&CVID=nPpTRi7.
[8] MGE Tariff, Sheet E-3.6 Schedule RFB-1. https://www.mge.com/MGE/media/Library/pdfs-documents/rates-electric/electric-rates.pdf#page=22.
[9] Uplight press release: https://uplight.com/press/uplight-launches-plus-empowering-utility-customers-to-participate-in-the-clean-energy-transition-with-personalized-subscription-energy-bundles/.

Q. Are customers interested in the subscription pricing plans?

A. Yes, utilities have achieved significant levels of enrollment in their subscription pricing offers. For example, over 330,000 of Georgia Power's 2.3 million residential customers (14%) have enrolled in its FlatBill offer.[10] OGE has roughly 58,000 of its 680,000 residential customers (9%) on its Guaranteed Flat Bill tariff.[11] Xcel Energy's EV charging subscription pilot is closed to new customers due to reaching its enrollment cap of 150 participants.[12]

Q. Is subscription pricing different than budget billing?

A. Yes, subscription pricing is different than budget billing. With budget billing, customers are still charged based on their applicable volumetric rate. Budget billing participants must pay a true-up at the end of the year to reconcile their estimated bills with their actual usage, exposing them to any bill changes attributable to fluctuations in costs, usage, or other factors. With subscription pricing, there are no true-ups and no surprises.

As an indicator that subscription pricing and budget billing are distinctly different customer offerings, all eight utilities that I am aware of that offer subscription pricing on a full scale basis also offer budget billing as a separate product. It is my understanding that Evergy also has budget billing product known as "Average Payment Plan".

Section III: Overview of Evergy's Subscription Pricing Pilot Proposal

Q. Please provide an overview of Evergy's subscription pricing pilot proposal.

A. Evergy's subscription pricing pilot proposal would provide each participating customer with a monthly fixed bill that applies for a 12-month term. The fixed bill is based on each

[10] Georgia Power FERC Form 1 2020 Schedule Sales of Electricity by Rate Scedules, page 304.
[11] Oklahoma Gas and Electric Company FERC Form 1 2020 Schedule Sales of Electricity by Rate Scedules, page 304.
[12] Xcel Energy Tariff: https://ev.xcelenergy.com/subscription-pilot-mn/, accessed 11/30/2021.

individual participant's expected usage under normal weather conditions. To encourage efficient electricity consumption, if the participant's weather-normalized usage does not increase during the 12-month term, they are provided an incentive payment ("efficiency incentive") at the end of the 12-month term. The subscription pricing offering also includes two optional "add-ons", which I discuss later in my testimony.

Q. What is the importance of the efficiency incentive?

A. Including the efficiency incentive allows Evergy to introduce a subscription pricing product that is consistent with the state's energy efficiency goals. The efficiency incentive is a unique and innovative feature which, as far as I am aware, does not yet exist in subscription pricing offers in any other jurisdiction.

The design of the efficiency incentive is attractive from a customer satisfaction standpoint because it is a risk-free opportunity. The incentive rewards customers if they are able to limit their usage, without penalizing them if they fail to do so. In this sense, the efficiency incentive is consistent with subscription pricing's central theme of containing no hidden charges or surprises.

Further, I believe the design of the efficiency incentive will be both understandable and actionable from the customer's standpoint. The simple message to the customer is that continuing to consume energy at least as efficiently as they have in the past will position them to earn the incentive.

Additionally, the design of the efficiency incentive means that it can be earned by any participant. It does not require investment in new technology, home ownership, or other factors that may limit customers from participating in other programs.

Q. Will Evergy's subscription pricing offer include any additional options for customers?

A. Yes, Evergy's proposal includes two optional "add-ons" to the base offer that would further improve subscription pricing's contributions to energy efficiency and clean energy objectives. The first add-on provides participants with a smart thermostat to improve energy efficiency and establish a platform for future demand response offerings. The second add on provides participants with assurance that 100% of their expected electricity consumption is matched with renewable energy credits ("RECs").

Q. Please describe the Smart Thermostat Add-on.

A. With the Smart Thermostat Add-on, participants will have the opportunity to include the purchase of a smart thermostat in their monthly subscription pricing fee. Evergy will provide the smart thermostat to the customer at cost. The cost of the thermostat will be divided by 12 months, and the customer's monthly fixed bill offer will be increased by that amount if they select this add-on.

The Smart Thermostat Add-on provides several benefits:

- Energy savings: Smart thermostats have been shown to reduce overall energy use.[13] This will improve participants' ability to earn the efficiency incentive and will reduce energy consumption impacts of subscription pricing overall.
- Improved service: Participants will benefit from a range of non-energy benefits smart thermostats provide, such as remote control and easy programming.

[13] Nest Labs, "Energy Savings from the Nest Learning Thermostat: Energy Bill Analysis Results," Nest Labs White Paper, February 2015. https://storage.googleapis.com/nest-public-downloads/press/documents/energy-savings-white-paper.pdf.

- Enabling advanced future customer offerings: In future enhancements to the design of the subscription pricing plan, customers with smart thermostats could be offered a reduced fixed bill for allowing Evergy to manage their energy use in a way that reduces the cost of serving them.

Q. Please describe the Clean Energy Add-on.

A. With the Clean Energy Add-on, participants will have the option to pay a premium for assurance that 100 percent of their usage is matched with RECs. When customers accept this offer, their fixed bill will include an adder based on their average expected monthly usage multiplied by the total Renewable Energy Charge in the Green Pricing REC Program Rider.[14] As such, the Clean Energy Add-on is effectively a channel for increasing enrollment in the Green Pricing REC Program.

The Clean Energy Add-on benefits subscription pricing participants by providing them with a new opportunity to participate in the decarbonization transition. This offering is particularly relevant from an equity and inclusion standpoint, as it is an opportunity to reduce the carbon footprint for customers who are not eligible for rooftop solar and otherwise are not interested or unable to participate in Evergy's Solar Subscription program. By driving new participants to the Green Pricing REC Program, the Clean Energy Add-on will promote decarbonization of the regional power supply.

Q. At what scale will Evergy's subscription pricing plan be introduced?

A. Evergy is proposing to introduce subscription pricing on a pilot basis. Initially, enrollment will be limited to 20,000 participants. Introducing subscription pricing as a pilot initially

[14] Company witness Winslow further describes the proposed Green Pricing REC Program Rider in her testimony.

will provide Evergy and stakeholders with an opportunity to learn more about the impacts of subscription pricing before it is made available to all customers.

Q. Could other add-ons be introduced in the future?

A. Yes. I consider the scope of Evergy's proposed pilot to be innovative in the sense that it includes not only a new core fixed bill offer, but also a number of features that are designed to improve the environmental and energy efficiency outcomes of the pilot. This will serve as a useful platform for gaining experience with a variety of subscription pricing concepts. In the future, the subscription pricing framework could be expanded to further improve the benefits of the programs to customers and the power grid. Such additions within the fixed bill offer could include, for example, an add-on that is oriented toward improving load flexibility or an add-on that encourages efficient off-peak charging of EVs.

Section IV: Subscription Pricing Pilot Design Details

Q. How is the base fixed bill calculated?

A. To calculate the base fixed bill offer, Evergy first will determine each customer's expected usage under normal weather conditions. The Residential General Service rate then will be applied to calculate the customer's annual bill based on that expected weather normalized usage. The annual bill is divided by 12 months to arrive at a monthly fixed bill amount.

Q. Does offering subscription pricing result in increased financial risk to Evergy?

A. Yes. By fixing the revenue collected from participants for a 12-month term and decoupling that revenue from any unexpected changes in electricity consumption or costs, subscription pricing introduces the potential for Evergy to under-recover costs from participants in a given year.

Q. What are the sources of risk to Evergy when offering subscription pricing?

A. Subscription pricing introduces the following risks for Evergy:

- Behavioral/usage risk: This is the potential for increased usage when customers no longer face a price signal that is directly based on their kilowatt-hours of electricity consumption.
- Weather risk: A hot summer or cold winter could result in usage that is higher than the expected amount upon that the fixed bill calculation is based.
- Other usage variability risk: Usage could increase due to factors other than those described above, such as adoption of new electric loads (e.g., purchasing an additional television) or changes in lifestyle (e.g., a new long-term guest at the residence).
- Model risk: The fixed bill is calculated based on weather-normalized usage. Inaccuracy in the weather adjustment could result in an under-estimated fixed bill.
- Price risk: The fixed bill may be under-estimated due to not accounting for increases in fuel costs or other riders during the 12-month term.
- Self-selection bias: Customers who are attracted to subscription pricing may be inherently different than the class-representative customer sample used to analyze risks.

Q. How does Evergy propose to mitigate these risks?

A. Adders will be applied to the base fixed bill to mitigate the increased financial risks to Evergy shareholders and to recover program costs from participants. The customer's subscription pricing offer will include a behavioral usage adder, a risk premium adder, and a program cost adder. The behavioral usage adder is five percent, the risk premium adder is not-to-exceed 10 percent, and the program cost adder is up to $2.50 per month. These

values are stipulated in the tariff. The adders will be evaluated by Evergy on an ongoing basis.

Q. What is the behavioral usage adder?

A. Evergy's estimate of each customer's expected usage will include a five percent adder to the customer's weather-normalized historical usage (the "behavioral usage adder").[15] That five percent adjustment accounts for a potential increase in usage that may result from the change in rate design (i.e., no longer being billed on a volumetric rate that charges per kilowatt-hour of consumption). If the customer's weather-normalized usage does not increase, the behavioral usage adder will be paid back to the customer as the efficiency incentive. For an average-sized customer, the efficiency incentive would amount to around $70 per year.

Participants qualify for the efficiency incentive based on a comparison of their weather-normalized usage during the 12-month subscription pricing term to their historical weather-normalized usage. The comparison is made on a weather-normalized basis to ensure that customers have the opportunity to earn the incentive even when weather is hotter or colder than average.

Q. What is the risk premium adder?

A. The risk premium adder is incorporated as an increase in each customer's fixed bill amount, and it is the same on a percentage basis for all participants. It is proposed to not exceed ten percent.

The risk premium is determined by identifying the historical conditions under which annual revenue shortfall due to subscription pricing would be the largest relative to

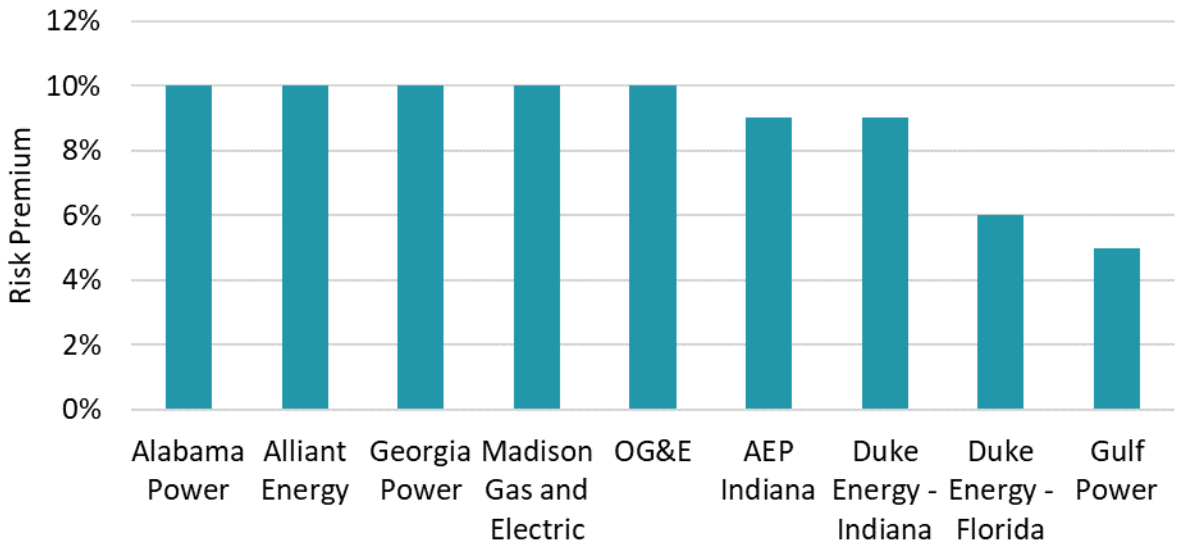
[15] The five percent behavior adder is in the middle of the range of similar adjustments that are incorporated in subscription pricing offers in other jurisdictions.

the standard rate, and then setting the risk premium to limit this single-year loss to a level that is acceptable to Evergy. This concept is referred to as managing the company's "value at risk".

Q. Do other utilities include a risk premium in their subscription pricing offerings?

A. Yes. Every full-scale utility subscription pricing offering that I am aware of includes a risk premium. The cap on the risk premium in these other utility offerings ranges from five to ten percent, with more than half of the utility offerings having a cap of ten percent. Figure 2 summarizes the risk premium cap in each utility tariff that I reviewed. Exhibit RH-2 includes links to the utility tariffs.

FIGURE 2: RISK PREMIUM CAPS IN SUBSCRIPTION PRICING OFFERINGS IN OTHER JURISDICTIONS



Q. You previously mentioned that participant usage will be adjusted for weather when designing the subscription pricing offer. How will this work?

A. Weather adjustments to customer usage will be based on Evergy's established class-level weather normalization methodology. Based on analysis of historical weather and usage data, the weather normalization methodology produces factors that can be used to remove the usage effects of temperatures that are hotter or colder than normal. These factors will

be applied when estimating the usage of all customers for the purposes of calculating the fixed bill offer as well as their eligibility for the efficiency incentive.

Q. Will Evergy's subscription pricing offer include an adder for program-related costs specific to participants?

A. Yes, the fixed bill offer will also include an adder (called the "program cost adder") designed to collect at least a portion of program costs from participants. Those program costs include measurement and verification ("M&V"), marketing, and general program administration and overhead. The purpose of the program cost adder is to limit the extent to which the rates of non-participants would be impacted by the introduction of subscription pricing.

The program cost adder will be set at a level that fully recovers program costs from participants once subscription pricing is available to all customers and participation has reached the anticipated steady state level. Initially, the program cost adder will be up to $2.50 per participant per month.

Q. Is it possible that a customer who enrolls in subscription pricing will pay more than they would under the standard rate?

A. Yes, it is possible (though not certain) that a subscription pricing participant would pay more under subscription pricing than they otherwise would have under the standard rate. For the reasons discussed above, participants in the subscription pricing pilot are shifting financial risk to Evergy by paying an entirely fixed bill. The subscription pricing pilot offering is designed to mitigate that financial risk, as well as to recover incremental program costs. For this reason, when marketing subscription pricing to customers, it is common practice for utilities to be clear that the offer is not designed to minimize the customer's bill. The voluntary and entirely transparent nature of the subscription pricing

offer ensures that participants are aware of the price that they will pay for electricity before they enroll. Substantial voluntary enrollment in subscription pricing offerings in other jurisdictions indicates that, among participants, the simplicity, transparency, and predictability benefits of subscription pricing outweigh this potential for a higher bill.

Q. Who will be eligible for subscription pricing?

A. To be eligible for participation in the subscription pricing pilot, customers must be in good financial standing with Evergy. Subscription pricing will not be available to customers that receive service under Evergy's Net Energy Metering tariff, or have multiple meters on one account. For the purposes of the subscription pricing pilot, participants must have lived in their current residence for at least the previous 12 months and have at least 12 months of actual meter readings. Given the frequency of move-in/move-outs and new customers to its territory, Evergy is exploring ways to relax the requirement that customers have 12 months of usage history at the residence. This could be achieved by utilizing residence usage history from prior occupants, or using data analytics to predict the customer's usage based on factors other than historical usage. My understanding is that Evergy will seek Commission approval to revise eligibility requirements once a path forward on this issue has been determined.

Q. Will subscription pricing participants be allowed to drop out before the end of their 12-month term?

A. Yes. A participant who is unable to complete the 12-month term may be required to pay an additional amount. Specifically, the participant may be charged a $50 fee ("Removal Charge") to compensate Evergy for costs associated with leaving the program prior to the end of the 12-month participation period. The fee will be waived for participants who change locations within Evergy's service territories. Additionally, if the amount of

electricity the participant actually used would have resulted in a billing amount under the Residential Service tariff that is greater than the amount for which they have been billed under the subscription pricing pilot tariff, the participant must pay that difference (referred to as a "Reconciliation Fee"). Participants will not receive a refund or credit for amounts paid under the subscription pricing pilot tariff.

Based on my review of eight full-scale utility subscription pricing offers in other jurisdictions, three include a Removal Charge and all eight include a Reconciliation Fee.

Q. What happens at the end of the participant's 12-month term?

A. Near the end of the participant's 12-month term, Evergy's estimate of the customer's expected weather-normalized usage will be updated with their usage from the previous 12 months, and a new fixed bill offer will be calculated using the revised usage estimate, the applicable Residential General Service rate, and existing riders or other known charges. Participants will be notified of the new offer at least 45 days prior to the end of the 12-month contract period.

Participants' contracts will automatically renew for the following year at that new fixed bill amount, unless the new subscription pricing offer exceeds the prior subscription pricing charge by at least 15 percent, or if the customer notifies the Company otherwise. This 15 percent bill increase threshold for auto-renewal is designed to protect customers from significant unexpected bill increases under the auto-renewal policy.

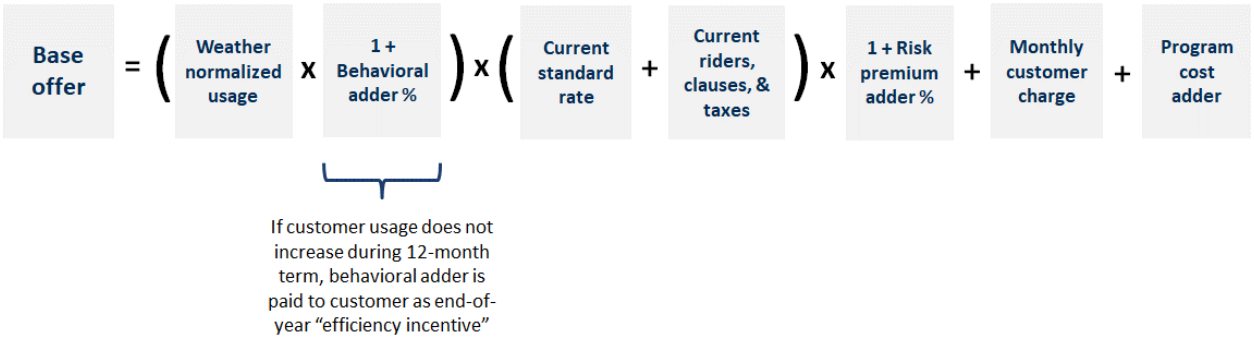
Q. How are riders and taxes treated in the fixed bill design?

A. All riders and clauses will be included in the fixed bill calculation, based on their levels at the time the fixed bill is being calculated. Taxes will also be included in the fixed bill offer if feasible, though Evergy is still determining whether or not that is possible.

Q. Please summarize how the subscription pricing design details discussed previously are combined into a customer offer.

A. Figure 3 illustrates how the previously discussed components of the subscription pricing design are combined into the simple offer that is ultimately presented to the customer. The proposed subscription pricing pilot tariff describes the calculations in further detail.

FIGURE 3: ILLUSTRATION OF SUBSCRIPTION PRICING BASE OFFER CALCULATION



Q. Given the complexity in designing the subscription pricing offer, can it be kept simple for customers?

A. Yes. Despite complexity in calculating the subscription pricing offer, it is still an extremely simple concept from the customer's standpoint. For instance, messaging to the customer could be as simple as the following:

> *Your subscription pricing offer is $130 per month. No hidden fees, no surprises. It's the same every month!*
>
> *Additionally, you are eligible for an incentive if you use the same or less than last year. If your annual usage* does not increase during the 12-month term, you will earn $70 at the end of the 12 months.*
>
> ** Your usage will be adjusted for weather effects. So you may still be able to earn the incentive even if the weather is hotter or colder than average.*

Section V: Subscription Pricing Implementation

Q. Are you familiar with how Evergy proposes to treat incremental changes in revenues and costs from subscription pricing relative to its standard rate?

A. Yes. My understanding is that any incremental changes in revenue relative to the standard rate will be treated "below-the-line", meaning the changes are a direct benefit or loss to Evergy's shareholders. The details of this approach are described further in the Direct Testimony of Bradley D. Lutz. Evergy is requesting a deferral for program costs. The details of this approach are described further in the Direct Testimony of Kimberly H. Winslow.

Q. Do other utilities treat incremental revenues and costs in this way?

A. I am aware of at least four utility jurisdictions with subscription pricing offers that account for incremental changes in revenue below-the-line: AEP Indiana, Duke Energy Indiana, Duke Energy Florida, and OG&E. Those four utilities also account for changes in costs below-the-line.

Q. Will subscription pricing increase rates for non-participants?

A. I expect any changes in rates to be negligible due to the introduction of subscription pricing. With the exception of the portion of administrative program-related costs that will be socialized during the pilot, Evergy's subscription pricing offer is designed to only affect the bills of participants. Accounting for increases or decreases in revenues below-the-line ensures that non-participants will not bear the effects of those revenue changes.

Q. You mentioned earlier that the subscription pricing offering initially will be deployed as a pilot. What is the objective of the pilot?

A. Evergy is initially deploying subscription pricing as a pilot in order to develop experience with this new customer offering at a limited, manageable scale. Evergy's goal is to use the

learnings from the pilot to determine whether to move forward with full-scale deployment. Aspects of the subscription pricing offering to be evaluated through the pilot will be established by Evergy in a formal pilot evaluation plan, but I would expect the evaluation to include metrics such as number of participants, pilot enrollment rates (including adoption of the add-ons), average participant size, usage impacts, revenue impacts, customer satisfaction, and pilot costs.

Q. What is the target size of the pilot?

A. The pilot will have a minimum target enrollment level of 3,500 participants. A minimum target enrollment level ensures that there will be enough pilot participants to draw statistically meaningful conclusions about the impacts of subscription pricing. This is the same level of participation that was targeted for Evergy's recent time-of-use ("TOU") pilot. Enrollment in the pilot will be capped at 20,000 participants in order to limit the scale of the offering until the key lessons from the pilot are understood by Evergy and stakeholders.

The experience of pilot participants will be evaluated relative to a matched control group. The control group can be created from the pool of non-participants and does not require their participation in the pilot, or any change to the nature of their electricity service.

Q. How will participants be recruited into the subscription pricing pilot?

A. Customer participation in the pilot will be entirely voluntary and on an opt-in basis. To reduce the potential impact of self-selection bias on the pilot results, Evergy will selectively market to and recruit customers to participate in the pilot, which will allow Evergy to enroll participants that are balanced across relevant, observable metrics (e.g., customer size, income).[16] For instance, through the pilot, Evergy will want to understand how satisfaction

[16] However, even with this selective recruiting approach, Evergy will not restrict participation from any customer if they are eligible and request enrollment.

with subscription pricing differs across participations with different income levels. With targeted recruitment, Evergy can ensure that each relevant income level is sufficiently represented in the pilot by specifically modifying the recruitment emphasis over time to focus on customers for which the desired level of participation has not yet been reached.

Q. What happens if Evergy does not meet the 3,500 minimum threshold?

A. My understanding is that Evergy plans to enroll customers on an ongoing basis as they accept the offer to participate in the pilot, rather than waiting to enroll all customers when the 3,500 participant threshold is reached. Thus, Evergy will conduct the pilot even if participation ultimately does not reach 3,500 participants. This approach will provide Evergy with useful implementation experience regardless of whether the quantitative impacts of the pilot are found to be statistically significant.

Section VI: Conclusion

Q. What do you conclude about Evergy's subscription pricing proposal?

A. Subscription pricing is an innovative, relatively new trend in residential rate design, and an exciting opportunity for Evergy's customers. It is a unique new rate choice that emphasizes simplicity, transparency, and predictability. I expect it to appeal to customers who want to remove the element of "surprise" from their electricity bill, and who benefit from its predictability for budgeting purposes.

I also believe that Evergy's subscription pricing offering can and should be a platform for facilitating achievement of the company's and state's energy goals. As currently designed, Evergy's proposal includes a number of features that will encourage energy efficient behavior, the adoption of smart energy technology, and investment in clean sources of power generation. In the future, subscription pricing can be expanded to include additional services such as load flexibility to reduce system costs and reliably integrate

renewable generation into the power system. Subscription pricing also could be a channel for facilitating the efficient charging of electric vehicles, promoting daily load shifting, or further enhancing energy efficiency investment.

Evergy's proposal is a low-risk and potentially high-reward opportunity for its customers. Its introduction as a pilot will allow for lessons learned from the initial experience with subscription pricing to be incorporated into a full-scale rollout. The transparent and opt-in nature of subscription pricing means that no participant will experience an unexpected bill increase. The design of Evergy's subscription pricing offering ensures that non-participants will remain virtually unaffected by its introduction.

Q. Does this conclude your Direct Testimony?

A. Yes, it does.

BEFORE THE PUBLIC SERVICE COMMISSION
OF THE STATE OF MISSOURI

In the Matter of Evergy Metro, Inc. d/b/a Evergy Missouri Metro's Request for Authority to Implement A General Rate Increase for Electric Service	))))	Case No. ER-2022-0129

AFFIDAVIT OF RYAN HLEDIK

STATE OF OREGON)
) **ss**
COUNTY OF Clackamas)

Ryan Hledik, being first duly sworn on his oath, states:

1. My name is Ryan Hledik and I am a Principal of The Brattle Group.

2. Attached hereto and made a part hereof for all purposes is my Direct Testimony on behalf of Evergy Missouri Metro consisting of Twenty-four (24) pages, having been prepared in written form for introduction into evidence in the above-captioned docket.

3. I have knowledge of the matters set forth therein. I hereby swear and affirm that my answers contained in the attached testimony to the questions therein propounded, including any attachments thereto, are true and accurate to the best of my knowledge, information and belief.

Ryan Hledik
Ryan Hledik

Subscribed and sworn before me this 5th day of January 2022.

Caitlyn Gardner
Notary Public

My commission expires: 04/08/2025

OFFICIAL STAMP
CAITLYN DIANN GARDNER
NOTARY PUBLIC - OREGON
COMMISSION NO. 1011025
MY COMMISSION EXPIRES APRIL 08, 2025

Schedule RH-1: Statement of Qualifications

Ryan Hledik is a principal of The Brattle Group specializing in regulatory and planning matters related to emerging energy technologies.

Mr. Hledik has consulted for more than 80 clients across 35 states and 9 countries. He has supported his clients in matters related to energy storage, load flexibility, distributed generation, electrification, retail tariff design, energy efficiency, and grid modernization.

Mr. Hledik's work has been cited in regulatory decisions establishing procurement targets for distributed energy resources, authorizing billions of dollars in smart metering investments, and approving the introduction of innovative rate designs. He is a recognized voice in debates on how to price electricity for customers with distributed generation. He co-authored Saudi Arabia's first Demand Side Management (DSM) plan, and the Federal Energy Regulatory Commission's landmark study, *A National Assessment of Demand Response Potential*.

Mr. Hledik has published 30 articles on electricity matters and has presented at industry events throughout the United States as well as in Brazil, Belgium, Canada, Germany, Poland, South Korea, Saudi Arabia, the United Kingdom, and Vietnam. His research on the "grid edge" has been cited by *Forbes, National Geographic, The New York Times* and *The Washington Post*, and in trade press such as *GreenTech Media*, *Utility Dive*, and *Vox*. He was named to *Public Utilities Fortnightly's* "Under Forty 2019" list of rising stars in the utility industry.

Mr. Hledik received his M.S. in Management Science and Engineering from Stanford University, where he concentrated in Energy Economics and Policy. He received his B.S. in Applied Science from the University of Pennsylvania, with minors in Economics and Mathematics. Prior to joining Brattle, Mr. Hledik was a research assistant with Stanford's Energy Modeling Forum and a research analyst with Charles River Associates.

AREAS OF EXPERTISE

- Innovative Retail Electricity Pricing
- Energy Storage
- Grid Modernization
- Demand Response and Energy Efficiency
- Electrification
- Wholesale Electricity Markets
- Model Development
- Energy Asset Valuation
- Mergers & Acquisitions

EXPERIENCE

Innovative Retail Electricity Pricing

For Lawrence Berkeley National Lab, contributed to a report on rate design for a power system with variable renewable energy resources. The report is intended to be filed with U.S. Congress.

For a large Midwestern utility, developed a proposal for a subscription pricing plan. The proposal included innovative features to promote energy efficiency and clean energy adoption.

For a large Midwestern utility, contributed to the development of the utility's rate modernization plan. The project involved developing and analyzing TOU rate design proposals.

For APS, conducted a review of the utility's online bill comparison tool. Results, summarizing Brattle's assessment of the accuracy of the tool, were filed with the Arizona Corporation Commission (ACC).

For a Western utility, benchmarked the utility's operating costs and services against a relevant sample of comparison utilities in order to identify areas of relative strength, as well as growth opportunities.

For a Midwestern utility, assessed the extent to which various distribution rate design options were cost reflective and aligned with the utility's underling cost of service.

For Abradee, the trade association for the Brazilian distribution utilities, developed two whitepapers. The first paper addressed international stakeholder perspectives on emerging distribution tariff designs. The second paper summarized opportunities and risks associated with new utility services.

For Vector, a distribution utility in New Zealand, evaluated the relative advantages and disadvantages of a variety of new distribution tariff designs that the utility was considering. Conducted analysis of customer bill impacts and estimated likely demand response from the new tariff offerings, in addition to establishing other rate evaluation metrics.

For NorthWestern Energy, provided regulatory support for the utility's proposal to create a new rate class for customers with distributed generation and to introduce three-part rates for those customers.

For Arizona Public Service, provided regulatory support and analysis in a proceeding to determine if the utility's commission-approved rate increase had been appropriately implemented.

For Westar Energy, supported the utility's proposal to create a separate rate class for residential customers with distributed generation, and to introduce a three-part rate for those customers.

For Idaho Power supported the utility's proposal to create a separate rate class for residential customers with distributed generation. Included an analysis of the extent to which behind-the-meter storage would impact the load shapes of customers with rooftop solar and reduce their energy exports to the grid.

For Commonwealth Edison, contributed to the development of a pilot that would test customer acceptance of a prepayment metering program. Work involved identifying pilot objectives, developing experimental design, and establishing appropriate sample size.

For Citizens Advice, the largest consumer organization in Great Britain, led a study on the value of time-varying rates. The study included detailed power system modeling to quantify the monetary value time-varying rates in terms of avoided system costs. The study also included primary and secondary market research to identify the features of time-varying rate offerings that are most appealing to customers. The final report has informed ongoing dialogue in Great Britain around how to best capture value from the nation's ongoing smart metering rollout.

For the U.S. Department of Energy (DOE), co-authored a whitepaper on methods for unbundling and pricing distribution services in an environment of high distributed energy resource (DER) market penetration. The report identified the various services that are provided by the utility to DER customers, the discrete services provided by DER customers to the utility, and various frameworks for packaging and pricing these services. The report included an assessment of the advantages and disadvantages of each pricing framework from the perspective of both the utility and its customers.

For a clean energy organization, developed a whitepaper on residential demand charges, their impact on low income customers, and the potential opportunities that they would create for behind-the-meter energy storage.

For the Edison Electric Institute (EEI), researched stakeholder perspectives on residential demand charges. Conducted interviews with nine consumer advocates to better understand their views on the advantages and disadvantages of demand charges relative to other rate design options. Findings were summarized in a *Public Utilities Fortnightly* article.

For Georgia Power, developed a model to simulate likely customer response to demand charges (i.e. load shifting and/or changes in overall consumption). The model assumptions are based on a review of price elasticity studies as well as three pricing pilots involving residential demand charges. Also surveyed recent utility experience with residential demand charges and established a list of "lessons learned" from this experience.

For Westar Energy, assessed the extent to which a new three-part rate (with a fixed charge, a demand charge, and a variable charge) would impact customer bills. Simulated the impact on

owners of distributed generation (DG) and assessed the extent to which rate increases associated with sales reductions due to DG adoption would be reduced by introducing the new rate. Estimated likely customer rate switching behavior that would result from the introduction of the new options and the impact that this would have on utility revenue.

Assisted a large Southwestern U.S. utility in establishing its vision for the ideal residential rate. Established key principles for ratemaking and evaluated a comprehensive range of rate designs against these principles, particularly as they relate to fairness and equity in an environment of rapidly growing solar PV adoption. Provided strategic recommendations for transitioning to the ideal rate design.

For a large Midwestern utility, assessed the bill impacts of a rollout of mandatory residential demand charges. The assessment included a particular focus on the impacts on low income customers using estimates of household-level income data obtained through a market data firm and validated with public data from the U.S. Census.

For Citizens Advice, led a study on distribution network tariff design. The report includes insights from interviews with industry stakeholders, a survey of tariff reform activity in other countries, and detailed modeling of the distribution of bill impacts from the new tariff designs for more than 14,000 British customers. The simulations account for likely consumer response to the tariffs.

For Xcel Energy, contributed to rebuttal testimony in support of the utility's proposal to eventually introduce three-part rates for residential customers. Addressed points in intervenor testimony regarding the efficacy of residential demand charges.

For a large Midwestern utility, simulated likely customer response to a three-part rate. Developed three different approaches to estimating the impacts. Results were provided in context of the utility's rates proceeding.

For Salt River Project (SRP), conducted an assessment of the utility's rate proposal for residential DG customers. The proposal was a mandatory, revenue neutral three-part rate with a tiered demand charge. Analysis culminated in the development of a whitepaper that was presented to SRP's Board. The rate proposal was approved by the Board.

Assisted PGE in the design of a dynamic pricing pilot. Providing pilot design and evaluation assistance to test a number of under-researched issues, such as the impact of behavioral DR and differences in customer response when rates are offered on an opt-in versus an opt-out basis.

For more than 15 utilities and other organizations across North America, designed dynamic pricing rates such as time-of-use (TOU), critical-peak pricing (CPP), peak-time rebates (PTR), and real-time pricing (RTP). Simulated the likely impact of the rates on utility load shapes and customer bills. Conducted cost-effectiveness analysis of offering these rates to the mass market. Recently,

these studies have been conducted in Arizona, California, Connecticut, the District of Columbia, Delaware, Florida, Hawaii, Idaho, Illinois, Kansas, Maryland, Michigan, Missouri, New Jersey, North Carolina, Oregon, and Pennsylvania. Several of the analyses served as input to AMI business cases. The analyses also included a review of other demand-side options such as direct load control and energy efficiency.

For the three California investor-owned utilities (IOUs), assessed the likely impact of residential rate reform on consumption. Analyzed the extent to which rate design changes (e.g., a reduction in the price differential between tiers of the inclining block rate, the introduction of a monthly customer charge, a reduction in the low income discount) would affect conservation. Drafted expert testimony that was submitted to the California Public Utilities Commission.

For a large southwestern utility, benchmarked the utility's projected retail rate against those of other utilities. Reviewed utility resource plans to estimate each utility's retail rate trajectory. Compared the utilities across a variety of rate drivers, such as reserve margin, fuel mix, load growth, load factor, renewables investment requirements, and demand-side activities. Provided strategic recommendations for addressing these drivers of future rate growth.

For PacifiCorp, assessed the likely impacts of new rate designs on customer behavior. Projected likely adoption of the new rate offerings based on a survey of enrollment rates in other jurisdictions. Extrapolated the customer-level impacts to system-level impacts. Analysis was a key element of the utility's DSM potential study.

For a large Western utility, evaluated the degree to which the introductions of new optional residential rate options would affect the utility's revenue. Developed a model to simulate customer switching behavior between the rate options. Provide strategic advice for transitioning from the current rate offering to a new paradigm of rate choice.

For the Regulatory Assistance Project (RAP), co-authored a whitepaper on issues and emerging best practices in dynamic pricing rate design and deployment. The paper's audience was international regulators and rate analysts in regions that are exploring the potential benefits of AMI and innovative retail pricing.

For multiple U.S. utilities, helped design pilot programs for testing the impact of dynamic pricing rates and enabling technologies such as smart thermostats and in-home energy information displays. Contributions to pilot design included designing and selecting the appropriate treatments and providing general recommendations for ensuring the statistical validity of the results.

For China Light & Power, provided guidance on dynamic pricing pilot design. Also evaluated the utility's methodology for calculating customer baseline consumption when determining rebate payments for a Peak Time Rebate program.

For the Ontario Energy Board (OEB), developed recommendations for improving the effectiveness of the province's mandatory residential TOU rate. Co-authored a whitepaper benchmarking the rate's design and deployment against best practices, and provided suggestions for improving certain elements. Co-presented the findings at a stakeholder workshop in Ontario.

For Commonwealth Edison, contributed to the design of the first opt-out residential dynamic pricing pilot. Reviewed rate designs and simulated expected bill impacts across a representative sample of customers. Developed estimates of the potential value of an opt-out deployment of peak time rebates.

For the Demand Response Research Center (DRRC), co-authored a whitepaper on leading issues in rate design. Developed a set of dynamic rates that were used in a workshop to guide California decision makers through the process of designing dynamic rates. Results were cited in a landmark ruling making dynamic pricing the default rate offering in California.

For Xcel Energy, contributed to expert testimony supporting a filing proposing new inclining block rate (IBR) designs. The rates were designed to provide incentives for Xcel's customers to conserve energy. Developed a model for simulating customer response to the new rate designs and the resulting impact on Xcel's sales.

For a large North American utility, developed estimates of the likely impact of moving from an inclining block rate structure to a time-of-use rate structure. Simulated the impact on overall energy consumption and peak demand under a range of rate design and price elasticity scenarios.

For a large Southeastern utility, assessed the costs of the utility's green pricing program. Benchmarked the costs against those of similar programs offered by other utilities. Analyzed differences across programs and provided an assessment of the utility's costs, which was presented to the regulatory commission.

Load Flexibility, Demand Response, and Energy Efficiency

For the Alliance to Save Energy, developed the content for an interactive website designed to provide a variety of industry stakeholders with information about the value of load flexibility.

For a large Canadian utility, served as an advisor on the utility's load flexibility assumptions in its integrated resource plan.

For Oracle, assessed the potential for "consumer action pathways" to play a key role in reducing national carbon emissions. The customer action pathway consisted of energy efficiency, electrification, rooftop solar PV, and load flexibility.

For PGE, participated in a team developing the utility's 2021 DER potential study. The study informed PGE's integrated resource plan and distribution resource plan.

For a utility in the Upper Midwest, conducted a load flexibility study to inform the strategic development of the utility's demand-side resources.

For an east coast IOU, conducted analysis to forecast how the utility's load would increase if aggressive decarbonization goals are met through electrification, and to determine the extent to which energy efficiency and load flexibility measures could mitigate that load growth, highlighting the key role that load flexibility will play in facilitating the decarbonization transition.

For a DER software developer, estimated the potential market value of residential load flexibility offerings across five utilities. The analysis highlighted that the load flexibility value proposition varies significantly depending on system and market conditions. The final report is a key input to the company's load flexibility business case. Subsequent work involved conducting a workshop for the company's staff on valuing load flexibility.

For an investment firm considering an investment in a demand response aggregator, provided an outlook on DR market opportunities and an overview of the current state of DR in the U.S.

For the U.S. Department of Energy, developed a national roadmap for grid-interactive efficient buildings (GEBs). The engagement involved modeling the national potential for GEBs, as well as research and stakeholder engagement to identify barriers to GEB deployment, as well as opportunities for overcoming the barriers. The release of the Roadmap was announced by the Secretary of Energy in May 2021.

For the U.S. Department of Energy, led a study to assess the relative benefits of energy efficiency and load flexibility technologies for buildings under a variety of decarbonization scenarios.

For Lawrence Berkeley National Lab (LBNL), led a study to assess the extent to which various policy and technology developments could increase cost-effective energy efficiency deployment potential. The study involves simulation of a representative Southeastern U.S. utility using Brattle's resource planning model, GridSIM.

For an Asian utility deploying its first demand response programs, provided research on current practices by utilities and third party aggregators with DR offerings in ISO and non-ISO markets. The research was used as input to the utility's DR strategy development initiative.

For a natural gas distribution utility, leading a study to assess the market potential for demand response programs. The first-of-its-kind study assesses opportunities to utilize demand response as an alternative to developing gas distribution infrastructure. The study will serve as input to the utility's resource planning process.

For Xcel Energy, led a study to assess opportunities for load flexibility in its Northern States Power service territory. The study looked beyond conventional DR options to evaluate the potential for emerging programs (e.g., EV charging control, behavioral DR) while considering new value streams (e.g. ancillary services, off-peak load building, around-the-clock load flexibility). The study utilized Brattle's LoadFlex model and is based on a detailed survey of DR programs and pilot projects deployed around the U.S. The study was filed with the Minnesota PUC and results were be used as inputs to Xcel Energy's integrated resource plan in the Upper Midwest

For EPRI, conducted a study to explore methods for incorporating DERs into integrated resource planning. A unique feature of this study was the use of Brattle's capacity expansion model, Grid SIM, to quantitatively illustrate the implications of various DER modeling techniques. In the first phases of the engagement, we assessed the implications of different approaches to modeling energy efficiency (EE) and demand response (DR), such as the advantages and disadvantages of modeling these resources on the "supply side" versus the "demand side" of the model. The current phase of the project focuses on electric vehicles (EVs) and rooftop solar, and includes a review of techniques for forecasting adoption of these technologies, as well as modeling the resource impacts of growth in EV adoption.

For Xcel Energy, conducted a first-of-its-kind study to assess the extent to which "organic conservation" (also known as naturally occurring energy efficiency) was affecting electricity sales. Surveyed industry contacts about trends in organic conservation. Conducted a quantitative assessment of the impact of organic conservation for three end-use case studies using data from the U.S. Energy Information Administration and Xcel Energy.

Contributed to a study for the Texas Clean Energy Coalition to determine role of demand response, energy efficiency, and combined heat and power in future energy scenarios in Texas. Developed a feasible portfolio of EE and DR measures, including costs and performance characteristics. The programs were then fed into a suite of resource planning models to determine the impacts of EE and DR on ERCOT prices and system operations. The final report was highly publicized and presented to stakeholders and policymakers throughout the state.

For EnerNOC, developed a whitepaper on valuing DR in international markets. Provided guidelines for quantifying the value of DR and presented three international case studies to illustrate how those calculations vary across markets.

For a large power developer, assessed the energy efficiency aspects of the U.S. Environmental Protection Agency's (EPA's) Clean Air Act, section 111(d). Specifically, analyzed the extent to which the energy efficiency targets that were established in the proposed policy were reasonable and achievable, and whether the EPA had represented energy efficiency correctly in its modeling scenarios.

For the Kingdom of Saudi Arabia's energy regulator (ECRA), worked with a team of consultants to develop the nation's first demand-side management (DSM) plan. Participated in an introductory workshop with key stakeholders and conducted a series of in-country interviews to gather more detailed information. Co-authored an extensive study on the potential impacts and cost-effectiveness of a full range of DSM measures in Saudi Arabia. Worked with the team to develop policy recommendations and a ten-year plan for rolling out DSM measures across the country.

For a national team of energy stakeholders in the Kingdom of Saudi Arabia, assessed the potential for broader adoption of combined heat and power (CHP). Developed a model to predict CHP potential by industry and technology type for a range of policy scenarios. Assessed barriers to adoption.

For the Federal Energy Regulatory Commission (FERC), managed a team of contractors that developed the National Action Plan for Demand Response. The report defined a blueprint for maximizing the amount of cost-effective demand response (DR) that can be achieved in the United States. Led the development of a model that can be used to quantify the potential impacts and benefits of a variety of demand response and smart grid portfolios. Results were filed with U.S. Congress in June 2010.

For FERC, developed a state-by-state assessment of the potential for DR. The analysis used a bottom-up approach to quantify economic and achievable potentials individually for each of the 50 states, and to characterize the existing level of DR in each state. Additionally, the work involved a comprehensive survey and analysis of existing literature on DR barriers at the wholesale and retail levels, as well as policy options for addressing these barriers. Results were filed with U.S. Congress in June 2009 in a report titled A National Assessment of Demand Response Potential. Co-authored the document and managed its development across a team of subcontractors.

For the California Energy Commission (CEC), co-authored two whitepapers on demand response and the potential for the CEC to exercise its load management authority to further increase demand response efforts in the state. The whitepapers were the impetus for two CEC-sponsored workshops involving the California utilities, regulators, consumer advocates, and other stakeholders. The whitepapers contributed to the CEC's 2007 Integrated Energy Policy Report and have resulted in a formal proceeding on the CEC's load management authority.

For one of California's investor-owned utilities, developed recommendations for a forward-looking demand response strategy. Conducted a series of interviews with internal stakeholders and helped to lead two workshops to create a common understanding across the company regarding the value proposition of demand response, and ways in which it can be used to address key challenges facing the utility.

Lead architect of the Demand Response Impact and Value Estimation (DRIVE) model for assessing the hourly system impacts of portfolios of smart grid programs over a 20-year forecast horizon. The model simulates hourly system dispatch for 13 regions of the United States, both before and after a user-specified deployment of smart grid programs. The model is available on the FERC website.

For Lawrence Berkeley National Laboratory (LBNL), updated the assumptions in FERC's 2009 A National Assessment of Demand Response Potential to reflect more recent industry developments. The results of that update were used as inputs to the Western Electricity Coordinating Council's (WECC's) transmission planning activities.

For Portland General Electric, developed a bottom-up assessment of the peak demand reductions that could be achieved through and expanded offering of DR programs. Tailored the analysis to the specific market conditions that are unique to the Pacific Northwest and PGE's service territory. Reviewed studies on the ability of DR to integrate renewable energy resources into the grid. The study was first conducted in 2009 and then updated in 2012 and again in 2015. The 2015 update included a number of emerging DR options, such as bring-your-own-thermostat, behavioral DR, electric vehicle load control, and smart water heating programs.

For Xcel Energy's Colorado and Minnesota service territories, conducted a bottom-up assessment of the potential impacts of DR programs. In Colorado, the study included an assessment of the cost-effectiveness of the DR options and results were filed with the Colorado PUC. In Minnesota, the study included the development of DR supply curves, which are inputs to Xcel Energy's integrated resource planning process.

For the Midwest Independent System Operator (MISO), Bonneville Power Administration (BPA), and one of the largest power generation companies in the U.S., developed regional forecasts of the potential impacts of demand response and energy efficiency programs. Forecasts included a bottom-up assessment of existing demand response programs and a detailed projection of the achievable potential peak savings for each of these programs. The studies also included an assessment of the costs associated with the peak savings. The forecasts were used as inputs to the ISO's full-scale transmission expansion modeling effort and to enhance the market modeling efforts of BPA and the power generation company.

For a large southern utility, assessed policies, standards, and rules/regulations addressing the development and implementation of energy efficiency programs and renewable energy resources by utilities. Analysis included an assessment of the pros and cons of various energy efficiency incentive mechanisms such as the Save-a-Watt model and California's shared savings model. Assessed the political influence and collaboration potential of the utility's stakeholders as part of the strategy formulation process.

For a large Independent System Operator (ISO), co-authored a whitepaper assessing the status of the region's achievement of its demand response potential. The paper included an assessment of the barriers to achieving the demand response potential, followed by policy and market design recommendations for addressing the barriers. The results were presented at the ISO's annual board meeting.

For a large ISO, co-authored a whitepaper summarizing the current state of third party access to smart meter data. The paper reviewed existing policies in states that have already explored this issue, and drew parallels to other industries that have dealt with similar problems.

For Comverge, developed an estimate of the potential benefits of offering an expanded residential direct load control program in the ComEd service territory. The assessment included quantification of avoided resource costs and a qualitative description of additional potential benefits, such as improved reliability and emissions reductions.

Energy Storage

For a large Southeastern utility, conducted an assessment of two proposed battery projects. The study included identification and analysis of additional value streams not considered by the utility, and analysis of battery cycling strategies to optimize revenue while accounting for degradation effects.

For a large international energy company, evaluated the revenue potential of an investment in three U.S. battery storage developers. The company ultimately made large investments in two of the three companies.

For a large U.S. renewables developer, assisted the company in its entry into the utility-scale storage business by evaluating storage and solar+storage revenue potential in various organized wholesale markets in the U.S.

For a large Southeastern utility, led a study to assess long-term opportunities for deploying storage to meet a large legislative requirement. The study focused on opportunities for emerging long-duration storage technologies.

For Arevia, the developer of a large solar-plus-storage project in Nevada, provided regulatory testimony on the costs and benefits of the proposed project. The project, which was the largest solar-plus-storage project in the United States, was approved by the Public Utilities Commission of Nevada in December 2019.

Served on the Energy Storage Association's Technical Advisory Council. Responsibilities included technical advice, providing input to the organization's research agenda, and developing whitepapers on emerging issues in the storage industry.

For the ESA, organized and led a two-day seminar on emerging industry practices for incorporating energy storage into utility resource planning. Developed content and program, focused on issues such as storage costs and benefits, modeling and valuation techniques, the current state of energy storage in utility IRPs, and the interface between bulk system and distribution resource planning.

For Public Service Company of New Mexico (PNM), led analysis of the value that new energy storage developments could provide to the utility's system. The analysis focused specifically on the benefits of standalone, utility-scale battery storage deployments. Results were summarized in a report titled, "The Value of Energy Storage to the PNM System," which was attached to a regulatory filing by PNM in June 2019.

For the Public Utilities Commission of Nevada and the Nevada Governor's Office of Energy, led a study to estimate the statewide potential for cost-effective energy storage deployment. The analysis involved detailed modeling of the Western U.S. power system and included an assessment of both utility scale and behind-the-meter storage. Results were published in a report titled, "The Economic Potential for Energy Storage in Nevada." The study has contributed to a regulatory proceeding to establish an energy storage procurement target for the state.

For Dominion Energy, provided and assessment of the opportunities available for deploying energy storage pilots. The analysis began with a screening analysis to identify most attractive pilot options based on net economic benefits as well as other practical considerations such as implementation time, technical feasibility, consistency with state policies, and repeatability. Based on the findings of the screening analysis, a detailed assessment of specific solar-plus-storage and standalone storage projects estimated the benefits and costs of each project under a range of market price scenarios, technology configurations, and operational strategies. The proposed pilots were approved by the Virginia State Corporation Commission (SCC).

For a large solar and storage developer, provided due diligence support for a potential investment in a solar-plus-storage facility in California. The analysis estimated revenue potential for the project under a range of price forecasts, technology configurations, and battery dispatch scenarios.

For an international investor in power assets, analyzed the revenue opportunities and risks for standalone storage projects in California, Ontario (Canada), and New York. In addition to detailed revenue forecasts, the analysis included a review of wholesale market participation opportunities, state policies and incentives, and trends in market fundamentals.

For an energy storage developer, provided an outlook of revenue opportunities in Ontario, Canada. The analysis included an assessment of near-term revenue potential and commentary on the likely impact of regulatory and market developments on that potential.

For a large Midwestern utility, contributed to the development of a model that forecasts behind-the-meter storage adoption and its impact on utility revenues and costs, electricity rates, system peak demand, and other key metrics.

For a battery technology manufacturer, reviewed the impacts that PJM rule changes for participation in the frequency regulation market had on the battery's performance.

For EOS, a battery storage developer, assessed the "stacked value" of a battery in the California market. The valuation included a detailed assessment of market prices and was based on realistic modeling of the battery's ability to simultaneously capture multiple value streams. The study also included an assessment of barriers to capturing this value, and recommendations regarding retail tariff design features that could address the barriers.

For an environmental advocacy group (NRDC) and consortium of utilities (NRECA), estimated the costs and benefits of using controllable hot water heaters as "thermal batteries." Evaluated several control strategies, including daily energy arbitrage, peak shaving, and fast-response controllers capable of providing ancillary services. The study was covered by the *Washington Post* and in industry trade press.

For a battery manufacturer, assessed the potential benefits that could be realized by deploying their technology in PJM and NYISO. Developed a dispatch model to simulate the technology's optimal operation in wholesale energy and ancillary services markets. Also quantified the value of avoided generation capacity and transmission and distribution capacity costs, as well as the reliability value if deploying the battery behind the meter. Assessed the ability of various stakeholders (ratepayers, utilities, third parties) to capture the value.

Grid Modernization

For Enchanted Rock, a developer of microgrids, assessed the economic, resilience, and GHG impacts of a variety of microgrid options, including natural gas, renewable natural gas, and solar-plus-storage, as well as "hybrid" microgrids that combine these options.

For Entergy, provided regulatory support for the company's proposal to roll out smart meters. Support included analysis of the energy efficiency and demand response benefits that would be enabled by the rollout.

For a large British energy supplier, conducted an assessment of the national smart metering program. Identified risks that have emerged since the program's inception. Developed recommendations for plausible paths forward to mitigate the risks and increase the likelihood of the program's success. Research involved a detailed review of the BEIS smart metering Impact Assessment (IA), including modifications to the IA based on alternative future smart metering adoption and TOU uptake scenarios.

For the U.S. Department of Energy, served as a member of a Technical Advisory Group to review the activities of recipients of federal stimulus funding for consumer behavior studies. Reviewed smart grid pilot designs and provided guidance to improve their likelihood of success. Participated in regular meetings with the utilities on behalf of the U.S. DOE to monitor progress.

Lead architect of Brattle's *iGrid* model for assessing the costs and benefits of smart grid deployment strategies over a long-term (*e.g.,* 50-year) forecast horizon. The model was used to evaluate seven distinct smart grid programs and technologies (*e.g.,* dynamic pricing, energy storage, plug-in hybrid electric vehicles) against seven key metrics of value (*e.g.,* avoided resource costs, improved reliability).

Supported an expert witness in litigation regarding a contractual dispute between two smart grid companies. Assessed the likely market size for a new smart grid product using top-down and bottom-up modeling approaches. Drafted expert testimony.

For the five Vietnamese distribution utilities, developed a 10-year roadmap for smart grid deployment across the country. The project began with a series of in-country stakeholder interviews and an initial assessment of the state of the Vietnamese grid. This information was used to develop preliminary recommendations for smart grid investment, which was presented and discussed during a one-day workshop with industry stakeholders. Feedback was incorporated into a final report titled *Vietnam's 10-year Smart Grid Roadmap*. The project was funded by the World Bank.

For a firm investing in emerging energy technologies, developed an overview of key smart grid market developments. Topics included new non-traditional entrants to the utilities space, factors driving the decline in utility sales growth, and emerging regulatory constructs that could lead to new investment opportunities.

For Pepco Holdings, established a universal list of metrics through which to track the impact of their smart grid rollout. Reviewed existing metric reporting requirements and proposed additional metrics that would be useful to report in future regulatory proceedings.

For a smart grid technology startup, provided strategic advice on how to design a smart grid pilot that would best demonstrate the value of their products. Authored a whitepaper summarizing key recommendations and assisted the company in effectively articulating the full value proposition of their integrated approach to home energy management.

For Oak Ridge National Lab (ORNL) and the Electric Power Research Institute (EPRI), contributed to a report for evaluating the cost-effectiveness of smart grid investments. The report was published under the title *Methodological Approach for Estimating the Benefits and Costs of Smart Grid Demonstration Projects*.

For the Connecticut Department of Energy and Environmental Protection (DEEP), contributed to the state's annual Integrated Resource Plan (IRP). Developed a chapter on emerging technologies (such as AMI, energy storage, and advanced waste-to-energy) and their potential future role in the state's mix of energy resources.

Electrification

For Pepco, led the development of a study to analyze the peak demand impacts of achieving Washington, D.C.'s decarbonization goals through electrification. The study included analysis of a portfolio of advanced energy efficiency and load flexibility measures to mitigate peak demand growth, and concluded that the projected peak demand growth rates would remain within the historical range experienced by the utility.

With the Smart Electric Power Alliance (SEPA), co-authored a paper on time-varying rates for home electric vehicle (EV) charging. The report is based on a survey of current utility rate offerings and identifies practices that are related to high enrollment in the rates.

For the Electric Power Research Institute (EPRI), developed a survey and associated discrete choice modeling experiment to better understand drivers of EV adoption. The survey results were used to develop EV adoption models and resulting forecasts for several electric utilities.

For EEI, developed a whitepaper to assess options and experience with rate design for fast-charging infrastructure to support adoption of electric vehicles. The whitepaper, titled, "Facilitating Electric Vehicle Fast Charging Deployment," was published in October 2018.

For EPRI, developed a framework for evaluating the cost-effectiveness of new electrification initiatives. The framework, referred to as the Total Value Test, built upon cost-effectiveness tests used to evaluate demand-side management (DSM) programs. The report was published in August 2019.

Wholesale Electricity Markets

For a large Canadian utility, developed long-run projections of marginal energy and capacity prices under a variety of scenarios (which were defined by different assumptions about fuel prices, demand, carbon prices, etc.). To help explain trends in the prices, these forecasts were accompanied by scenario-specific detail about capacity additions and retirements, emissions, unit dispatch, and other outputs.

Developed energy and capacity price forecasts under a range of market conditions to assist a large investor-owned utility in developing a strategy related to the decision to potentially retire a nuclear generating facility.

Worked with an ISO to integrate demand response into its resource adequacy requirements. Reviewed existing utility demand response programs to identify those that would meet resource adequacy criteria. Developed a forecast of the potential for new demand response for the ISO's planning purposes.

For a large transmission company, contributed to analysis using Brattle's Regional Capacity Model (RECAP) model to assess the value that new transmission lines would have from the perspective of bringing more renewables into the power market. The model quantified the impact of an increased market penetration of wind generation on system costs.

For projects with multiple utilities, developed wholesale electricity price forecasts for regions across the United States using commercially licensed linear optimization models. Model forecasts were driven by assumptions about the outlook of fossil fuel prices and regional electricity demand levels, among other variables. Forecasts were developed using multiple data sources to create a range of price forecasts encompassing the varying assumptions established in the industry. Researched the inputs, set up and calibrated the model, and analyzed the resulting forecasts.

For power marketers in California during the Western Energy Crisis, analyzed historical hourly California electricity bid data to quantify the potential economic impacts of the bidding strategies on regional electricity markets. Analysis included bids into the ISO's day ahead and real-time energy markets and ancillary services markets, as well as the California PX markets.

Model Development

For the New York Department of Public Service (DPS), contributed to a model that will illustrate the impact of the state's Renewing the Energy Vision (REV) policy on utility financials. The analysis includes pricing structures for customers with distributed energy resources (DERs) as key inputs. The model can be used to assess the impacts of a range of DER market penetration scenarios on utilities, rates, and bills.

Lead developer of the Regional Capacity Model (RECAP), an optimization model for forecasting the mix of generating capacity necessary to meet U.S. electricity demand. The model closely calibrates to Annual Energy Outlook forecasts and was used in a whitepaper for the Edison Electric Institute to quantify the amount of generation and transmission capital investment that could be avoided through demand-side management.

Worked with a team to develop a linear optimization model for forecasting the economic impact of various emission control policies. The model has been used to provide strategic emissions compliance advice to large electric utilities and for forecasting generator-specific environmental decisions.

Created a tool for determining the optimal dispatch of energy storage technologies against given price series (energy and ancillary service markets), subject to the device's specific operating constraints. The tool was used to develop an economic valuation of a pumped storage plant in New England and to assess the potential value of a large scale battery for a technology manufacturer.

Developed a general equilibrium model for forecasting trends in international natural gas markets. The model was used in a study on the potential impacts of liquefied natural gas (LNG) adoption in the United States.

Participated as a Research Assistant with Stanford University's Energy Modeling Forum (EMF). Presented an overview of participating models for an EMF study on issues in international natural gas markets.

Energy Asset Valuation

For an infrastructure investment fund, provided due diligence support on potential fuel cell project investments in New York. Analysis included a forecast of potential project revenues and an assessment of regulatory risks facing the project.

For NRECA and NRDC, assessed the costs and benefits of rooftop versus community solar in the context of zero net energy building policy. The study considered different solar PV configurations and market scenarios.

For a foreign investor, assessed the likely future value of an investment in a new gas-fired combined cycle power plant in Western Pennsylvania. Projected gas, energy, and capacity prices under a range of plausible scenarios. Simulated the dispatch of the unit against these hourly price series to estimate potential earnings. Benchmarked the results against the performance of comparable units in the region.

For one of the largest electricity consumers in the United States, conducted due diligence on the potential purchase of a large gas-fired combined cycle plan. Determined how a purchase of the plant would affect the firm's energy portfolio. Used EPRI's Energy Book System (EBS) to estimate the plant's energy value given uncertainty in future electricity and fuel prices. Researched capacity and ancillary services markets to assess the plant's potential for providing additional value in those areas. Investigated California LMP studies to determine whether the plant would have a price advantage or disadvantage due to transmission constraints when California transitioned to the MRTU market structure. Supplemented the LMP analysis with independent forecasts of nodal market prices in California using a large scale production cost model. Analyzed the plant's historical operations using publicly available data to determine how it was dispatched against

market prices and to identify any additional synergistic benefits that might be achieved if the firm were to own the plant.

Mergers and Acquisitions

Conducted a detailed audit of the FERC merger filing between Duke Energy and Progress Energy, which created the largest regulated utility in the United States. Updated data in the market power assessment and estimated new Herfindahl-Hirschman Indices (HHI). Explored new mitigation strategies that would alleviate screen failures that arose from the update.

For several large electric utility mergers, aided electric utilities and their counsel in FERC regulatory filings. Performed analyses to measure the impacts on market concentration of proposed mergers between large electric utilities in the United States. Utilized a proprietary linear optimization model to calculate market shares before and after the mergers and suggested divestitures that would minimize the potential impacts of the mergers.

PUBLICATIONS

Articles

"Avoiding Blackouts in California Through Load Flexibility," with Ahmad Faruqui, *Utility Dive* Op-Ed, September 14, 2020.

"A New Paradigm for Utilities: Electrification of the Transportation and Heating Sectors," with Ahmad Faruqui, Jurgen Weiss, J. Michael Hagerty, and Long Lam, *American Bar Association's Energy Infrastructure, Siting and Reliability Newsletter*, November 13, 2019.

"Emerging Landscape of Residential Rates for EVs: Creative Design Ahead," with John Higham and Ahmad Faruqui, *Public Utilities Fortnightly*, May 2019.

"Two Paths for Advancing the Smart Metering Programme," *Utility Week*, December 2018.

"Status of Residential Time-of-Use Rates in the U.S.: Progress Comes Slowly," with Cody Warner and Ahmad Faruqui, *Public Utilities Fortnightly*, November 2018.

"Storage-Oriented Rate Design: Stacked Benefits or the Next Death Spiral?" with Jake Zahniser-Word and Jesse Cohen, *The Electricity Journal*, October 2018.

"Nothing Worth Having Comes Easy: Capturing the Stacked Benefits of Energy Storage," RTO Insider, December 19, 2017.

"The Electrification Accelerator: Understanding the Implications of Autonomous Vehicles for Electric Utilities," with Jurgen Weiss, Roger Lueken, Tony Lee, and Will Gorman, *The Electricity Journal*, December 2017.

"The Distributional Impacts of Demand Charges," with Gus Greenstein, *The Electricity Journal*, July 2016.

"Competing Perspectives on Demand Charges," with Ahmad Faruqui, *Public Utilities Fortnightly*, September 2016.

"Trends and Emerging Opportunities in Demand Response," with Lucas Bressan and Ahmad Faruqui, *Recursos Energeticos Distribuidos*, May 2016.

"Understanding the UK's Potential for Demand Response," with Jurgen Weiss and Serena Hesmondhalgh, *Utility Week*, December 12, 2015.

"The Emergence of Organic Conservation," with Ahmad Faruqui and Wade Davis, *The Electricity Journal*, June 2015.

"The Paradox of Inclining Block Rates," with Ahmad Faruqui and Wade Davis, *Public Utilities Fortnightly*, April 2015.

"Rediscovering Residential Demand Charges," *The Electricity Journal*, August/September 2014.

"Smart by Default," with Ahmad Faruqui and Neil Lessem, *Public Utilities Fortnightly*, August 2014.

"Analytical Frameworks to Incorporate Demand Response in Long-Term Resource Planning," with Andy Satchwell, *Utilities Policy*, March 2014.

"Benchmarking Your Rate Case," with Ahmad Faruqui, *Public Utilities Fortnightly*, July 2013.

"Drivers of Demand Response Adoption: Past, Present, and Future," with Kelly Smith, *Public Utilities Fortnightly*, January 2012.

"Smart Pricing, Smart Charging," with Ahmad Faruqui, Armando Levy, and Alan Madian, *Public Utilities Fortnightly*, October 2011.

"The Energy Efficiency Imperative," with Ahmad Faruqui, *Middle East Economic Survey*, September 2011.

"Unlocking the €53 Billion Savings from Smart Meters in the EU: how increasing the adoption of dynamic tariffs could make or break the EU's smart grid investment," with Ahmad Faruqui and Dan Harris, *Energy Policy*, October 2010.

"Rethinking Prices," with Ahmad Faruqui and Sanem Sergici, *Public Utilities Fortnightly*, January 2010.

"Fostering Economic Demand Response in the Midwest ISO," with Ahmad Faruqui, Attila Hajos, and Sam Newell, *Energy Journal,* Special Issue on Demand Response Resources, October 2009.

"Piloting the Smart Grid," with Ahmad Faruqui and Sanem Sergici, *The Electricity Journal*, August 2009.

"Smart Grid Strategy: Quantifying Benefits," with Ahmad Faruqui and Peter Fox-Penner, *Public Utilities Fortnightly*, July 2009.

"How Green is the Smart Grid?" *The Electricity Journal*, April 2009.

"The Power of Dynamic Pricing," with Ahmad Faruqui and John Tsoukalis, *The Electricity Journal*, April 2009.

"Transitioning to Dynamic Pricing," with Ahmad Faruqui, *Public Utilities Fortnightly*, March 2009.

"The Power of Five Percent," with Ahmad Faruqui, Samuel A. Newell, and Johannes P. Pfeifenberger. *The Electricity Journal*, October 2007.

Conference Presentations

"The Energy Future Is Smart: Grid-Interactive Efficient Buildings," panel at Los Angeles Better Buildings Challenge (LABBC) webinar, July 29, 2021.

"A National Roadmap for Grid-Interactive Efficient Buildings," presentation at Grid Forward's "Building the Decarbonized Grid" summit, June 9, 2021.

"Flexibility: The New Grid Zeitgeist," panel at Microgrid 2020 Global Conference, November 18, 2020.

"How Pricing is Playing a Greater Role in Grid Transitions," panel at Peak Load Management Alliance (PLMA) 2020 Fall Conference, November 10, 2020.

"The National Potential for Load Flexibility," Rocky Mountain Utility Exchange, Keynote Session, September 30, 2020.

"Load Flexibility: Yoga for the Power Grid," SEPA Virtual Grid Evolution Summit, August 12, 2020.

"The Potential for Load Flexibility," Washington Utilities and Transportation Commission Workshop on Demand Response Potential and Target Setting, June 8, 2020.

"The National Potential for Load Flexibility," 2020 ASHRAE Virtual Conference, June 5, 2020.

"Electric Vehicle Managed Charging: Considerations for an Emerging Opportunity," NARUC EV Working Group Meeting, April 28, 2020.

"The National Potential for Load Flexibility," panel at NARUC 2020 Winter Policy Summit, Washington, DC, February 20, 2020.

Participant, "Demand Flexibility and Control," panel at North America Smart Energy Week, Salt Lake City, Utah, September 24, 2019.

Participant, "Load Flexibility Potential in U.S. by 2030," PLMA Dialogue with Rich Barone, September 5, 2019.

Participant, "Transportation Electrification: Smart Strategies to Manage New Electric Vehicle Loads," panel at the SEPA Grid Evolution Summit, Washington, DC, July 29, 2019.

"The Potential for Load Flexibility in Northern States Power's Service Territory," Peak Load Management Alliance (PLMA) 2019 Spring Conference, Minneapolis, MN, May 14, 2019.

"Incorporating DERs into Resource Planning: Energy Efficiency," with Sanem Sergici and DL Oates, EPRI Winter 2019 Advisors Meeting, Tucson, Arizona, February 26, 2019.

"Determining Optimal Storage Deployment Levels: Insights from Nevada," with Roger Lueken, Energy Storage Association Webinar, December 11, 2018.

"Behind-the-Meter Storage: Stacked Benefits or the Next Death Spiral?" EEI Strategic Issues Roundtable, Pittsburgh, PA, October 12, 2018.

"The Value of TOU Tariffs in Great Britain," Citizens Advice Public Workshop, London, UK, July 10, 2017.

"The Hidden Battery," 3rd Annual Ancillary Services and DR Management Forum, Frankfurt, Germany, May 11, 2017.

"The Hidden Battery," Smart Energy Summit, Brussels, Belgium, April 6, 2017.

"Distribution System Pricing With Distributed Energy Resources," LBNL Future Electric Utility Regulation Series Webinar, May 31, 2016.

"The Emergence of Residential Demand Charges," 2016 EEI Rate Analysts Meeting, Baltimore, MD, May 23, 2016.

"Electricity Pricing for the Consumer of the Future," International Congress of Energy Science and Industry, Energi@21, Poznan, Poland, May 11, 2016.

Participant, "Community Storage Initiative and Hidden Battery Report," PLMA Dialogue with Keith Dennis, March 24, 2016.

"A Path Forward for Residential Demand Charges," 2015 NASUCA Annual Meeting, Austin, TX, November 10, 2015.

"The National Landscape of Residential Rate Reform," 2015 SNL Utility Regulation Conference, Washington, DC, December 10, 2015.

"The Top 10 Questions about Residential Demand Charges," EUCI Residential Demand Charges Symposium, Los Angeles, CA, August 31, 2015.

"Residential Rate Design: Emerging Issues," EEI WebTalks webinar, August 27, 2015.

"The Top 10 Questions about Residential Demand Charges," EUCI Residential Demand Charges Symposium, Denver, CO, May 14, 2015.

"Rolling out Residential Demand Charges," EUCI Residential Demand Charges Symposium Pre-Conference Workshop, Denver, CO, May 13, 2015.

"Residential Demand Charges: An Emerging Opportunity in Rate Design," EUCI webcast, December 16, 2014.

"Residential Demand Charges: A Rate Design Revolution?" Center for Research in Regulated Industries 27th Annual Western Conference, Monterey, CA, June 26, 2014.

"Rediscovering Residential Demand Charges," 2014 EEI Rate and Regulatory Analysts Meeting, San Francisco, CA, May 20, 2014.

"The New Direction of Home Energy Management," 2014 Comverge Utility Conference, New Orleans, LA, May 7, 2014.

"Surviving Sub-One Percent Growth," 2014 Institute for Regulatory Policy Studies Conference, Springfield, IL, April 16, 2014.

Panelist, Wharton Energy Conference, Smart Grid Panel, Philadelphia, PA, November 8, 2013

"The Smart Grid and the Future of Demand Response," presented at Energy Central webinar titled "Integrated Demand Response - How Utilities Leverage Data for Intelligent Decisions," September 18, 2013.

"Analytical Frameworks to Incorporate Demand Response in Long-term Resource Planning," with Andy Satchwell, CRRI Western Conference, June 21, 2013.

"The Future of Rate Design." 2013 EEI Rate Analysts Meeting, May 21, 2013. Orlando, Florida.

"Demand Response: Lessons Learned from Across the Border," presented at the CAMPUT Energy Regulation Course, Kingston, Ontario, August 1, 2012.

"The Current State of U.S. Demand Response," presented as moderator at Energy Bar Association Annual Event, Washington, DC, April 26, 2012.

"Vietnam's 10-year Smart Grid Roadmap," presented at World Bank stakeholder workshop in Hanoi, December 8, 2011.

"Bringing DSM to the Kingdom of Saudi Arabia," presented at AESP webinar, October 13, 2011.

"Dynamic Pricing Pilots: Past, Present, and Future," presented at EEI Rate Analysts Meeting, May 17, 2011.

"Inclining Block Rates – Are They a Good or Bad Thing?" presented at an EEI webinar, August 5, 2010.

"Do Customers Respond to Dynamic Pricing?" presented at the Brookings Institution Behavior Insights for Smart Grid Policy Workshop, Washington, DC, July 28, 2010.

"Innovative Pricing for a Smarter Grid," presented at TechConnect 2010, June 24, 2010.

"The Geography of Demand Response," presented at the 2010 Southern California Edison Demand Response Forum, June 3, 2010.

"Fairness and Equity in Dynamic Pricing," presented at the 2010 EEI Rate Analysts Meeting, May 18, 2010.

"A National Assessment of Demand Response Potential," presented at an AESP webinar, October 15, 2009.

"A National Assessment of Demand Response Potential," presented at the ALCA 2009 Fall Meeting, Los Angeles, CA, October 8, 2009.

"How Green is the Smart Grid?" presented at an EUCI webinar, July 23, 2009.

"Sizing up the Smart Grid," presented at the ConnectivityWeek GridWise Expo, San Jose, CA, June 11, 2009.

"Integrating Dynamic Pricing and Inclining Block Rates," presented at the Stanford Energy & Feedback Workshop, Palo Alto, CA, September 5, 2008.

"Evaluating Alternative Dynamic Pricing Designs," presented at the CRRI 21st Annual Western Conference, Monterey, CA, June 19, 2008.

"The Coming Wave of Price-Based Demand Response," presented at the ConnectivityWeek DR Expo, San Jose, CA, May 22, 2008.

Selected Whitepapers and Reports

"The Customer Action Pathway to National Decarbonization," with Sanem Sergici, Michael Hagerty, Ahmad Faruqui, and Kate Peters, prepared for Oracle, September 27, 2021.

"Decarbonized Resilience: Assessing Alternatives to Diesel Backup Power," with Peter Fox-Penner, Roger Lueken, Tony Lee, and Jesse Cohen, prepared for Enchanted Rock, LLC, June 2020.

"FixedBill+: Making Rate Design Innovation Work for Consumers, Electricity Providers, and the Environment," with Peter Fox-Penner and Andy Lubershane, The Brattle Group and Energy Impact Partners Working Paper, June 2020.

"Identifying Likely Electric Vehicle Adopters," with D. McFadden, K. Train, A. Levy, J. Weiss, and N. Irwin, prepared for the Electric Power Research Institute, December 2019.

"Solar-Plus-Storage: The Future Market for Hybrid Resources," with Roger Lueken, Judy Chang, Hannes Pfeifenberger, Jesse Cohen, and John Imon Pedtke, December 2019.

"Residential Electric Vehicle Rates That Work," with Erika H. Myers, Jacob Hargrave, Richard Farinas, and Lauren Burke, prepared for the Smart Electric Power Alliance, November 2019.

"The Total Value Test: A Framework for Evaluating the Cost-Effectiveness of Efficient Electrification," with Ahmad Faruqui, Michael Hagerty, and John Higham, prepared for the Electric Power Research Institute, August 2019.

"The National Potential for Load Flexibility: Value and Market Potential Through 2030," with Ahmad Faruqui, Tony Lee, and John Higham, The Brattle Group Report, June 2019.

"Two Paths for Advancing Great Britain's Smart Metering Programme," with Pinar Bagci and Saurab Chhachhi," The Brattle Group Whitepaper, December 2018.

"Facilitating Electric Vehicle Fast Charging Deployment," with Jurgen Weiss, prepared for the Edison Electric Institute, October 2018.

"The Value of TOU Tariffs in Great Britain: Insights for Decision-makers," with Will Gorman and Nicole Irwin, prepared for Citizens Advice, July 2017.

"Beyond Zero Net Energy? Alternative Approaches to Enhance Consumer and Environmental Outcomes," prepared for the National Rural Electric Cooperative Association (NRECA) and the Natural Resources Defense Council (NRDC), June 2018.

"Electrification: Emerging Opportunities for Utility Growth," with Jurgen Weiss, Michael Hagerty, and Will Gorman, The Brattle Group Whitepaper, January 2017.

"Distribution System Pricing with Distributed Energy Resources," with Jim Lazar, prepared for Lawrence Berkeley National Laboratory's Future Electric Utility Regulation series, May 2016.

"The Tariff Transition: Considerations for Domestic Distribution Tariff Redesign in Great Britain," with Ahmad Faruqui, Jürgen Weiss, Toby Brown, and Nicole Irwin, prepared for Citizens Advice, April 2016.

"The Hidden Battery: Opportunities in Electric Water Heating," with Judy Chang and Roger Lueken, prepared for the National Rural Electric Cooperative Association (NRECA), the Natural Resources Defense Council (NRDC), and the Peak Load Management Alliance (PLMA), January 2016.

"An Evaluation of SRP's Electric Rate Proposal for Residential Customers with Distributed Generation," with Ahmad Faruqui, prepared for Salt River Project, January 5, 2015.

"Valuing Demand Response: International Best Practices, Case Studies, and Applications," prepared for EnerNOC, January 2015.

"Exploring Natural Gas and Renewables in ERCOT, Part III: The Role of Demand Response, Energy Efficiency, and Combined Heat & Power," prepared for The Texas Clean Energy Coalition, May 29, 2014.

"Demand Response Market Potential in Xcel Energy's Northern States Power Service Territory," with YouGov America, prepared for Xcel Energy, April 2014.

"Incorporating Demand Response Into Western Interconnection Transmission Planning," with Andy Satchwell, Glen Barbose, Ahmad Faruqui, and Charles Goldman, LBNL Report, July 2013.

"Estimating Xcel Energy's Public Service Company of Colorado Territory Demand Response Market Potential," with YouGov America, prepared for Xcel Energy, June 2013.

"Time-Varying and Dynamic Rate Design," with Ahmad Faruqui and Jenny Palmer, prepared for the Regulatory Assistance Project, July 2012.

"Vietnam's 10-year Smart Grid Roadmap," prepared for Northern Power Corporation and The World Bank, December 2011.

"Bringing Demand Side Management to the Kingdom of Saudi Arabia," with Global Energy Partners and PacWest Consulting Partners, prepared for ECRA, May 2011.

"National Action Plan on Demand Response," with GMMB, Customer Performance Group, and Definitive Insights, prepared for the Federal Energy Regulatory Commission, June 2010.

"A National Assessment of Demand Response Potential," with Freeman, Sullivan & Co. and Global Energy Partners, prepared for the Federal Energy Regulatory Commission, June 2009.

"Assessment of Achievable Potential from Energy Efficiency and Demand Response Programs in the U.S.," with Global Energy Partners, prepared for the Electric Power Research Institute, January 2009.

"Transforming America's Power Industry: The Investment Challenge," prepared for the Edison Electric Institute, November 2008.

"Rethinking Rate Design: A Survey of Leading Issues Facing California's Utilities and Regulators," prepared for the Demand Response Research Center, Lawrence Berkeley National Laboratory, August 2007.

"California's Next Generation of Load Management Standards," prepared for the California Energy Commission, May 2007.

"The State of Demand Response in California," prepared for the California Energy Commission, April 2007.

PRESS MENTIONS

"State of the Electric Utility 2021: Despite sharp drop, cost remains key obstacle to more storage, some say," Kavya Balaraman. Quoted in *Utility Dive*, April 1, 2021.

"Solar panels and batteries on your home could help prevent the next grid disaster," Alejandra Borunda. Quoted in *National Geographic*, February 25, 2021.

"2021 Outlook: The DER boom continues, driving a 'reimagining' of the distribution system," Herman Trabish. Quoted in *Utility Dive*, January 12, 2021.

"Two barriers to utility and customer savings with flexible loads and how regulators can help," Herman Trabish. Quoted in *Utility Dive*, January 6, 2021.

"California Considers Landmark Appliance Rule to Ease Grid Demand," Emily C. Dooley. Quoted in *Bloomberg Law*, October 23, 2020.

"Demand Response Failed California 20 Years Ago; the State's Recent Outages may have Redeemed it," Herman Trabish. Quoted in *Utility Dive*, September 28, 2020.

"Smart Meters Giving Missouri Customers Incentive to Save Energy During Peaks," Karen Uhlenhuth. Quoted in *Energy News Network*, September 28. 2020.

"Tesla Promises Cars that Connect to the Grid, even if Elon Musk Doesn't Really Want Them to," Justine Calma. Quoted in *The Verge*, September 23, 2020.

"Virtual Power Plants are Coming to California Apartment Buildings," Justine Calma. Quoted in *The Verge*, August 27, 2020.

"Momentum Grows for Piloting Netflix-like Fixed Subscription Rates, but not Everyone's on Board," Herman Trabish. Quoted in *Utility Dive*, July 7, 2020.

"Battery Energy Storage is Getting Cheaper, but How Much Deployment is too Much?" Herman Trabish. Quoted in *Utility Dive*, June 30, 2020.

"Tesla's Ex-storage Chief on Trump, Musk and the 'Holy Grail'," David Iaconangelo. Quoted in *E&E News*, May 15, 2020.

"Calif. Inks Largest U.S. Battery Purchase in History," David Iaconangelo. Quoted in *E&E News*, May 5, 2020.

"Biding One's Utility Time," Chuck Ross. Quoted in *Electrical Contractor Magazine*, March 2020.

"Want Cheaper Electricity? Xcel Energy Wants to Help – if You're Willing to do Your Laundry at 2 a.m.," Mark Jaffe. *Colorado Sun*, February 20, 2020.

"Time-of-Use Electricity Rates May Hit Vulnerable Groups Harder, Study Finds," Maria Gallucci. Quoted in *IEEE Spectrum*, December 16, 2019.

"EV-specific rates are the gateway to direct load management, SEPA report finds," Robert Walton. Quoted in *Utility Dive*, November 14, 2019.

"A Utah Housing Development is Just the Start of Sonnen's US Solar Ambitions," Wolfgang Kerler. Quoted in *The Verge*, August 28, 2019.

"Renewables' Variability Sends Wary Utilities from Traditional DR to DER and Load Flexibility," Herman K. Trabish. Quoted in *Utility Dive*, August 14, 2019.

"Using Electricity at Different Times of Day Could Save Us Millions of Dollars," David Roberts. Quoted in *Vox*, August 7, 2019.

"Rise of Net Zero Energy Homes Could Boost Utility-Led Community Solar," Herman K. Trabish. Quoted in *Utility Dive*, July 19, 2018.

"Stacking Energy Storage Values to Make Batteries More Profitable: Brattle Report," Quoted in *MicroGrid Knowledge*, September 18, 2017.

"Brattle: Regulatory Barriers Prevent Stacking of Battery Benefits," Peter Maloney. Quoted in *Utility Dive*, September 13, 2017.

"Batteries Hold Value in Various Applications: Study," Quoted in MW Daily, September 12, 2017.

"Utilities in hot water: Realizing the benefits of grid-integrated water heaters," Herman K. Trabish. Quoted in *Utility Dive*, June 20, 2017.

"ComEd jumps on the demand charge train with new Illinois proposal," Peter Maloney. Quoted in *Utility Dive,* May 9, 2016.

"Your home water heater may soon double as a battery," Chris Mooney. Quoted in the *Washington Post,* February 24, 2016.

"Move over, fixed fees—utilities see demand charges as revenue cure," Kari Lydersen. Quoted in *Midwest Energy News,* December 2, 2015.

"Using Telecom Tech, eCurv Looks to Lower Energy Bills, Raise Money," Thomas Miller. Quoted in *Xconomy,* May 4, 2015.

"Questions swirl around possible rates under a Boulder utility," Erica Meltzer. Quoted in *Daily Camera,* January 31, 2015.

"After SONGS: Forecasting the fate of demand response in California," Lisa Weinzimer. Quoted in *Utility Dive,* March 21, 2014.

"A National 'Smart Grid' Remains a Vision with Many Gaps," Peter Behr. Quoted in the *New York Times,* October 22, 2009.

Testimony And Regulatory Filings

Before the Public Service Commission of the District of Columbia, "An Assessment of Electrification Impacts on the Pepco DC System," report filed on behalf of Pepco in Formal Case No. 1167, August 27, 2021 (with S. Sergici, M. Hagerty, and J. Olszewski).

Before the Alberta Utilities Commission, "Modernizing Distribution Rate Design," report filed on behalf of ATCO in *Distribution Inquiry – Combined Module (2 and 3)*, Proceeding ID 24116, March 13, 2020 (with A. Faruqui and L. Lam).

Before the Arizona Corporation Commission, "An Assessment of APS's New Bill Comparison Web Tool," report filed on behalf of APS in *Arizona Public Service Company's (APS) Rate Review and Examination*, Docket No. E-01345A-19-0003, January 15, 2020 (with A. Faruqui and C. Bourbonnais).

Before the Nova Scotia Utility and Review Board, "An Assessment of Nova Scotia Power's Proposed Extra Large Industrial Active Demand Control Tariff," expert report filed on behalf of NS Power *In the Matter of an Application by Nova Scotia Power Incorporated for Approval of an Extra Large Industrial Active Demand Control (ELIADC) Tariff, Under Which Port Hawkesbury Paper LP Will Take Electric Service From NS Power*, Matter No. M09420, September 26, 2019 (with A. Faruqui).

Before the Public Utilities Commission of Nevada, direct testimony filed on behalf of Solar Partners XI ("Arevia"), *Joint Application of Nevada Power Company d/b/a NV Energy and Sierra Pacific Power Company d/b/a NV Energy for approval of the third amendment to its 2018 Joint Integrated Resource Plan to update and modify the renewable portion of the Supply-Side Plan and the Transmission Action Plan,* Docket No. 19-06039, Aug 26, 2019.

Before the Minnesota Public Utilities Commission, "The Potential for Load Flexibility in Northern States Power's Service Territory," report filed on behalf of Xcel Energy in *2020-2034 Upper Midwest Integrated Resource Plan*, Docket No. E002/RP-19-368, June 2019 (with A. Faruqui, P. Donohoo-Vallett, and T. Lee).

Before the New Mexico Public Regulation Commission, "The Value of Energy Storage to the PNM System," report filed on behalf of Public Service Company of New Mexico *In the matter of Public Service Company of New Mexico's Consolidated Application for Approvals for the*

Abandonment, Financing, and Resource Replacement for San Juan Generating Station Pursuant to the Energy Transition Act, Case No. 19-00195-UT, August 4, 2019 (with J. Pfeifenberger, J. Chang, P. Ruiz, and J. Cohen).

Before the Public Utilities Commission of Nevada, "The Economic Potential for Energy Storage in Nevada," report filed on behalf of the Public Utilities Commission of Nevada and the Nevada Governor's Office of Energy, *Investigation and Rulemaking to Implement Senate Bill 204 (2017)*, Docket No. 17-07014, October 1, 2018 (with J. Chang, R. Lueken, J. Pfeifenberger, J. Imon Pedtke, and J. Vollen).

Before the Oregon Public Utilities Commission, "Demand Response Market Research: Portland General Electric, 2016 to 2035," report filed on behalf of Portland General Electric *In the Matter of Portland General Electric Company, 2016 Integrated Resource Plan*, Docket No. LC 66, November 15, 2016 (with A. Faruqui and L. Bressan).

Before the Oregon Public Utilities Commission, "An Assessment of PGE's Demand Response Potential," report filed on behalf of Portland General Electric *In the Matter of Portland General Electric Company, 2013 Integrated Resource Plan*, Docket No. LC 56, March 2014 (with A. Faruqui).

Before the Federal Energy Regulatory Commission, Affidavit on Behalf of Comverge Regarding PJM's Proposed Tariff Revisions Regarding Demand Response Capacity Market Participation Requirements. Docket No. ER13-2108-000, August 22, 2013 (with A. Faruqui).

Schedule RH-2: Summary of Subscription Pricing Offerings in Other Jurisdictions

	Utility	State	Tariff Name	Comments
Full-Scale Offerings				
1	AEP Indiana	IN	Residential EZ Bill (R.S. EZB)	Standard fixed bill
2	Alabama Power	AL	Family Dweling Flat Bill (FDF)	Standard fixed bill
3	Alliant Energy	WI	Fixed Amount Bill Rider (FA-1)	Standard fixed bill
4	Duke Energy	FL	Fixed Bill Program (FB-1)	Standard fixed bill
5	Duke Energy	IN	Your FixedBill	Standard fixed bill
6	Georgia Power	GA	Flatbill (FLAT-5)	Standard fixed bill
7	Gulf Power	FL	Residential/Commercial Fixed Rate (FLAT-1)	Standard fixed bill
8	Oklahoma Gas and Electric	OK	Guaranteed Flat Bill (R-GFB)	Standard fixed bill
Pilots				
9	AES Indiana	IN	IPL Plus	Proposed pilot; bundled with clean energy offer
10	Austin Energy	TX	EV360℠ Plug-In Electric Vehicle Charging Subscription	Specific to off-peak EV charging; includes access to public charging stations
11	Duke Energy	FL	Fixed Bill Program (FB-1)	Includes financial incentive for existing participants to enroll smart thermostat in demand response offering
12	Madison Gas & Electric	WI	Renewable FlatBill Pilot	Includes fixed bill adder to match annual usage with energy from MGE-owned wind/solar plants
13	Xcel Energy	MN	Residential Electric Vehicle Subscription (A82/A83)	Specific to off-peak EV charging; includes lease of home EV charger

1. Indiana Electric Service Tariff, I.U.R.C No. 18. See Section 10.1. https://www.indianamichiganpower.com/lib/docs/account/bills/ezbill/IM_IN_TB_18_06-29-2020.pdf#page=50
2. Alabama Power tariff, Rate FDF. https://www.alabamapower.com/content/dam/alabama-power/pdfs-docs/Rates/Terms_and_Conditions_Flat_Bill_Residential.pdf
3. Alliant Energy Wisconsin Electric Rates. See Rate FA-1 Sheet 3.40. https://www.alliantenergy.com/accountandbilling/billmeterrates/ratesandtariffs
4. Duke Energy Florida Rate Schedules, Section VI Sheet No. 6.390. https://desitecoreprod-cd.azureedge.net/_/media/pdfs/for-your-home/rates/rates-fl/def-fb-1.pdf?la=en&rev=3166d5bef9f141f5a0478dffa43a2a39
5. Duke Energy Indiana Rates for Single-Phase Service, Sheet No. 20. https://desitecoreprod-cd.azureedge.net/_/media/pdfs/for-your-home/rates/electric-in/iurc-15/010-de-in-rider-20-fixed-bill.pdf?la=en&rev=3fc5fb054afe44e5bd0ec47f3358a40e
6. Georgia Power Electric Service Tariff, Flatbill Schedule. https://www.georgiapower.com/content/dam/georgia-power/pdfs/residential-pdfs/residential-rate-plans/FLAT-5.pdf
7. Gulf Power Rate Schedule, Section No. VI Sheet No. 6.39. https://www.gulfpower.com/content/dam/gulfpower/us/en/pdf/rates/flat-1.pdf
8. Oklahoma Gas and Electric Rate Tariff, 3.40-3.41.

https://www.oge.com/wps/wcm/connect/8e8d52e5-2e96-4e4e-861e-d1ad79f93b67/3.40+-+R-GFB+Stamped+Approved.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-8e8d52e5-2e96-4e4e-861e-d1ad79f93b67-nPAYsE1

9. Uplight press release. https://uplight.com/press/uplight-launches-plus-empowering-utility-customers-to-participate-in-the-clean-energy-transition-with-personalized-subscription-energy-bundles/
10. Austin Energy Tariff, pages 34-35. https://austinenergy.com/wcm/connect/bca7e254-aaf2-4f4c-ae38-070288f4e94e/Residential-PilotPrograms.pdf?MOD=AJPERES&CVID=nPpTRi7
11. Florida PSC Docket No. 20200222-El. http://www.psc.state.fl.us/library/filings/2021/01449-2021/01449-2021.pdf
12. MGE Tariff, Sheet E-3.6 Schedule RFB-1. https://www.mge.com/MGE/media/Library/pdfs-documents/rates-electric/electric-rates.pdf#page=22
13. Xcel Energy Electric Rate Tariff, Section 5 Sheet 5-8.1. https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Me_Section_5.pdf