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March 29, 2023

VIA ELECTRONIC FILING

Mr. Bernard Logan, Clerk
c/o Document Control Center
State Corporation Commission of Virginia
Tyler Building - First Floor
1300 East Main Street
Richmond, Virginia 23219

RE: Application of Virginia Electric and Power Company for approval of its 2022 DSM Update pursuant to § 56-585.1 A 5 of the Code of Virginia

Case No. PUR-2022-00210

Dear Mr. Logan:

Enclosed for filing in the above-captioned proceeding is the **Direct Testimony of Chelsea Harnish**, which is being filed on behalf of the **Virginia Energy Efficiency Council**. Ms. Harnish's testimony includes five attachments, labeled CH-1 through CH-5. The testimony and attachments are being filed in a public version only.

If you should have any questions regarding this filing, please contact me at (434) 924-4776, or via email at cjaffe@law.virginia.edu.

Regards,

Cale Jaffe

Counsel of Record
Virginia Energy Efficiency Council

cc: Parties on Service List
Commission Staff

CERTIFICATE OF SERVICE

I hereby certify that the following have been served with a true and accurate copy of the attached filing on behalf of the Virginia Energy Efficiency Council by electronic mail only:

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DATED: March 29, 2023

Cale Jaffe
University of Virginia School of Law

Witness Direct Testimony Summary

Witness: Chelsea Harnish

Title: Executive Director of the Virginia Energy Efficiency Council

Summary:

Chelsea Harnish, Executive Director of the Virginia Energy Efficiency Council ("VAEEC"), offers testimony in support of the VAEEC's position in this docket. Principally, Ms. Harnish offers the VAEEC's support for the Company's proposed Phase XI programs and bundles, while also making recommendations for strengthening these programs moving forward to meet targets under the Virginia Clean Economy Act. Ms. Harnish also offers recommendations related to the methodology for implementing and using the cost-effectiveness tests to assess programs in Virginia.

Ms. Harnish's testimony is broken down into three main sections: (1) Support for the Phase XI filing as necessary to meet VCEA targets; (2) Opportunities to strengthen the proposed programs; and (3) Review of cost-effectiveness test methodology.

In supporting the Company's Phase XI proposal, Ms. Harnish first notes that approval of the programs and bundles in Phase XI is likely necessary to meet the efficiency targets of the Virginia Clean Economy Act. She also emphasizes the many values of program bundling for customers and contractors alike. Indeed, program bundling was a specific recommendation made through the stakeholder process for its potential to improve awareness, customer experience, and enrollment, while also cutting vendor costs. That is, the Company has provided the four program bundles included in Phase XI in response to stakeholder input.

Ms. Harnish's testimony also includes several recommendations for improvements, including the potential of doing more to leverage the functionalities of Advanced Metering Infrastructure ("AMI") in demand-response programs. An initial step would be to utilize AMI for a geotargeted Peak Time Rebate Program that identifies service areas that are chronically capacity-constrained and focuses greater marketing, education, and outreach efforts to achieve participation in those areas. She also recommends retaining a requirement for contractors to obtain Building Performance Institute ("BPI") certification for the installation of all measures in the Residential Home Retrofit Bundle.

In terms of improving the methodology for cost-effectiveness tests to make test scores more accurate, Ms. Harnish recommends accounting for non-energy benefits ("NEBs"), including the social cost of carbon, among the benefits included in the analyses. She also expresses concern about an inappropriate reliance on building codes as energy efficiency baselines, which will significantly under-count program energy savings. She notes that the appropriate baseline would be the existing efficiency of the building or equipment, and recommends that the Company perform baseline studies for proposed programs. Finally, she observes that the Inflation Reduction Act and Bipartisan Infrastructure Law present significant funding opportunities that should also be accounted for in cost-effectiveness test scores.

DIRECT TESTIMONY OF
CHELSEA HARNISH ON BEHALF OF
THE VIRGINIA ENERGY EFFICIENCY COUNCIL
STATE CORPORATION COMMISSION OF VIRGINIA
CASE NO. PUR-2022-00210

I. INTRODUCTION

Q. Please state your name, business address, and position with the Virginia Energy Efficiency Council ("VAEEC" or the "Council").

A. My name is Chelsea Harnish, and my business address is 313 East Broad Street, Suite 226, Richmond, Virginia. I am the Executive Director of the Virginia Energy Efficiency Council.

Q. Please tell us about the VAEEC and describe your role within the organization.

A. The VAEEC is a 501(c)3 charitable organization that provides a platform for stakeholder engagement while assessing and supporting cost-effective energy efficiency programs, best practices in the energy efficiency industry, and sound policies that advance energy efficiency in Virginia. We also provide networking, outreach, and business services for the Commonwealth's energy efficiency industry and the public at large. Simply put, the VAEEC is the voice for the energy efficiency industry in Virginia. As Executive Director, my primary responsibility is to work with our members and stakeholders to fulfill our mission through our programmatic work. I oversee our staff, manage the organization's budget and contracts, and lead the VAEEC's regulatory and legislative work. On behalf of the VAEEC, I also participate regularly in the Dominion Energy Efficiency Stakeholder group, and I am chair of the Dominion Energy Efficiency Stakeholder Policy Subgroup.

Q. Please summarize your professional and educational expertise with respect to energy policy.

A. I have been Executive Director at the VAEEC since November of 2015. Prior to joining the VAEEC, I worked for the Virginia Conservation Network on climate and energy policy, with a special focus on energy policy matters before the General Assembly. Prior to my time at the Virginia Conservation Network, I served as the Virginia Policy Coordinator for the Chesapeake Climate Action Network. Before that, I worked with Clean Power Now in Massachusetts in support of the Cape Wind offshore wind project. I have a master's degree in marine science from Boston University and an undergraduate degree in biology from University of South Carolina. A copy of my resume is included with this testimony as **Attachment CH-1**.

Q. Why did the VAEEC elect to intervene in this proceeding?

A. VAEEC has more than 100 members, including energy efficiency businesses, universities, nonprofits, local governments, and electric utilities. These members recognize the important value that cost-effective energy efficiency programs can provide to all ratepayers—both participants in the programs and non-participants alike. Our goal is to ensure that energy efficiency is properly recognized as an integral part of Virginia's economy and clean energy future. Together with our members, the VAEEC is identifying cost-effective energy efficiency solutions that improve the quality of life in our work and home environments.

Q. Has the VAEEC participated in previous DSM dockets involving Dominion Energy?

A. Yes. The VAEEC has intervened as a participant in multiple DSM proceedings involving the Company prior to the current docket: PUE-2016-00111; PUR-2017-00129; PUR-2018-00168; PUR-2019-00201; PUR-2020-00156, and PUR-2021-00247. The VAEEC has also participated in multiple efficiency dockets for Appalachian Power Company.

Q. Did you personally file testimony as a witness in any of those earlier dockets?

A. Yes. I sponsored testimony in support of the VAEEC's position in PUE-2016-00111, PUR-2017-00129, and PUR-2021-00247.

II. OVERVIEW OF RECOMMENDATIONS

Q. Have you had the opportunity to review Dominion's initial filing in this docket?

A. Yes, I have.

Q. Please summarize your understanding of the Company's application.

A. The Company's Application seeks approval of five new energy-efficiency programs and four new program bundles as part of Phase XI. I support the Company's proposed programs and bundles. The package, taken as a whole, represents a critically essential addition to the Company's DSM portfolio, and is likely necessary to achieve the efficiency targets imposed on the Company by the Virginia Clean Economy Act ("VCEA").

Q. How is your testimony structured?

A. My testimony provides an overview of the position of the Virginia Energy Efficiency Council in this docket. I explain my support for the proposed Phase XI programs and bundles and make recommendations for strengthening these programs moving forward to meet future VCEA targets. Further, I make recommendations related to the cost-effectiveness methodology.

My testimony is broken down into three main sections:

1. Support for the Phase XI filing as necessary to meet VCEA targets;
2. Opportunities to strengthen the proposed programs; and
3. Review of cost-effectiveness test methodology.

III. THE PHASE XI FILING IS CRITICAL TO MEETING THE VCEA ENERGY EFFICIENCY TARGETS

Q. Please describe your understanding of the VCEA energy efficiency savings targets.

A. The Virginia Clean Economy Act amended Va. Code § 56-596.2 B 2 to require the Company to meet a year-by-year series of energy savings targets through the implementation of DSM programs.[1] These targets are calculated based on the Company's average annual energy jurisdictional retail sales in calendar year 2019 and are cumulative, representing the total savings from the term year as well as from previous years. The savings targets start at 1.25% for calendar year 2022 and increase each year by an increment of 1.25%, requiring the Company to achieve a savings total of 2.5% of 2019's consumption by the end of 2023.[2]

[1] VA. CODE ANN. § 56-596.2 B 2.
[2] VA. CODE ANN. § 56-596.2.

Q. Is approval of the Company's Phase XI application necessary in order to meet the VCEA energy efficiency targets?

A. Likely yes. The Phase XI application updates existing programs that have demonstrated success in achieving cost-effective energy savings in the past, such as the Residential Customer Engagement and Peak Time Rebate programs. The application also updates the Energy Efficiency Products Marketplace so that rebates can be issued to eligible customers to purchase up-to-date energy efficient appliances.

The Phase XI application also fills gaps in program eligibility and expands the pool of potential eligible customers. For example, it extends the Phase IX Agricultural Program to customers who could benefit from the programs offerings but operate under a residential tariff, such as family farms. Similarly, the Non-residential Custom Program enables customers to partner with the Company to pursue complex efficiency projects that might not fall neatly into other program categories. This improves the flexibility of the Company's DSM portfolio and allows it to tap into energy savings that were unattainable in previous years.

Q. Are there any especially noteworthy improvements in the Phase XI proposal as compared to prior applications or petitions from the Company?

A. Yes. The Phase XI application heeds the suggestions of stakeholders by forming program bundles out of existing offerings. These bundles are effective because they couple energy efficiency audit programs with rebate and installation offerings to ensure that eligible customers receive not just information on how to improve their energy efficiency, but the technology and

hardware to realize those improvements. Further, program bundles can save costs as they accomplish multiple initiatives in a single vendor visit.

Q. Has the Company adequately taken advantage of the stakeholder process?

A. Largely yes. While there is always room for greater stakeholder engagement, the VAEEC is generally pleased with the Company's engagement with stakeholders while preparing this case, as well as its responsiveness to stakeholder feedback to improve the Phase XI application.

Q. Could you provide some examples of stakeholder suggestions that have been adopted by the Company?

A. Yes, I can provide several examples. First, my testimony from last year's filing included a recommendation that the Company work with the stakeholder group to develop a cohesive marketing plan as a next step after developing the Long-Term Plan.[3] In response, the Company presented an initial plan for their marketing approach in collaboration with marketing consultants (the West Cary Group) at a stakeholder meeting earlier this year. A copy of the West Cary Group's presentation from that meeting, which was provided to the VAEEC by the Company in response to an interrogatory, is attached to my testimony as **Attachment CH-2**. On slides 30 and 31 of the presentation, the Company indicates its intention to form a Customer Awareness and Outreach Subgroup of the stakeholder group.

Also, in last year's filing, Company Witness Frost responded to questions raised in my testimony by indicating that the Company would continue working with stakeholders to explore modifying

[3] Direct Testimony of Chelsea Harnish at 18-24, Petition of Virginia Electric and Power Company (2021) (No. PUR-2021-00247), available at https://www.scc.virginia.gov/docketsearch/DOCS/6t7_01!.PDF.

its implementation of the cost-benefit tests to ensure it accurately captures all of a program's benefits.[4] I am pleased to report that the stakeholder Policy Subgroup has a meeting next month to continue this discussion.

Finally, program bundling was a specific recommendation made through the stakeholder process for its potential to improve awareness, customer experience, and enrollment while cutting vendor costs. In response, the Company has provided four robust program bundles and has indicated that it will continue to move toward a streamlined DSM portfolio of bundled offerings.[5]

Q. Could you say more about how the development of program bundles progressed through the stakeholder process?

A. Yes. Specifically, Commission Staff in Interrogatory 05-106 asked about stakeholder involvement in program bundling. The Company's response to that interrogatory is included as **Attachment CH-3** with my testimony.

The development of program bundles is a perfect example of how the stakeholder process has worked well. In reviewing the Company's Long-Term Plan last year, several stakeholders were concerned that the Company was not planning to move fast enough to address the need to streamline programs as recommended in the Plan. The Company has taken that feedback into account and responded by introducing four new program bundles with a plan to continue to bundle more programs, where cost-effective, in the future.

[4] Rebuttal Testimony of Nathan J. Frost at 5, Petition of Virginia Electric and Power Company (2021) (No. PUR-2021-00247), available at https://www.scc.virginia.gov/docketsearch/DOCS/75zw01!.PDF.
[5] Direct Testimony of Michael T. Hubbard at 7, Application of Virginia Electric and Power Company (2022) (No. PUR-2022-00210), available at https://www.scc.virginia.gov/docketsearch/DOCS/7phr01!.PDF.

Q. Could you describe how program bundling benefits Virginia ratepayers and customers?

A. Previously, I have testified as to how bundling makes a program more attractive to a broader and more diverse array of customers. The approach also helps to recruit contractors, as bundled programs provide more opportunities for vendors to get into households and serve more customers than they otherwise could through implementation of isolated, individual measures or programs. The more attractive the overall bundled program is to customers, the more popular it is also going to be for contractors.

Not only does bundling make measures more popular—it also increases their cost-effectiveness. According to an analysis by Matthew Socks of Optimal Energy, Inc., presented at the 2016 ACEEE Summer Study on Energy Efficiency in Buildings, program bundles "reduce transaction costs while simplifying the overall process for customers."[6] For example, program bundles provide the opportunity for contractors to visit a home to perform an energy assessment, spontaneously note opportunities for equipment or building shell upgrades to the homeowner, and even install measures in a single visit. Unbundled, those same energy-efficiency savings might require three or four visits, often by multiple contractors, which would make them less cost-effective.

[6] Direct Testimony of Chelsea Harnish at 6, Application of Virginia Electric and Power Company (2016) (No. PUE-2016-00111), available at https://www.scc.virginia.gov/docketsearch/DOCS/3d4s01!.PDF.

Q. What programs would be discontinued if the Phase XI proposed bundles are approved?

A. If the Phase XI portfolio is approved, it is my understanding that the Company proposes discontinuing the following programs: Phase VII Residential Home Energy Assessment Program; Phase VII Non-residential Window Film Program; Phase VII Non-residential Small Manufacturing Program; Phase VII Non-residential Heating and Cooling Efficiency Program; Phase VII Residential Appliance Recycling Program; Phase VII Non-residential Office Program; and Phase VIIIHB 2789 (Heating and Cooling/Health and Safety).[7]

Q. Do you endorse the discontinuation of these programs?

A. Only if the new Phase XI programs and bundles are approved. Furthermore, I have concerns about shutting down these currently operating programs at the end of the year. These programs should continue to be offered until the new bundles are ready to launch, to avoid any start-stop issues for contractors, particularly because the Company has indicated in Staff Interrogatory 01-14 that it is still working to implement last year's Phase X programs at this point. The Company's response to that interrogatory is included with my testimony as **Attachment CH-4.**

Q. Could you please describe these stop-start issues faced by contractors?

A. Yes. Please allow me to reference the testimony of Andrew Grigsby, who served as a VAEEC witness in the Company's 2016 DSM docket. At the time, Mr. Grigsby worked as an

[7] Direct Testimony of Michael T. Hubbard at 6, Application of Virginia Electric and Power Company (2022) (No. PUR-2022-00210), available at https://www.scc.virginia.gov/docketsearch/DOCS/7phr01!.PDF.

energy efficiency contractor with the Local Energy Alliance Program ("LEAP").[8] Mr. Grigsby testified that "it causes confusion, customer loss, and a substantial harm to small businesses when programs are started, cancelled, and restarted after a gap in the program. It hurts contractors to have to hire, lay off, and then attempt to rehire staff who have moved on to other jobs and opportunities." Mr. Grigsby went on to recommend a program extension that would "allow for an efficient transition between the original program and the extended program, without any harmful gaps in service." I echo this recommendation today. The Company should extend existing programs beyond December 2023, as needed, in order to ensure a consistent term of service for both contractors' and customers' sake.

IV. OPPORTUNITIES TO IMPROVE THE COMPANY'S PHASE XI FILING

Q. Notwithstanding the VAEEC's overall support for the Company's Phase XI filing, do you have any recommendations for how it might be improved?

A. Yes. Moving forward there are promising opportunities to improve the effectiveness of the Residential Customer Engagement Program, and to leverage the functionalities of Advanced Metering Infrastructure ("AMI") in the Peak Time Rebate Program to unlock further energy savings.

Q. Do you have any recommendations on how the Company might improve the Residential Customer Engagement Program?

A. Yes. The Phase XI Residential Customer Engagement Program proposes to update the design of the Phase VIII Residential Customer Engagement Program, which the Company's

[8] Direct Testimony of Andrew Grigsby at 6-7, Application of Virginia Electric and Power Company (2016) (No. PUE-2016-00111), available at https://www.scc.virginia.gov/docketsearch/DOCS/4%408h01!.PDF.

EM&V data have shown to be one of the top energy saving programs in its portfolio.[9] This program builds an important foundation by educating high-usage customers about their consumption through Home Energy Reports. The Company should leverage this foundation to achieve greater energy savings by pairing the Residential Customer Engagement Program with targeted, robust incentives for measure installation. One way to do that would be through the creation of a new program bundle.

Q. Do you have any recommendations on how to improve the Residential Peak Time Rebate Program?

A. Yes. There is a good bit of room to do more to leverage the functionalities of AMI in demand-response programs. These programs can be better tailored to achieve their peak-shaving goals, at lower cost, if the Company takes advantage of what it learns about customer behavior from the AMI data.

An initial step would be to utilize AMI for a geotargeted Peak Time Rebate Program that identifies service areas that are chronically capacity-constrained and focuses greater marketing, education, and outreach efforts to achieve participation in those areas. AMI functionality should also be used to identify customers with load profiles that suggest substantial potential for peak usage reduction, who could then receive targeted marketing offers. Moving forward, this demand response program should be bundled with energy efficiency programs to offer targeted incentives to customers for installation of load-reduction measures (such as improved insulation or

[9] Application of Virginia Electric and Power Company at 8 (2022) (No. PUR-2022-00210), available at https://www.scc.virginia.gov/docketsearch/DOCS/7psl01!.PDF.

installation of efficient appliances) that will reduce, rather than merely shift, their load during high-usage events.

Q. Could you expand on the potential for geotargeting in DSM programs?

A. First, I would like to note that the Company has stated an intention to investigate geotargeted programs and marketing materials in its Long-Term Plan.[10] And the VAEEC has emphasized the potential for geotargeting in prior testimony from myself and from Mark James, a professor at Vermont Law and Graduate School. I encourage the Company to work with stakeholders to develop marketing and program implementation plans that include geotargeting in order to increase DSM program participation and harness the potential that DSM programs offer as a grid resource.

In a previous filing, VAEEC witness Mark James had described geotargeting as an opportunity to "focus energy and demand reductions in areas where they produce high customer and system benefits by allowing the Company to test the potential of DSM programs to reduce specific load and peak demand in congested areas, while collecting data that would inform the design of future programs."[11] I have previously testified on how the geotargeting of constrained distribution and transmission areas can allow the Company to obtain greater cost savings through deferred or avoided capital expenditures.[12]

[10] Direct Testimony of Terry M. Fry, Schedule 1 at 103, 108, Petition of Virginia Energy and Power Company (2021) (No. PUR-2021-00247), available at https://scc.virginia.gov/docketsearch/DOCS/67%40%2301!.PDF.
[11] Direct Testimony of Mark James at 30, Petition of Virginia Electric and Power Company (2019) (No. PUR-2019-00201), available at https://scc.virginia.gov/docketsearch/DOCS/4lyz01!.PDF.
[12] Direct Testimony of Chelsea Harnish at 22, Petition of Virginia Electric and Power Company (2021) (No. PUR-2021-00247), available at https://www.scc.virginia.gov/docketsearch/DOCS/6t7_01!.PDF.

With sufficient installation of AMI technologies throughout the Company's jurisdictional service territory, the data needed to achieve increased savings and improved grid stability will be at the Company's fingertips. The Company should seize the opportunity that geotargeting provides.

Q. Are there other use cases for AMI functionalities outside of geotargeted marketing?

A. Yes. In general, the near-real-time feedback from AMI technologies enhances the quality of insights on energy use and provides data that can be used for improved program design.

AMI-gathered data may be used to maximize cost-effectiveness by pre-screening customers for focused outreach efforts. By utilizing interval data to examine characteristics such as peak-period usage, baseload demand, load-shape characteristics, and discretionary demand, the Company may identify customers who are most likely to participate and possess the most potential for greatest energy savings. As one example, Pacific Gas & Electric published a recent study showing dramatic increases of over 50% in average customer savings for whole-house retrofit and commercial direct install programs when targeting customers based on temperature-to-load correlation and total usage.[13] That PG&E study is included with my testimony as **Attachment CH-5.** In addition to revealing potential for higher savings at lower cost, the analysis also helped to rule out neutral and negative savers from program eligibility.[14]

[13] Adam M. Scheer et al., *Customer Targeting via Usage Data Analytics to Enhance Metered Savings*, ACEEE SUMMER STUDY ON ENERGY EFFICIENCY IN BUILDINGS (2018), available at www.aceee.org/files/proceedings/2018/index.html#/paper/event-data/p195.
[14] *Id.*

Q. Are there other noteworthy functionalities of AMI?

A. Another potential use case for AMI technology is meter-based, pay-for-performance, which is an emerging model for energy efficiency program design that rewards energy savings on an ongoing basis rather than through up-front payments based on estimated savings. The Company could use AMI data to determine performance payments at an hourly resolution, as well as to set higher reward rates to incentivize savings at peak demand periods. These data could also provide the Company with insights into how to improve programs in real time rather than through retroactive review.

Q. How could the pool of customers who are eligible to participate in DSM programs be expanded?

A. Maximizing the pool of eligible customers for DSM programs is crucial to the continued satisfaction of the Company's VCEA goals. One way to achieve this is to extend program eligibility to customers who use both gas and electric appliances in their homes. These so-called "dual-fuel customers" are allowed to participate in energy efficiency programs offered by other utilities. For those energy efficiency programs, utilities are able to use inputs for avoided fuel savings in their cost-effectiveness tests.[15] For one example, through my participation in Old Dominion Power's stakeholder process, I understand that their proposed Bring Your Own Thermostat energy efficiency program will be available to dual-fuel customers. Potomac Electric and Power Company ("PEPCO") similarly offers efficiency programs to dual-fuel customers

[15] Direct Testimony of Chelsea Harnish at 17, Petition of Virginia Electric and Power Company (2021) (No. PUR-2021-00247), available at https://www.scc.virginia.gov/docketsearch/DOCS/6t7_01!.PDF, citing EMPOWER MARYLAND 2020 COST-EFFECTIVENESS RESULTS REPORT PRESENTED TO BALTIMORE GAS & ELEC. (Oct. 22, 2021).

receiving service from Washington Gas.[16] The Commission should consider directing the Company to expand program eligibility for dual-fuel customers. Alternatively, opportunities for dual-fuel customers should be explored in the stakeholder process. Expanding the pool of eligible customers not only leads to substantial increases in kilowatt-hour savings, which can be applied toward the Company's VCEA targets, but also extends energy-saving options and a provides a better customer experience to more customers.

Q. Do you have additional thoughts on improvements the Company might consider?

A. Yes. To meet future energy savings targets, the Company should consider further AMI integration to enhance zero-energy buildings into grid-interactive efficient buildings ("GEBs"), which combine multiple AMI use cases (such as dynamic pricing, real-time feedback, and geotargeting) to extract more grid value from programs and reduce capital costs. GEBs can leverage the distributed energy resources of zero-energy buildings to interact with the grid in real time in exchange for compensation, as in the Peak Time Response Program.

I have been pleased with the Company's participation in the stakeholder process, and its genuine consideration of the issues raised. Furthermore, the Commission Staff's participation in the stakeholder process has been especially important. I am optimistic that ideas for program improvement such as these can be addressed through future stakeholder meetings and orders of the Commission.

[16] Potomac Electric Power Co., *PEPCO Energy Wise Rewards*, available at https://energywiserewards.pepco.com/wp-content/uploads/2020/11/Pepco_Program_Rules.pdf.

Q. Does the Company's Phase XI application contain any changes that you do not support?

A. Yes. Company Witness Hubbard states in his testimony that the Company, as part of its redesign of the Residential Home Retrofit Bundle, will no longer require a Building Performance Institute ("BPI") certification for the installation of all measures.[17] I have concerns about the removal of this requirement.

First, Virginia law requires that residential building energy analysts hold a Virginia Residential Building Analyst license.[18] Residential building energy analysts are persons who, among other duties, may enter a home to "prepare a residential building energy analysis report and provide recommendations for improvements."[19] Residential building energy analysis is defined as:

> (i) an inspection, investigation, or survey of a dwelling or other structure to evaluate measure, or quantify its energy consumption and efficiency, including lighting, HVAC, electronics, appliances, water heaters, insulation, and water conservation, and (ii) recommendations to reduce energy consumption and improve efficiency of a dwelling or other structure, including lighting, HVAC, electronics, appliances, water heaters, insulation, and water conservation for compensation conducted or made by a licensed residential building energy analyst.[20]

In order to receive this license, analysts must complete an accredited residential building energy analyst training program, such as BPI. The Company cannot do away with the BPI certification

[17] Direct Testimony of Michael T. Hubbard at 11, Application of Virginia Electric and Power Company (2022) (No. PUR-2022-00210), available at https://www.scc.virginia.gov/docketsearch/DOCS/7phr01!.PDF.
[18] VA. CODE ANN. § 54.1-1145.
[19] VA. CODE ANN. § 54.1-1144.
[20] *Id.*

requirement because it is also a requirement of the Virginia REBA license, which is needed by any contractor performing a home energy analysis in the Residential Home Retrofit Bundle.

Q. Outside of requirements set by state law, are there practical reasons to require licensure of building energy analysts?

A. Yes. Requiring BPI licensure for all contractors performing a home energy assessment as part of the Residential Home Retrofit Bundle ensures consistency and quality in the assessments for each participating customer. Being licensed, bonded, and insured does not necessarily guarantee that each contractor understands the basic principles of building science, which is essential to completing any thorough energy assessment. Additionally, contractors prefer BPI training. One nationwide survey of contractors reports that 61% of respondents preferred BPI certifications over other options for qualifying contractors to perform this work.[21]

Q. Why has the Company suggested making this change to do away with BPI certification?

A. The Company points to a lack of participating contractors in their programs for this change, but it would be prudent to evaluate underlying factors for this phenomenon. The COVID-19 pandemic created serious challenges for energy efficiency contractors. During the height of the pandemic, energy efficiency contractor jobs fell 11.4% from 2019 numbers. Residential contractors were unable to enter homes due to safety concerns and government social distancing guidelines, according to the 2021 U.S. Department of Energy's Energy and

[21] Kara Saul Renaldi & Skip Wiltshire-Gordon, *AnnDyl Contractor Survey*, ANNDYL POL. GRP. (2023), available at https://www.anndyl.com/contractor-survey-results/.

Employment Report ("USEER").[22] Likewise, Mr. Hubbard highlighted some of the lingering effects that COVID-19 has had on the Company's programs in his testimony regarding the Company's decision to discontinue the Residential Appliance Recycling Program.[23]

Q. Are these circumstances expected to continue?

A. No. In fact, the 2022 USEER indicates that we are already seeing a rebound from the pandemic in this respect.[24] And that rebound is about to skyrocket. With the passage of the Inflation Reduction Act ("IRA"), the U.S. Department of Energy will deliver $9 billion to states for residential energy efficiency and electrification projects, which will create an unprecedented demand for skilled contractors involved in the installation of energy efficiency measures. Contractors who perform home energy efficiency and electrification upgrades as part of these programs are federally required to be familiar with BPI standards and procedures.[25] For these programs to be successful, the energy efficiency workforce will need to grow significantly, which in turn requires investment in training and education. The Department of Energy will be providing hundreds of millions of dollars to states for contractor training and education and specifically endorses BPI's Energy Auditor training. The fact that this funding is being distributed to states first before rebate program funds only underscores the urgent need to prepare for the surge in skilled energy efficiency contractor demand that these programs will generate.

[22] U.S. DEP'T OF ENERGY, 2021 U.S. ENERGY AND EMPLOYMENT REPORT (2021), available at https://www.energy.gov/policy/2021-us-energy-and-employment-report.
[23] Direct Testimony of Michael T. Hubbard at 12, Application of Virginia Electric and Power Company (2022) (No. PUR-2022-00210), available at https://www.scc.virginia.gov/docketsearch/DOCS/7phr01!.PDF.
[24] U.S. DEP'T OF ENERGY, 2022 U.S. ENERGY AND EMPLOYMENT REPORT (2022), available at https://www.energy.gov/policy/us-energy-employment-jobs-report-useer.
[25] 42 U.S.C. 18795(b)(1).

By requiring the same certification as the programs that will distribute federal funds, the Company is helping to ensure that Virginia contractors are poised to take advantage of these funds once they become available. It also ensures that consumers who want to take advantage of federal funds will be able to leverage utility programs in a streamlined and efficient manner.

V. COST-EFFECTIVENESS TESTS

Q. How is the cost-effectiveness of DSM programs currently measured?

A. Virginia law requires that utility DSM programs must pass three out of four cost-effectiveness tests in order to be deemed "in the public interest."[26] This requirement is unusually restrictive, as only two other states require DSM programs to pass multiple cost-effectiveness tests.[27]

Q. Would you recommend a reform of the process for how Virginia's uses the cost-effectiveness tests?

A. Yes, and this is an issue that merits further discussion in the stakeholder process. Company witnesses have previously testified that the Company has refrained from proposing several programs widely used by other utilities due to concerns with the inappropriate use of the cost-effectiveness tests under Virginia's approach.[28] Furthermore, Virginia is unusual in that it

[26] VA. CODE ANN. 56-576. Notable exceptions to this requirement exist for low-income and age-qualifying programs, which apply to several of the proposed Phase XI program bundles.
[27] Direct Testimony of Chelsea Harnish at 24, Petition of Virginia Electric and Power Company (2021) (No. PUR-2021-00247), available at https://www.scc.virginia.gov/docketsearch/DOCS/6t7_01!.PDF.
[28] Direct Testimony of Michael T. Hubbard, Schedule 5 at 1, Petition of Virginia Electric and Power Company (2021) (No. PUR-2021-00247), available at https://scc.virginia.gov/docketsearch/DOCS/67%40gQl!.PDF. These programs include the Strategic Energy Management program used by multiple utilities, including Duke Energy. *See* Ethan Rogers et al., *Features and Performance of Energy Management Programs,* AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON. at 61-62 (Jan. 2019), available at https://www.aceee.org/sites/default/files/publications/researchreports/ie1901.pdf.

assesses cost-effectiveness at the individual program level, whereas most jurisdictions evaluate at the overall portfolio level.[29] This restrictive procedure deprives customers of significant potential savings and hinders the Company's ability to meet its VCEA targets.

Q. Are there issues related to how Virginia's cost-effectiveness tests are calculated?

A. As stated in my previous testimony,[30] the Commission should consider recommendations in the *National Standard Practice Manual for Benefit-Cost Analysis of Distributed Energy Resources* ("NSPM for DERs") for cost-effectiveness testing.[31] The NSPM for DERs provides a comprehensive framework for improving cost-effectiveness practices for energy efficiency and other distributed energy resources. One of its main principles is to develop a primary test that aligns with state policies, such as the VCEA.

The Commission does not need to invent a new test to use the NSPM approach. Rather, the Commission could modify an existing cost-effectiveness test in a way that draws on appropriate components from multiple tests to advance Virginia's energy goals and policies. The Dominion Energy Efficiency Stakeholder Policy Subgroup, which includes representatives of the utility, the Commission Staff, cost-benefit testing experts, and stakeholders, has been meeting over the last year to discuss how Virginia can move towards this approach to better align proper use of the cost-effectiveness tests with Virginia policy.

[29] Martin Kushler et al., *A National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs*, AM. COUNCIL FOR AN ENERGY-EFFICIENT ECON. 31 (Feb. 2012), available at https://www.aceee.org/sites/default/files/publications/researchreports/ul22.pdf.
[30] Direct Testimony of Chelsea Harnish at 27-28, Petition of Virginia Electric and Power Company (2021) (No. PUR-2021-00247), available at https://www.scc.virginia.gov/docketsearch/DOCS/6t7_01!.PDF.
[31] NAT'L ENERGY SCREENING PROJECT & E4THEFUTURE, NATIONAL STANDARD PRACTICE MANUAL FOR BENEFIT-COST ANALYSIS OF DISTRIBUTED ENERGY RESOURCES (Aug. 2020), available at https://www.nationalenergyscreeningproject.org/national-standard-practice-manual/.

Q. Company Witness Edmund J. Hall testified that the Company responded to stakeholder feedback by analyzing the social cost of carbon benefits associated with each DSM programs. Do you have comments on that analysis?

A. Yes. I was pleased to see that this analysis was done and that it was determined by Mr. Hall that DSM programs can reduce overall carbon emissions. However, this analysis was performed on a standalone analysis and was not included in the cost-effectiveness testing.[32] The cost-effectiveness tests should be modified to include the social cost of carbon as well as other non-energy benefits ("NEBs"). These benefits are experienced by customers through increased comfort, air quality, and convenience, as well as by utilities, through reduced bill complaints and required shut-off notices, especially in low-income communities.[33] NEBs also affect society more broadly through increased community health, improved aesthetics, and greater energy self-reliance.[34] Indeed, the Company's Long-Term Plan acknowledges reduced greenhouse gas emissions as a NEB provided by energy efficiency programs.[35] The Stakeholder Policy Subgroup is actively exploring this topic, and has discussed other high impact NEBs such as avoided environmental compliance costs and market price effects. The *National Standard Practice*

[32] Direct Testimony of Edmund J. Hall, Schedule 8, Application of Virginia Electric and Power Company (2022) (No. PUR-2022-00210), available at https://www.scc.virginia.gov/docketsearch/DOCS/7pht01!.PDF.
[33] NAT'L ACTION PLAN FOR ENERGY EFFICIENCY, UNDERSTANDING COST-EFFECTIVENESS OF ENERGY EFFICIENCY PROGRAMS: BEST PRACTICES, TECHNICAL METHODS, AND EMERGING ISSUES FOR POLICY-MAKERS 44 (Nov. 2008).
[34] *Id.* at 45.
[35] Direct Testimony of Terry M. Fry, Schedule 1 at 109, Petition of Virginia Electric and Power Company (2021) (No. PUR-2021-00247), available at https://scc.virginia.gov/docketsearch/DOCS/67%40%2301!.PDF (stating that "some industry experts anticipate that GHG reductions could become . . . a key input to calculating the cost-effectiveness of these efforts").

Manual for Benefit-Cost Analysis of Distributed Energy Resources also provides extensive discussion and guidance on NEBs.[36]

Q. Do you have other suggestions for how cost-effectiveness testing in Virginia can be improved?

Yes. The use of state building codes as an evaluation, measurement and verification ("EM&V") baseline for calculating energy savings likely leads to undercounting program savings. Building codes are an appropriate baseline for "naturally occurring" installations, such as those in new construction, where the utility seeks to make a more efficient installation than would otherwise be required.

But most energy efficiency programs incentivize customers to take actions they otherwise would not take, such as replacing existing equipment with a more efficient model, or voluntarily improving a building shell. In these cases, the appropriate baseline is the existing efficiency of the building or equipment.

An inappropriate reliance on building codes as energy efficiency baselines will significantly under-count program energy savings. The VAEEC urges the Company to perform baseline studies for programs that encourage customers to take voluntary actions to implement energy efficiency measures in existing buildings (*e.g.*, early replacement of equipment, additional building shell efficiency improvements) by using appropriate indicators for "existing conditions"

[36] NAT'L ENERGY SCREENING PROJECT & E4THEFUTURE, NATIONAL STANDARD PRACTICE MANUAL FOR BENEFIT-COST ANALYSIS OF DISTRIBUTED ENERGY RESOURCES (Aug. 2020), available at https://www.nationalenergyscreeningproject.org/national-standard-practice-manual/.

in participant buildings. The U.S. Department of Energy has produced program evaluation guidelines that describe baseline issues in more detail.[37]

Q. Beyond these suggestions for amending cost-effectiveness test methodology, are there other developments on the horizon that will bear on cost-effectiveness calculations of energy efficiency programs?

A. Federal policy developments, including the Inflation Reduction Act and Bipartisan Infrastructure Law, present significant funding opportunities that could supplement energy efficiency programs. When the Department of Energy releases its guidance on these offerings later this year, the Company should make sure that these sources of funding are appropriately accounted for in cost-effectiveness analyses.

Q. Does this conclude your direct testimony?

A. Yes.

[37] *See* U.S. DEPT. OF ENERGY EVALUATION, MEASUREMENT, VERIFICATION WORKING GRP., SEE ACTION GUIDE FOR STATES: EVALUATION, MEASUREMENT, AND VERIFICATION FRAMEWORKS—GUIDANCE FOR ENERGY EFFICIENCY PORTFOLIOS FUNDED BY UTILITY CUSTOMERS 43 (Jan. 2018) (DOE/EE-1721); EPA, GUIDEBOOK FOR ENERGY EFFICIENCY EVALUATION, MEASUREMENT, AND VERIFICATION 10-12 (Jun. 2019).

Attachment CH-1:

Resume of Chelsea Harnish

Chelsea Harnish

Attachment CH-1

409 E. Main St. • Richmond, VA 23219 • Phone: 804.457.8619 • E-Mail: Chelsea@vaeec.org

Experience

Executive Director, Virginia Energy Efficiency Council — November 2015- present

- Work with membership and stakeholders to fulfill the organization's mission through our programmatic work
- Lead the organization's regulatory and legislative work
- Manage budgets and contracts

Policy and Campaigns Manager, Climate and Energy, Virginia Conservation Network — July 2012-October 2015

- Facilitated monthly meetings and coordinate legislative agenda for work group during general assembly sessions
- Participated in revising state energy plan through four-year appointment on the Governor's Energy Council
- Wrote and edited whitepapers on energy policy for annual briefing book for state legislators and their staff

Project Management Consultant, Virginia Conservation Network — February 2012-June 2012

- Coordinated a press conference to release the report, *Potential Economic Impacts of Renewable Energy in Virginia*
- Set up a webinar for legislators to showcase report findings
- Worked with researchers and stakeholders to finalize the report for public release

Virginia Policy Coordinator, Chesapeake Climate Action Network — September 2010-February 2012

- Established the legislative agenda for Virginia staff
- Collaborated with coalition partners on federal and state environmental policy initiatives
- Lobbied General Assembly on priority energy legislation

Regional Campaign Coordinator, Chesapeake Climate Action Network — January 2009-August 2010

- Developed and implemented campaign strategy for federal, state and local issues
- Lobbied General Assembly on priority legislation with emphasis on renewable energy and energy efficiency
- Built grassroots base throughout Virginia to support our work

Development Associate, Clean Power Now — May 2008-December 2008

- Wrote grant applications for submission to foundations
- Assisted with direct mail appeals to our membership
- Planned and executed summer house parties

Membership Coordinator, Clean Power Now — October 2005-May 2008

- Coordinated with Executive Director to develop campaign strategy promoting Cape Wind
- Handled all communication with members including e-newsletters and campaign materials

Education

Boston University — September 2004

Master of Science in Biology with an emphasis in Marine Ecology and Conservation

University of South Carolina — May 2000

Bachelor of Science in Biology with an emphasis in Marine Science

Attachment CH-2:

West Cary Group Presentation

Virginia Electric and Power Company
Case No. PUR-2022-00210
Virginia Energy Efficiency Council
First Set

The following response to Question No. 5 of the First Set of Interrogatories and Requests for Production of Documents propounded by the Virginia Energy Efficiency Council and received on March 9, 2023, was prepared by or under the supervision of:

Michael T. Hubbard
Manager, Energy Conservation
Dominion Energy Virginia

Question No. 5

Reference the Dominion Energy Virginia, Energy Efficiency Programs, Stakeholder meeting of February 24, 2023. Provide all PowerPoint slides and accompanying documents associated with the presentation on a Customer Awareness Update, "What Has Been Done – First 90 Days (West Cary Group)."

Response:

Please refer to Attachment VAEEC Set 01-05 (MTH).

Dominion Energy®

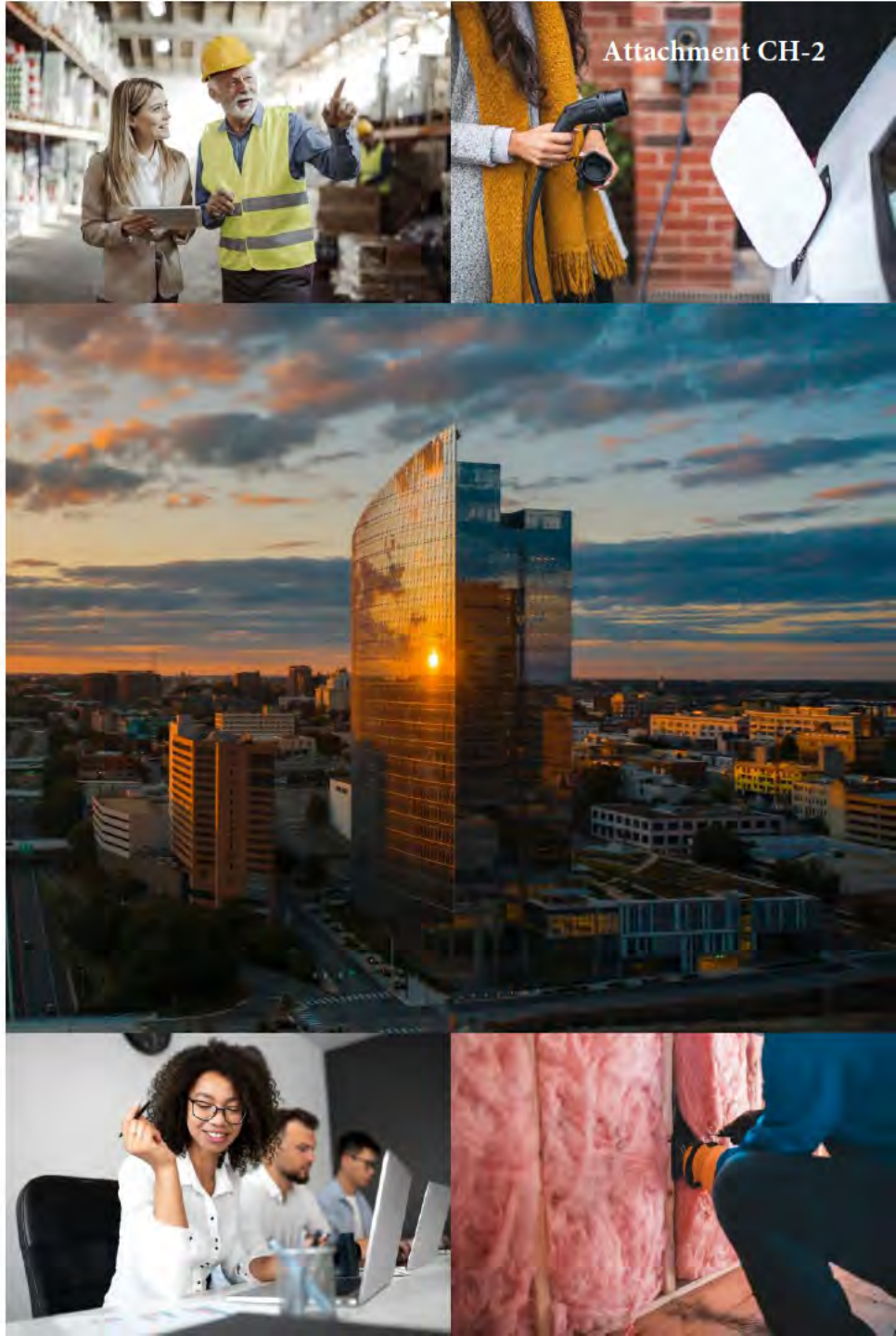
Stakeholder Session: Dominion Energy DSM

February 24, 2023

west cary group

West Cary Group Updates

- 90-Day Plan Recap (slides 3–4): *Courtney Nichols (in person)*
- Experience/UX Overview (slides 5–12): *(Mike Benjamin (in person)*
- Creative Overview (slides 13–18): *Debra Fitzgerald (in person) & Emily Peters (virtual)*
- Digital Overview (slides 19–20): *Grant Smith (virtual) & Nick Mastro (in person)*
    - SEO Overview (slides 21–23)
    - SEM Overview (slides 24–26)
    - Performance Tracking (slides 27–28)
- Customer Awareness & Outreach Subgroup (slides 29–31): *Robyn Link (virtual), Bridget Williams (virtual) & Ted Knicker (moderator/in person for poll questions)*



Dominion Energy

90-Day Plan Recap & What's Next

First 90 Days with WCG

COMPLETE ONGOING: Phase 1

Heuristic Evaluations

- **Existing digital properties evaluation:** opportunity mapping and recommendations
- **SEM and SEO evaluation:** opportunity mapping and recommendations
- Evaluations of GP collateral, competitive landscape marketing, and program analysis

Collateral Optimization

- **Work with DE team** to prioritize recommendations and deliver against high- and medium-level findings
- **Begin concept ideation** and refinement
- **Take immediate actions** against high- and medium-level findings from SEO/SEM analysis

Project Logistics for Long-Term Plan

- **Finalize logistics to** ensure a smooth-running project (e.g., CBTs, data, RACI, team norms, status calls)
- **Secure data** sharing and access (as needed)
- **Define project priorities** and align on prioritized workstreams for specific programs

Immersion

- **Hold general and program-specific kickoff sessions** (for prioritized workstreams) with key stakeholder groups, vendors, and trade partners
- **Conduct thorough immersion sessions in the business strategy,** industry reports, data, and best practices

Key Deliverables:
Report recommendations and quickly implement initial SEM/SEO optimizations.

Key Deliverables:
Best practices applied to existing collateral (e.g., email, landing page, DM) to immediately enhance communications

Key Deliverables:
Q3-Q4 drive calendar of check-ins, project kickoffs, and client presentations for prioritized workstreams

Key Deliverables:
Conduct immersion sessions and begin work outlined in Phase 1 of WCG's approach.

User Experience (UX) Review

Why designing a good user experience matters:

When interacting with products and services, we constantly look for **shortcuts to get jobs done more quickly**.

We process information rapidly, we **expect experiences to align with our mental models and expectations**, and when we encounter friction or a challenge, we assess a situation and **enter fight-or-flight mode.**

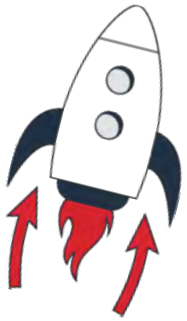
Negative experiences lead to **frustration, abandonment**, and unfavorable views toward a brand.

Investment in UX pays back BIG!

On average, every dollar invested in UX brings nearly $100 in return.

- Forrester Research

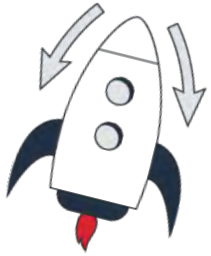
Reducing friction means you can expend significantly less on fuel to soar.



Fuel (Marketing Spend):

Getting more users into the marketing funnel.

This can be accomplished by improving search rankings, buying Google ads, investing in targeted ads, etc.



Friction Reduction (Good UX)

Improving the conversion rate (the percentage of visitors who end up completing one of your goals, such as signing up for an audit, claiming a rebate, etc.).

The more friction you can reduce, the higher your conversion rate will be.

We wanted to evaluate friction in the user experience. This was our approach:

Incorporated primary inputs
allowing us to develop empathy and understanding of the target audience during the evaluation

Analyzed patterns and insights
gathered through secondary research, peer evaluations, marketing platforms, and content tools we subscribe to as a filter for our review

Used our extensive UX expertise
to review the most critical components of the site

We conducted the evaluation through the lens of two personas to identify opportunities in the experience.

Meet Mary, a 68-year-old homeowner from Chester, VA.

She lost her husband a few years ago and now is the primary caretaker of her house, which was built in 1982 and isn't energy efficient.

With an annual income of $33,800, Mary sometimes struggles to make ends meet. When Mary receives her monthly energy bill, she notices DE's commitment to helping customers reduce their costs.

Mary logs in to domsavings.com to see what type of assistance is available.

Let's review some of the friction points Mary faces while finding out more about low-income and age-qualifying programs.

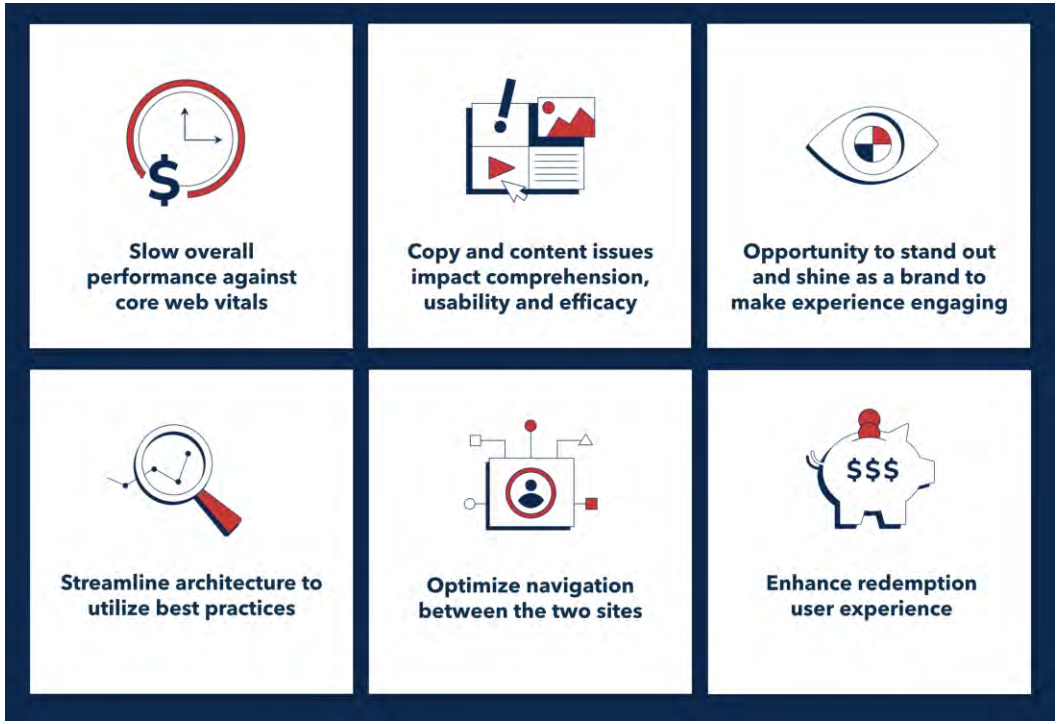
Meet Roland, a 34-year-old homeowner in Ashland, VA, who recently moved from Idaho.

Roland loves gadgets and technology and wants to ensure he is maximizing his energy savings. While shopping for appliances, he was informed that DE has various incentives and rebates he may qualify for.

Roland starts with a Google Search.

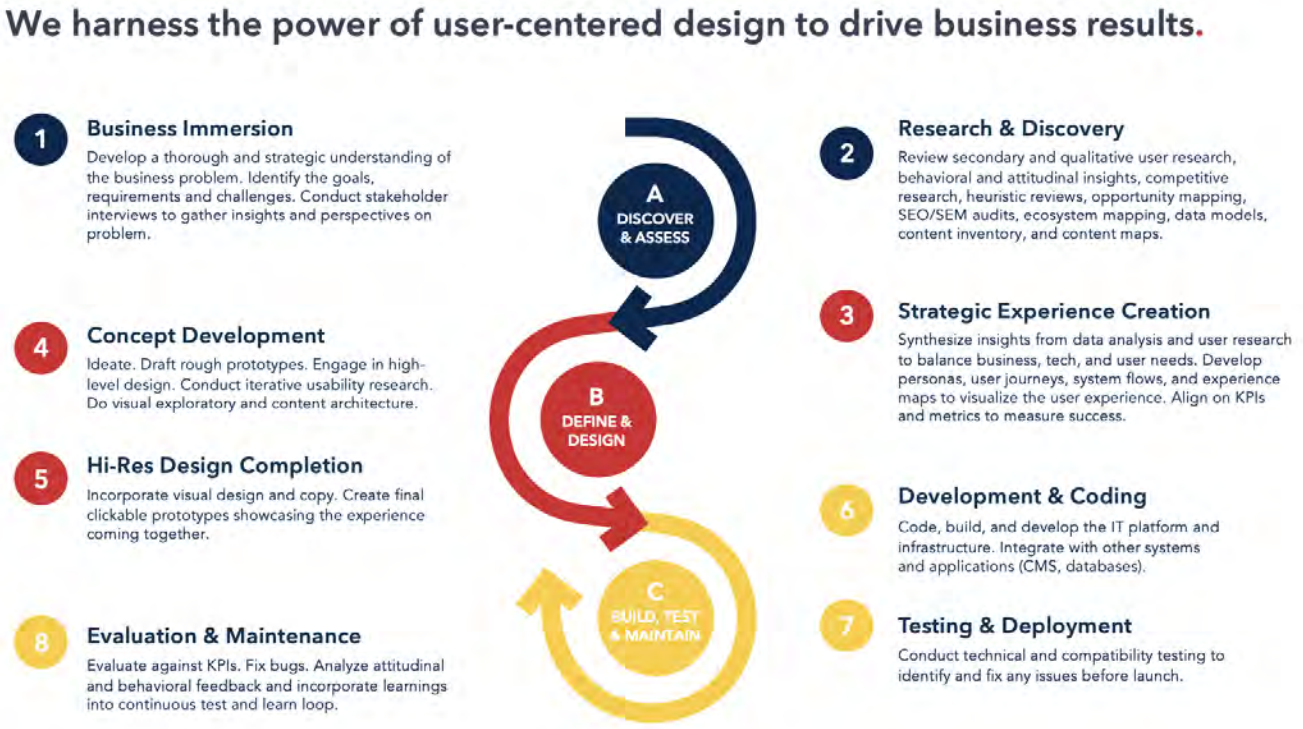
Findings

Core issues with overall experience can be addressed as part of a longer-term initiative.



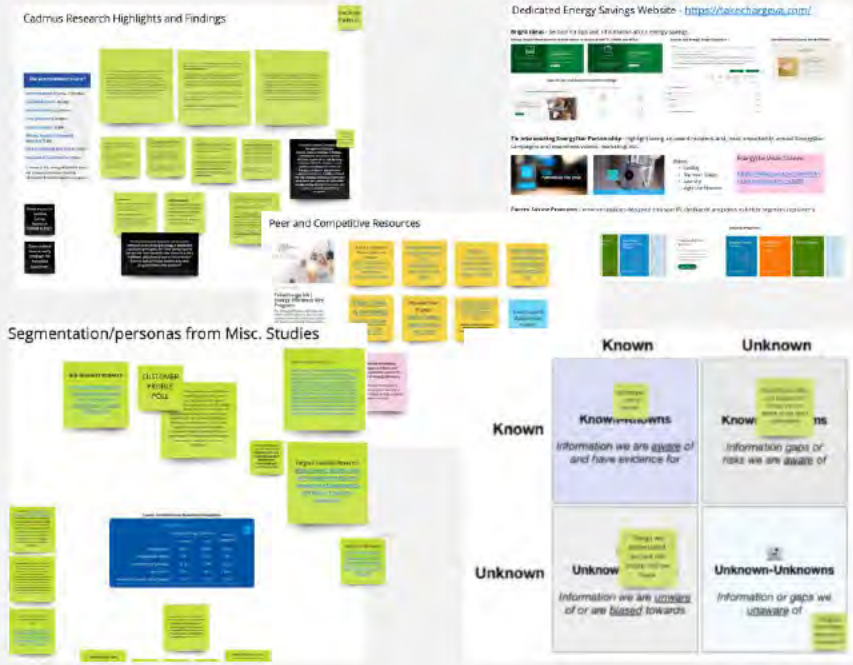
In addition to the UX reviews, as we wrapped up the first 90 days, we moved to the Research & Discovery phase of the DSM project.

- We are working on steps 1 and 2 of the UCD process, establishing a strong foundation for the work ahead.
- Completed a UX peer review
- Aligned on goals and objectives through an ecosystem mapping exercise
- Searched and collected primary and secondary research and conducted a systematic review of that research
- Began the initial creation of archetypes, which will aid in communication design and targeting work
- Began segmentation and persona research work



We gathered, synthesized, and distilled insights from the numerous data sources to better understand the landscape and environment.

We devised a composite picture of the customers we are trying to reach so that we can engage them more effectively.



Using well-proven frameworks of design and business, we already have a much clearer picture of the landscape and customer, allowing us to devise a more cohesive strategy.

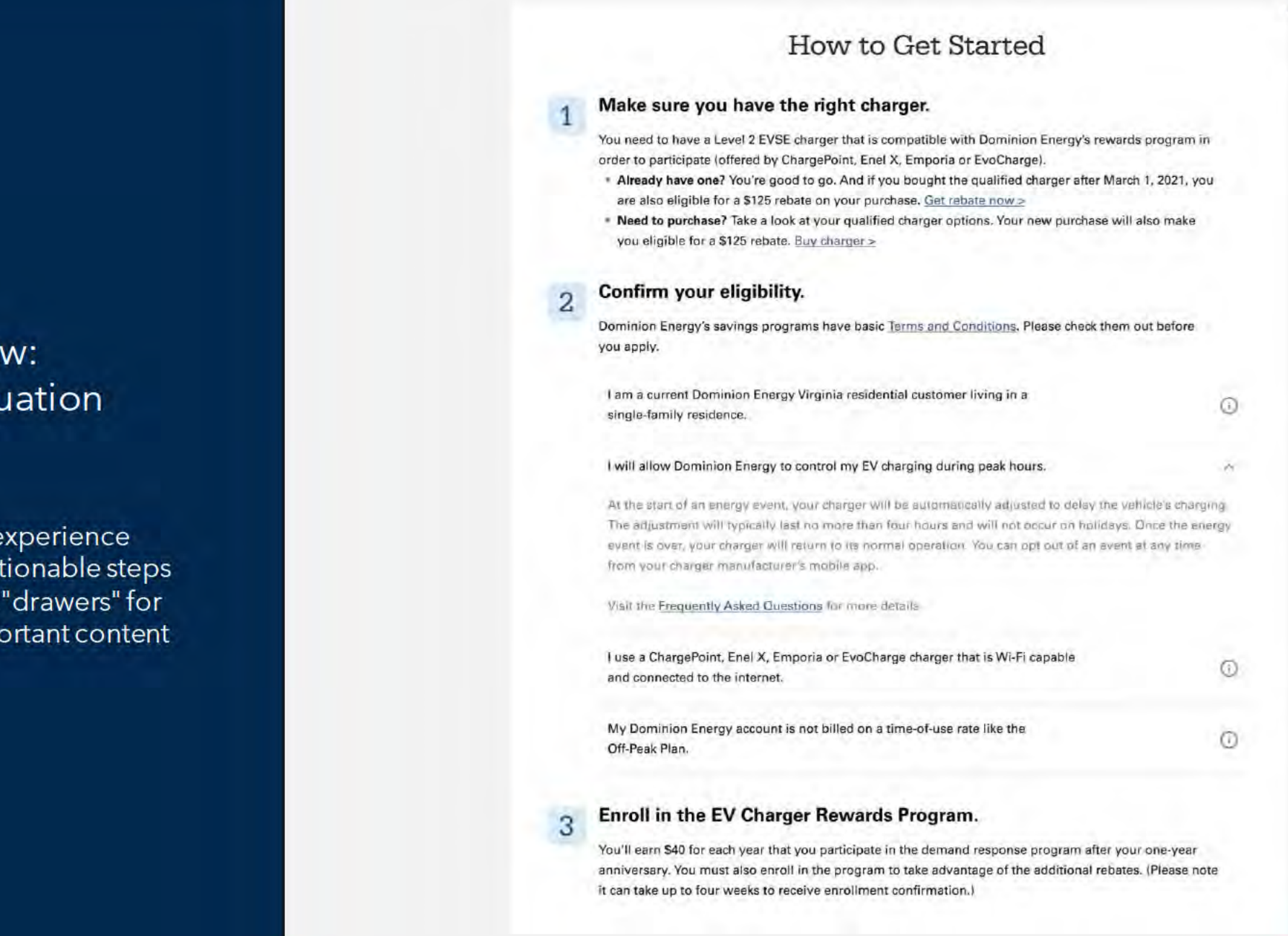
Creative Overview

Creative Review: Optimization of Key In-Market Communications

- Highlighting value of energy savings kit
- Streamlining and optimizing content for additional clarity
- Prominent placement of eligibility requirements to avoid expanding drawers

Creative Review: Microsite Evaluation

- Optimizing user experience
- Defining clear, actionable steps
- Creating content "drawers" for categorizing important content



How to Get Started

1 Make sure you have the right charger.

You need to have a Level 2 EVSE charger that is compatible with Dominion Energy's rewards program in order to participate (offered by ChargePoint, Enel X, Emporia or EvoCharge).

- **Already have one?** You're good to go. And if you bought the qualified charger after March 1, 2021, you are also eligible for a $125 rebate on your purchase. Get rebate now >
- **Need to purchase?** Take a look at your qualified charger options. Your new purchase will also make you eligible for a $125 rebate. Buy charger >

2 Confirm your eligibility.

Dominion Energy's savings programs have basic Terms and Conditions. Please check them out before you apply.

I am a current Dominion Energy Virginia residential customer living in a single-family residence.

I will allow Dominion Energy to control my EV charging during peak hours.

At the start of an energy event, your charger will be automatically adjusted to delay the vehicle's charging. The adjustment will typically last no more than four hours and will not occur on holidays. Once the energy event is over, your charger will return to its normal operation. You can opt out of an event at any time from your charger manufacturer's mobile app.

Visit the Frequently Asked Questions for more details.

I use a ChargePoint, Enel X, Emporia or EvoCharge charger that is Wi-Fi capable and connected to the internet.

My Dominion Energy account is not billed on a time-of-use rate like the Off-Peak Plan.

3 Enroll in the EV Charger Rewards Program.

You'll earn $40 for each year that you participate in the demand response program after your one-year anniversary. You must also enroll in the program to take advantage of the additional rebates. (Please note it can take up to four weeks to receive enrollment confirmation.)

Creative Review: Bill Insert Examples

- Lead with key benefits
- Short, succinct headlines
- Condensed copy to maximize white space
- Prominent QR code feature

Choose how you save.

A certified contractor will review all your options for cutting energy costs, including:

- Night temperature setback
- Chiller condenser temperature reset
- Discharge air temperature reset
- Static pressure reset
- HVAC heat content control
- Lighting systems and HVAC equipment scheduling
- Reduce variable air volume minimum position

Scan now to learn more about our Non-Residential Office Program.

DomSavings.com/Office-Program
1-888-366-8280

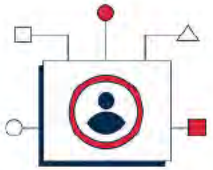
Dominion Energy

Dominion Energy

Creative Review: Work in Progress

Bill insert and email insert templates and resources for implementors to leverage

Dominion Energy demand side management "look & feel"



Messaging & value proposition development for DE DSM archetypes

General education & awareness "Umbrella Campaign" (target deployment: May/June 2023)

DSM Umbrella Campaign Sneak Peek

West Cary Group is exploring a broad messaging, naming, and visual platform that will unify Dominion Energy's large suite of DSM programs, increasing awareness, engagement, and participation for Virginia customers.

This includes:

- Developing a consistent communications strategy for DSM programs
- New visual identity
- Program name
- Program logo
- New voice, tone, and messaging hierarchy

How we'll get there:

- Leveraging UX research/archetypes
- Maintaining relevance of existing DSM messaging principles:
  - Saving money
  - Saving energy
  - Reducing carbon footprint
- Ensuring consistency with DE brand
  - New look and feel will blend seamlessly with existing Dominion Energy brand standards
- Collaborating with program managers and implementors

Dominion Energy

wcc west cary group

Digital Overview

Search Engine Marketing and Search Engine Optimization Explained

SEM and SEO are digital marketing strategies utilized to increase the visibility of a website in search engine results pages (SERPs).

SEM leverages paid media campaigns targeting specific keywords.

SEO is an organic tactic that leverages content and keyword usage to improve how Google ranks your site in SERPs.

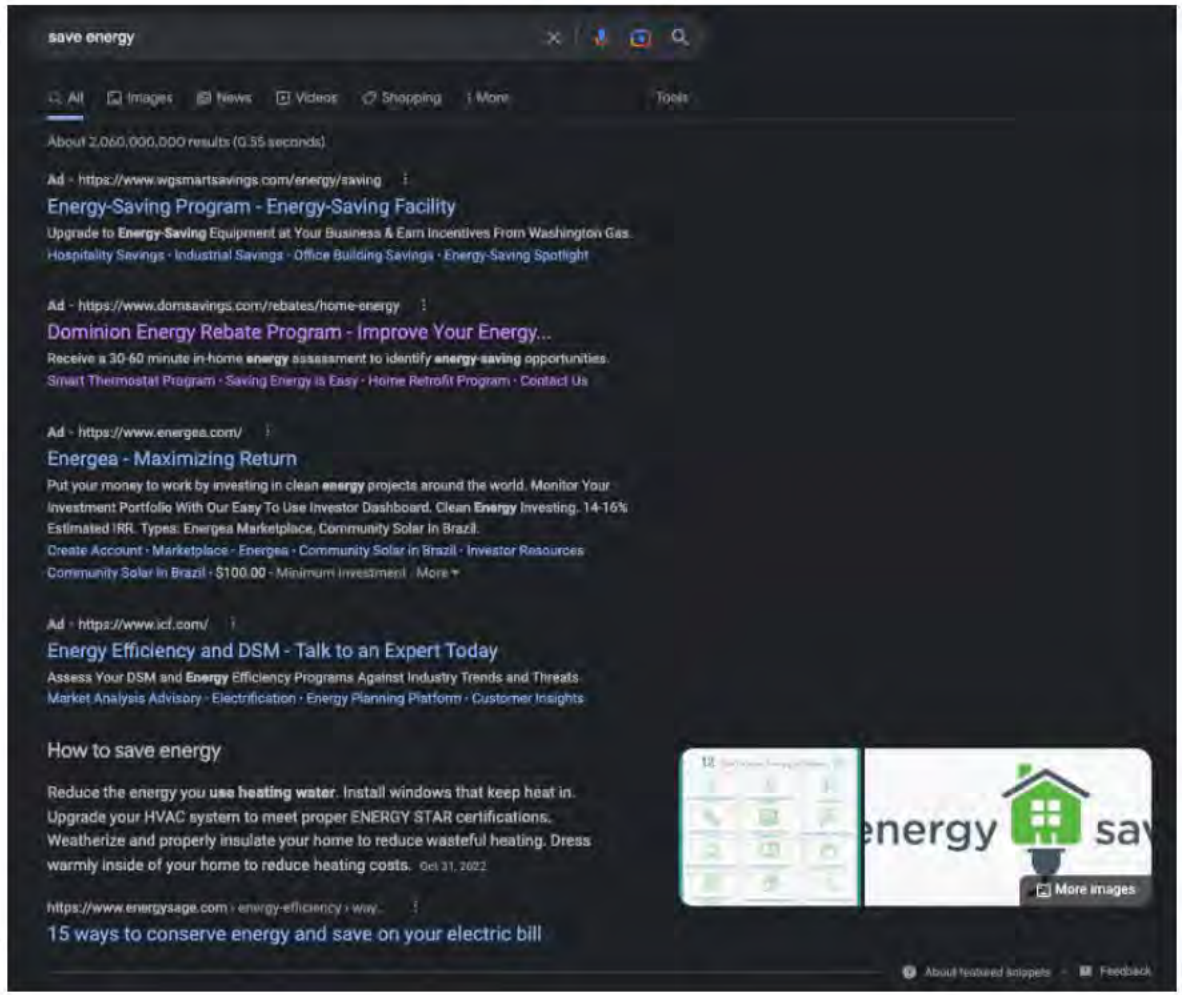
Overall Goal
Improved content visibility

SEM Goal
Increased quality of site traffic

SEO Goals
Improved site page ranking and improved search intent

Dominion Energy

SERP Page



SEO Overview

SEO Optimizations in Action: Save Energy

Virginia

Save Energy

Save energy and money with rewards, rebates and conservation programs.

At Dominion Energy, we've made a promise to deliver clean and reliable energy. To support this promise, we encourage you to explore ways to reduce your energy use at home and at work. Our programs can help. Questions? Call 888-366-8280 for more information.

To learn more about the savings our programs have achieved, check out our Annual Report.

Open Transcript

Residential | Non-Residential | Income-Qualifying | Key Documents

Residential Categories

Get a Home Energy Assessment or Audit | Buy Energy Star Products | Control Your Heating & Cooling
Charge Your Electric Vehicle | Appliance Recycling | Other Approved Programs

Get a Home Energy Assessment or Audit

Find out where your home is costing you comfort and energy dollars.

- Smart Home
- Virtual Energy Audit
- Quick Energy Check-Up
- Full Energy Audit
- Manufactured Housing
- Multifamily Program

Virginia

Save energy to save money.

Simple, convenient savings programs that fit into your life—not the other way around.

Dominion Energy is committed to bringing clean and reliable energy to the communities where we live and work. But we can't do it alone. We serve millions of homes and businesses right here in Virginia, and it takes all of us working together to save energy, help save the environment and save money. That's why we have over 40 energy-saving programs that go way beyond the basics. Take a closer look and find the program that's right for you.

Questions? Call 888-366-8280 for more information.

Open Transcript

Featured Programs

Residential | Non-Residential | Income- and Age-Qualifying

Benefit From a Home Energy Audit

You use energy in so many different ways throughout your home—so we think you should be able to customize all of the different ways you want to save, too.

- Buy your base Smart Home Kit and receive our fully integrated, conveniently bundled set of compatible smart home technologies.
- Get a FREE energy efficiency kit through our virtual audit, or schedule an in-home assessment for a quick check-up or a more comprehensive evaluation of improvements to help you save.

Save Energy With Smart Technology

Smart thermostats are everywhere—and for good reason. They give you an easier way to control the temperature in your home and help you figure out how to save electricity at the same time. If you already have one, you could save energy by connecting it to our WeatherSmart program. And if you don't, now's the time to find out what you've been missing. You don't even need a Smart thermostat through Dominion Energy. The savings apply regardless of what brand you use, so start getting rewards today.

On-Page SEO Optimization

To drive SEO improvements for DSM-related content pages, WCG is working with the DominionEnergy.com site development team to update on-page content and key HTML elements for a new keyword strategy.

On-Page Essentials in HTML or CMS: These elements need to be configured when content is pushed to the website. They should be unique for each page and optimized for SEO.

Page URL String: include primary keyword

Page Title: 55 characters, include primary keyword

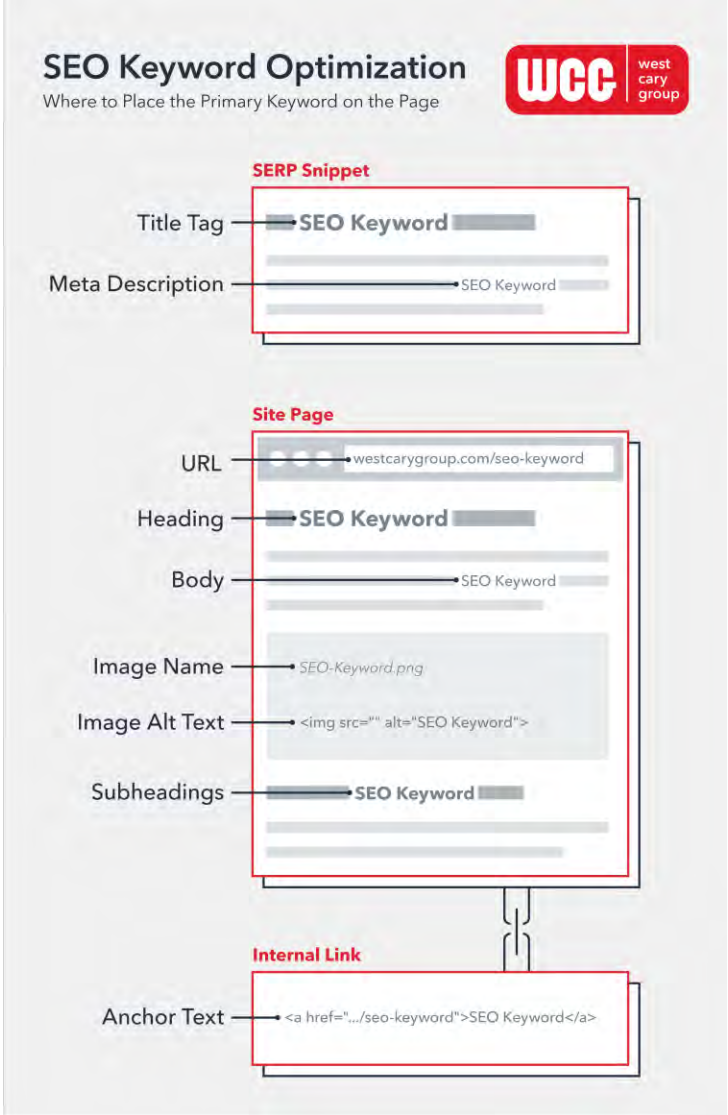
Meta Description: 155 characters, include primary keyword

Headers (<H1> thru <H6>): leverage primary and supportive keywords

Image Alt Tags: leverage primary and supportive keywords

Content Length: 500 words+ baseline, recommendation dependent on target keyword

Internal/External Linking: more quality links = higher value to Google

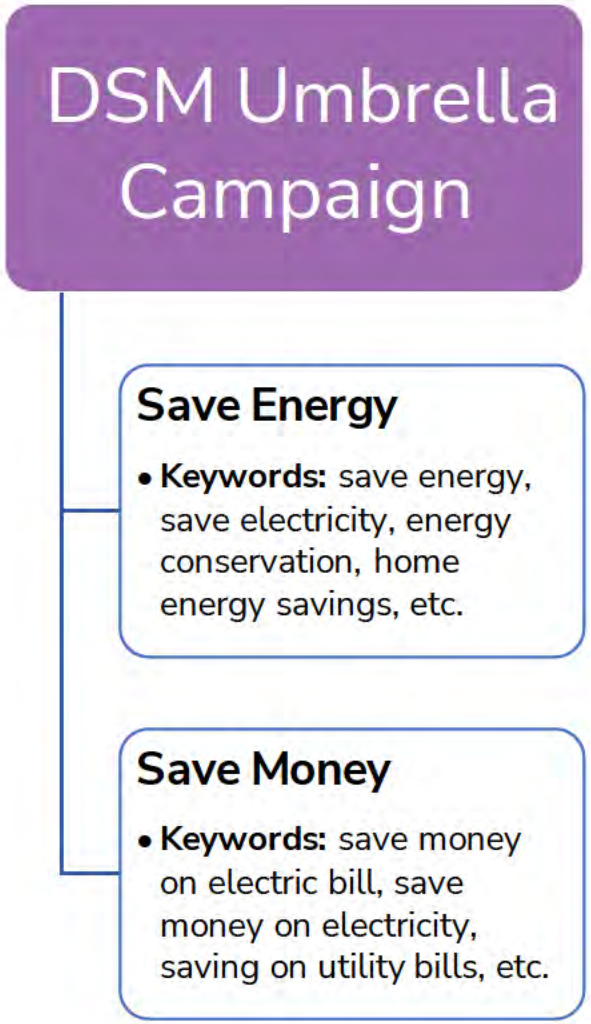


SEM Overview

SEM Opportunity Identified for DSM Awareness

WCG keyword research revealed popular search queries with high intent for broad DSM program awareness based on search behaviors around **saving energy** and **saving money**.

This is the basis for our strategy to introduce a "DSM Umbrella Campaign" promoting awareness of the overall program.



Path Forward for Search Engine Marketing

● COMPLETE ○ ONGOING

Phase 1 (Months 1-2)

- Launch Umbrella SEM Campaign, initially optimized for clicks ○
- Collaborate keyword strategy with Honeywell to avoid competition ●

Phase 2 (Months 3-4)

- Supplement demand generation with Umbrella Performance Max Campaign
- Assist Honeywell with keyword strategy for individual program campaigns
- Convert Umbrella SEM Campaign to optimize for conversions

Phase 3 (Months 5-6)

- Establish SEM campaigns for programs not currently covered by SEM

Next Steps to Launch Umbrella Campaign for Phase 1:

- Complete SEM ad development
- Finalize and launch updates to "/Save-Energy" page to serve as an ad destination
- Determine schedule for report-outs and recommendations for optimizations

Performance Tracking

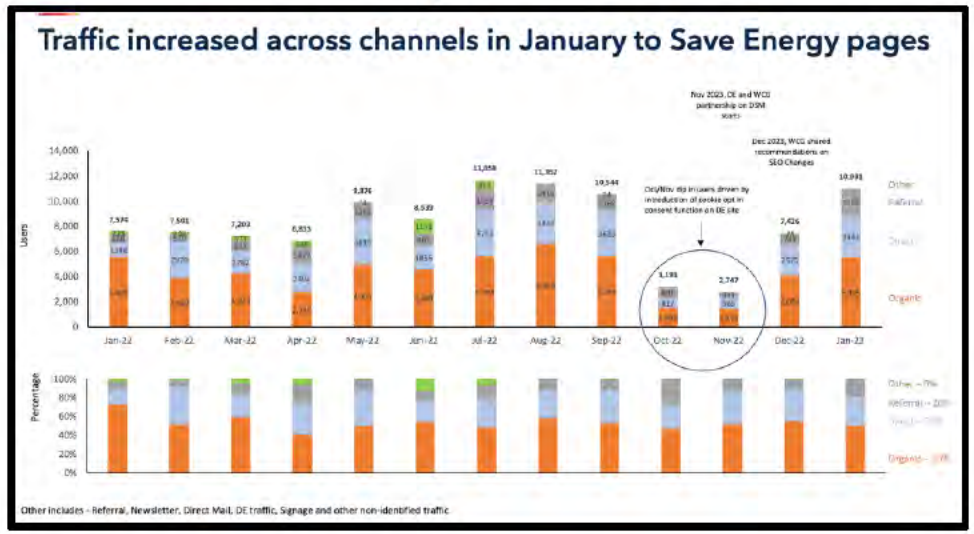
Tracking and Performance

- WCG has built a **web analytics dashboard** for DominionEnergy.com (Save Energy pages) and DomSavings.com.
  - This artifact allows us to monitor and track which efforts are increasing traffic and engagement on these domains, including SEO & SEM metrics.

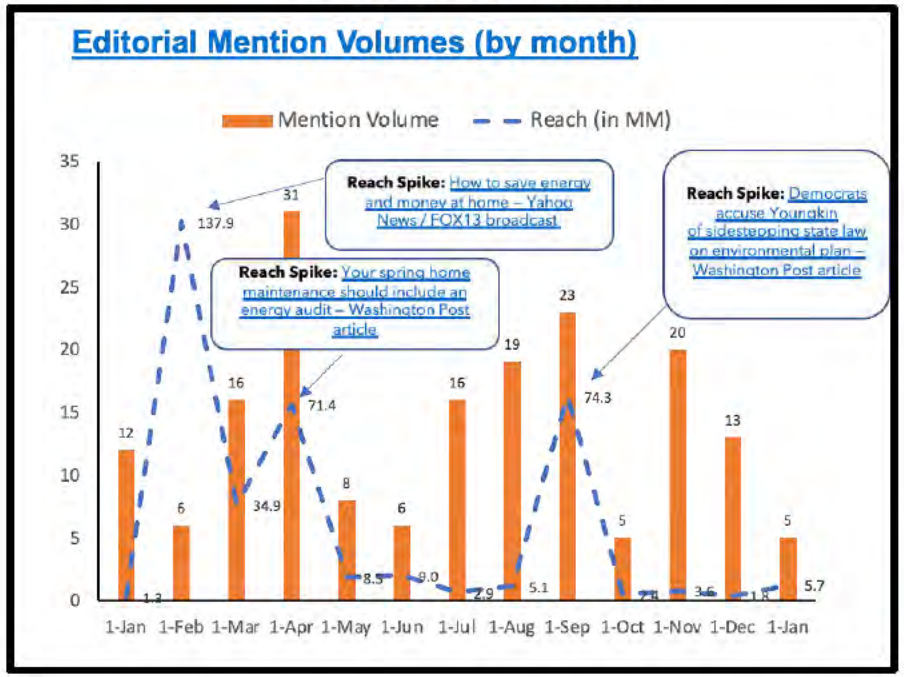
- WCG has conducted a **media listening & sentiment audit**, identifying volume, reach, and sentiment of mentions related to DSM from news and social sources in 2022.

- Next, we're building a **tagging resource for implementors** to leverage that will help standardize tracking across DSM programs.
  - This will largely involve UTM codes for online efforts and UTM codes + URLs for offline efforts.

Web Analytics Dashboard



Sentiment Audit



Customer Awareness & Outreach Subgroup

Customer Awareness and Outreach Subgroup Meeting Objectives

Engage and collect valuable inputs on subgroup stakeholder perceptions and expertise

Conduct several annual subgroup meetings to inform key stakeholders of the timeline and status of the initiative (frequency to be determined with subgroup)

Provide subgroup members with the opportunity to ask questions and provide feedback

Share updates, materials, and resources related to customer awareness and outreach deliverables with subgroup members

What to Expect at the First Subgroup Meeting

Introductions

Meeting norms and responsibilities

Communication preferences discussion and alignment

Meeting cadence and schedule discussion and alignment

Overview of project timeline and deliverables for year one

Share current active project(s) for input and feedback

THANK YOU!

Idea Collection

[Meeting poll or survey]

Are you interested in joining the subgroup?

If you are interested in joining the subgroup, would you be interested in being a co-chair?

If you cannot participate in the subgroup, would you be open to participating in:

- engagement with interactive tools such as a virtual whiteboard
- providing feedback through Basecamp/emails
- optional 1:1 interviews/focus groups when applicable for program context
- none of the above

Idea Collection

What kind of information related to customer awareness and outreach are you interested in receiving? Your feedback can be broad or specific. [open-ended]

What are some good examples of customer awareness and outreach for DSM-related programs that you have seen or encountered? [open-ended]

Do you have any other comments or suggestions? [open-ended]

Attachment CH-3:

Response to Staff Interrogatory 05-106

Virginia Electric and Power Company
Case No. PUR-2022-00210
Virginia State Corporation Commission Staff
Fifth Set

The following response to Question No. 106 of the Fifth Set of Interrogatories and Requests for Production of Documents propounded by the Staff of the State Corporation Commission and received on March 9, 2023, was prepared by or under the supervision of:

Nathan J. Frost
Director - New Technology & Energy Conservation
Dominion Energy Virginia

Terry M. Fry
Senior Vice President
Cadmus

Question No. 106

Has the Company been provided with any examples or recommendations from stakeholders that compiling programs into bundles would increase customer participation, ease the implementation process, decrease difficulty of marketing, enhance the experience, and/or improve customer awareness?

Response:

The Company and its consultant, Cadmus, have engaged in active dialogues with numerous stakeholders throughout the various stages of the Company's long-term planning process. Numerous in-depth interviews were conducted with stakeholders, which include current and active members of the DSM stakeholder review process as well as program implementors. One common theme that the various stakeholders provided is that the Company is offering an overwhelming number of stand-alone programs. This has also been voiced by environmental respondents within the formal DSM proceedings. As such, Cadmus utilized its industry expertise and knowledge and recommended that the Company provide a program bundling approach for its DSM Program portfolio, when practicable.

Attachment CH-4:

Response to Staff Interrogatory 01-14

Virginia Electric and Power Company
Case No. PUR-2022-00210
Virginia State Corporation Commission Staff
First Set

The following response to Question No. 14 of the First Set of Interrogatories and Requests for Production of Documents propounded by the Staff of the State Corporation Commission and received on February 8, 2023, was prepared by or under the supervision of:

Michael T. Hubbard
Manager, Energy Conservation
Dominion Energy Virginia

Question No. 14

Please identify whether any of the Phase X projects have been implemented since the Final Order in Case No. PUR-2021-00247.

Response:

The Company is currently in the final stages of contract negotiations and other program launch activities, including building out IT data requirements and transfer protocols with various program design implementation vendors. Also, the Company is coordinating with the new customer information platform, which is scheduled to roll out in April of 2023. The Company anticipates that customer facing information specific to all approved Phase X programs will be available around the end of Q1 2023.

Attachment CH-5:

Pacific Gas & Electric Study

Customer Targeting via Usage Data Analytics to Enhance Metered Savings

Adam M. Scheer, Ph.D., Pacific Gas and Electric Company
Sam Borgeson, Ph.D., Convergence Data Analytics
Robert Kasman, Pacific Gas and Electric Company
Megan Geraci, Pacific Gas and Electric Company
Frances Dahlquist, Pacific Gas and Electric Company

ABSTRACT

With a $1 billion annual investment, California spends more on energy efficiency (EE) than any other state. Yet this funding amounts to less than $20 per household or small business, a tiny fraction of a comprehensive energy retrofit. The limited reach of EE dollars compels a question: *How can we prioritize projects with the highest savings potential?* In this paper we showcase the capacity for data analytics to enhance savings through customer targeting. We detail targeting research covering representative programs across both residential and non-residential sectors. Using straightforward selection criteria derived exclusively from pre-program usage data, our targeting approaches yield substantial savings increases when applied retroactively to participants in past programs. For example, in PG&E's whole-house retrofit and commercial direct install programs, average participant savings increase by 53% and 76% upon targeting the top half of customers via criteria including temperature-to-load correlation and total usage, revealing immediate potential for higher savings at lower cost. Beyond identification of likely high savers, our targeting strategies effectively eliminate neutral and negative savers. The capacity of pre-program interval data alone to accurately predict the full range of savings outcomes implies that takeback, occupancy changes, load additions, and other extraneous variables need not be considered intolerable risk factors in moving beyond prescriptive deemed savings. Harnessing these findings, PG&E is taking customer targeting to the field in the meter-based Pay-for-Performance (P4P) platform.[1] If successful, P4P with customer targeting can enable innovative program designs and deployment of EE as a competitive grid resource.

Introduction

Recent meter-based studies (ODC 2014, Evergreen Economics 2016, Scheer 2017) on several downstream EE programs reveal consistent patterns:

1. Metered savings vary widely among program participants.
2. A small fraction of participants accounts for a high fraction of total metered savings.
3. A significant number of program participants consume more energy after the program than before (i.e. contribute *negative* metered savings).

1 At PG&E the P4P Platform enables third party programs that count and incentivize savings observed via meter-based analyses.

When evaluating a program, these are interesting observations. When implementing deemed[2] interventions, at-the-meter savings can be intriguing, but are often don't impact the immediate bottom line. But in a program in which savings and incentives are determined at the meter, like PG&E's Pay for Performance (P4P) program, these results have immediate and important implications. On one hand they show that a deemed or custom program plugged directly into a metered analysis may sorely disappoint. On the other they point to an opportunity that is the focus of this work: If customers' likely savings potential can be predicted, we can both limit risk and increase benefits of EE investment through targeted customer recruitment.

This paper summarizes results from several recent and ongoing studies conducted in partnership between PG&E and Convergence Data Analytics in which we develop and test predictive customer targeting schemes based on AMI data analytics. Our research utilizes data from longstanding PG&E EE programs in both the residential and small/medium business (SMB) sectors. In every case, features derived exclusively from customers' pre-program usage data are used as targeting criteria and tested against metered savings outcomes. We find highly impactful and intuitive schemes for all programs we have investigated to date, including Advanced Home Upgrade, the Residential and Commercial Quality HVAC[3] Maintenance programs, and the SMB Direct Install (DI) Program. In all of these programs targeting shows potential to increase aggregate savings by 50 – 200% or to make metered measurement viable. We also find that the optimal targeting strategies depend on the specific program interventions and goals.

The Nature of Metered Savings

Before exploring targeting strategies and impacts for EE programs, it is important to touch on the statistical nature of energy usage and metered savings. Figure 1 gives a histogram distribution that shows the variation in annual cooling electricity usage from one year to the next for a random sample[4] of approximately 5,800 single family homes in California's Central Valley.[5] The difference in annual energy consumption, or "savings" runs along the x-axis with the y-axis indicating customer count. As is true for all analyses presented in this paper, these results are weather-normalized.[6]

The distribution consists of a pronounced peak centered around 0 MWh (dashed blue line), indicating that many customers exhibit negligible year-over-year change in electricity consumption. The average savings, indicated by the solid red line, was 49 kWh.[7,8] In other

[2] 'Deemed' savings refer to engineering estimates for the *average* savings that would be expected for a particular EE measure.
[3] Heating, Ventilation, and Air Conditioning
[4] Note that this random sample has not been explicitly selected as a matched control group for a program.
[5] California's Central Valley consists of climate zones 11 – 13 and generally experiences hot summers and colder winters than more temperate inland and coastal regions.
[6] See the Methodology section in (Scheer 2017) for more details of the analysis.
[7] Little average change in year-over-year energy usage is to be expected in the absence of dramatic exogenous factors such as a significant economic recession or natural disaster.
[8] Outliers have been eliminated in the determination of all savings values, averages, and other metrics presented throughout this paper. For the Residential programs only the middle 3.0% to 97.0% of savers are retained. Eliminating the bottom and top 3% of

words, an average single-family Central Valley home reduced cooling kWh usage by about 0.5% compared to the previous year.[9] However, the distribution also shows substantial positive and negative tails, leading to a standard deviation of approximately 750 kWh, which amounts to about 15% of average total annual usage for a typical Central Valley home. This variability is the result of many factors that occur largely on an individual household level. Customers regularly experience occupancy changes, undertake structural renovations, take vacations, add plug loads and integrated devices, and upgrade HVAC and lighting systems among many other possibilities.

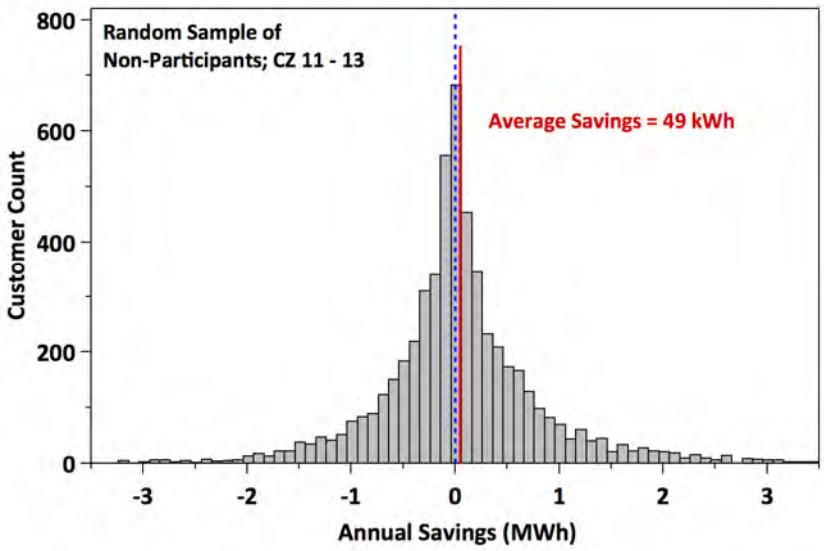


Figure 1. Histogram distribution of Pre – Post annual cooling electricity usage for a random sample of single-family households in California Central Valley. The "intervention" date for the pre – post analysis is randomly assigned.

Now we consider the nature of metered savings from an EE intervention and the challenge of isolating the program's impact. Importantly, the intervention acts on top of the underlying savings distribution. Figure 2 compares the savings distribution of the random sample (bottom) to that of participants in PG&E's Advanced Home Upgrade program (AHU).[10,11]

One can see that program participation shifts and widens the savings distribution. Compared to the random sample, a smaller fraction of customers consumes more after the intervention, or has "negative savings." Additionally, the peak of the distribution shifts well into positive territory, along with more pronounced positive tail. Average household cooling savings (solid red line) are observed to be more than 1 MWh (1,084 kWh).

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the savings distributions ensures that results better reflect legitimate program impacts. In general, when outliers are included, results are observed to change by approximately 10% or less.

[9] The average annual electricity consumption of a single-family home in climate zones 11-13 is approximately 11 MWh (PG&E 2017).

[10] The AHU sample consists of approximately 900 customers in climate zones 11-13 who participated in 2015. At least one full year of pre and post-participation hourly interval electricity usage data is assessed for each customer. Each customer included in the reported analysis passed a number of quality control criteria (Scheer 2017) to minimize the impact of artifacts in the dataset.

[11] Advanced Home Upgrade is designed to deliver deep savings (~20% of total usage) through whole home retrofits focused on building shell and HVAC upgrades.

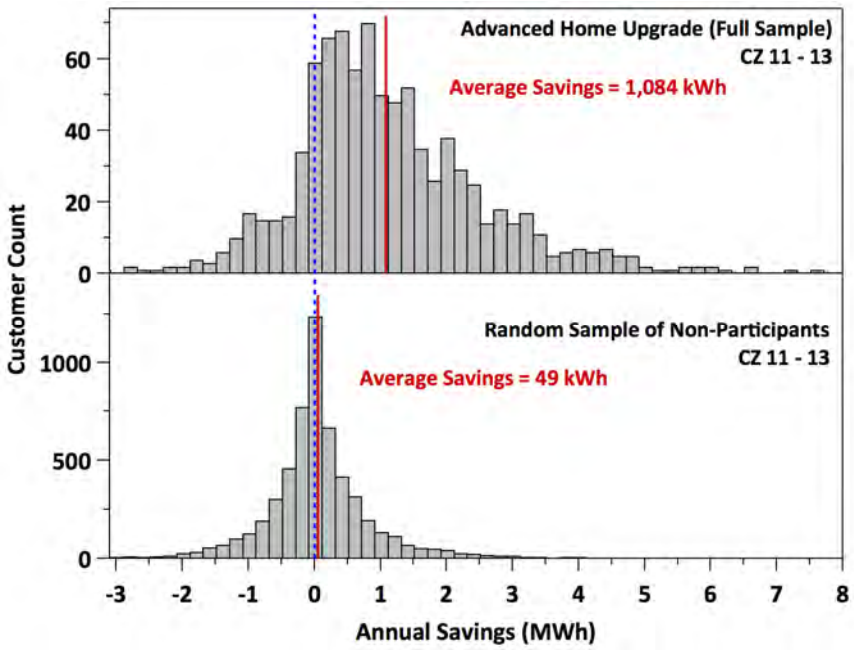

Figure 2. Histogram distributions of Pre – Post annual cooling electricity usage. Bottom – Random sample of single-family households in California Central Valley. Top – Central Valley Advanced Home Upgrade Participants.

Customer Targeting: The Concept

Figure 2 shows that the patterns discussed above from recent meter-based savings analyses hold true for the AHU sample. Savings vary greatly among program participants and, despite undertaking a substantial EE retrofit, many customers remain near-neutral or negative savers. Among only the positive savers, the top third of households accounts for nearly two-thirds of total savings. These and similar results from other programs lead us to three questions that are at the heart of this research: 1. Can a predictive targeting scheme identify a subset of customers with stronger savings performance? 2. If so, what are the most effective targeting schemes? 3. What savings impact at the meter could be expected from targeting?

In a 2017 report (Scheer 2017) we detail the development and optimization of targeting schemes for AHU and PG&E's Residential HVAC Quality Maintenance program (AC/QC). For these programs, the most effective scheme to enhance savings consisted of two criteria:

1. High total summer electricity usage (Summer kWh)
2. High ratio of summer-to-shoulder[12] period electricity usage (Summer-to-Shoulder Ratio)

Selecting customers who met minimum pre-program thresholds for these criteria significantly enhances average savings. Figure 3 shows how the savings distributions change when using these criteria to target approximately half[13] of Central Valley AHU participants. The bottom

[12] Summer months are taken as June, July, and August. Shoulder months are taken as November, February, and March.
[13] Targeted customers had average daily summer usage of at least 26.98 kWh and a Summer-to-Shoulder ratio of at least 1.138.

panel reproduces the savings distribution of the full sample while the middle and top panels show the savings distributions for eliminated and targeted customers respectively.

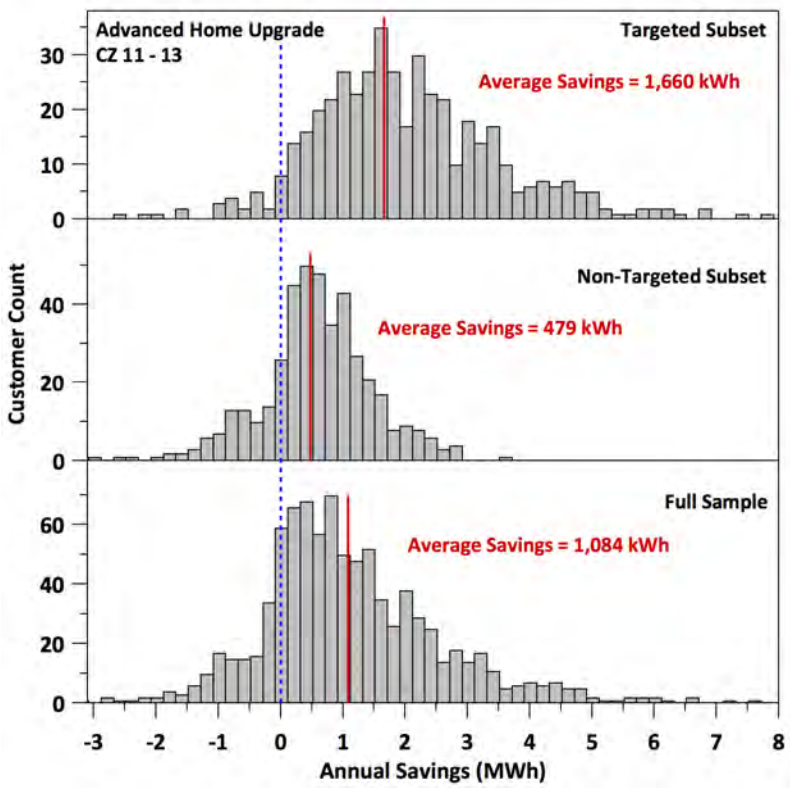

Figure 3. Histogram distributions of Pre – Post annual cooling electricity usage for Advanced Home Upgrade participants in Climate Zones 11 – 13. Bottom – Full Sample. Middle – subset of customers not selected by the targeting criteria. Top – subset of customers selected by the targeting criteria (see row 3 of Table 1).

From the change in savings distribution one can see the following impacts from targeting:

1. The reduction in the negative tail (top panel) shows that targeting minimized the "negative saving" customers. That some customers remain in the neutral and negative-saving region is expected from the random sample distribution (Fig. 1), which shows a tail that extends beyond -2 MWh.
2. Targeting effectively identified the customers with high likelihood of significant positive savings, as indicated by the enhanced mean and positive tail also seen in the top panel.
3. Targeting shifted the peak in the distribution toward significantly higher positive savings.

Overall, targeted AHU customers, accounting for about half of all AHU participants (51%), saved an average of 1.66 MWh, 53% more than the average AHU Central Valley participant *and more than three times that of the average non-targeted customer*. While the non-targeted customers still saved an average of 479 kWh, the majority of these participants likely did not achieve the anticipated efficiency gains. This raises an important point: for both participating

customers and the broader customer base, targeting can help ensure incentives are directed to projects with a high likelihood of delivering the desired benefits.

To this point we have illustrated one targeting level that selects approximately half of Central Valley AHU participants. However, targeting can be made more or less rigorous by tuning the selection criteria as in the Table 1 scheme, in which a higher percentage of customers are filtered out at each step. In this scheme customers must pass both criteria to be targeted at a given level.

Table 1: AHU Central Valley Targeting Scheme; Threshold Filter Values

% Customers Filtered Out	Average Daily Summer kWh	Summer-to-Shoulder[a] Usage Ratio
10	**12.93**	**0.827**
24	**19.60**	**0.827**
49	**26.98**	**1.138**
73	**39.58**	**1.498**
89	**42.14**	**1.805**

[a]Summer = June, July, August; Shoulder = November, February, March

The right side of Fig. 4 shows the evolution of savings distributions as the targeting criteria are made more rigorous, while the left side shows the corresponding changes in average savings. The arrows guide the eye between distributions and their averages. One can see that at each step, a substantial increase in average participant savings is observed.

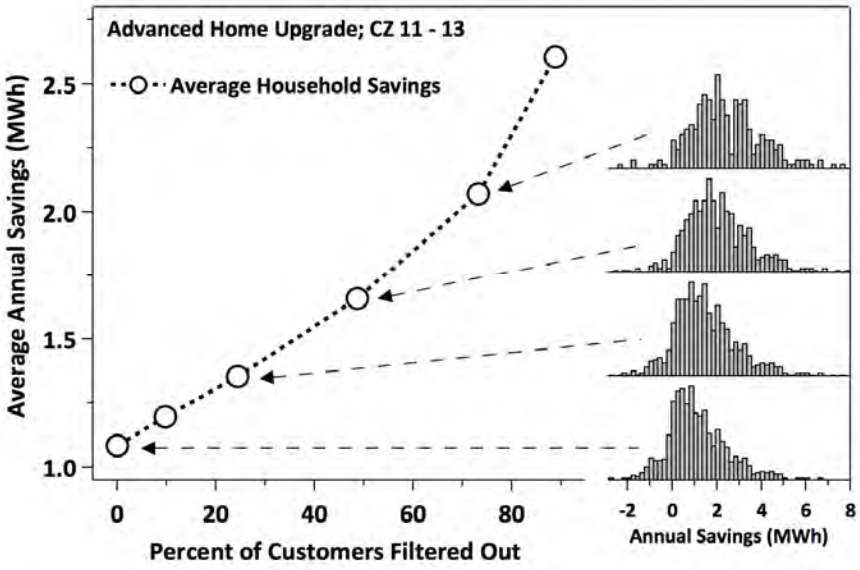

Figure 4. Left – Average annual cooling savings (outliers excluded) for Advanced Home Upgrade participants in the Central Valley as targeting criteria are made more rigorous (see Table 1). Right – The histogram distributions of Pre – Post annual modeled cooling electricity usage that yield the corresponding average values.

While not as information-rich, the left side of Fig. 4 is more economical and this style of figure is used to explain results from several programs and targeting schemes presented below.

Customer Targeting: Additional Results

Testing Individual Targeting Criteria

Thus far we have described targeting concepts and results for Advanced Home Upgrade. The targeting scheme combined the two criteria of Table 1. We have investigated other individual targeting criteria and combined schemes within several programs, observing a wide range of results. Figure 5 shows performance of a number of individual targeting features for PG&E's residential Air-Conditioning Quality Care (AC/QC) program, which focuses on HVAC maintenance measures.

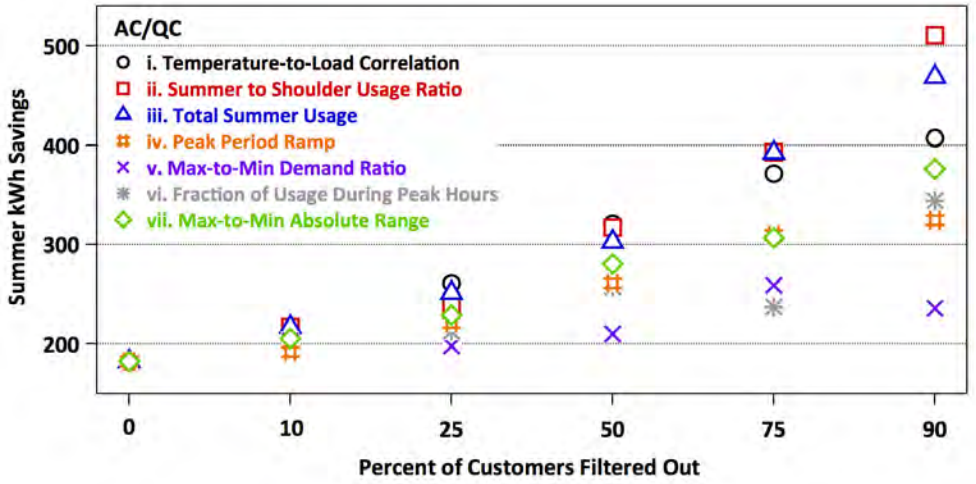

Figure 5. Average household summer cooling savings for AC/QC participants when targeting based on the individual criteria i – vii.

The individual criteria tested in Fig. 5 were selected based on customer-usage features hypothesized to be indicative of savings potential. Some of the features can be determined with monthly billing data while others, including daily load-shape features, require interval data. More details are given in Scheer (2017). Generally, for both AC/QC and AHU application of each filter has a positive effect on the average savings and peak demand reduction. However, some filters perform very well, while results for others are underwhelming. In both AC/QC and AHU, the three filters focused on electricity usage and efficiency (i – iii in Fig. 5) all behave well. For example, selecting AC/QC participants in the top half of the Temperature-to-Load correlation metric nearly doubles average household savings.

Targeting to Increase Depth of Savings, and Combining Targeting Filters

Instead of focusing only on total energy savings, a program administrator or implementer may wish to target projects with high depth of savings. Here we define depth as savings as a percentage of a building's pre-program energy usage. Targeting for savings depth can help minimize project scope, optimizing savings per dollar. In Figure 6 we gauge the impact of two

individual targeting criteria for Central Valley AHU participants. The figure gives a comparison between average *total* household savings (x-axis) and average *percent* household savings (y-axis) when targeting based only on the total summer kWh or the summer-to-shoulder usage ratio.

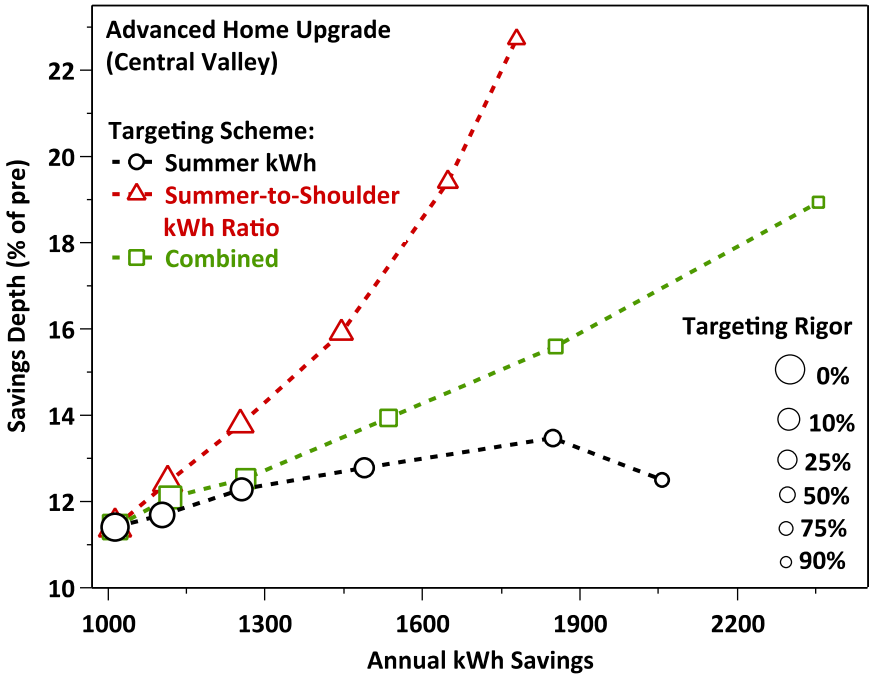

Figure 6. Savings magnitude (x-axis) vs. savings depth (y-axis) achieved for the indicated targeting schemes and levels of rigor.

The summer kWh filter (black circles) outperforms the summer-to-shoulder ratio filter (red triangles) for total savings. However, this feature yields only slight improvement in savings depth. In contrast, a significant increase in savings depth is observed upon application of the summer-to-shoulder filter. Thus both filters are effective, but in different ways. While the summer kWh criterion successfully selects customers with savings correlated to initial demand, the summer-to-shoulder filter identifies a different subset of customers who are more likely to exhibit a high degree of energy waste or inefficiency. Through the lens of a program implementer, such features oriented toward identifying inefficiency can be a particularly attractive by signaling the probability of savings at a smaller scope of work.

Assessing the impacts of usage and efficiency criteria to both total savings and savings depth led us to the combined targeting scheme of Table 1 for AHU. Figure 6 shows how the combined scheme (green squares) balances savings magnitude and savings depth compared to the individual criteria applied in isolation. One can see that the combined scheme balances the ability of the total usage criterion to achieve higher absolute savings and the efficiency criterion to drive higher savings depth. In the end, the combined scheme achieves a significant enhancement of savings depth and greater savings magnitude than either of the individual features in isolation.

SMB Sector: Matching Targeting Schemes to the Program

Figure 7 shows results for several targeting strategies tested on three sets of SMB customers.[14] Customers in "DI-Lighting" (top panel) participated in the SMB Direct Install program and received only EE measures to upgrade lighting equipment. Customers in "DI-Refrigeration" (middle panel) also participated in the SMB Direct Install program but received only refrigeration equipment upgrades. Customers in "HVAC Maintenance" (bottom panel) participated in the Commercial Quality HVAC Maintenance program. The left side of the figure shows targeting results for absolute kWh savings while the right side gives results for savings depth. The targeting criteria plotted for each program are indicated in the legend to the right.

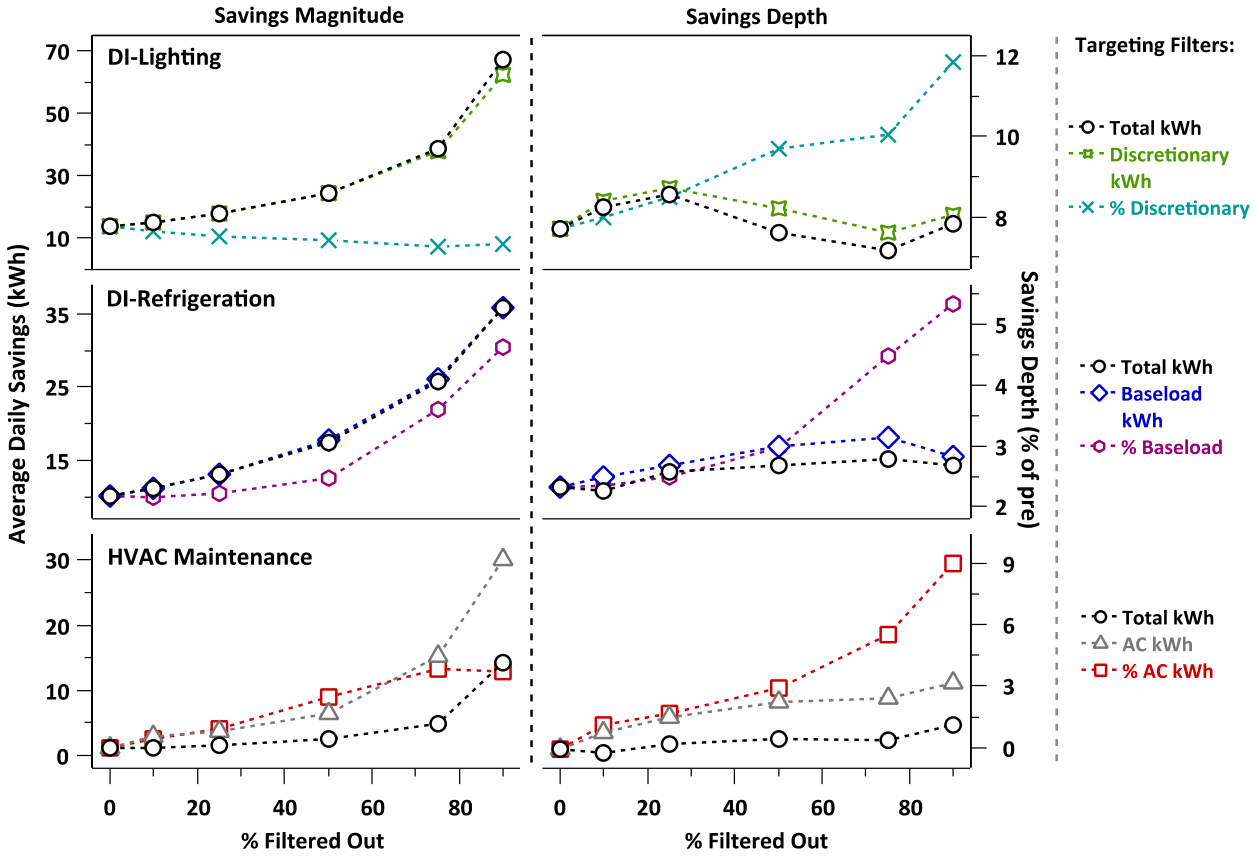

Figure 7. Targeting results for participating SMB customers in DI-Lighting (top), DI-Refrigeration (middle), and HVAC Maintenance (bottom). The left hand panels show savings magnitude (kWh/day) and the right hand panels show savings depth (% of pre). Targeting filters are indicated on the right for each program.

Several important results are apparent in Fig. 7. First, targeting can substantially enhance savings and/or depth of savings in each program. For DI-Lighting and DI-Refrigeration, targeting the top half of customers based on total usage (black circles) yields average savings increases of 77% and 72% respectively. However, targeting based on total usage is not an

[14] Methodological details will be published in an upcoming report.

effective strategy for HVAC. Air conditioning savings are much better predicted by isolating the component of usage devoted to cooling (grey triangles).

To increase depth of savings, normalized metrics outperform their absolute counterparts. For example, for refrigeration measures, which address baseload[15] consumption, targeting based on the percentage of total usage devoted to baseload (% Baseload; purple hexagons) yields substantially enhanced savings depth, especially at higher levels of targeting, while targeting on total baseload consumption (blue diamonds) provides limited benefit. Similarly, % Discretionary (aqua X's) and % AC usage (red squares) are high performing filters for savings depth in DI-Lighting and HVAC Maintenance, while the corresponding absolute features (discretionary kWh and AC kWh) fail to predict savings depth despite being good filters for absolute savings.

Importantly, these results show that targeting strategies should be specific to the intervention and goal of the program. While total usage can be a good targeting scheme by itself for certain programs, when more specific information on a dedicated end use can be ascertained, targeting can be made more precise. Because of the strong correlation between temperature and AC usage, the disaggregated cooling load serves as a more optimal targeting strategy than total usage. More advanced analytics to better isolate lighting and refrigeration loads may yield improved targeting strategies for those end uses as well.

Finding the Right Balance

To this point we have shown that targeting has the potential to substantially increase average project savings for a variety of EE programs. In each case, as targeting criteria are made more rigorous, average savings are enhanced. However, maintaining full participation when targeting only a fraction of the customer base creates additional pressure on program recruitment. Returning to AHU, an analysis presented in Fig. 8 can help determine the right balance. This figure reproduces the left-hand trace of Fig. 8 (open circles), which gives average savings for targeted customers as selection criteria are made more rigorous. The lower trace (black X's) shows the average savings for customers *removed* by the targeting scheme. The upper green trace (filled triangles, right hand y-axis) shows the percentage of savings from the full sample that is retained at the different targeting levels after removal of non-targeted customers.

At the 10% targeting level, the lower curve (X's) shows that the eliminated customers deliver almost no savings, with more than 99% of total program savings retained within the targeted group. At the 24% and 49% targeting levels, more than 94% and 78% of savings are retained, respectively. In other words, upon removing half of customers based on pre-program usage analytics, less than a quarter of total program savings is lost.

[15] Here baseload refers to the average minimum hourly usage across each 24-hour period and represents constant load.

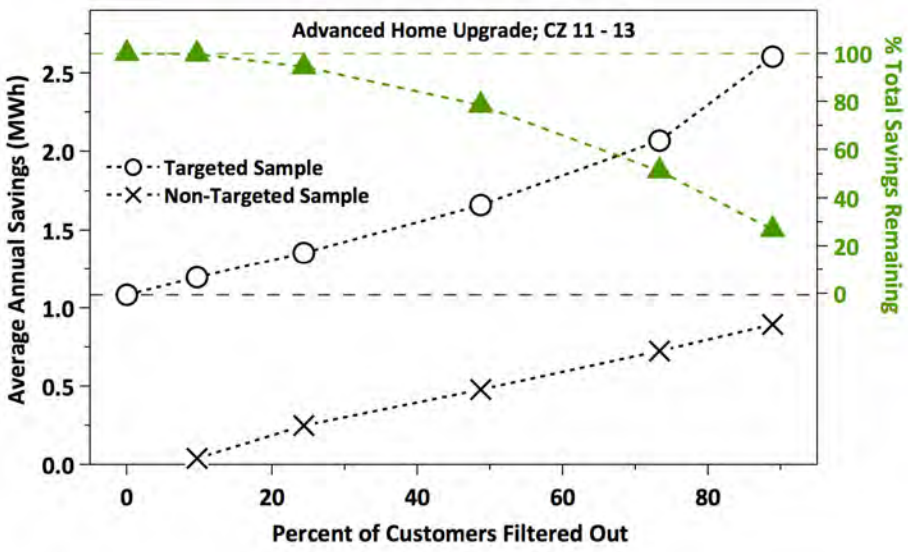

Figure 8. Black circles and X's – Average annual cooling savings (outliers excluded) for targeted and eliminated Central Valley Advanced Home Upgrade participants as targeting criteria (Table 1) are made more rigorous. Green triangles – The percentage of total savings remaining after removing additional customers at each step.

Of course, if eliminated customers are replaced with others who meet the targeting criteria, total program savings would increase a great deal. The point here is that PAs and implementers must carefully balance aggressive targeting to enhance savings with maintaining full program pipelines. Consider targeting at the 73% level in Fig.8. In this case more than half of total savings would need to be replaced by additional program recruitment – which must occur exclusively from only 27% of the customer base. This may or may not be feasible.

Additional Implications

Beyond customer targeting, several important insights arose during this research. As has been found in previous studies, we observe a high degree of variability in program outcomes with many participating customers failing to achieve savings at the meter. Knowing only this may lead to speculation on multiple fronts: Are contractors delivering quality work? Is there a high fraction of projects with added load, a high propensity of occupancy changes, or a high degree of behavioral takeback? Our results indicate that when programs serve customers with high savings opportunities, the large majority of customers achieve significant savings at the meter. This implies that non-routine events are likely restricted to isolated incidences rather than being pervasive features of the programs.

That targeting may eliminate subsets of customers with low propensity to save may raise questions of equity in resource allocation. We suggest the best way to address this concern is through a) incorporating desired customer attributes as additional targeting criteria and b) using a more individualized approach to EE, something naturally motivated by P4P program designs. In general, this research showcases the need for more tailored design and delivery of EE programs.

Taking Targeting to the Field

All of the results discussed thus far show the potential for targeting based on analysis of past program participant data. The next step is to take the most promising strategies to the field. PG&E is doing exactly this in the Residential P4P program. In Residential P4P, implementers are paid based on savings observed at the meter. At the time of this paper, two implementers have launched independent programs and both are targeting customers with PG&E's assistance. The first implementer is focused on traditional building shell and HVAC retrofits. PG&E has provided the implementer a list that contains both randomly selected customers and customers who meet thresholds around the 60% targeting level. If a sufficient number of these customers can be recruited, it will allow a direct measurement of targeting impacts in the field. The other P4P implementer is focused on behavioral interventions for customers with very high baseload usage. In this case PG&E has identified customers with average baseload usage of at least 500 W, helping the implementer focus recruitment.

Conclusions

First and foremost, targeting using meter data can enhance program savings. Our results across multiple programs in multiple sectors consistently indicate that average customer savings of 1.5 to 2 times current savings are achievable. A boost on this order could make existing programs significantly more cost effective and make new and innovative programs viable. However, we believe that to motivate implementation of effective targeting strategies, meter-based savings platforms are needed and programs should be designed accordingly. PG&E's Residential Pay for Performance program is employing the targeting strategies described here because of a direct expectation for greater return on investment. In contrast, traditional deemed approaches do not provide the motivation, accountability, or flexibility for targeting to thrive. Finally, by recruiting customers with high savings potential, targeting also has the potential to simultaneously improve outcomes for both individual participants and for the rate base. Finally, with EE being considered alongside other distributed energy and traditional supply-side resources, customer targeting can help make EE a more reliable, competitive grid resource.

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