EXH. SR-1T
DOCKET UE-210795
2022 PSE CEIP
WITNESS: SCOTT REEVES

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

In the Matter of PUGET SOUND ENERGY, INC. 2021 Clean Energy Implementation Plan	**Docket UE-210795**

PREFILED RESPONSE TESTIMONY (NONCONFIDENTIAL) OF

SCOTT REEVES

ON BEHALF OF NW ENERGY COALITION AND FRONT AND CENTERED

October 10, 2022

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LIST OF EXHIBITS

INTRODUCTION

Q. Please state your name, title, and business address.

A. My name is Scott Reeves. I am the Director at the Cadeo Group on the Distributed Energy Resources ("DER") and Electrification team. My business address is 107 SE Washington Street, Suite 450, Portland, Oregon 97214.

Q. Please describe your background and experience.

A. I have spent over 15 years in the energy industry focused on research, planning, and evaluation to improve strategies and outcomes of energy programs at the intersection of equity and clean energy planning. At Cadeo, I am a director on our DER and Electrification team and lead its work in helping clients develop strategies and plans to more effectively deploy energy resources that provide benefits to underserved populations.

I have developed, directed, and implemented research aimed at improving the performance of energy programs on a range of topics, including extensive work regarding income-eligible programs, demand response, and flexible load resources. Examples of recent research relevant to this case include:

- I conducted over 60 planning, research, and evaluation studies of income-qualified energy programs, including traditional EM&V (Evaluation, Measurement, and Verification), non-energy benefit assessments, and geographic analysis. Specifically, I evaluated PSE's Low-Income Weatherization Program in 2012 and 2017, and led PSE's recent Low-Income Needs Assessment in 2020.
- I led evaluations of Portland General Electric's (PGE) residential demand response pilots between 2016-2021, including peak time rebates, time of use,

behavioral demand response, smart thermostat direct load control, and its Smart Grid Test Bed project, the latter focused on customer value proposition, messaging, and engagement regarding various demand response products.

- I led a recent locational analysis study for PGE aimed at developing indices and incorporating equity, environmental, and resiliency factors within its distribution system planning process.
- I am conducting a study for the Regional Technical Forum and Northwest Power and Conservation Council regarding impacts of flexibility in power system planning, including framework development for interactions between energy efficiency, demand response, and time-varying rates.

Prior to joining Cadeo, I worked at Cadmus as a senior associate within its Advanced Analytics group. During that time, I was the subject-matter expert of income-qualified / equity-focused energy programs, conducting a variety of planning, research, and evaluation projects for public, private, and non-profit clients across the country. I also led multi-year evaluations of demand response pilots involving a range of treatments, research designs, and load analysis. I also specialized in customer research aimed at improving demand response design/delivery, understanding value propositions, and customer experience and engagement.

I currently serve on the Northwest Power and Conservation Council's Demand Response Advisory Council and have served on the advisory board for Grid Forward as well.

My resume is included as Exh. SR-2.

Q. Have you provided testimony before the Washington Utilities and Transportation Commission before?

A. I have not.

Q. On whose behalf are you appearing in this proceeding?

A. I am testifying as a witness for NW Energy Coalition and Front and Centered.

Q. What is the scope of your testimony?

A. My testimony will focus on several specific DER programs outlined in PSE's Clean Energy Implementation Plan (CEIP) for 2022-2025, especially as they pertain to serving vulnerable populations (VP) and highly impacted communities (HIC) (collectively referred to as "named communities"). Specifically, I will focus on demand response (DR) direct load control (DLC) programs for heating and water heating; distributed solar initiatives; and distributed storage initiatives.

Q. Please provide a high-level summary of your findings and conclusions from your review of PSE's CEIP filing.

A. In general, I commend PSE for their effort in this inaugural CEIP– the complexities of planning for the clean energy transition, program design, and equity requirements are challenging and novel (in Washington and much of the country). I think many aspects of PSE's planning reflect commendable first steps. There are, however, several areas where I believe PSE's CEIP falls short.

My biggest concern with PSE's DER proposals is a lack of specific detail that links the rhetorical language around PSE's commitment to serving named communities to pathways and discrete mechanisms to achieve those outcomes. Specifically, the CEIP includes insufficient minimum designated benefits for named communities (small for

some programs, none for others) and inadequate design elements to help direct benefits to named communities. In many cases, discussed below, PSE's plans would benefit from additional detail regarding how PSE will ensure benefits flow to named communities in individually proposed programs, including specific energy savings or cost targets; carve-outs for minimum participation; and strategies for targeting, recruitment, and engagement. The plan should include more discrete program planning, design, and delivery details highlighting how PSE is committed to engaging named communities and ensuring equitable allocation of benefits throughout the proposed portfolio, not just in a few programs. I recognize that some of these details may be forthcoming in the next phase of planning, whether this clarification occurs internally at PSE, through the implementation of contractor proposals, and/or is co-created with its Equity Advisory Group (EAG). However, certain design elements and mechanisms that provide clearer pathways for achieving equitable outcomes through specific actions are worth defining at the outset.

I also have some concerns with specific aspects of PSE's proposed DER programs. In addition to certain aspects of design/delivery discussed below, PSE's proposed demand response targets are too conservative and do not account for efficiencies like co-deployment by leveraging existing energy efficiency programs, which can lead to increased cost-effective delivery and increased adoption through improved pathways to reach all customers, and in particular, those in named communities. I am also concerned that PSE's solar and storage initiatives are not designed to provide equitable benefits to named communities and income-qualified customers.

Q. Please summarize the issues you recommend the Commission address in conditions of approval of PSE's CEIP.

A. Based on my review and assessment of PSE's proposed program strategies, I recommend the following:

- PSE should develop mechanisms for intentionally serving customers in named communities in each of their individual DER programs, including carve-outs for program costs (including outreach/education), savings targets, and minimum participation thresholds. PSE should also include strategies for targeting named communities beyond using income as the sole criterion for program eligibility in each of their DER programs.
- PSE should increase its DR target for DLC offerings that include increased bring-your-own-device pathways for smart thermostats and water heaters. PSE should also develop associated strategies that leverage current equipment/device saturations, existing energy efficiency offerings, and increased potential for enrollment and conversion. These programs should also include dedicated channels for reaching named communities.
- PSE should be explicit about how it intends to co-deploy resources, specifically with regard to energy efficiency products and programs; and develop plans and incremental targets that reflect co-deployment strategies, in particular for serving low-income customers and named communities.
- PSE should increase its community solar sub-target to 50 MW by 2025. In future CEIPs, PSE should aim to significantly increase this target as the program ramps up.

- PSE should provide rent-to-own options for solar and storage programs for named communities.
- PSE should modify its program design for solar and storage DER programs to better ensure benefits flow to named communities, including by offering higher incentives for low-income customers and named communities; ensuring benefits flow to tenants in affordable multifamily housing; and targeting storage programs to vulnerable populations where increased reliability would reduce vulnerabilities.

I have included more detail on each of these recommendations below.

Q. Describe the structure of the remainder of your testimony.

A. My testimony first addresses the need for PSE to incorporate strategies across programs to ensure that the benefits of its DER programs flow equitably to named communities. I then cover a series of sub-topics specific to PSE's proposed demand response, solar, and storage programs, including factors related to serving named communities.

ANALYSIS

Benefits for Named Communities

Q. Could you provide a brief overview of PSE's DER offerings and overall goals and targets in its CEIP?

A. Under the Clean Energy Transformation Act (CETA), PSE has developed a 4-year plan (CEIP, currently 2022-2025) for staging CETA progress towards goals, including an overview of savings targets and a proposed portfolio of efficiency, demand response, and renewable programs. Targets for this 4-year period include: energy efficiency (1,073,434 MWh – building off its IRP trajectory), demand response (23.7 MW), and renewables

(1,917,068 MWh), the latter of which includes 800 MW of utility-scale renewables, 80 MW of solar, and 25 MW of battery storage.

Q. What strategies has PSE included to ensure that these DER offerings benefit named communities?

A. PSE has included a list of discrete programmatic strategies for building out these new offerings in its CEIP. Of the proposed demand response (DR), solar, and storage programs in the CEIP, few of them have explicit targets or strategies for delivering benefits to named community customers. Of the programs that do include specific targeting, several include targeting only by income qualifications. I believe that the program targets and strategies in the CEIP do not sufficiently ensure equitable participation of named communities in DER/DR programs. Given the mandate in CETA to ensure benefits are equitably allocated to named communities, it is imperative to have specific mechanisms for ensuring successful outcomes, such as targets for savings, budget, and participation, clearly detailed in PSE's CEIP by individual program or at least by suite (e.g., across all demand response initiatives).

Q. What are mechanisms or strategies that could increase enrollment, engagement, and participation of named communities in PSE's proposed DER programs?

A. While I encourage PSE to engage with its EAG, Low-income Advisory Committee (LIAC), and other community-based organizations to flesh out specific tactics, target levels, and the pace of these engagements, there are several specific elements that I would like to see explicitly included across all of PSE's DER programs:

- ***Savings targets*** – PSE should designate an explicit portion of capacity targets that will come from participants in named communities and/or low-income customers.

- ***Funding allocation*** – PSE should allocate a specific portion of program budgets to named community outreach, recruitment, and participation.
- ***Minimum participation thresholds*** – PSE should include minimum participation goals to ensure named community and low-income customer representation and access to the benefits of these investments.
- ***Dedicated outreach, education, and recruitment strategies*** – PSE should include clearly defined language addressing how it will target named communities for recruitment in its DER programs, including strategies like geographic targeting and addressing potential barriers including language, education, and access to Wi-Fi. While I recognize implementation contractors will likely bring additional tactical insight regarding these approaches (and appreciate PSE mentioning factors like offering multilingual awareness strategies, p.112), there are some fundamental components, including geographic targeting, local partnerships and outreach strategies, and co-deployment, that PSE must define across its initiatives as core elements of its planning and highlight its leadership around proactive strategies for reaching named communities.
- ***Locational Targeting*** – PSE should be more explicit in how it will embed locational targeting strategies for delivery of DR/DER products in general, and specifically for named communities. Distributed energy products and flexible load resources have potential to provide localized benefits for to the grid (including distribution and transmission systems) and for specific communities. Highly impacted communities are defined geographically (and PSE has chosen in this CEIP to define vulnerable populations geographically as well), which means that

targeted deployment by location and customer attribute are intuitive strategies to explicitly serve these communities. Locational targeting can also optimize societal benefits, such as resiliency, reliability, and environmental impacts, within specific, local communities. These strategies have the potential to increase the array of benefits generated from DR/DER deployment for customers within named communities.

PSE will need to develop specific strategies for each DER offering that incorporate these elements to ensure that its DER programs are equitably enrolled and designed with inclusion in mind at the outset.

Below, I suggest several design elements that are specific to individual DLC, solar, and storage programs. PSE will also need to work with its EAG and other community-based organizations to develop additional strategies as PSE implements these offerings to ensure that they are equitably enrolled.

Q. Can PSE ensure that benefits from its DER programs flow to named communities by requesting that implementation contractors responding to Requests for Proposals include strategies to reach named communities?

A. PSE should not rely entirely on contractors to ensure that the benefits of its DER programs are shared by named communities. For some programs proposed in its CEIP, PSE notes that it intends to evaluate RFP results, in part, based on respondents' proposals to serve named communities. For example, on p. 109 of its CEIP, PSE notes that it is evaluating how specific DR programs and actions will mitigate risks to named communities. On p. 112, PSE also notes that respondents to the Targeted DER RFP will also be evaluated based on strategies to serve named communities. It is reasonable for

implementation contractors to propose tactical strategies to help PSE achieve its goals, but PSE must include overarching strategies to ensure that PSE meets its obligation to ensure benefits to named communities across programs. Strategies that can more broadly ensure named community customer participation in DER programs (and that are largely absent in the CEIP) include dedicated delivery channels, targeted recruitment, setting explicit targets/goals within individual programs, and evaluating its progress towards achieving these targets/goals.

As a point of comparison, an example of a program that exclusively targets low-income customers exists in energy efficiency portfolios: low-income weatherization programs, which target customers by income eligibility guidelines and typically pay 100% of incentives. An equity issue exists with regard to standard market-rate energy efficiency, as all ratepayers typically contribute to DSM program costs, and low-income customers do not typically participate similarly in market rate programs that provide incremental incentives to reduce the cost of high-efficiency products. One approach to addressing this equity issue has been to develop specific programs (i.e., low-income weatherization programs) to serve low-income customers directly, including targeting by income eligibility, paying higher incentives often equal to total cost of energy efficiency measures, and contributing to other costs that pose barriers to installation, such those related to health, safety, and repairs. Dedicated delivery channels (such as an explicit income-eligible program like low-income weatherization) are not the only option. PSE can and should embed targets and strategies for reaching named communities in DER programs that are not exclusively income-eligible.

In short, I recommend that PSE develop a range of dedicated pathways for engaging named communities in each of its DER programs. Strategies developed by implementation contractors can supplement, but not replace, a comprehensive strategy developed and implemented by PSE.

Demand Response

Q. Could you provide a brief overview of PSE's DR offerings and overall goals/targets?

A. As shown in Table 1 below, PSE has proposed a total of 23.7 MW of DR by 2025 to be achieved through the following programs: residential direct load control for heating loads (including strategies using retrofit switches and bring-your-own-thermostat (BYOT)), residential direct load control for water heater heating (involving grid-enabled electric resistance and heat pump water heaters), and medium commercial direct load control for heating loads (switch only).

Table 1. PSE CEIP DR 2022-2025 Programs

	Projected MW in 2025
Residential Direct Load Control (DLC) Heat — Switch	16.41
Residential DLC Heat — Bring your own thermostat (BYOT)	0.36
Residential DLC Electric Resistance Water Heater — Grid Enabled	5.10
Residential DLC Heat Pump Water Heater — Grid Enabled	0.08
Medium Commercial DLC Heat — Switch	1.71
TOTAL PROGRAMS	23.66

Q. Please summarize your high-level takeaways from your review of PSE's residential DLC programs.

A. Based on my review of PSE's proposed residential DLC programs, I have highlighted my key takeaways below:

- The proposed DLC programs in the CEIP do not include focused strategies targeting named communities. PSE should include strategies for reaching named communities such as savings and participation targets, outreach and education, minimum funding allocations, and more broadly, explicit plans for co-deployment between programs/products across PSE's portfolio (e.g., including DR enablement/enrollment within Low Income Weatherization).
- The proposed Residential DLC offerings underscoped the potential and associated benefits of smart thermostat DLC, which can be easier to recruit and more cost-effective to enroll than switch-based DLC. While the proposed DLC programs also should include more focused targets and strategies for named communities (as noted above), the expansion of smart thermostat DLC is applicable to the broader customer population.
- The proposed Water Heater DLC offerings for ERWHs (electric resistance water heaters) and HPWHs (heat pump water heaters) do not appear to leverage existing energy efficiency incentives or opportunities for co-deployment (as noted by Josh Keeling GRC testimony),[1] which again could improve cost-effectiveness, increase enrolled units, and serve as a pathway for reaching named community and low-income customers.
- Pathways for EE/DR co-deployment of DLC with smart thermostat incentives and installation are also omitted. These strategies increase customer benefits (including thermostat conservation effects and other features), can include

[1] *See* Exh. LCM-5 at 37.

direct install options, have the potential to actively target named communities and low-income customers, and address barriers in access to technology to participate.

Q. What are the benefits of DR to PSE's system and to customers?

A. DR resources can provide additional grid flexibility not just to mitigate peak loads, but to support distribution system processes and planning. The 2021 Northwest Power Plan highlights that demand response provides both power system benefits related to peak capacity, and benefits as a resource to address transmission constraints and potential deferral of grid infrastructure investments.[2] As noted in Josh Keeling's testimony[3], PSE's current resource plan does not appear to account for locational and temporal benefits. Non-wires solution (NWS) pilots often focus DR deployment within specific areas on a distribution network (e.g., feeders, substations), which can in turn help to prevent outages or need to build grid infrastructure within communities. Furthermore, demand response can yield environmental impacts by reducing emissions potentially associated with marginal energy resources (e.g., fossil fuel peakers) generated during peak periods.

Specifically for customers, demand response DLC programs can provide nominal financial incentives for enrollment and seasonal participation. Some DLC programs may provide free equipment (such as smart thermostats) and installation in exchange for a multi-year commitment to participate in DLC. In some cases (specifically for smart thermostat DLC), this equipment provides other benefits to the customer, such as

[2] https://www.nwcouncil.org/fs/17680/2021powerplan_2022-3.pdf at 47.

[3] *See* Exh. LCM-5.

increased home comfort and energy savings. Otherwise, customers can experience broader, societal benefits of demand response, as discussed above (e.g., environmental, reliability, resiliency), which may occur at a system level, or could be targeted to achieve more acute societal benefits within discrete communities, such as via NWS initiatives.

Q. Are there locational benefits for DR deployment within named communities?

A. Yes. To the extent that named communities overlap with areas that have aging infrastructure or higher incidences of outages, targeted DR within these communities could provide a range of benefits that would be important to consider with respect to cost effectiveness and deployment strategy. For example, geographically targeted demand response could increase reliability and reduce outages in certain areas. It could also avoid the need to build additional infrastructure such as substations in residential neighborhoods. It can also serve as a pathway to reduce local peaks, allowing for increased electrification of household end uses and transportation, which in turn may yield localized health and environmental benefits for these customers as well.

Other utilities have started incorporating locational benefits and a community lens to resource planning. Portland General Electric recently developed an approach to better account for underserved communities and locational benefits in their distribution system planning process. Specifically, Portland General Electric developed indices for equity, environmental, and resilience factors that will be used to inform siting for proposed NWS pilots.[4]

[4] https://downloads.ctfassets.net/416ywc1laqmd/2Fr2nVc4FKONetiVZ8aLWM/b209013acfedf1125ceb7ba2940bac71/DSP_Part_2_-_Full_report.pdf

PSE included geographic data on named communities in its service territory in its CEIP. PSE should leverage these data and integrate other geographic data regarding PSE's grid and resiliency, such as age of grid infrastructure and outage frequency and duration, to identify priority geographic areas for targeted named community outreach and program funding for non-wires solution deployment. This type of localized targeting of demand response can generate benefits including increased reliability and grid resiliency in named communities.

Q. Are there other benefits to named community customers from participating in DR programs?

A. As discussed above, DLC programs provide nominal financial incentives and may provide free equipment that offers co-benefits. While enrollment and seasonal financial incentives have a minimal impact on factors like energy burden (by comparison to whole-house energy efficiency or community solar), there are other reasons PSE should ensure that its programs reach named communities. Demand response programs represent a fundamental shift in the relationship between customers and utilities. DR programs require increased and ongoing engagement between a utility and its customers, in contrast to typical energy efficiency products where the relationship is short term, occurring at point of purchase or installation. PSE must engage with all its customers and especially named communities at the outset to ensure no customers are left behind and no group's needs are overlooked in this transition.

Q. Has PSE proposed any specific targeting, education, and recruitment strategies or goals for including named communities within its proposed demand response offerings?

A. None of the demand response residential DLC offerings include explicit detail regarding program design, delivery strategy, or targets/goals for including customers within named communities or by income eligibility. Including intentional planning for inclusion of these populations will be key to ensure they receive services and associated benefits of investments in flexible load resources like demand response.

Q. What strategies should PSE consider to increase DR participation within named communities?

A. I suggest several targeted strategies below for individual DLC programs. In general, I would suggest that PSE work with their EAG, named communities, and other stakeholders to tailor education and outreach by specific customer segments; coordinate with local CBOs to co-deliver program launch and outreach, leveraging word-of-mouth from trusted organizations; and develop dedicated targeting for named communities, rather than solely using household income as the principle criteria to screen for customer eligibility.

Q. What is co-deployment of EE/DR measures?

A. Co-deployment refers to the ability to leverage existing products, programs, and systems that encourage a combined deployment of resources, yielding benefits of measure interactivity and achieving more cost-effective delivery. For example, combining messaging and incentives for customers to (1) purchase/install a smart thermostat and (2) enroll in smart thermostat DLC reduces separate marketing/recruitment efforts, increases likelihood of demand response enrollment (lowering incremental marketing costs), and increases both customer and power system benefits (combining conservation effects and peak load impacts).

Q. What are the benefits of co-deployment?

A. Enrolling customers in DLC through existing energy efficiency programs, such as low-income weatherization programs, can increase program participation and benefits for several reasons. First, co-deployment of DLC with low-income weatherization programs leverages trusted partners (e.g., community action agencies) with in-person enrollment (helping with education), reducing standalone costs for enrollment.

Second, homes that have been weatherized can realize additional benefits from the interaction between energy efficiency measures and DR measures. For example, weatherization reduces infiltration and increases comfort and the ride-through ability of homes on DLC programs to maintain temperature (and not prematurely trigger temperature thresholds to override events, in the case of smart thermostat DLC, or opt out due to discomfort) – this directly impacts the average load impact associated with DLC.

Third, installing smart thermostats and HPWHs through existing low-income programs or other market rate programs increases the number of DLC-eligible units in the market and increases likelihood of participation, particularly if delivery staff can enroll customers while on site. As discussed further below, a Connecticut pilot by United Illuminating (UI) leveraged its dedicated energy efficiency channel to serve low-income customers, installed enabling devices on HPWHs, and achieved a conversion rate of 90% enrollment into its demand response program. Co-deployment of DR with other energy efficiency initiatives that target the entire PSE residential customer population (not only named communities), including single family retrofits offerings, midstream and upstream initiatives that can embed enrollment at the point of purchase (i.e., pre-enrollment), offer

many of these same benefits, such as reduced program costs, increased program benefits, and increased DR enrollment.

Co-deployment of both energy efficiency measures (like weatherization and HPWHs) and DLC can also help to mitigate increased peak electric loads resulting from end-use electrification. For example, a home that replaces a gas furnace with a heat pump would add an incremental electric heating load in winter (and potentially cooling load in summer if there was no pre-existing cooling equipment) as the HVAC end use changed from gas to electric fuel. Adding other energy efficiency measures like weatherization would increase the efficiency of the HVAC, thereby incrementally reducing the shape of that end use load, including the peak heating and cooling loads. Enrolling that same household in a time of use rate could also change the shape of different end use loads during on-peak pricing periods (assumed to be coincident with summer and winter peaks), result in load shifting and load sheading (conservation) further reducing these peaks. Finally, enrolling that same household in DLC for curtailing heating (and/or cooling) would further mitigate peak loads, as well as reap benefits of thermal storage from weatherization, increasing ride-through potential and maintaining thermal temperature, which further reduces the potential peak impact of electrification. This example is intended to highlight the interactions between energy efficiency and demand response and the potential for achieving additional value by bundling these products wherever possible. This would also potentially mitigate some of the impact associated with increased energy costs and burden associated with electrification (including replacing gas heat for electric, and potentially adding cooling loads).

Q. Please summarize PSE's proposed DLC offerings of residential HVAC end uses.

A. PSE has proposed two residential DLC offerings aimed at curtailing HVAC load, specifically heating load: Residential DLC Heat-Switch and Residential DLC Heat – BYOT.

Residential DLC Heat – Switch programs are dispatchable, event-based programs wherein utilities can call load control events (typically over a 1-to-4-hour event period) and curtail HVAC loads. Switch-based DLC programs use load control switches that are retrofitted to HVAC units and used to control the equipment loads during peak events, often through remotely cycling them (a practice where HVAC units are turned on and off). Typically, participants receive nominal financial incentives, and the combined effect of the cycling across households can contribute to peak load reduction, offsetting marginal resources or the need to acquire or develop new power generation to meet peak demand.

Residential DLC Heat – BYOT (Bring Your Own Thermostat) programs are similar DLC programs that target customers with existing, installed smart thermostats to participate. Thermostat-based DLC programs will curtail peak HVAC loads using temperature setbacks, where utilities can remotely adjust thermostat setpoints and set a curtailment strategy where HVAC units will turn off until indoor temperature change within a few degrees of a threshold temperature. For this reason, a home's thermal envelop efficiency becomes a critical element in determining how long HVAC loads can be curtailed before a change in indoor air temperature triggers the setback threshold, reactivating the HVAC unit. Additionally, to preserve customer comfort and increase ride-through potential of an HVAC event (i.e., how long a customer can comfortably cost through an event before manually overriding or before triggering the thermostat setpoint),

a common practice involves pre-conditioning, where a thermostat will be set to increase conditioning during an hour or two before a control event in an attempt to maintain comfort and to prolong the period before reaching the setback temperature.

PSE's Residential DLC Heat – Switch program accounts for approximately 69% of the proposed DR portfolio MW target (16.41 MW) and 77% of the proposed DR budget ($4.08M). In contrast, PSE's Residential DLC Heat – BYOT program accounts for only approximately 1.5% of the proposed DR portfolio MW target (0.36 MW) and less than 1% of the proposed DR budget ($0.03M).

Q. Do you believe that PSE's focus on control switch-based DLC (i.e., DLC Heat – Switch), rather than smart thermostat DLC (such as through Residential SLC Heat – BYOT), is appropriate?

A. No. I was surprised that PSE did not include a higher investment and target through DLC channels that leveraged smart thermostats, for a few reasons.

First, smart thermostat DLC programs are fairly common and have been thoroughly piloted with respect to both winter and summer capabilities in the Pacific Northwest. For example, Portland General Electric has been operating its smart thermostat DLC pilots since 2016 in winter and summer seasons, across multiple thermostat brands, and through several channels, including bring-your-own-thermostat (as PSE has proposed), direct install, and a virtual install that leverages an on-line marketplace.

Second, smart thermostat DLC can leverage existing saturations of smart thermostats to easily recruit and quickly scale its BYOT channel. Utilities can leverage direct notifications to customers (via email, device, or in-app) through thermostat original

equipment manufacturers (OEMs) for targeted recruitment into a BYOT program. For example, PGE's BYOT pilot launched in 2015 and quickly scaled its participation, enrolling 10,881 customers (approximately 1,169 winter participants) by 2018[5] and 15,298 by 2020 (approximately 2,013 winter participants),[6] largely through OEM direct marketing to customers with existing or newly purchased thermostats. Depending on the saturation of existing smart thermostats, PSE could scale its DLC resource through targeted recruitment of installed devices more quickly and at a lower cost than installing switches.

Third, related to the prior point, PSE can leverage its energy efficiency efforts for smart thermostats to increase installations, recruitment, and conversion of demand response enrollment. This relates to PSE's downstream smart thermostat rebates, as well as other offerings like whole-house audits, HVAC, and specific low-income weatherization to increase participation in income-qualified and named communities. This is true for DLC programs aimed at HVAC, as well as water heating DLC discussed below. The 2021 Northwest Power Plan is explicit about these opportunities: "As organizations and utilities develop demand response capability, they should do so by leveraging existing energy efficiency infrastructure and considering them together as part of an integrated demand-side management approach to optimize delivery of both resources holistically and equitably."[7]

[5] Note, PGE launched its BYOT pilot in 2015 with only Nest thermostats and did not expand recruitment to ecobee and Honeywell thermostats until the fall of 2017, which may reflect lower initial enrollment totals compared to a BYOT pilot including more eligible brands at the outset.

[6] Sources: https://edocs.puc.state.or.us/efdocs/HAD/um1708had9400.pdf and https://edocs.puc.state.or.us/efdocs/HAD/um1708had165015.pdf

[7] 2021 Northwest Power Plan at 47, https://www.nwcouncil.org/fs/17680/2021powerplan_2022-3.pdf

On these points, PSE's 2021 conservation potential assessment identifies smart thermostats as the fifth highest residential electric saving energy efficiency measure within its 10-year achievable technical potential (9.5 aMW), which may not account for additional, incremental smart thermostat deployment through HVAC or whole home initiatives like its Low Income Weatherization program.[8] While levelized costs for DLC-BYOT are lower than DLC-Switch—slightly lower for winter potential ($71/kW-year vs. $61/kW-year) and significantly lower for summer potential ($160/kW-year vs. $60/kW-year)—the study indicates that achievable winter potential is substantially higher for DLC-Switch (50 MW) compared to DLC-BYOT (3 MW). Upon review of study assumptions (see Table 40 in the potentials assessment report), DLC-BYOT eligibility was based on whether a home had an existing smart thermostat; this may have inadvertently assigned the remainder of the population (those without existing smart thermostats) to DLC-Switch, despite the fact that these customers could be eligible for installation of either switches or smart thermostats. It is also unclear if this study reflected interactions between energy efficiency initiatives (such as increasing smart thermostat installs fed into potential for DLC BYOT), or other dedicated initiatives such as thermostat direct install options that would have increased BYOT potential, a lack of which may have underestimated DLC-BYOT potential and misrepresented the relative potential of DLC-Switch.

Fourth, smart thermostat BYOT programs rely on existing equipment, are easy to recruit, and have lower recruitment/installation costs. As noted in the 2020 conservation

[8] https://www.pse.com/-/media/PDFs/IRP/2021/appendix/16-IRP21_AppE_033021_FileUpdate-with-report.pdf?modified=20220307202829

potential assessment, equipment costs of switch direct install are listed as approximately $215 compared to $0 for BYOT. Co-deployment strategies leveraging energy efficiency delivery to increase DLC-BYOT enrollments involving direct install of smart thermostats would also include additional conservation benefits of smart thermostats and, in theory, share the equipment costs between the energy efficiency and demand response applications.

Additionally, targeted marketing for DLC enrollment through OEMs at the time of smart thermostat purchase is an effective means of recruitment into DLC-BYOT. Recent research around strategies like demand response pre-enrollment have the potential to increase conversion rates of DLC-BYOT enrollment. Pre-enrollment involves embedding enrollment in demand response programs at the point of purchase of equipment, such as smart thermostats or water heaters, a technique that has been shown to increase conversion rates from 10-20% to 60-80% (Uplight 2021).[9]

Fifth, smart thermostat DLC programs involve dispatch strategies aimed at reducing impacts on customer comfort during load control events. For example, to mitigate the impact on internal temperature during load control events, some smart thermostat DLC programs (like PGE's) will precondition participant homes in the hour or two prior to a load control event – specifically, pre-heating in winter or pre-cooling in summer to provide an additional buffer to ride-through events. In theory, preconditioning should help maximize the load impact by increasing the potential to ride through an event, delaying the point at which a thermostat reaches its threshold temperature and

[9] Source: https://uplight.com/wp-content/uploads/2021/06/U_eBook_DRPE_ExperienceAndGridFlexibility-1.pdf

resumes space conditioning. It will be important for PSE to develop strategies to maintain participant comfort, in particular in homes that have higher infiltration and are in need of shell efficiency improvements, typical of low-income customers participating in weatherization programs. Increased insulation and air sealing will help improve thermal storage to maintain indoor temperatures during load control events, reducing potential discomfort, and ultimately improving the load impact potential by avoiding premature opt-out of events. This is another benefit of co-deployment that highlights the interaction between energy efficiency and demand response.

Sixth, smart thermostat DLC provides incremental benefits through the smart thermostat device beyond the peak capacity value of DLC. There are clearly efficiency savings from smart thermostat installations (as noted above, reflected in PSE's potentials assessment). Smart thermostats also provide increased demand response potential associated with dynamic pricing, such as TOU (time of use) or PTR (peak time rebate), providing customers remote control over HVAC loads as well as scheduling and algorithm-based features to optimize usage in lower pricing periods. A meta-evaluation conducted by Brattle of 163 treatments showed that enabling technologies like smart thermostats increase the potential peak savings of TOU programs by approximately 5% to over 15% (dependent upon the on-peak to off-peak price ratio).[10] Increasing deployment of smart thermostats in general, and for DLC specifically, will equip all customers with tools allowing them to be more successful with the proposed dynamic rate offerings, and yield additional conservation benefits that reduce HVAC peak loads.

[10] Brattle 2013. "Arcturus: International Evidence on Dynamic Pricing." The Electricity Journal. Vol. 26.

Lastly, by the same means PSE could deliver installations of switches for its DLC-Switch channel, it could consider a direct install pathway for smart thermostat DLC. Given the added benefits of smart thermostats (including conservation effects, improved comfort, and increased savings potential for dynamic pricing programs), PSE should consider potential tradeoffs between installing switches or installing smart thermostats. As an example, PGE launched a direct install track for its smart thermostat DLC program in 2018, and piloted a virtual install track in 2020, both of which achieved high participant satisfaction and accessed a different customer segment than early adopters that would install smart thermostats independently and enroll through BYOT.[11] In another example, Consumers Energy launched a smart thermostat give-away program, providing 100,000 Google Nest E thermostats free to customers in exchange for signing up for its DLC program.[12] Consumers Energy also offers a BYOT program providing a $100 enrollment incentive, in addition to $25 per event season.[13] These are good examples of strategies that help quickly scale deployment through removing the technology barrier (i.e., lack of smart thermostat), streamline DR enrollment, and provide higher customer incentives to encourage enrollment.

Q. What strategies could PSE employ to ensure BYOT programs are equitably enrolled?

[11] https://edocs.puc.state.or.us/efdocs/HAD/um1708had165015.pdf

[12] https://www.greentechmedia.com/articles/read/can-free-smart-thermostats-boost-demand-response-potential-in-the-covid-19-era

[13] https://welcome.demandresponse.consumersenergy.com/?utm_campaign=smart-thermostat-program&utm_medium=vanity-url&utm_source=smartthermostat&utm_content=smartthermostat

A. I had hoped to see explicit carve-outs for savings, costs, and participation for named communities and income qualified customers in PSE's DR programs. Embedding these targets within upfront planning ensures intention and accountability in serving named communities, reduces barriers, and helps promote an equitable allocation of benefits.

I also see opportunity to increase demand response potential, reduce costs, and expand services to named communities through co-deployment of demand response through existing energy efficiency programs, such as through PSE's Low Income Weatherization Program.

A direct install track could provide a dedicated channel to reach named communities and low-income customers and address potential barriers to enrollment in BYOT, such as first cost of smart thermostats and lack of program awareness. Additionally, PSE could partner with organizations focused on increasing access for reliable, high-speed internet/WiFi, which may also be critical for removing barriers to participation for named communities.

Additionally, as mentioned above, co-deployment of DLC enrollment with energy efficiency, such as through PSE's Low Income Weatherization Program, would pair enrollment and control technology needed to participate in demand response options with the increased thermal efficiency of building envelope measures. The benefits of energy efficiency will likely yield increased participant comfort during load control events, higher success rates for customer ride-through (maintaining temperatures across the full event period), and lead to higher DLC load impacts by reducing event overriding (either manually due to discomfort or automatically by changing temperatures triggering setpoint thresholds). As noted below, a recent pilot in Connecticut used its low-income energy

efficiency program (a whole-building retrofit program, HES-IE) as a vehicle to install HPWHs and directly enroll customers in the utility's demand response program, yielding a 90% conversion rate. Similarly, for HVAC DLC, installing smart thermostats, adding shell efficiency measures to improve ride-through, and enrolling customers in DR while onsite has the opportunity to both increase direct customer benefits and the per-household load impact and associated resource potential.

Q. How would PSE need to change the way it runs its DLC programs to intentionally promote co-deployment?

A. PSE would need to develop a deliberate strategy across DLC and energy efficiency programs (and solar and storage programs, which would also benefit from co-deployment, as I discuss below). Strategies for successful co-deployment often vary based on the type of program. For example, pre-enrollment may work well for certain upstream programs where enrollment can be bundled with incentivized energy efficiency measures at point of purchase (e.g., HPWH, smart thermostat, HVAC equipment). For retrofit programs like Low Income Weatherization, PSE may need to change program protocols, refine measure offerings, set associated incentives, provide contractor training, update energy education (e.g., including information on peak load management and/or time-varying pricing), and increase coordination with contractors and community organizations to help provide increased support for co-deployment. PSE would need to consider explicit strategies for all programs, but the above strategies would be good first steps.

Q. Please summarize PSE's proposed DLC offerings for residential water heating end uses.

A. PSE has proposed two residential DLC offerings aimed at curtailing water heating load, specific to electric resistance water heaters (ERWH) and heat pump water heaters (HPWH), respectively. First, Residential DLC ERWH – Grid-Enabled, which accounts for approximately 22% of proposed DR portfolio MW target (5.1 MW) and 17% of proposed DR budget ($0.93M).

Second, Residential DLC HPWH– Grid-Enabled, which accounts for less than 1% of the proposed DR portfolio MW target (0.08 MW) and less than 1% of proposed DR budget ($0.03M).

DLC programs for water heating are similar to DLC for HVAC in that control devices allow utilities to manage water heater loads during peak events or cycle them at more granular intervals. Typically, utilities provide nominal seasonal incentives for participation in DLC programs, and some programs may provide free equipment and installation in exchange for program participation.

Q. Please describe the analysis PSE conducted to support these proposals, and discuss their cost-effectiveness.

A. PSE indicates that it relied on information from its conservation potentials assessment (CPA) to estimate DR cost effectiveness.[14] A review of its CPA highlights methods that are fairly common in the industry, using a hybrid approach for demand response that considers system, customer, and end use loads paired with market data on program and event participation. For distributed solar potential, the study uses a diffusion modeling

[14] https://www.pse.com/-/media/PDFs/IRP/2021/appendix/16-IRP21_AppE_033021_FileUpdate-with-report.pdf?sc_lang=en&modified=20220307202829&hash=94A39F3C9AD8C26E97EEE9FEBFCCD8DA

approach accounting for factors including estimated available roof area, historic adoption of solar in PSE territory, and a price forecast to model future adoption.

For demand response resources, a levelized cost of electricity (LCOE) is estimated from a total resource cost (TRC) perspective that compares annualized product cost to annual kW load reduction. The study then applied design assumptions about how each resource would be used – these include operating dispatchable resources on average for 40 hours per year (i.e., 10 four-hour events), using a seven-year ramp to meet achievable potential targets, and applying a transmission and distribution deferral value (set as a negative cost) of $15.15/kW-year.

This approach considers total program costs relative to only those energy benefits achieved through these design assumptions. As such, valuation of these DR resources primarily considers impacts on generation capacity (with exception of the T&D deferral assumption), neglecting other potential benefits (e.g., ancillary services, like frequency/voltage control).[15] It would also not account for community benefits or CBIs (confirmed by PSE, on p.24 of the CEIP), such as environmental impacts, or through locational targeting of DR resources for a non-wire solution application (for example, within named communities). These additional benefits would have potential to yield a more holistic perspective when considering resource impacts and associated cost effectiveness.

Q. What changes to these programs would help ensure that they are equitably enrolled?

[15] *See* Guidehouse whitepaper on water heater demand response and grid service applications: https://plma.memberclicks.net/assets/resources/Guidehouse%20Insights_ArmadaPowerWhitePaper.pdf

A. Similar to the other residential DLC pilots, I had hoped to see explicit carve-outs for savings, costs, and participation for named communities and income qualified customers. I also see opportunity to increase demand response potential, reduce costs, and expand services to named communities through co-deployment of these DLC ERWH and DLC HPWH options through energy efficiency programs.

Specifically, as discussed in Josh Keeling's GRC testimony[16], as of January 2023, all HPWHs sold, leased, and installed in Washington state are required to meet CTA 2045 compliance for standardizing grid-enablement and communication protocols. This means that every HPWH incentivized and installed through PSE's energy efficiency portfolio could be enrolled in demand response. Pre-enrollment strategies would increase the conversion rate and likely increase the near-term demand response targets PSE can achieve, assuming these interactions and strategies were not explicitly modeled in PSE's recent resource planning.

In another example, a Connecticut utility demonstrated successful co-deployment of energy efficiency and demand response specifically targeting low-income customers. Connecticut's Home Energy Solutions – Income-Eligible (HES-IE) program serves customers at 60% state median income and provides whole-home audits and comprehensive retrofits at no cost to participants. In 2018, United Illuminating (UI) delivered a pilot through HES-IE installing HWPHs and recruiting customers with WiFi to enroll in a DLC program. Approximately 90% of customers with installed HPWHs enrolled in UI's demand response program.[17] PSE should consider a similar approach to

[16] *See* Exh. LCM-5.

[17] Source: https://www.aceee.org/sites/default/files/pdf/conferences/hwf/2019/7d-rodrigues.pdf

leveraging its Low Income Weatherization program to install grid-enabled water heaters to provide a dedicated pathway for named communities and low-income customers to participate in demand response.

Additionally, another dedicated pathway for reaching named communities and low-income customers could be through a program targeting multifamily and affordable housing. Ecotope recently conducted research for the city of Seattle demonstrating the effectiveness of load shifting for commercial HPWHs in low-income and non-low-income multifamily buildings. Initial findings indicate effective load shifting from peak morning and evening hours and high participant satisfaction due to maintained hot water supply.[18] Enabling named community participation through designs that target these customers are the types of explicit strategies for delivering services to named communities that PSE must include in its CEIP for each of its DER offerings.

Distributed Generation - Solar Overview

Q. Please provide a high-level overview of the DER solar programs in PSE's final CEIP, and explain whether PSE's CEIP includes provisions to ensure these programs benefit named communities.

A. PSE's CEIP includes seven distributed solar programs: multifamily rooftop solar incentive, multifamily solar partnership, residential rooftop solar leasing, commercial and industrial rooftop solar incentive, PSE Customer-sited Solar+Storage, third-party distributed solar PPA, and community solar. Of these, only two programs mention targeting low-income customers: community solar and residential rooftop solar leasing,

[18] Source: https://www.advancedwaterheatinginitiative.org/chpwh-project-update

with the latter being a space leasing (customer roof) program where the customer does not even see the bill savings of hosting the solar installation. A third program, the PSE customer-sited Solar+Storage Offering, "may offer higher incentives to income-eligible customers" but PSE has not explicitly set aside a portion of its total market potential (14.7 MW) or designated other specific pathways for serving income-qualified customers. While these programs mention targeting based on income eligibility, there is no discussion of serving named communities or using other criteria beyond income to target these programs. Although PSE does state that it will consider relying on the geographic nature of highly impacted communities and linguistic isolation to target its outreach efforts, income eligibility remains the only officially acceptable criteria for participating in this proposed suite of programs (CEIP, p.65). Furthermore, there are no explicit carveouts for named communities, details stipulating level of customer benefits for community solar or multifamily tenants (e.g., allocation covering a percentage of utility bills, fixed amount per participant), nor common approaches such as rent-to-own pathways that would reduce the upfront cost and increase accessibility of clean energy products like distributed solar to named communities.

While PSE has indicated that they will be working with their EAG to co-create these programs, I recommend that PSE include additional measures in each of these programs to ensure that named communities receive benefits, such as carve-outs for program participation, designated budgets, and savings targets.

Distributed Generation – Community Solar

Q. Could you describe PSE's proposed Community Solar Program?

A. PSE has proposed 25.6 MW through its Community Solar program, which provides customers the ability to subscribe to locally developed solar projects and receive bill credits as a share of its energy production. PSE has proposed several rounds of delivery, including: Round 1 in 2022, developing 7 MW across six projects (each with shares for income-eligible customers); Round 2 in 2023-2024, developing 13 MW (including shares for income-eligible customers); and a final round of 5.4 MW intended to serve Highly Impacted Communities and multifamily customers (based on stakeholder input) (CEIP, p.128).

Q. Does the proposed Community Solar program have specific carve-outs for low-income, named communities, or multifamily customers?

A. The Community Solar program includes provisions primarily for income-eligible customers only, where eligibility is set at 200% of or below the federal poverty level (p.129). In Round 1, the Community Solar Program will enroll approximately 4,300 customers across five projects, 1,200 of whom will be income-eligible customers enrolled at no cost. An additional project is noted for development at the Olympia Center with benefits that will be 100% dedicated to income-eligible households and service providers.

In 2023 (Round 2), PSE indicates additional projects of 6 MW and 7 MW, which will include some allocation to income-eligible customers. Finally, in 2024 PSE will file for approval of an additional 5.4 MW of community solar dedicated to HICs and customers in multifamily housing. According to Appendix D of the CEIP, a total of 9.2 MW (36% of total proposed community solar resource allocation) will be dedicated to income-eligible customers, multifamily customers, and highly impacted communities

through the Community Solar Program. There are no specific targets or carve-outs for vulnerable populations.

Q. Should PSE increase the MW target for its community solar program, and the share of the community solar program that is designated for named communities? If so, why?

A. Yes, PSE should increase the MW target for its community solar program, and PSE should also increase the share of the program that is designated for named communities. Specifically, I recommend that PSE increase its community solar target to 50 MW, representing approximately 25 MW annually over the latter part of the current planning cycle (e.g., 2024, 2025), and PSE should consider designating a higher allocation of total capacity to named communities (e.g., 40-60%), given the higher potential impact on energy burden this program has relative to other programs.

PSE must ensure that its solar DER offerings equitably benefit named communities, individually and as a whole. Of PSE's seven distributed solar initiatives, only two include any designated benefits for named communities (or low-income customers, which may serve as an incomplete proxy): community solar and distributed solar rooftop leasing. Of the total 80 MW for distributed solar programs taken together, only 9.88 MW appeared to be explicitly allocated for income-eligible customers, highly impacted communities, or multifamily customers. In other words, only slightly more than 12% of the energy benefits of PSE's distributed solar programs are specifically designated, and vulnerable populations are not explicitly included in the designation. In contrast, PSE reports that 27% of PSE's customers are in highly impacted communities and 37% are in highly vulnerable populations. (CEIP, Figures 3-6 and 3-7, p.63). This

means that named communities may receive a significantly smaller share of the energy benefits of PSE's distributed solar programs than their share of PSE's customer base, without increased targets and intentional planning.

PSE should work to ensure that each of its distributed solar initiatives reaches and benefits named communities. Because these strategies are absent in the CEIP for all but two initiatives, PSE should also adopt an aggressive community solar target to help ensure that PSE's solar portfolio taken as a whole provides an equitable distribution of benefits.

Q. Why do you believe that a Community Solar target of 50MW by 2025 (representing approximately 25MW annually in 2024 and 2025) is appropriate for PSE?

A. As I discussed above, I believe PSE should adopt a more aggressive community solar target to help ensure compliance with CETA's equity mandate. Community solar offers program participants substantial benefits including decreased energy burden, and this context is a critical driver for my recommendation.

I also believe that a community solar target of 50MW (representing 25MW annually in 2024 and 2025) is appropriate based on what other utilities have been able to achieve. There are many factors that go into an individual utility's community solar investment targets, and in looking across the country, there is a lot of variability in the solar market within each state. Differences can be attributed to state/local policies, size and maturity of installer network, and even factors like space and building stock. While there are many examples of utilities that have significantly smaller community solar targets than PSE (and many with no targets at all), because PSE must comply with CETA's equity mandate, I believe examples of utilities that have quickly ramped up

community solar programs and achieved high MW targets are more relevant examples for PSE than utilities and states that have made little progress. Additionally, I have only considered utilities that are ramping up their community solar programs as relevant points of comparison, because states with well-established and extensive programs (such as New York) offer cost savings and extensive networks of available installers that are not likely to be available to utilities with newer programs, like PSE.

There are several other utilities that appear to have been successful in meeting and exceeding ambitious community solar targets within a short time frame. For example, Xcel's Minnesota territory launched its community solar program in 2014 and by 2019—within five years—it achieved 390 MW. One year later, in 2020, they increased the community solar capacity to 784 MW, nearly doubling the program capacity.[19] By comparison, PSE is similar to Xcel Minnesota regarding size of residential customer base (approximately 1.04 M compared to 1.17 M, respectively), with slightly higher sales (10.97 M MWh vs. 9.03 M MWh, as of 2020).[20] Looking beyond Xcel to Minnesota as a whole, Minnesota ramped up community solar installations significantly starting in 2017, with approximately 250 MW coming online in that year alone.[21]

The Xcel example, and Minnesota more broadly, highlight that it is possible for community solar programs to ramp up quickly and achieve ambitious targets in a

[19] https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7b30F73F77-0000-C61C-8E6F-83370320D64C%7d&documentTitle=20211-170270-01

[20] Xcel Energy, *Upper Midwest Integrated Resource Plan 2020-2024,* Northern States Power Company Docket No. E002/RP-19-368, https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/The-Resource-Plan-No-Appendices.pdf.

[21] https://www.seia.org/state-solar-policy/minnesota-solar

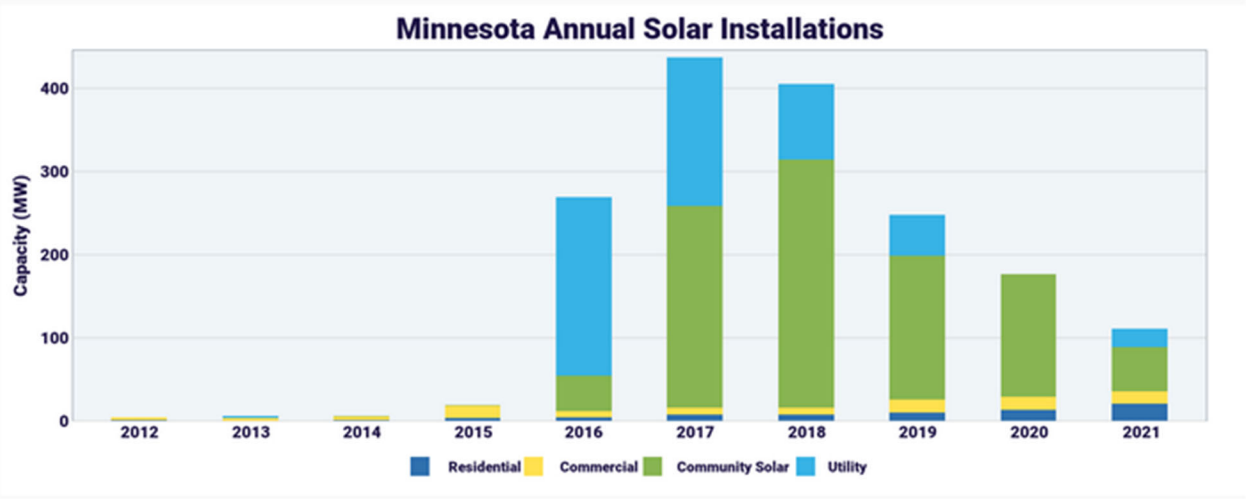
program's early years. As I noted above, Xcel Minnesota's initial five-year community solar achievement was 390 MW, or an average of approximately 78 MW annually. Xcel is similarly sized to PSE with respect to retail sales and size of customer base, so these targets may indicate that PSE can achieve a similar ramp rate.

Nor is Xcel an outlier in the state – as shown in Figure 1 below, community solar installations increased dramatically across Minnesota as a whole in recent years. Scaling the Minnesota state-wide numbers also indicates that PSE could achieve a more aggressive near-term ramp of community solar. For example, PSE is responsible for approximately 25% of Washington state retail sales[22] – and 25% of Minnesota's total state level annual community solar installations were approximately 62 MW (2017), 75 MW (2018), and 50 MW (2019). Comparing PSE to 25% of Minnesota state-wide totals may underestimate the appropriate target for PSE, since PSE and Xcel have similar electric sales and serve a similar sized customer base, and Xcel serves closer to half of Minnesota's customer base.[23]

[22] EIA https://www.eia.gov/electricity/data.php#sales

[23] Xcel's Minnesota territory represents closer to 47% of customers within the state, and 44% of MWh sales. As PSE is closer to 25% of state, the proportion used in this example – 25% of Minnesota state-wide targets – is conservative.

Figure 1. SEIA State Level Solar Installations by Year – Minnesota



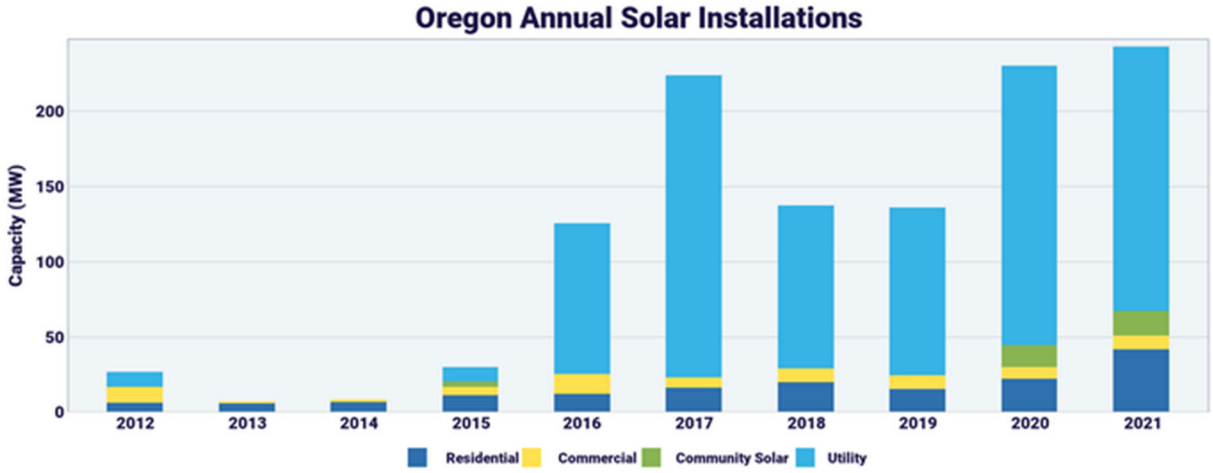
PSE is proposing targets for 2022 through 2025, and I recognize that initial planning may delay the ramp of annual achievements in 2023. However, it seems reasonable that PSE could increase its annual targets to approximately 25 MW, at a minimum, once the program is launched, totaling 50 MW by 2025. This 25 MW annual target is significantly smaller than Xcel's average annual acquisitions in the early years of its program, and significantly smaller than 25% of the Minnesota statewide total during the state's significant ramp.

As another example, in 2016, Oregon legislation required the public utility commission to develop a community solar program setting a capacity-limited target equal to 2.5% of the electric utilities' 2016 system peak.[24] For PGE service territory, with approximately 900,000 customers, the community solar target is 93.15 MW. For the Pacific Power territory, at around 600,000 customers, this is 64.6 MW. In 2020, 50% of

[24] Oregon Senate Bill 1547 (Clean Electricity and Coal Transition Plan) directed the Public Utility Commission to establish the Community Solar Program. https://www.oregoncsp.org/wp-content/uploads/2021/03/PIM-v20210112.pdf

this program capacity was released. In 2020, its first year, 9 MW of capacity were in operation in PGE's service territory, and 51 MW of capacity are projects currently in queue, meaning they are fully approved with third-party installation expected soon.[25] If we assume a similar ramp rate, PSE should be able to exceed its 25.6 MW target proposed over the 2022-2025 period.

Figure 2. SEIA State Level Solar Installations by Year – Oregon



To reiterate, while many variables can influence an individual utility's community solar achievements, I believe that utilities in Minnesota and Oregon that are quickly ramping up new programs are solid points of comparison in assessing what PSE should aim to achieve. Utilities with lackluster or no community solar programs are not an appropriate point of comparison for PSE, which has to demonstrate an equitable distribution of benefits from its solar portfolio under CETA.

Finally, community solar programs are recognized nationally as tried and true approaches to both provide affordable solar energy to households, regardless of whether

[25] https://www.oregoncsp.org/

they have a home suitable for rooftop panels, and also reduce energy burden in low-income communities. By comparison, community solar provides the biggest potential impact on customer energy burden relative to other energy products. For example, comprehensive energy efficiency retrofits through programs like Low Income Weatherization typically result in 10-20% savings (and notably, a variety of other non-energy benefits), and incentives for demand response (e.g., $25 seasonal incentives, $100 enrollment incentive) arguably provide a negligible impact on energy burden. Community solar, by comparison, has the potential to cover a much higher proportion of total energy costs, depending on the per-customer allocation. Increasing the total program target and the percentage of the total that is designated for named communities are among the most significant changes PSE can make to more broadly distribute these substantial benefits to named community customers.

Recognizing these benefits, in 2021 the US DOE set a community solar target to increase community solar deployment from 3 GW in 2020 to 20 GW by 2025. The National Community Solar Partnership, an initiative of the U.S. DOE led by the Solar Energy Technologies office, intends to make community solar accessible to every US household.[26]

Considering the policy environment at both state and national levels, I believe PSE should increase its total community solar target to 25 MW annually by 2024, and more once the program has ramped up. Specifically, a target of 50 MW total by 2025 seems reasonable given initial capacity achievements in other programs, with potentially

[26] https://www.energy.gov/communitysolar/about-national-community-solar-partnership

higher targets for the next CEIP round based on what is ultimately achievable after the initial rollout.

Q. How does PSE propose to help low-income and named communities customers overcome financial barriers to participating in its proposed Community Solar program?

A. PSE states that low-income customers who participate in the first and second rounds of Community Solar will do so at no cost. PSE also states that participants in the Multifamily Community Solar Program will receive discounted membership in the program (CEIP, Table 2-10). PSE does not explicitly state what incentives will be offered to customers from named communities (e.g., whether they offer a no-cost participation option and/or a monthly subscription discount). It is also unclear whether customers from named communities will need to meet income eligibility requirements to participate in Community Solar.

Q. What changes do you recommend to reduce financial barriers to Community Solar participation in named communities?

A. PSE should clearly address how they will target named community customers for participation, whether they will require income eligibility or expand eligibility to other factors, and what the overall benefits (e.g., minimum savings in energy bills) will be, including incentives for participation.

There is considerable ambiguity in what the overall benefits will be for income-eligible, multifamily, and named community participants in the Program. Reducing barriers to enrollment, such as upfront payments, and offering considerable monthly

subscription savings will support increased appeal and accessibility for historically underserved populations, such as low-income customers and named communities.

Based on review of other community solar programs across the country, benefits of community solar programs typically reduce low-income customers' net annual electric costs between 10-50%.[27] For example, Washington D.C.'s Solar for All Program set a goal of providing the benefits of solar electricity to 100,000 low-income households (at or below 80% Area Median Income), and to reduce their energy bills by 50% (based on the 2016 residential rate class average) by 2032.[28] Programs that set the proportion of bill coverage at the higher end will have a more substantial impact on a customer's electric energy burden.

It is also important to have transparency around annual costs, such as subscription fees, and expected benefits. PSE did not explicitly spell out the level of costs and savings for income-eligible customers in this CEIP. Program benefits should be clearly communicated, in addition to being substantial enough to incentivize the target demographic to participate. I fully support PSE's proposed intended outreach approach targeting highly impacted communities via partnerships with community-based organizations, open houses, and multilingual educational materials (CEIP, p.65). All materials developed as part of this process should include specific and clearly defined information about the subscription process, fees or lack thereof, and expected savings over the course of participating in the program.

[27] https://www.lowincomesolar.org/wp-content/uploads/2020/12/LISPG-Community-Solar-Policy-Chart_2020-update.pdf

[28] *Id*.

Currently, the program does not mention a minimum savings target for low-income participants. Within a set MW target, there is inherently a tradeoff between how many customers can participate in community solar projects and the amount of savings allocated to individual customers. Without a stipulated minimum savings target, it is possible that participating customers may not realize sufficient or equitable impacts on energy bills if enrollment is very high. There are different approaches that could be taken to setting minimum savings targets. One approach is to set them as a percentage saved on utility bills (10%-50%); another is to provide benefits allowing customers to reduce energy costs down to a minimum energy burden threshold. However they are formulated, minimum savings targets ensure that benefits are not watered down beyond a given threshold, which in turn could provide much stronger incentives for participation. I recommend that PSE offer a minimum savings target for low-income customers in conjunction with its Community Solar program. The target can be developed for the biennial CEIP update.

Q. Are there additional ways that PSE could modify the design of its proposed Community Solar program to increase benefits to named communities?

A. While PSE's proposed initiatives do have some design elements that should provide benefits to named communities, the income-eligible pathway for the Community Solar program could be strengthened by specifying targets for both subscriptions and project capacity allocated to income-eligible and named community customers, covering both highly impacted communities and vulnerable population customers. Each round of projects included in PSE's CEIP seems to follow different allocations for the target demographic. Moreover, the targets are not consistent in how the allocations are made.

Some are spelled out in terms of number of customers, others in terms of committed MW of total capacity – it would be helpful to see consistent reporting to more easily compare benefits (e.g., net energy savings, number of participants, dollars savings). Additionally, there is no stipulation regarding the type of multifamily participants, which may be helpful to ensure the emphasis is specific to low-income or affordable housing.

In addition to the minimum savings targets discussed above, another way to increase the savings allocation to individual income-eligible participants could involve facilitating participation of backup subscribers and/or "anchor tenants," such as larger non-residential entities like non-profits, who can subscribe to a higher portion of capacity and/or pay higher monthly fees that could be in part used to pass down deeper savings to income-eligible customers.

Alternatively, anchor tenants could be used to enroll more income-eligible participants at either no or much lower costs. Illinois' Solar for All (ILSFA) Program demonstrates this unique mechanism for subsidizing the low-income portion of its community solar program. Specifically, it provides incentives to approved community solar project developers in the form of renewable energy credits (RECs), incentivizing them to build projects and receive payment through RECs sales of complete projects.[29] Since RECs represent an environmental value of the system, rather than energy generated, developers are paid for completed projects and participants are then able to benefit from ongoing clean power generation. PSE could also consider facilitating donations of excess energy credits from other solar customers, and unsubscribed energy

[29] Source: https://www.illinoissfa.com/programs/community-solar/

purchased by the utility from community solar projects to income-eligible customers who are not program participants.[30]

Distributed Generation – Rooftop Solar

Q. Could you describe PSE's proposed residential rooftop solar programs?

A. PSE's rooftop solar programs include Residential Rooftop Solar Leasing, Multi-family Rooftop Solar Incentives, and Multi-family Solar Partnership programs.

- The Residential Rooftop Solar Leasing Program is a program in which PSE would lease rooftop space from residential customers to install and operate solar PV systems, allowing "customers to participate in and benefit from clean energy generation without any investment" (CEIP p.123).
- The Multi-family Rooftop Solar Incentive incentivizes property owners by reducing upfront costs of solar installation and ownership.
- The Multi-family Rooftop Solar Partnerships Program is aimed at facilitating billing system support to allocate savings from multifamily solar systems among its tenants.

Q. Do PSE's proposed Multi-family residential rooftop solar programs target low-income or named communities customers?

A. No, not explicitly. While a significant portion of low-income communities tend to live in multifamily buildings, not all multifamily buildings are accessible to low-income communities as more and more luxury buildings are emerging in the market, attracting a higher-income population. For this reason, is important that PSE's multifamily programs include explicit carve-outs and recruitment strategies to target low-income customers and

[30] https://www.lowincomesolar.org/wp-content/uploads/2020/01/Utility-LMI-Solar-paper.pdf

named communities, in addition to market rate customers, to ensure minimum thresholds of delivery and reduce any potential risk with unintended outcomes (e.g., higher rates of non-low-income participation that exhaust available program funding at the exclusion of low-income and named communities).

Q. Do PSE's proposed residential rooftop solar programs have specific carve-outs for low-income or named communities customers?

A. Only the Residential Rooftop Solar Leasing program includes an income-eligible component, accounting for only 12% of the total nameplate capacity allocated to this program, for a total of 0.68 MW. Additionally, the program does not include specific carve-outs for named communities. Not having specific carve-outs for named communities could limit the opportunity for engagement and overall participation of the target demographic in this suite of programs. Although there is overlap between income-eligible and named communities customers, relying on income eligibility alone will exclude a portion of the target demographic from accessing residential rooftop solar.

Q: Does the proposed Residential Rooftop Solar Leasing Program provide direct bill savings for low-income participants?

A. No. Because this is a roof leasing program, participants will not realize direct electric bill savings from generated renewable energy. Instead, participants will receive lease payments from PSE for the use of their roof space.

While lease payments will provide some benefit to participating customers, a more significant set of benefits for low-income customers and named communities would involve (1) access to bill savings through the clean energy generation occurring on their roof, directly reducing energy burden, and (2) a rent-to-own option, providing a pathway

for accumulation of wealth and increased property value. Providing a more complete strategy and benefit package for named communities will also better reflect intentionality for inclusion of these communities and their values. This will also help gain support of community-based organizations that will be important for building community trust and increased recruitment and participation within named communities.

Q. Has PSE considered a rent-to-own model for its rooftop solar programs?

A. Yes, PSE did consider rent-to-own solar as it was supported by stakeholders, however this program design did not make the list of concepts PSE considered for final inclusion (CEIP, p.32). PSE reported that rent-to-own distributed solar had a similar market potential as the rooftop solar leasing program but had lower returns for customers. *Id*.

Q. Do you agree that rent-to-own distributed solar provides lower benefits than a rooftop leasing program?

A. PSE's conclusion leads me to believe PSE may have omitted some factors in evaluating ownership programs to add to its list of concepts. While PSE notes that rent-to-own distributed solar programs had "lower returns for customers," the CEIP does not appear to include a detailed explanation for this conclusion. Absent this detailed explanation it is difficult to assess PSE's claim.

Speaking generally, however, rent-to-own models provide an avenue for customers in named communities to acquire sustainable energy assets. Asset ownership has often been disproportionately low in named communities. Although solar leases undeniably provide an opportunity for participation in sustainable energy, a model that transfers ownership of solar assets to customers in named communities could potentially yield much greater benefits, from increased property values for homeowners, to

additional rebates/incentives/credits and deeper savings over the lifetime of the system (20 years).[31] Because rooftop leasing programs do not offer these benefits, I am concerned that PSE may have omitted or inadequately weighted these benefits in its evaluation of ownership programs to make the list of concepts. Lease-to-own rooftop solar ownership program evaluations should take into consideration non-energy impacts like increased property values from the presence of solar assets and the opportunity of wealth accumulation in order to assess the overall returns to customers.

Q. Can PSE better target their distributed solar programs to include named communities?

A. As noted above, of the seven programs proposed by PSE's CEIP, only two directly address income-eligible customers. While there is mention of targeting highly impacted communities, it is unclear if the selection is going to be based on income eligibility or other criteria or strategies like special carve-outs for these communities. Similarly, PSE does not address how it will ensure that benefits from these programs flow to vulnerable populations. Of the total 80 MW for distributed solar, only 9.88 MW appeared to be explicitly allocated for income-eligible customers, highly impacted communities, or multifamily customers. In other words, only slightly more than 12% of the energy benefits of PSE's distributed solar programs are specifically designated, and vulnerable populations are not explicitly included in the designation. In contrast, PSE reports that 27% of PSE's customers are in highly impacted communities and 37% are in highly

[31] As an example, recent studies show an average increase in resale value between $4,020 and $5,911 for each 1 kilowatt of solar panels installed, https://www.sunrun.com/go-solar-center/solar-articles/do-solar-panels-increase-home-value

vulnerable populations. (CEIP, Figures 3-6 and 3-7, p.63). This means that named communities may receive a significantly smaller share of the energy benefits of PSE's distributed solar programs than their share of PSE's customer base, without increased targets and intentional planning.

To ensure named communities receive an equitable share of the energy benefits of its distributed solar programs, PSE should set dedicated solar targets for named communities. PSE should also consider several elements for developing effective strategies to deliver benefits to named communities, including:

- Consistent allocation of carve-outs and savings targets for named communities, either by nameplate capacity or number of customers,
- Ensure a minimum saving target for income-eligible customers and/or named communities,
- Provide explicit detail about energy and non-energy benefits for named communities participating in programs to help better articulate value proposition, and
- Ensure that all participants benefit from clean energy directly.

Distributed Generation – Storage

Q. Can you describe PSE's proposed residential storage programs?

A. PSE proposed two residential storage programs (CEIP, Table 2-9): Residential PSE Battery Leasing Program (including income-eligible and market rate customers) and Customer-sited Solar + Storage Offering (CEIP, p.133). Under the Residential Battery Leasing Program, PSE will lease energy storage systems to residential customers, who will benefit from access to a backup power sources in exchange for a monthly fee. Under

the Customer-sited Solar + Storage Offering, customers receive monthly incentives for hosting combined solar and storage systems.

Q. Do any of the proposed residential storage programs include carve-outs for low-income and or named community customers?

A. Under the Residential Battery Leasing Program, PSE states that it will look to further reduce or eliminate fees for income-eligible customers to increase affordability and will also identify customers located in areas with higher outages and lower reliability (CEIP, p.133). PSE also states that they may offer higher incentives to income-eligible customers in the Customer-Sited Solar + Storage Program.

PSE has proposed installed capacity of its Battery Leasing program of 3.8 MW; of that, 0.3 MW is designated for income-eligible customers, reflecting approximately 7% of total storage leasing MW capacity (CEIP Table 2-15). The Customer-Sited Solar + Storage Program is projected to be 12.5 MW of market potential of solar capacity (Appendix D-1, Table D-4), with no specific amount designated for income qualified customers or named communities. Taken together, then, less than 2% of PSE's residential battery programs are designated for income-eligible customers (0.3 MW out of 16.3 MW between two programs), with no specific designations for named communities.

In its approach to residential storage programs, PSE should consider strategies to increase benefits to named communities and income-eligible customers, including by increasing minimum designations for named communities. Other strategies to increase named community and low-income participation could include setting robust financial incentives, including eliminating upfront participation fees and offering higher incentives than market rate customers. As an example, California's Self Generation Incentive

Program (SGIP), a California Public Utilities Commission (CPUC) program that offers performance-based incentives for installing energy storage, set an Equity incentive rate of $850/kWh and the Equity Resiliency incentive rate at $1,000/kWh, meaning that energy storage systems would be accessible at nearly no cost to the customer.[32] These incentives aim to ensure lower-income, medically-vulnerable, and at-risk-for-fire communities are at the front of the line to receive competitive incentives for battery storage. The history of the program demonstrates the importance of setting substantially higher incentives for vulnerable communities. The original SGIP Equity Budget was established for low-income customers in 2016 and carved out 25% of SGIP funds; however, the program languished and never had meaningful uptake because incentive levels were consistent with those of the general program ($250/kWh). To improve the likelihood of program participation, the Equity Budget incentive was increased to $850/kWh. Currently, the program is fully subscribed and is operating on a waiting-list basis.

Distributed Generation – Overarching Issues

Q. Do any of the proposed solar programs include strategies paired with energy efficiency programs?

A. No, none of the proposed solar programs have been proposed to be co-deployed with energy efficiency programs. Co-deployment could result in deeper savings for participants from low-income and named communities. For example, multifamily properties enrolled in PSE's low-income weatherization program should be assessed for and enrolled in solar opportunities as part of that initiative. According to an evaluation

[32] https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/demand-side-management/self-generation-incentive-program/participating-in-self-generation-incentive-program-sgip

done by the Colorado Energy Office, energy efficiency measures paired with solar provided low-income households with greater savings-to-investment ratios.[33] PSE should assess whether bundling energy efficiency with solar provides more cost-effective savings and opportunities to provide clean energy benefits to named communities.

Q. Do any of the proposed programs offer incentives specifically for affordable multifamily housing?

A. No. Currently PSE's proposed solar programs do not contain specific provisions to target affordable multifamily housing. Additionally, it is possible that proposed multifamily solar programs may not offer sufficient incentives (or strategies like dedicated carve-outs or targeting) to generate significant participation amongst this segment. In the event that affordable housing developers do participate in one of the Multifamily Rooftop Solar programs, there are currently no provisions to pass down any of the savings to tenants or to protect tenants from bearing any additional costs through increased rents, adjustments to utility allowances, or other mechanisms. PSE should provide clear language that addresses these potential concerns, providing targeted outreach for multifamily affordable housing and including provisions to guard against property owners detracting from the full benefits that could be realized by their tenants.

A good example of a distributed solar program serving affordable housing can be found in California. The Solar on Multifamily Affordable Housing Program (SOMAH) was created to provide incentives for the installation of solar distributed generation

[33] https://www.lowincomesolar.org/best-practices/single-family-colorado/

projects sited on existing multifamily affordable housing.[34] It requires that tenants receive at least 51% of the solar credits from each project, using virtual net metering to apply solar credits directly to tenants' utility bills.[35] Additionally, provisions are included to reduce cost barriers for property owners, including incentives that cover the portion of the system allocated to tenants at a level that approximately covers their costs, in addition to lower incentives for portions of the system covering common areas.[36]

CONCLUSION AND RECOMMENDATIONS

Q. Please provide a list of the terms that you believe the Commission should include as conditions of its approval of PSE's CEIP.

A. Based on my review and assessment of proposed program strategies, I recommend the following:

- ***Develop Explicit Mechanisms/Targets for Serving Named Communities*** – PSE should develop mechanisms for intentionally serving customers in named communities in each of their individual DER programs, including carve-outs for program costs (including outreach/education), savings targets, and minimum participation thresholds (at minimum for the DR, solar, and storage initiatives as discussed).
- ***Develop Explicit Co-Deployment Strategies*** – PSE should be explicit about how it intends to co-deploy resources, specifically with regard to energy efficiency products and programs; and develop plans and incremental targets that reflect

[34] https://calsomah.org

[35] https://calsomah.org/understanding-your-utility-bill-after-solar

[36] https://www.lowincomesolar.org/toolbox/consumer-protection/

these specific actions, in particular for serving low-income customers and named communities.

- ***Increase DR Targets for DLC*** – PSE should increase its DR target for DLC offerings that include increased bring-your-own-device pathways for smart thermostats and water heaters; associated strategies that leverage current equipment/device saturations, existing energy efficiency offerings, strategies with increased potential for enrollment and conversion, and dedicated strategies for explicitly reaching named communities (e.g., locational targeting, direct installation).
- ***Increase Emphasis of Named Communities Beyond Income Eligibility*** – PSE should include targeting for named communities beyond using income as the sole criterion for program eligibility.
- ***Increase Community Solar Target and Benefits to Named Communities*** – PSE should increase its community solar subtarget to 50 MW by 2025, with a minimum target of 25 MW annually as the program ramps up going forward.
- ***Provide Rent-to-Own Options*** – PSE should provide rent-to-own options for solar and storage programs for named communities.
- ***Increase DER Deployment and Benefits to Named Communities*** – PSE should modify its program design for solar and storage DER programs to better ensure benefits flow to named communities, including by offering higher incentives for low-income customers and named communities; ensuring benefits flow to tenants in affordable multifamily housing; and targeting storage programs to vulnerable populations where increased reliability would reduce vulnerabilities.

Q. Does this conclude your testimony?

A. Yes, it does.