

TECH Clean California “Good Stewardship of the Panel” Webinar Resources

Event held on January 23, 2024

Introduction

Question	Answer	Topic
What are some scenarios in which transformer upgrades, where the service transformer serves multiple customers, would not be covered by the utility?	Specific scenarios will need to be analyzed by the tariffs interpretation team, and costs will be allocated between the utility and the customer(s) based on the specific scenarios.	Costs - Transformer Upgrades

Session 1 Part 1 – Utilities

Question	Answer	Topic
Do we see similar requirements to apply for an upgrade outside of California that are similar?	Building Decarb Coalition looked at service upgrade processes in a few states. All the states looked at required applications but found examples of best practices by some utilities that could be adopted more widely. View the report at buildingdecard.org .	Costs - Transformer Upgrades Outside California
Is there a specific panel brand that qualifies?	<p>PG&E: For PG&E, we go by the PG&E Green Book, which is all the rules for electric and gas service connection. Then, we don't have any specific brands that we recommend or prohibit. It just comes down to whether the panels have the right features and types of equipment that meet the requirements for the application.</p> <p>SCE: For Edison, we have our electric service requirements manual, and the panel needs to meet the requirements for that that are in that ESR manual.</p> <p>SDG&E: For SDG&E, it's the same for us as well. We have our standards that the meter panel needs to meet, but we don't have a specific panel brand that we recommend.</p>	Qualified Product List

Disclaimer: Please note comments that did not ask a question or contribute to the intent of this symposium were not included in this Q&A. For a full transcript of the Q&A, please request it from Energy Solutions directly at TECH.info@energy-solution.com.

Question	Answer	Topic
Is there a cost to site spotter? Also, when there are two properties in California, do they need to merge service?	All Utilities: So as far as having a planner from SDG&E go out to the home, there's not a cost for that for the service planning team for SDG&E. And the two properties question is a little bit more complicated. We wouldn't really be able to answer that without going out to the home and seeing the specific site conditions.	Costs - Site Spotter
What are the types of triggering events for a panel upgrade? Was it a single measure like heat pump water heaters or multiple measures?	<p>We do not run that data since we track single measure rebates on TECH Clean California, but I'll put the request into the Data Team.</p> <p>There is a correlation between panel upgrades and full decommissioning of the heating system, but beyond the correlation in data analysis, we have not captured the triggering event as a specific piece of data.</p> <p>Per the NV5 study, common triggers include level two EV charging, Solar PV, and HVAC.</p>	Panel Upgrade Triggers

Session 1 Part 2 - Customer Considerations

Question	Answer	Topic
Does the HEA study include a known number of homes with heat pumps or EV chargers?	<p>Those homes did not have EV chargers. That's what we know about them, but they could have been all-electric or gas hybrid. In PG&E service area, we're still looking at only maybe eight percent of the homes are all electric.</p> <p>No more than eight percent of that data represents all electric homes, so it's almost all gas-powered homes without EV chargers.</p>	Heat Pump/EV Charger Market Penetration
What's the average electrician's response to our pushback on needing a panel upgrade, and how can we prepare for that conversation?	By doing the load calculations and sharing them with the electrician, they see the same space remaining, but, if nobody does the calculations, nobody sees the invisible space remaining.	Electrician Response to Upgrades
How does the 1-hour peak compare to shorter time intervals (15-minute, 5-minute)?	By looking at the 15-minute data and comparing it to the 1-hour it's within, we see 15-minute peaks can be about 1-2 kW higher (4-8A) than 60-minute peak hours. I think it's cooking surges likely causing the 15-minute intervals to be higher.	Peak Hours

Question	Answer	Topic
<p>What’s the source for the California Housing Stock Age and Knob & Tube figures?</p>	<p>The source for the housing stock age is US Census Bureau American Community Survey.</p>	<p>Knob & Tube - Data Sources</p>
<p>Is it true that if you replace any of the knob and tube, you must replace the whole system?</p>	<p>No, that’s not true.</p>	<p>Knob and Tube - Code Requirements</p>
<p>Do any of the common hybrid heat pump water heaters allow the user to program a load up, to concentrate compressor run time into the daytime when solar is producing?</p>	<p>We’ve heard people say that they’ve been able to program different setpoint temperatures for different times of day through the app or online interface. We’re not sure whether it’s possible through the device interface.</p>	<p>Heat Pump Water Heater Programming</p>
<p>Does raising the temperature to 140 degrees Fahrenheit still make sense if you have a large heat pump water heater? If capacity isn’t an issue, wouldn’t it be more efficient to run the unit at 120 degrees Fahrenheit in heat pump mode?</p>	<p>Yes, because the higher the temperature of the tank, the more heat loss. The lower the temperature stored in the tank, the less heat loss, and less energy consumption, assuming you don’t have that electric resistance element kicking in.</p> <p>For the electric resistance element, if you can get that turned off, that’s the big energy savings. If you have an 80-gallon tank, and you’re not running out of hot water, you should lower the tank temperature as low as you can (not below 120 degrees Fahrenheit). At 117 degrees Fahrenheit, you can have Legionnaire disease start to grow, and that’s a very terrible illness that feels like a bad flu.</p>	<p>Heat Pump Water Heater Programming</p>
<p>What’s your experience with reliability of current generation heat pump water heaters?</p> <p>Nate Adams (“Nate the House Whisperer,” a hands-on contractor who posts frequently about electrification) and other contractors on his Facebook Electrify Everything group report that many heat pump water heaters fail within first few years, at a percentage that’s high enough to concern them. Are you seeing the same or better? Any manufacturer better than others?</p>	<p>With thousands of water heaters installed, they last up to their warranty around 10 years, just like anything else. After 10 years, they start to fail. Tanks generally last about 15 years, just like any tank.</p>	<p>Heat Pump Water Heater Reliability</p>

Question	Answer	Topic
<p>Efficiency-wise, what's best, a 220V or 110V heat pump water heater?</p>	<p>240V units often have marginally better energy factor values than 120V units. Those energy factor values assume no resistance heat is used, whereas in real life, resistance is used approximately 15 to 30 percent of the time. 120V units have no resistance heating.</p>	<p>Heat Pump Water Heater Reliability</p>
<p>Another issue not being addressed in the electrification conversation is the issue of the lifetime of electrical services. In the Pacific Northwest, we see a high rate of services that are corroded and need to be replaced minimally every 20 to 25 years. Do you have any thoughts on this issue?</p>	<p>Entropy happens. Everything fails. Things from the 1970s generally need to get replaced by now because 50 years is a fair amount of life for almost anything to corrode.</p>	<p>Heat Pump Water Heater Reliability</p>
<p>Do your studies consider future loads due to the adoption of EVs and EV chargers?</p>	<p>What we've found is that EVs do not add significantly to loads in homes, if they are managed. If you put a level two fast charger on at the same time as you're cooking dinner and everything else electrical, that's a problem. Offsetting electrical usage by charging your car while you're asleep may be a better option. Most cars don't need more than a 120V plug-in to meet their daily loads, and most people don't need even a level two charger. They really don't increase significantly the peak loads if you do it right. If you do everything wrong, then it could be a problem.</p>	<p>Panel Upgrade Triggers</p>
<p>Can you confirm that 120V heat pump water heaters have a built-in thermostatic mixing valve, or since no resistance heating is used in these units, the water does not get hot enough to require a thermostatic mixing valve?</p>	<p>Yes, it does.</p>	<p>Heat Pump Water Heater Mixing Valve</p>

Session 2 Part 1 – Power Efficiency

Question	Answer	Topic
<p>For the home total amperage inventory in the PG&E service area, did you consider both phases and a single-phase peak amperage?</p>	<p>On common single phase two-leg 240V services, we think the study data is combined load on both legs as measured by energy meter, not looking separately at each leg and the neutral for the smaller loads on 120V circuits. Their energy is included.</p>	<p>Panel Upgrade Triggers</p>
<p>Can some panels upgrade from 100A to 125A just by replacing the main breaker?</p>	<p>Yes, that can work when the panel busbars are rated for 125A or more and the service line, and service riser lines can also accommodate the 125A delivery, and it involves some utility process, so check with your utility.</p>	<p>Panel Upgrades</p>
<p>For sizing heat pumps for HVAC, current best practice is to do Manual J calculations and/or blower door test. But I've seen an approach that intrigues me, download hourly gas consumption data from the utility (most gas utilities, at least in California, now have meters that report hourly).</p> <p>Then, you can pick out the handful of highest consumption hours of the year and figure out the BTU output required from a proposed heat pump based on the BTU input to the existing gas furnace. (You'd want to adjust if the home has fewer occupants than its "bedroom capacity," or if the homeowner reports they set the thermostat uncomfortably low). Seems this will require less design labor and greater accuracy. What are your thoughts?</p>	<p>We've been working to popularize that reality, behavior-based methods. It works great for California climates that are heating peak dominated e.g. the coast and mountains. We need to learn more about how the method works in cooling-dominated climates.</p> <p>An analogous method from heat wave peak periods will give similar results about how the existing cooling systems are peaking. Then, as you swap out to a more efficient heat pump (better cooling COP), lower loads would occur. In both methods, we can exogenously calculate the capacity savings of added insulation projects.</p>	<p>Heat Pump Water Heater Sizing</p>
<p>What happens if you keep your water heater below 120 degrees Fahrenheit?</p>	<p>There's the potential for legionella bacteria to reproduce in water below 120 degrees Fahrenheit.</p>	<p>Heat Pump Water Heater Programming</p>
<p>Can you recommend any worksheets or calculators for performing electrical load calculations?</p>	<ul style="list-style-type: none"> • Watt Diet Site • Josie's Plan Making App: ZeroCarbon-Home.com 	<p>Electrical Load Calculations</p>

Question	Answer	Topic
<p>Are you finding that AHJ's (in Norcal) are actually accepting top-down and bottom-up load calculations? From what I'm hearing, there seems to be skepticism from electricians or AHJs.</p>	<p>That's very normal for trades that are adding one device. That's the easy way to go about doing it. You can quickly show there's generally a lot of space left in the calculation, and the device I'm adding is a little part of it. Then, they sometimes publish on their AHJ websites, and they'll publish the full-blown stack diagram of how you do the bottom-up calculation, the 83B. Be careful though, they'll use 83A for new homes because they're also dealing with new homes.</p> <p>Some of the differences are a new home counts 10kW of basic loads as always on at 100 percent coincidence factor, and the retrofit code allows us to use 8kW. We get a little extra space by using 83B, so do look at what they're asking you to use.</p>	<p>Electrical Load Calculations</p>
<p>When picking high efficiency equipment, many utilities with peak load challenges want us to use EER/EER2. What's your perspective on the right metrics to use when picking efficient equipment that doesn't impact peak loads as much?</p>	<p>Basically, the more efficient the equipment, the lower its peak use is going to be, and the lower its energy use will be on that peak stress day. That leaves more space on the grid to get more people electrified.</p>	<p>Electrical Load Calculations</p>
<p>In what scenario(s) would it make sense to choose a 240V heat pump water heater over a 120V heat pump water heater?</p>	<p>For instance, if the customer has a lot of bedrooms and bathrooms with a narrow closet, you need a high first hour rating of multiple gallons of water delivered in that first hour. A small volume water heater or a water heater with small dimensions such as a 240V unit is required instead of a low power one.</p>	<p>Heat Pump Water Heater Voltage Selection</p>
<p>Are there any studies or research on combo heat pump laundry units for multifamily or single family homes?</p>	<p>There are none. However, we've been trying to encourage research on this for a while, both for load shifting and for electrifying apartments.</p>	<p>Combo Appliances</p>
<p>Can you clarify if the 120V Rheem Proterra is a hybrid unit, or if it's a heat pump only? My understanding from Rheem is the 240V is hybrid, but the 120V is heat pump only with no resistance heating.</p>	<p>The 120V version is a shared circuit model. It has black cowling where the mixing valve is. It has no resistor, but it had an onboard mixing valve. It allows you to program the unit up to 140 degrees Fahrenheit and still dial in to deliver 120-degree safe, non-scalding water.</p>	<p>Hybrid Heat Pumps</p>
<p>How do you feel about surge protectors?</p>	<p>They protect equipment from voltage (upward) surges causing damage. We're not aware of them counting toward getting code permission to add more electric loads.</p>	<p>Surge Protectors</p>

Question	Answer	Topic
Does the 120V heat pump water heater need outdoor unit?	No, it's a unitary system. The heat pump is mounted on top of the water tank.	120V Heat Pump Water Heater
Are line-side taps often allowed for residential solar?	They're allowed if you have the lines. Sometimes you have these combination meter boxes, much like the one where the meter socket is in the box. When you've got a separate meter from your panel box, there's lines, and that's where you can get your line-side tap in. The meter collar mentioned is a way that just plugs into the meter socket and can land solar there, or there's new smart meter collars that can take offtake power also from that meter collar.	Line-Side Taps

Session 2 Part 2 – Power Control

Question	Answer	Topic
<p>Regarding the question about 120V heat pumps and first-hour recovery challenges meeting code for larger homes, has anyone approached the Building Standards Commission to act on this issue formally allowing the higher first-hour recovery from higher temperature settings with TMVs on 120V heat pump water heaters versus the first hour rate on the yellow DOE energy label that permitting counters rely on, but do not reflect higher first hour rate with higher tank temperature settings?</p> <p>This will help avoid panel upgrades for lots of customers but is currently a permitting counter challenge without formal language from the state.</p>	We are not aware of anyone approaching the Building Standard Commission about this.	Code Requirements
Does a circuit splitter kill the power to the heat pump water heater if used, and we have found you have to reset the heat pump water heater?	he heat pump water heater comes back on, and the power goes off. That's just what it does, right? Some of those circuit splitters also have a little bit of power that goes to each one, but it has a draw. As soon as it draws a load, it switches over. It keeps the control panels up and running on them. It's not going to really matter that much.	Circuit Splitters

Question	Answer	Topic
<p>Do you not need to derate the EV supply equipment if you only use the 30A dryer circuit?</p>	<p>Yes, you could also install a little sub panel after the car charger. If you're running it off a 50A wire, running it down to a 30A dryer, and you want to run a 50A to your car, you could do a little sub breaker after the splitter and break it down to 30A and that's kind of what we did on those heat pumps. That would work as well, but you could just get a 30A car charger. If you need to set your car charger up for 30A, it's not going to change the mileage that much. Maybe you want to share a range circuit if you need that higher output.</p>	<p>Circuit Splitters</p>
<p>Is this webinar recorded?</p>	<p>Yes, the webinar is being recorded. A link to the recording will be sent to registrants and posted on the event web page.</p>	<p>Webinar</p>
<p>120V heat pumps are great, but is anyone talking about the first hour rating, and does it disqualify many homes?</p>	<p>There's a rating on the first hour of specific systems. The first hour rating of an HPVX66DHPT Premier 120V plug-in is 76. The highest first hour rating requirement on the plumbing code is 74. It would have to be a state or A.O. Smith with 120V plug-in for electric heat, and that is a hybrid water heater. It has a very small electric element in it, and it's still a circuit-sharing device. There are options for every size of house.</p>	<p>Code Requirements</p>
<p>Can we combine all the rebates available or is it one of the other?</p>	<p>Some rebates are stackable and some of them are not. The big heat pump water heater rebates from TECH Clean California, the \$3,100 (or \$3,800) rebate and the kicker incentive for the panel are achievable with the tax credit. Those two can work together. I believe that there's a rebate from California Energy Smart Homes that's not stackable with BayREN and some of the others. Some of the BayREN rebates are not stackable with other rebates as well. It just depends on where the money is, and what coffer the money is coming out of. A great place to check out these rebates is switchison.org.</p>	<p>Layering Rebates</p>
<p>If you are heating a space that was not formerly air conditioned, are any of the rebates still applicable?</p>	<p>For TECH Clean California incentives, the heat pump must be replacing an existing system. The tax credits mentioned on Iris do not appear to have that requirement; read more at irs.gov.</p>	<p>Rebate Qualifications</p>

Session 2 Part 3 – Policy Impacts and Status

Question	Answer	Topic
<p>Is there a plan to standardize permitting like solar permitting? Can you give some more details about that? How is solar permitting standardized?</p>	<p>Renewable Energy Laboratory several years ago that showed that permitting and inspection costs accounted for eight percent of the costs of installing rooftop solar, and that kicked off an effort in California to reduce those costs that was quite effective. The first big step was that the governor’s Office of Planning and Research published a solar permitting guidebook, and legislation required local jurisdictions to use those best practices to streamline their permitting.</p> <p>Then, the most recent step is that since then legislation has been adopted to require that local jurisdictions start to use online systems for approving permits for solar panels. Solar app is the kind of leading application made by National Renewable Energy Laboratory for online permitting and trying to figure out how to make it all work for heat pumps. It’s still on the horizon.</p>	<p>Standardized Permitting</p>
<p>Does National Renewable Energy Labs (NREL) have a website for load calculations, so everyone uses the same calculation? Is CPUC planning to put a tool like this for the public as well?</p>	<p>There’s a couple of different load calculation tools available. There’s the NREL-1, SCE has an electrification calculator, and PG&E has one as well. There’s value to each of those. And TECH is also working on a little bit of this as well. They’re all slightly different approaches. We haven’t really decided as far as the presentation of the calculator on the CPUC website, but we’re certainly going to be getting feedback from stakeholders, including the IOUs, PG&E, and SCE who have these calculators to make sure we’re not having these wildly divergent assumptions.</p>	<p>Electrical Load Calculations</p>

Question	Answer	Topic
<p>Why did the CPUC energy efficiency (EE) decision exclude the gas appliance incentive prohibition from equity sector?</p>	<p>Yeah, great question. We had a lot of debate and commentary about this. We don't have enough information to be able to say that if we cut these incentives for gas, what level should we put them at for the heat pump, for electrification alternatives, or to make sure that we're not having people just reverting to baseline. We are essentially continuing the status quo, which is somewhat unjust.</p> <p>But the idea was that there's the possibility that if we implement this policy too quickly, we're going to make that status quo even worse for those communities that we're most interested in helping. It's the primary focus of the staff proposal I'm working on now for the next decisions, but we really didn't want to move so quickly that we're making the very problem we're trying to solve worse.</p>	<p>Natural Gas Phaseout</p>
<p>When will the fuel sub bill impact tool be available?</p>	<p>We hope to finish it in the next few months, but we do not have a release date yet.</p>	<p>Fuel Sub Impact Tool</p>
<p>What is the timeframe that the fuel sub bill impact tool will cover?</p>	<p>It covers a single representative year.</p>	<p>Fuel Sub Impact Tool</p>
<p>Does the bill impact calculator also calculate the decrease in gas costs - both with no rate increase as well as future gas rate increases?</p>	<p>No, we use current costs in the tool, which we plan to update several times a year once it is released.</p>	<p>Fuel Sub Impact Tool</p>
<p>Is the CPUC able to do anything to get the investor-owned utilities (IOUs) to hire more staff to shorten the duration of IOU load application processes? Is there anything the CPUC can do on this front?</p>	<p>We are aware of this issue. Some of the workforce delays and delays on the utility side are causing people to stick with gas, and we want them to electrify.</p> <p>This question of hiring more staff will probably come up in the proceedings mentioned earlier. It'll be a deep dive into how the process works at various investor-owned utilities and how to accelerate it. I'm sure the question of hiring more staff will be on the table. They haven't publicly released the information on the proceeding, but it should come soon.</p>	<p>Utility Staffing</p>

Resources

- [Building Decarb Coalition Service Upgrade Processes Per State](#)
- [NV5 Study](#)
- [US Census Bureau American Community Survey](#)
- [Tax Credit for Home Improvements](#)
- Electrical Load Calculators:
 - [Watt Diet Site](#)
 - Josie's Plan Making App: [ZeroCarbon-Home.com](#)
- [NEEA Research on High Efficiency Dryers](#)
- [Webinar Recording](#)
- [Span Smart Electrical Panel](#)

Notable Commentary

- **Electrical Code**
 - T24, Part 3, CA Electric Code 220.87, specifically notes "Exception: If the feeder or service has any renewable energy system (i.e. solar photovoltaic system or wind electric systems) or employs any form of peak load shaving, this calculation method shall not be permitted." So, smart panels cannot be used to shave base load. In addition, the same code section notes maximum demand, not one hour peak demand. In addition, the exception for calculated load based on 30-day measurement is on 15-minute intervals. One hour consideration is not code compliant.
 - That stipulation on load calculation method 220.87 (from metered or measured loads) tells me we can use solar systems, batteries, and a smart panel, etc. that all modify loads in our house. We just can't use the 220.87 load calculation method there. We must use the 220.83 bottom-up calculation methods to calculate loads and remaining panel space.
- **Knob and Tube - Insurance Requirements**
 - Insurance companies often want knob and tube requirements pulled out.
 - The knob and tube wires are coated with old plastic and eventually cracks, so all wiring must be replaced. There isn't some wiring system out there that lasts forever.
- **Electrical Load Calculations:**
 - The NEEP tool is excellent! It does require a load calculation, so that should always be a part of your HVAC plan.
 - I agree, do a load calculation or calculate it the way we mentioned from gas usage, backwards, up and out. I subtract out the summer baseline gas usage and figure out the rest for winter space heating on that peak day during the cold weather. PG&E even provides what the temperature was that day, so we can calibrate.
- **Combo Appliances:**
 - You can program smart breakers. I currently use the span panel where you program large loads. For those asking about research on high efficiency dryers, NEEA has some program work and reports that address some of the issues: neea.org/our-work/high-efficiency-clothes-dryers.
 - For getting code permission to add loads to panels via 220.83(B), I think only automatic load sensitive controls would meet the requirements. So, the smart breaker would need CT clamps on the main panel, and it could be automatically controlled based on total loads. The analogy is that Emporia Smart Charger. It controls itself automatically based on sensing whole panel load.
 - Smart Panels like SPAN have built in whole house electric load monitoring to decide when to automatically shed your lowest priority load.
- **Code Requirements**
 - The ideal electrical panel proposal should consider the customer's budget. The appliances like a combo heat pump washer and dryer or battery range (\$6) are expensive, plus the cost to combine circuits, especially in older homes.
 - We have these low energy ranges coming out, but they're not available to the masses yet, and most of the customers we deal with have small families. They're going to keep their own electric dryers and all that, so, we want to make provision for those. The costs we put into the SPAN panel can be offset by not having to purchase these other expensive devices. If we're doing the SPAN panel while doing the heat pump water heater, there's additional incentives for that.
 - There's a lot of good reasons to go for that, and the SPAN panel is going to open them up to more opportunities later if they want to add additional load to the house. I don't want my customer to electrify their whole house, and then go to the home show and see a hot tub and go, "man, I wish I could buy one of those, right?" So, it does give them the opportunity to expand their capacity beyond.
 - We often lock people into a full electrical panel on load capacity when they're just making the upgrade for major gas changes. It opens up an opportunity for expansion because people out there that are electrifying their homes want to do the right thing for the environment. They want to do the right thing for their house and switch off the gas, but not everybody wants to go out and change their entire lifestyle, right? So, we got to be cognizant of that and put in the right size water heaters. 110V sometimes is a good solution if it's a big enough tank to where we can offset some power.
- **Appliance Wiring Protections**
 - Breakers don't protect the machine they protect the wire from being overloaded and causing the circuit to have a catastrophic failure.
 - The breaker protects both things. Size it down; we must size it to protect the wire. There's a maximum size also related to the machine. The machine usually will accept a bigger breaker than the wire in most design cases.
- **IOU Bill Recommendations**
 - To make electrification easier, have the utilities post the max amps on each bill for that month so that the historical load calcs can be used more easily.