

Notes from 2019 Title 24, Part 6 Code Development Cycle Utility-Sponsored Stakeholder Meeting for Residential Water Heating

Posted June 5, 2017

Meeting Information

Meeting Date: March 23, 2017
Meeting Time: 9:00am – 12:00pm
Meeting Host: California Statewide Utility Codes and Standards Team

Attendees

| First Name | Last Name | Contact | Organization |
|---|------------|---------------------------------|---|
| Statewide Utility Codes and Standards Team | | | |
| <u><i>Utility Staff</i></u> | | | |
| Raad | Bashar | rbashar@semprautilities.com | Southern California Gas Company (SoCalGas) |
| Kelly | Cunningham | KACV@pge.com | Pacific Gas & Electric (PG&E) |
| Daniela | Garcia | dgarcia3@semprautilities.com | Southern California Gas Company |
| Randall | Higa | Randall.Higa@sce.com | Southern California Edison (SCE) |
| Marshall | Hunt | mbh9@pge.com | Pacific Gas & Electric (PG&E) |
| Brian | James | brian.james@sce.com | Southern California Edison (SCE) |
| Jim | Kemper | James.Kemper@ladwp.com | Las Angeles Department of Water & Power (LADWP) |
| Kate | Zeng | KZeng@semprautilities.com | Southern California Gas Company (SoCalGas) |
| <u><i>Codes and Standards Enhancement (CASE) Team Members</i></u> | | | |
| George | Burmeister | george@coloradoenergygroup.com | Colorado Energy Group, Inc. |
| Bill | Dakin | bldakin@davisenergy.com | Davis Energy Group |
| Marc | Esser | marc@negawattconsult.com | NegaWatt Consulting, Inc. |
| Heidi | Hauenstein | hhauenstein@energy-solution.com | Energy Solutions |
| Marc | Hoeschele | mhoesch@davisenergy.com | Davis Energy Group |
| Peter | Grant | pgrant@davisenergy.com | Davis Energy Group |
| Erin | Linney | elinney@energy-solution.com | Energy Solutions |
| Jon | McHugh | jon@mchughenergy.com | McHugh Energy Consulting |
| Vanessa | Morelan | vmorelan@energy-solution.com | Energy Solutions |
| Eric | Sikkema | esikkema@comcast.net | Colorado Energy Group, Inc. |
| Bo | White | bo@negawattconsult.com | NegaWatt Consulting, Inc. |
| California Energy Commission Participants | | | |
| Adrian | Ownby | adrian.ownby@energy.ca.gov | California Energy Commission (CEC) |
| Javier | Perez | jperez@energy.ca.gov | California Energy Commission (CEC) |
| Alex | Pineda | alex.pineda@energy.ca.gov | California Energy Commission (CEC) |
| Danny | Tam | Danny.Tam@energy.ca.gov | California Energy Commission (CEC) |
| Other Participants | | | |
| Eric | Adair | | Adair Concepts & Solutions LLC |
| Joy | Alafia | | Western Propane Gas Association |
| Tom | Alkire | | RepWest |

| | | |
|----------|---------------|--|
| Daniel | Beauchemin | EcoInnovation Technologies |
| Scott | Blunk | TRC Energy Services |
| Rod | Buchalter | Renewability Energy Inc. |
| Rick | Caruso | Swing Green |
| Robert | Choi | Naviem, Inc. |
| Kathy | Daudish | Eemax |
| Roger | Davenport | Butler Sun Solutions, Inc. |
| Pierre | Delforge | National Resource Defense Council (NRDC) |
| Sean | Dennisiton | New Buildings Institute |
| Nic | Dufee | TRC Solutions |
| Farhad | Farahmand | TRC Solutions |
| Michel | Fourcroy | CalCERTS, Inc. |
| Bob | Hitchner | Nexus eWater Inc. |
| Diane | Jakobs | Rheem |
| Russ | King | Benningfield Group |
| Rebecca | Legett | Navigant Consulting |
| Jim | Lutz | Hot Water Research |
| Tony | Martinez | ConSol |
| Beth | Maynard | Department of Housing and Community Development |
| John | Morton | ConSol |
| Lucas | Morton | Fergus Gaber Young |
| Kelly | Murphy | Steffes |
| George | Nesbitt | Environmental Design/Build |
| Ed | Osann | Natural Resources Defense Council (NRDC) |
| Gwelen | Paliaga | TRC Energy Services |
| Russell | Pate | Rheem Manufacturing Company |
| Laura | Petrillo-Groh | Air-Conditioning, Heating, and Refrigeration Institute (AHRI) |
| Robert | Raymer | California Building Industry Association (CBIA) |
| Gina | Rodda | Gabel Energy |
| Chad | Sanborn | Bradford White Water Heaters |
| Dan | Snyder | A. O. Smith |
| Frank | Stanonik | Air-Conditioning, Heating, and Refrigeration Institute (AHRI) |
| Nehemiah | Stone | Stone Energy Associates |
| Kyle | Thompson | International Association of Plumbing and Mechanical Officials (IAPMO) |
| Eric | Truskoski | Bradford White Corporation |
| Gerald | Van Decker | RenewABILITY Energy Inc. |
| David | Velan | EcoDrain Inc. |
| Kyra | Weinkle | NORESCO |
| Mark | Wiese | CalCERTS Inc. |
| Bruce | Wilcox | Bruce A. Wilcox, P. E. |
| Yanda | Zhang | ZYD Energy, Inc. |

Meeting Agenda

| Time | Topic | Presenter(s) |
|---------------|---------------------------------------|---|
| 9:00 – 9:25 | Introduction | Kelly Cunningham (PG&E) Daniela Garcia (SoCal Gas) |
| 9:25 – 10:40 | Compact Hot Water Distribution Design | Marc Hoeschele (Davis Energy Group) Peter Grant (Davis Energy Group) |
| 10:40 – 11:55 | Drain Water Heat Recovery | Bo White (NegaWatt Consulting) George Burmeister (Colorado Energy Group) |
| 11:55 – 12:00 | Review and wrap-up, next steps | Kelly Cunningham (PG&E) |
| 11:55 – 12:00 | Review and wrap-up, next steps | Kelly Cunningham (PG&E) |

Key Takeaways and Action Items

1. Introduction

- a. There are no key takeaways.

2. Compact Hot Water Distribution Design

- a. Important to maintain an easily accessible compliance credit for compact hot water distribution that does not involve HERS verification.
 - i. There are no action items, since the proposed measure provides for a basic credit option that does not involve HERS verification.
- b. Future distribution system improvements need to work towards more realistic pipe sizing requirements and plumbing designs.

3. Drain Water Heat Recovery (DWHR)

- a. Horizontal DWHR should be considered.
 - i. The Utility CASE Team will address further with stakeholders in the coming months.
- b. Present findings in draft CASE Report Impact of sub-metering of water in multifamily should be addressed.
 - i. The Utility CASE Team will organize a meeting to discuss with California HCD.
 - ii. The Utility CASE Team will present findings in draft CASE Report.

Meeting Notes

Introduction

- Kelly Cunningham (PG&E) and Daniela Garcia (SoCal Gas) presented.
- Presentation available [here](#).

Comments and Feedback

1. No comments or questions.

Compact Hot Water Distribution Design

- Marc Hoeschele and Peter Grant (Davis Energy Group, Utility CASE Team) presented.
- Presentation available [here](#).

Comments and Feedback

1. Ed Osann (NRDC): Why is this as an alternative compliance path as opposed to prescriptive?
 - a. Marc Hoeschele (Davis Energy Group, Utility CASE Team): It is a compliance option, making it voluntary and allowing credit. There is no prescriptive option. There is a desire to provide an array of compliance options for the building industry to have increased flexibility.
2. Roger Davenport (Butler Sun Solutions, Inc.): I have an issue with tankless water heaters being the standard. Is there a better forum for me to address that? We find tankless water heaters plug up quickly and require maintenance often. Also, they eliminate any solar possibility, since there is no storage. With the current costs of PV, it is cheaper to use grid-tied PV to heat water in a heat pump or standard electric water heater. We at Butler Sun Solutions, Inc. (butlersunsolutions.com) have developed a device to convert gas water heaters to electric grid operation, so you can reduce gas usage to zero and add PV to cover all electrical usage. Also, you can put a timer in to manage when the heater operates.
 - a. Utility CASE Team: The comment is outside of scope of CASE Authors, and will be directed to the Energy Commission.
3. Kyle Thompson (IAPMO): How did you obtain the qualification distance?
 - a. Peter Grant (Davis Energy Group, Utility CASE Team): The qualification distance relationship is represented by several equations depending on the type of distribution system (non-recirculation and recirculation systems) and the number of floors in the house. It was based on a review of 60 floor plans currently being built in California production homes. There is a downloadable appendix available at Title24Stakeholders.com that includes all the equations and the background on how it was derived.
4. Scott Blunk (TRC Energy Services): What is the percentage of hot water use in each room? This seems complicated to be done routinely when many of these decisions are made in the field?
 - a. Marc Hoeschele (Davis Energy Group, Utility CASE Team): The current ACM hot water methodology specifies hot water uses by end use (such as showers or sink uses) not by individual rooms.
5. Robert Raymer (CBIA): CBIA strongly supports a robust supply of compliance options, including those related to water heating and conservation.
 - a. Scott Blunk (TRC Energy Services): I support more compliance options as well. However, we need to make them simple to understand and verify in the field.
 - b. Robert Raymer (CBIA): I agree, with regards to the need for simplicity in both installation and inspection.
 - c. Bob Hitchner (Nexus eWater Inc.): I agree with the goal that these options need to be designed to get the industry to move in a particular direction. They need to be simple to understand and comply. Also, they need to be offer as many options for compliance as possible.
 - d. Utility CASE Team will follow up with stakeholder after the meeting.
6. George Nesbitt (Environmental Design/Build): These are not really compact design. You are asking the industry to change the design. The design needs to be done right the first time. [Nesbitt

described a situation where the design should have been compact (due to close proximity), but plumbing took a very circuitous route from water heater to some use points.]

- a. Marc Hoeschele (Davis Energy Group, Utility CASE Team): In your example, a wall-mounted water heater using one-inch pipe would not meet the criteria for the Expanded Compact Credit. Our intent is to reduce the footprint of plumbing installations. The savings with the basic credit are not that large, but the verification is relaxed.
 - b. Peter Grant (Davis Energy Group, Utility CASE Team): One problem with the old measure is buildings would meet the credit criteria, but the HERS verification cost represented a barrier due to the small credit.
 - c. George Nesbitt (Environmental Design/Build): If it is something that is not a large credit, builders might look to a different credit. It needs to be enough credit. In the Bay Area, you need a HERS Rater anyway.
 - d. Marc Hoeschele (Davis Energy Group, Utility CASE Team): For the Basic Credit, we are not proposing any HERS verification (simple and cheap).
7. Javier Perez (CEC): For this requirement, pipes for these compact systems cannot go in the attic?
- a. Peter Grant (Davis Energy Group, Utility CASE Team): Yes, that is true for the expanded credit. That requirement does not exist for the basic credit.
 - b. Javier Perez (CEC): Thank you.
 - c. Marc Hoeschele (Davis Energy Group, Utility CASE Team): For basic credit, no inspection is required. Only plan review verification.
 - i. Robert Raymer (CBIA): Marc raises a great point about the basic credit with no mandated quality inspection.
8. George Nesbitt (Environmental Design/Build): All recirculation "credits" are penalties. I rarely see recirculation systems modeled, yet they are installed.
- a. Utility CASE Team will follow up with stakeholder after the meeting.
9. Ed Osann (NRDC): Is the recirculation loop the hot water source in the recirculation system?
- a. Peter Grant (Davis Energy Group, Utility CASE Team): Although that is true, we use the straight line distance from the furthest fixture back to the water heater as a proxy for the size of the recirculation system. Generally, the larger the size (length and diameter of piping) of the loop, the greater the energy impact when the loop cools off between draw events.
 - b. Marc Hoeschele (Davis Energy Group, Utility CASE Team): The calculation process is similar, but the qualification distance is different for non-recirculating verses recirculating distribution systems.
 - c. Ed Osann (NRDC): I agree with George about getting the design right the first time, especially because of poor design choices. Straight line distance is a huge proxy, given the tradeoff between straight line distance that can be established at plan check, and actually measuring pipe length. I think the approach has a lot of advantages. There needs to be work with the plumbing code and pipe diameter. I am not convinced the equation for qualification distance provides enough added value.
 - d. Marc Hoeschele (Davis Energy Group, Utility CASE Team): The qualification distance calculation would be done automatically by the compliance software and is not directly visible to the user. The user would have to input the weighted distance. If it is less than the qualification distance, the system is deemed to be compact.
 - e. Peter Grant (Davis Energy Group, Utility CASE Team): A larger home has a higher qualification distance threshold than a smaller home.

10. Gina Rodda (Gabel Energy): Would this measure require plumbing design documents be provided for plan check to be verified? Plumbing drawings for single family construction is rare.
 - a. Marc Hoeschele (Davis Energy Group, Utility CASE Team): No design documents are required.
 - b. Gina Rodda (Gabel Energy): Thank you.
11. Jim Lutz (Hot Water Research): I do not see the resource containing the calculations.
 - a. Marc Hoeschele (Davis Energy Group, Utility CASE Team): It is in downloads pod of the Adobe Connect interface as well as on Title24Stakeholders.com.
12. George Nesbitt (Environmental Design/Build): A 90+ percent tankless is way more credit than any distribution credit we will ever come up with.
 - a. Utility CASE Team will follow up with stakeholder after the meeting.
13. Robert Choi (Navien, Inc.): Regarding the thermo-sensor required for the max recirculation credit, we noticed many issues when this sensor is installed in the attic as the location that is as close to the end of the recirculation loop.
 - a. Danny Tam (CEC): Robert, it is not part of this proposal, but it is something I need to look into on language cleanup in the Reference Appendix. I will follow up with you.
 - b. Robert Choi (Navien, Inc.): Thank you.
14. Scott Blunk (TRC Energy Services): I believe we should all be talking more about externally wall-mounted water heaters. They take combustion air outside the envelope, and they are put outside the master bath that will be close to the majority of hot water use in the house.
15. Marc Hoeschele (Davis Energy Group, Utility CASE Team): That is viable strategy to meet the compact criteria. From what we have heard this approach is more common in entry level homes. More expensive home designs often avoid wall-hung units, although recessed water heater closets are a potential alternative.
 - a. George Nesbitt (Environmental Design/Build): Credits should be creditable, meaning we actually achieve savings in practice.
 - b. Utility CASE Team will follow up with stakeholder after the meeting.
16. Jim Lutz (Hot Water Research): Unfortunately, the current water heating energy calculations in the ACM are unlikely to accurately reflect anything close to actual water heating energy consumption. Tagging on another factor is not likely to improve this accuracy of the energy calculations.
 - a. Utility CASE Team will follow up with stakeholder after the meeting.
17. Roger Davenport (Butler Sun Solutions, Inc.): So we think gas water heaters should be a thing of the past; electric (probably heat pump) is the future. Why tie people to gas forever, with PV costs coming down and giving the potential for 100 percent solar water heating?
 - a. Utility CASE Team: Heidi Hauenstein will email Roger Davenport.
18. Peter Grant (Davis Energy Group, Utility CASE Team): Externally mounted water heaters are coming up a lot in the chat window. They are a great option, if the weighted distance is larger than qualification distance.
 - a. Marc Hoeschele (Davis Energy Group, Utility CASE Team): There are builders who are remotely installing water heaters on exterior walls of conditioned space. That is another approach.
 - b. Peter Grant (Davis Energy Group, Utility CASE Team): We used water heater in the garage as the basis for our proposal because it is the most common location from builders. Placing the water heater in the garage is not a requirement.

19. Bob Hitchner (Nexus eWater Inc.): In southern California, many of the tankless units are installed outdoors to avoid the venting costs completely. So this will of course add a cost to construction. However, it also changes the calculation of tankless vs high efficiency heat pump water heaters. For #2, Peter, I am merely noting that there is no added cost to move a heat pump water heater from one corner of the garage, to another. In the case of tankless, there is an added cost of higher venting.
 - a. Peter Grant (Davis Energy Group, Utility CASE Team): I understand now. Thank you Bob.
 - b. George Nesbitt (Environmental Design/Build): Plastic venting is cheap and easy compared to metal venting. Exterior mounting has advantages of possibly no venting, but it is easy to steal.
 - c. Peter Grant (Davis Energy Group, Utility CASE Team): I did see one question in the poll about increased cost of condensing tankless versus cost savings of switching from metal to plastic vent pipe. From surveying builders, we have been told that condensing TWH (with plastic vent pipe) becomes cheaper than non-condensing tankless (with metal vent) if five or more feet of vent pipe is required.
20. Bob Hitchner (Nexus eWater Inc.): For reference, California is pushing water use down to 55 Gallons per Capita Day (GPCD) in residential. These savings are about three gallons per day per home. It seems that the energy impacts are more important. The 55 GPCD number is for indoor water use per person.
 - a. Peter Grant (Davis Energy Group, Utility CASE Team): Is that from the low flow fixture regulations?
 - b. Bob Hitchner (Nexus eWater Inc.): Good question, Peter. This is more a general water policy goal that is advanced by the Department of Water Resources. Let I will try to find the relationship with the low flow regulations after the meeting.
21. Bruce Wilcox (Bruce A. Wilcox, P. E.): Can you provide a link for the Building America report that discusses the detailed hot water distribution modeling?
 - a. Jim Lutz (Hot Water Research): <http://www.osti.gov/servlets/purl/1159372/>.

Drain Water Heat Recovery

- Bo White (NegaWatt Consulting, Utility CASE Team) and George Burmeister (Colorado Energy Group, Utility CASE Team) presented.
- Presentation available [here](#).

Comments and Feedback

1. David Velan (EcoDrain Inc.): The premise of drain water heat recovery is that it is easy for anyone to use. The performance test method in Canadian Standards Association (CSA) B55.1 can be used to qualify horizontal units.
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): Vertical and horizontal are very similar in terms of thermodynamics. We are limited since there is only one test method, and it is for vertical.
 - b. Gerald Van Decker (RenewABILITY Energy Inc.): David is essentially correct. However, a couple of things do need to be changed/added. For example, slope (close to horizontal, but not) and fouling. B55.1 is not only a test method. It is also for labelling and tracking.

- c. David Velan (EcoDrain Inc.): We have prepared a simple document which shows how the CSA B55.1 can be used to test horizontal units. We can share this for review.
 - d. Gerald Van Decker (RenewABILITY Energy Inc.): Yes, please share it David. It could form the basis for a standard for horizontal.
 - e. Marshall Hunt (PG&E): I look forward to your document.
 - f. Marc Esser (NegaWatt Consulting, Inc., Utility CASE Team): Horizontal DWHR has many benefits and it would be desirable for it to become established.
2. Kyle Thompson (IAPMO): You can reference CSA B55.1, although the test method is devised for something else. There are no defined performance requirements.
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): We can talk to Intertek, and look into that again and see if it is viable.
 - b. Kyle Thompson (IAPMO): IAPMO is also third party accreditor, along with ICC and UL.
 - c. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): I will contact you to discuss.
 - d. Gerald Van Decker (RenewABILITY Energy Inc.): CSA B55.1 is a standard. CSA is not doing the testing. CSA International (like UL and ETL) could be involved, but that is a separate organization.
 - e. Kyle Thompson (IAPMO): Gerald, the comment was specific to the proposed text "CSA rated effectiveness." Since CSA is not the only agent that can rate the effectiveness.
 - f. Gerald Van Decker (RenewABILITY Energy Inc.): Kyle, most people are confused about CSA. There are two entirely separate companies: one which writes/maintains standards, and the other which test/lists products for compliance to many different standards (CSA or otherwise).
3. Gwelen Paliaga (TRC Energy Services): Including horizontal HX brings up other questions about long term performance and fouling.
 - a. Utility CASE Team will follow up with stakeholder after the meeting.
4. David Velan (EcoDrain Inc.): The California Plumbing Code and the IAPMO standard together deal with how to use the units safely.
 - a. Utility CASE Team will follow up with stakeholder after the meeting.
5. Bob Hitchner (Nexus eWater Inc.): In the California plumbing code, is drain water heat recovery restricted to vertical only?
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): Can you explain?
 - b. Bob Hitchner (Nexus eWater Inc.): The plumbing code is instructive, and must provide guidance on how to install units. Are there limitations to what is in the plumbing code today? From what I understand, units that comply with IAPMO can be installed in California.
 - c. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): California plumbing code allows both.
6. Jon McHugh (McHugh Energy Consulting): RESNET allows drain water heat recovery, are they required to rate to the CSA standard? Is the evaluation service for IAPMO available to test to that standard?
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): I believe they do ask for CSA effectiveness.
 - b. Eric Sikkema (Colorado Energy Group, Inc., Utility CASE Team): In our discussions with IAPMO (Lee Mercer), we were told that IAPMO is currently not equipped to

- test/certify vertical. This could be possible, but it would take some time to get set up to test and certify vertical. Kyle may have more feedback as well for calculating savings.
7. Gerald Van Decker (RenewABILITY Energy Inc.): There is a lot of confusion here. We all desire horizontal, but there are no performance standards. Yes, the CSA standard can be used as basis. There does need to be a following test, for example the angle (horizontal is not full horizontal). CSA B55.1 is also a labeling and verification standard. CSA co-wrote with 13-member committee, but they do not certify for it. RESNET only references vertical.
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): Thank you, we will note your feedback.
 - b. Kyle Thompson (IAPMO): I do not agree that B55.1 cannot be used. It can show efficiency. The marking requirements are the manufacturer's name.
 8. David Velan (EcoDrain Inc.): The California Plumbing Code defines horizontal and vertical drain pipes. A horizontal drain pipe is defined as sloping 45° or less. A vertical, as sloping 45° or more. They also define when a cleanout is required.
 - a. The Utility CASE Team will address further offline.
 9. Participant: Are there any specifications on how long the heat exchanger should be versus the drain line?
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): It is recommended that the diameter of device matches the diameter of the drain pipe to create a smooth flow of water. The length will impact efficiency. We did calculations on four to five-foot units. The CSA rating allows comparison between units.
 10. Bob Hitchner (Nexus eWater Inc.): It seems that the technical issues are very large.
 - a. The Utility CASE Team will follow up with stakeholder after the meeting.
 11. Daniel Beauchemin (EcoInnovation Technologies): Correction, you cannot purchase ThermoDrain online on our site.
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): Thank you.
 12. Gerald Van Decker (RenewABILITY Energy Inc.): [HomeDepot.com](https://www.homedepot.com) has had the Power-Pipe for over six years.
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): Thank you.
 13. Gerald Van Decker (RenewABILITY Energy Inc.): Installed cost is now nominally \$420CDN for a 42 percent rated unit, which is about the same for Watercycles, ThermoDrain, Power-Pipe. The only real barrier is energy credits, or lack thereof in Title 24, Part 6.
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): Thank you, that is noted.
 14. Gerald Van Decker (RenewABILITY Energy Inc.): The life expectancy is 50 or more years for CSA B55.2 compliant units.
 - a. The Utility CASE Team has noted this and will address estimated life expectancy in the draft CASE Report.
 15. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): Please note that CPC Appendix L is an optional section of the CPC, depending on whether an agency has adopted it.
 - a. Eric Sikkema (Colorado Energy Group, Inc., Utility CASE Team): CPC Appendix L adoption is voluntary and has not been adopted by any jurisdictions to date.
 16. Gina Rodda (Gabel Energy): You covered a lot of those barriers already, which are not small.
 - a. Utility CASE Team will follow up with stakeholder after the meeting.
 17. Bob Hitchner (Nexus eWater Inc.): Can you elaborate further into how the submetering requirement changes the applicability in multifamily housing?

- a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): It will likely mean that any unit in multifamily will need submetering. That data will be used to appropriately charge the tenant for water usage. Depending on configuration of drain water heat recovery system, it would make it such that another water meter is needed. We included different configuration diagrams.
 - b. Bob Hitchner (Nexus eWater Inc.): Thank you for this explanation, very clear.
18. Gerald Van Decker (RenewABILITY Energy Inc.): Did you assume 115°F water temperature for multifamily? I wonder about the 115°F. It is also within the Legionella range. I thought 135°F to 140°F is more typical for a recirculation loop. Note that unequal flow to the cold side of the shower will not be very effective with a hot water temperature of 115°F, because it is so close to shower temperature.
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): Yes, it is 115°F, I think it does make sense, and applies to other calculations. This would be out of scope of our CASE Report, but we can talk to CBECC-RES team more. If that number were to be changed, then the algorithms will take that into account and there will be more savings.
 - b. Bruce Wilcox (P.E): The 115°F is the assumed hot water temperature at the shower and includes piping losses between the water heater and there. For central systems, the loop temperature is much higher.
19. Bob Hitchner (Nexus eWater Inc.): Can you share with me the calculation used for this. Is it a simple payback with no regard to interest rates?
 - a. Gerald Van Decker (RenewABILITY Energy Inc): Are the savings based upon natural gas or weighted with electric? What are the baseline water heater efficiencies?
 - i. Bob Hitchner (Nexus eWater Inc.): Exactly, Gerald.
 - ii. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): The equations work for any water heater. But we used instantaneous gas water heater, because that is the default prescriptive requirement.
 - b. Marc Esser (NegaWatt Consulting, Inc., Utility CASE Team): The calculation uses CBECC-Res 2019 and TDV.
20. Gerald Van Decker (RenewABILITY Energy Inc): Drain water heat recovery becomes part of the homes infrastructure, and should therefore assume the minimum legal water heater efficiency available for purchase in California. Five to ten water heaters will be installed over the life of a drain water heat recovery.
 - a. Utility CASE Team will follow up with stakeholder after the meeting.
21. Jim Lutz (Hot Water Research): Do the effectiveness calculations account for the different startup time or pre-purge times from different lengths of pipes between the DWHR and the shower/water heater.
 - a. Gerald Van Decker (RenewABILITY Energy Inc): Jim, the average temperature before running is room temperature. The average temperature during operations is slightly above or below room temperature. We have been through with the UK.
 - b. Peter Grant (CEC): The amount of startup time is a function in CBECC, which varies with floor area of the building. That being a calculated quantity, it is taken into account in the drain water heat recovery savings calculations
 - c. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): We systematically complete calculations to determine effectiveness of different flow rates of equal and unequal configurations. We also have a correction equation for the inlet temperature to the cold side. We use the hot water schedule from CBECC for every hour of the year. We use

- actual cold water temperature in the software at the hour, given the location. We calculate preheated temperature going out of drain water heat recovery unit. The preheated temperature is used to calculate the mix of cold and hot water at the shower fixture, and to properly calculate the usage of the water heater.
- d. Gerald Van Decker (RenewABILITY Energy Inc): Are you also including savings from sinks? There needs to be an allowance for it, as it is completely realistic.
 - e. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): Sinks are included in the draw scheduled, but we are not including savings from sinks or bathrooms. Maybe they could be added later to the software.
22. Bob Hitchner (Nexus eWater Inc.): How does "cost-effectiveness" impact? It was not important for compact design. Why is it important here?
- a. Utility CASE Team will follow up with stakeholder after the meeting.
23. Robert Raymer (CBIA): Because of Senate Bill 7, the Housing Community Development and the Building Standards Commission will be proposing/adopting building standards in the near future, and it is unclear how centralized water heating will be addressed.
- a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): Good to know. Everything we are putting into code will be compliant. It will not be something where everyone is forced to have an extra meter.
 - b. Beth Maynard (Department of Housing and Community Development): Please keep me included in these discussions, if possible.
24. Jim Kemper (LADWP): Senate Bill 7 goes into effect 1/1/2018 regardless of the Housing Community Development and the Building Standards Commission adopting language into the Plumbing and CALGreen Codes. The date of compliance applies to the date that the water services are ordered from the water utility.
- a. Utility CASE Team will follow up with stakeholder after the meeting.
25. Bob Hitchner (Nexus eWater Inc.): For compact plumbing design, we did not need to look at cost-effectiveness. Why is it necessary to look at it for DWHR? Is this being considered as a mandatory requirement?
- a. See 22a. above.
26. Gerald Van Decker (RenewABILITY Energy Inc.): These prices are all way too high. However, I do appreciate the process and the reference.
- a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): We can add some more details. Some of the assumptions are conservative.
27. David Velan (EcoDrain Inc.): Horizontal DWHR, B55.1.
- a. Gerald Van Decker (RenewABILITY Energy Inc.): Intertek is not actually the only possible player. We all currently use Intertek (for B55.1), but UL can also be used (which we do for B55.2). IAPMO or other Certified organizations could also be used.
 - b. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): I think the big takeaway is that we are going to talk to Kyle Thompson at IAPMO to discuss more and see if the test method can be applied to horizontal.
 - c. Kyle Thompson (IAPMO): If alternative language is proposed, how do you go about addressing?
 - i. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): The CASE team we follow up with everyone that made a comment today or offline. The draft CASE Report will be public and we welcome comments.

- ii. Heidi Hauenstein (Energy Solutions, Utility CASE Team): The Statewide Utility CASE Team process is not as open as the CEC. The comments will not be in the public record. The CASE Authors receive and consider comments. Later in the process the CEC runs their public workshop where comments are docketed.
 - iii. Kyle Thompson (IAPMO): Does the CEC base on ANSI or is it independent?
 - iv. Danny Tam (CEC): Independent.
- 28. Gina Rodda (Gabel Energy): For compliance, do you mean prescriptive?
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): It would be in prescriptive section of code; it will be one of the options that someone can take instead of the default.
 - b. Heidi Hauenstein (Energy Solutions, Utility CASE Team): Proposing an alternative prescriptive path.
- 29. Gina Rodda (Gabel Energy): Has it been considered how this would be included with quality insulation inspection potentially becoming prescriptive?
 - a. Danny Tam (CEC): Yes, it means the under 55-gallon option with quality insulation inspection would go away if quality insulation inspection becomes a prescriptive requirement.
- 30. Jim Kemper (LADWP): When installed in the configuration where the heated water from the drain water heat recovery device directly feeds the shower, what impact does the device have on the operation of the anti-scald valve performance?
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): The temperature coming back to shower mixing valve will not exceed 115°F, and will not affect scalding.
- 31. Bob Hitchner (Nexus eWater Inc.): Can you review assumptions in the payback cost calculator, what cost did you use per therm, and was it based on natural gas only? Did you use the same cost for the 30-year period?
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): We used the same method in CBECC Res. Cost is based on TDV. We used exact hourly data to convert from therms to TDV energy, then TDV costs. The same can be done with electric TDV.
 - b. Bob Hitchner (Nexus eWater Inc): Manufacturers were saying vertical can be installed horizontally, with minimal impacts to effectiveness. Any insight on calculations using CSA with horizontal orientation?
 - c. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): For implementation, only vertical is calculated. We did not attempt to find out a correction factor.
- 32. Gerald Van Decker (RenewABILITY Energy Inc.): CSA can be used to test horizontal. It does not mean it can be used as is, for labeling. The exact angle for the near horizontal unit needs to be incorporated. Some funding has been verbally committed to developing a horizontal test method.
 - a. Utility CASE Team will follow up with stakeholder after the meeting.
- 33. Gerald Van Decker (RenewABILITY Energy Inc.): What percent of savings are achieved for domestic hot water? It should be 56-50 percent for equal flow.
 - a. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): We did the calculation for a subset of building. I can try to add to the CASE Report since it is not in presentation. It was in the range of 20-30 percent; it makes sense it will be lower, because we use 115°F.
 - b. Gerald Van Decker (RenewABILITY Energy Inc.): Something must be wrong if your results are that much higher.
 - c. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): It is possible it is due to the cold water temperature being hotter in warmer climates.

- d. Gerald Van Decker (RenewABILITY Energy Inc.): You should get around 56-60 percent and also found in Germany. We are trying to prevent what happened in the United Kingdom.
- e. Bo White (NegaWatt Consulting, Inc., Utility CASE Team): We can discuss more offline.
- f. Bob Hitchner (Nexus eWater Inc): I think this discussion right now about the impact of savings in energy is very important. I would like to see it addressed in the final CASE Report.