CALIFORNIA ENERGY CODES & STANDARDS
A STATEWIDE UTILITY PROGRAM

Notes from 2019 Title 24 Part 6 Code Development Cycle Utility-Sponsored Stakeholder Meeting for Warehouse Topics

Posted May 23, 2017

Meeting Information

Meeting Date: March 21, 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			
Utility Staff			
Ricson	Chude	Ricson.Chude@ sce.com	SCE
Kelly	Cunningham	KACV@pge.com	PG&E
Daniela	Garcia	dgarcia3@semprautilities.com	SCG
Randall	Higa	Randall.Higa@sce.com	SCE
Marshall	Hunt	mbh9@pge.com	PG&E
Jim	Kemper	James.Kemper@ladwp.com	LADWP
Chris	Kuch	christopher.kuch@sce.com	SCE
Codes and Standards Enhancement (CASE) Team Members			
John	Arent	jarent@noresco.com	NORESCO
Trevor	Bellon	tbellon@vacomtech.com	VaCom Technologies
Cathy	Chappell	CChappell@trcsolutions.com	TRC
Dimitri	Contoyannis	dcontoyannis@noresco.com	NORESCO
Jay	Doshi	jdoshi@vacomtech.com	VaCom Technologies
Katie	Gustafson	Kgustafson@noresco.com	NORESCO
Heidi	Hauenstein	hhauenstein@energy-solution.com	Energy Solutions
Jon	McHugh	jon@mchughenergy.com	McHugh Energy Consultants
Rebecca	Rice	rrice@noresco.com	NORESCO
Sarah	Schneider	sschneider@energy-solution.com	Energy Solutions
Doug	Scott	dscott@vacomtech.com	VaCom Technologies
Silas	Taylor	Staylor@noresco.com	NORESCO
Kyra	Weinkle	kweinkle@noresco.com	NORESCO
California Energy Commission Participants			
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Mark	Alatorre	Mark.Alatorre@energy.ca.gov	California Energy Commission
RJ	Wichert	RJ.Wichert@energy.ca.gov	California Energy Commission

Other Participants			
Eric	Adair		None listed
Patrick	Blum		Clark Johnson Company
Beth	Fox		EvapCo
Larry	Gilliland		S Zero
Andrew	Haala		Hussmann
Trevor	Hank		EvapCo
Armin	Hauer		EBM Pabst
Philip	Hollander		Baltimore Air Coil
Kyle	Larson		None listed
George	Nesbit		House ISA System
Jeremy	Reefe		Hussmann
Gina	Rodda		Gabel Energy
Michael	Scalzo		NLCAA
Steven	Slayzak		Seely International
George	Stewart		Hussmann
Gordon	Struder		EvapCo

Meeting Agenda

Time*	Topic	Presenter
9:00 – 9:25	Introduction	Kelly Cunningham (PG&E)
9:25 – 10:40	Hybrid Condensers	Cathy Chappell (TRC Solutions)
10:40 – 11:55	Loading Dock Seals	John Arent (NORESCO)
11:55 – 12:00	Review and wrap-up, next steps	Kelly Cunningham (PG&E)

Key Takeaways and Action Items

1. **Introduction**
2. **Hybrid Condensers**
    a. Industry prefers using the term “adiabatic” instead of “hybrid” to avoid confusion with other products that operate both wet and dry. Terminology will be adopted for the equipment being addressed in the 2019 CASE Report on Hybrid Condensers.
    b. The stakeholder feedback on reasonable condenser TD was valuable and essentially consistent with initial findings.
3. **Loading Dock Seals**
    a. Stakeholders indicated this measure may be suited for a reach code or a utility rebate program.
    b. Stakeholder engagement following stakeholder meetings supported the assumptions regarding EUL and usage patterns used to determine the potential energy savings and cost effectiveness.

Meeting Notes

Introduction

- Kelly Cunningham (Pacific Gas & Electric Company) presented.
- Presentation available here.

Comments and Feedback

1. No comments or questions.

Hybrid Condensers

- Doug Scott (VaCom Technologies, Utility CASE Team) and Cathy Chappell (TRC, Utility CASE Team) presented.
- Presentation available here.

Comments and Feedback

1. Trevor Hank (EvapCo): We prefer not to use the term "hybrid," because of the different condensing technologies. It is important to set the definition strictly as "adiabatic," which is more industry recognized. I also want to caution that CO2 gas coolers and CO2 condensers should not be lumped in with typical condensers.
    a. Doug Scott (VaCom Technologies, Utility CASE Team): I appreciate the comment. I think that may be an easy change.
2. Phil Hollander (Baltimore Air Coil): Regarding hybrid versus adiabatic, the commercial refrigeration industry does associate hybrid and adiabatic together, although in the industrial refrigeration business there is a different definition for hybrid. It may be worth having more discussion before we separate them.
    a. Doug Scott (VaCom Technologies, Utility CASE Team): This is in part making it clear that this type of condenser could be used. There is a lot of innovation in the industry, and we certainly want to support innovation. We just want to make this option a clear and viable option for designers and owners.
3. Phil Hollander (Baltimore Air Coil): Why is this specific efficiency of the unit in dry mode relevant when the equipment operates wet when it is hot outside? When peak power is a general concern, the unit is in dry mode for most of the hour and the system is typically beneath the minimum condensing temperature. At this time, the fan is in variable speed, below top speed, and due to the power laws of fans, be in low power mode.
    a. Doug Scott (VaCom Technologies, Utility CASE Team): It is important to point out that this proposed measure is for California. California weather often results in condensers operating in the control band and in dry mode for most of year, rather than mostly operating at minimum condensing pressure, and the condenser operates in dry mode for most of year. We thought this (dry mode) reflected the size and specific efficiency of condensers more accurately. Secondly, it appears that a lot of the innovation and the difference in condensers concerns how manufacturers handled the tradeoff between saturation efficiency and condenser surface performance, so a given manufacturer may not want full speed fan operation (in design wet mode). We thought dry mode size was the better approach, to be simpler and not inhibit how different manufacturers would optimize their peak capacity (in wet mode).
4. Phil Hollander (Baltimore Air Coil): What is the target baseline?

   a. Doug Scott (VaCom Technologies, Utility CASE Team): We need to determine the baseline. We need to identify the cost-effective minimum efficiency for a hybrid condenser, which is not easy. In part, it is what is available. We look at what's being used, and then determine if we can move the needle up (increase the minimum efficiency) and still be cost-effective.

5. Phil Hollander (Baltimore Air Coil): Has the target changed since the last utility-sponsored stakeholder meeting? The statement made at the last meeting was that the target would be the energy parity for what an air-cooled system would be looking at the overall system approach. Has that changed?
   a. Doug Scott (VaCom Technologies, Utility CASE Team): That is not the target, but a point of reference. Our cost-effective analysis will look at the comparison to the minimum air-cooled definition to make sure we have some degree of parity. There is no requirement to use either an evaporative or air-cooled condenser, or a hybrid. A project would need to meet a minimum efficiency if using a hybrid condenser. We want a minimum efficiency for hybrid condensers, but want to make sure there is reasonable parity with an air-cooled minimum.
6. Armin Hauer (EBM Pabst): Are the commas set properly in the proposed draft? 'Condenser efficiency is defined as the Total Heat of Rejection (THR) capacity divided by all electrical input power including fan power at 100 percent fan speed, and power of spray/water pumps for evaporative condensers or hybrid condensers.'
   a. Doug Scott (VaCom Technologies, Utility CASE Team): We will review.
7. Phil Hollander (Baltimore Air Coil): The proposed maximum Temperature Differential (TD) does not reflect current industry practice for hybrid (adiabatic) condensers. Current industry practice already yields significant peak and kWh reductions over Title 24 requirements. What is the desired goal for setting the baseline? I would be happy to assist in any way.
   a. Doug Scott (VaCom Technologies, Utility CASE Team): It's clear that adiabatic condensers have peak demand savings. The question is if they yield kWh savings if higher TD during dry mode operation. There are a lot of variables. I think input from what industry thinks is the cost-effective dry mode TD would be helpful.
8. Gordon Struder (EvapCo): Referring to slide 47, the energy per square foot is listed, but where is the first cost of the unit in the savings equation? Where does that come into the increased first cost and overall return on investment?
   a. Doug Scott (VaCom Technologies, Utility CASE Team): You are correct, if you decrease the horsepower, the condenser gets physically larger, which increases the cost of the condenser. Is one more important than the other? Which one should we look at first? What's the right combination? We picked somewhat arbitrary staring points for both parameters, and looked at the effect on efficiency as each parameter was increased and decreased. Based on review of the available equipment, we determined we should look at specific efficiency first with a reasonable TD, figure out what is cost-effective for specific efficiency, and then (with that minimum specific efficiency) consider sizing.
9. Gordon Struder (EvapCo): It may be better to have an increased TD, such as 20 degrees, which is more realistic than 10 degrees. Would it make sense to be reset to 20-degree TD?
   a. Doug Scott (VaCom Technologies, Utility CASE Team): In terms of the right TD value with what we know now, 20-degree TD is close. We will revisit the analysis with what we have learned about specific efficiency, and look at sizing again, because a different specific efficiency would change all the curves.
   b. Gordon Struder (EvapCo): I agree with you, but 30 may not be the number. I suggest 20.

   c. Doug Scott (VaCom Technologies, Utility CASE Team): There is a balance between reasonable specific efficiency and reasonable TD.
   d. Trevor Bellon (VaCom Technologies, Utility CASE Team): Even at 20 – 25 TD, there is still a benefit. Closer to evaporative technology and gains.

10. Gordon Struder (EvapCo): For air-cooled condensers, Doug said that as size increases the motor size increases, which is actually inversely proportional to some of the efficiencies listed there. EvapCo has already given you our numbers. I just wanted to comment that it's not necessarily true, as it depends on the efficiency you're picking to begin with. If you want to meet a certain efficiency, you may have to go up in size, but may have to maintain your fan kW to meet a certain efficiency.
    a. Doug Scott (VaCom Technologies, Utility CASE Team): I agree. To clarify, as size increases to a certain efficiency, power goes up with it.
11. Cathy Chappell (TRC, Utility CASE Team): Our next step is to figure out the sweet spot between specific efficiency and size. Additional feedback from stakeholders will be very useful. We've done the analysis for large supermarkets, and we will do the analysis for refrigerated warehouses as well. We will post the updated results on the Title24Stakeholders.com. If anyone wants to see the details of the analysis you can email us or let us know now.
12. Jon McHugh (McHugh Energy Consultants): Climate Zone 16 is cost-effective and should be highlighted in green in the presentation.

Loading Dock Seals

- John Arent (NORESCO, Utility CASE Team) presented.
- Presentation available here.

Comments and Feedback

1. Larry Gilliland (S Zero): The leakage rate will be dependent on temperature difference (dock to ambient).
2. Jon McHugh (McHugh Energy Consultants): Is there a non-energy benefit associated with seals that protect trucks as a bumper?
    a. John Arent (NORESCO, Utility CASE Team): There may be some different configurations. Additional work may be needed to verify if there is a common configuration.
3. Gina Rodda (Gabel Energy): I suggest that this measure should be prescriptive since the cost-effective studies seems to have a lot of wiggle room.
    a. John Arent (NORESCO, Utility CASE Team): That's an interesting approach that could work. If the measure is cost-effective, we were considering proposing as a mandatory measure. However, we could consider proposing it as a prescriptive measure.
4. Gina Rodda (Gabel Energy): I read through the preliminary CASE Report, but didn't see the cost-effectiveness numbers? Is there an updated report?
    a. John Arent (NORESCO, Utility CASE Team): The estimates will be in the draft CASE Report due in April.