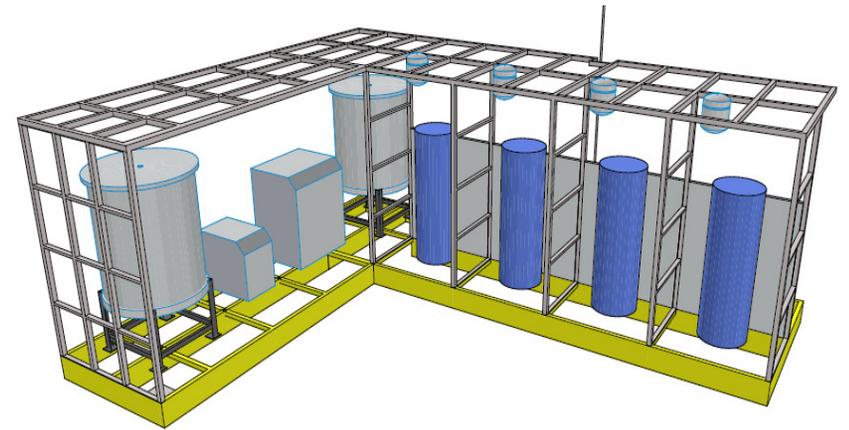


Heat Pump Water Heater Demonstration Lab



Engineering Services
Emerging Products & Technologies Team

Dave Rivers, Sean Gouw
3/18/2021

Energy for What's Ahead®



Exploring the Path for OpenADR

Goal

- Merging OpenADR 2.0 with Heat Pump Water Heaters (HPWH):
Design and build a flexible, safe research and demonstration environment capable of evaluating and showcasing HPWHs and DR technologies

Detailed Objectives

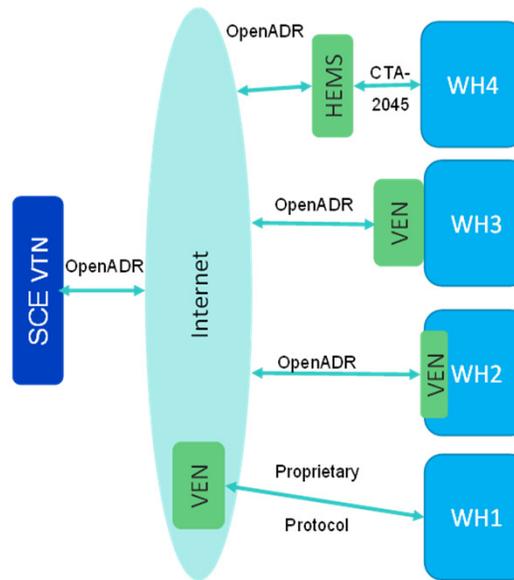
- Explore multiple customer-to-grid integration strategies
- Test HPWH communication capabilities and energy/thermal performance
- Reveal benefits and barriers to available DR communication protocols
- Enable load shape analysis based on more customer-representative hot water usage profiles

Merging Demand Response and HPWH

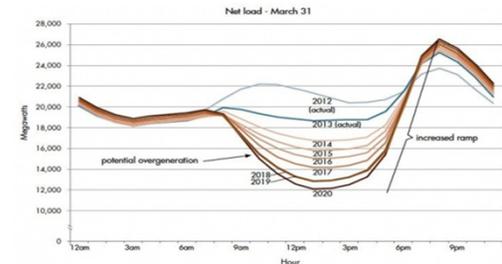
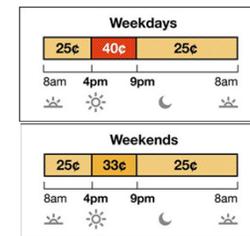
Performance

WATER TEMP (F)	LEGIONELLA NOTES	LENGTH OF CONTACT FOR A MILD DEGREE BURN	LENGTH OF CONTACT FOR A SECOND DEGREE BURN	OTHER NOTES
176	Disinfection Range			
158				
154		Instantaneous	1 Second	
151	Die within 2 minutes			
149		1 Second	2 Seconds	
140	Die within 32 minutes	2 Seconds	5 Seconds	
131	Die within 5 to 6 hours	5 Seconds	25 Seconds	
126		30 Seconds	90 Seconds	
122	Growth Range Can survive, but do not multiply	1 Minute	5 Minutes	
120		3 Minutes	9 Minutes	
116		35 Minutes	45 Minutes	Pain Threshold Approximate
115	Ideal Growth Range			Normal Hot Shower
110				
95	Growth Range	Survive but dormant		Cold water in storage tanks, piping, decorative fountains, and other equipment should ideally be kept below 68°F.
68				

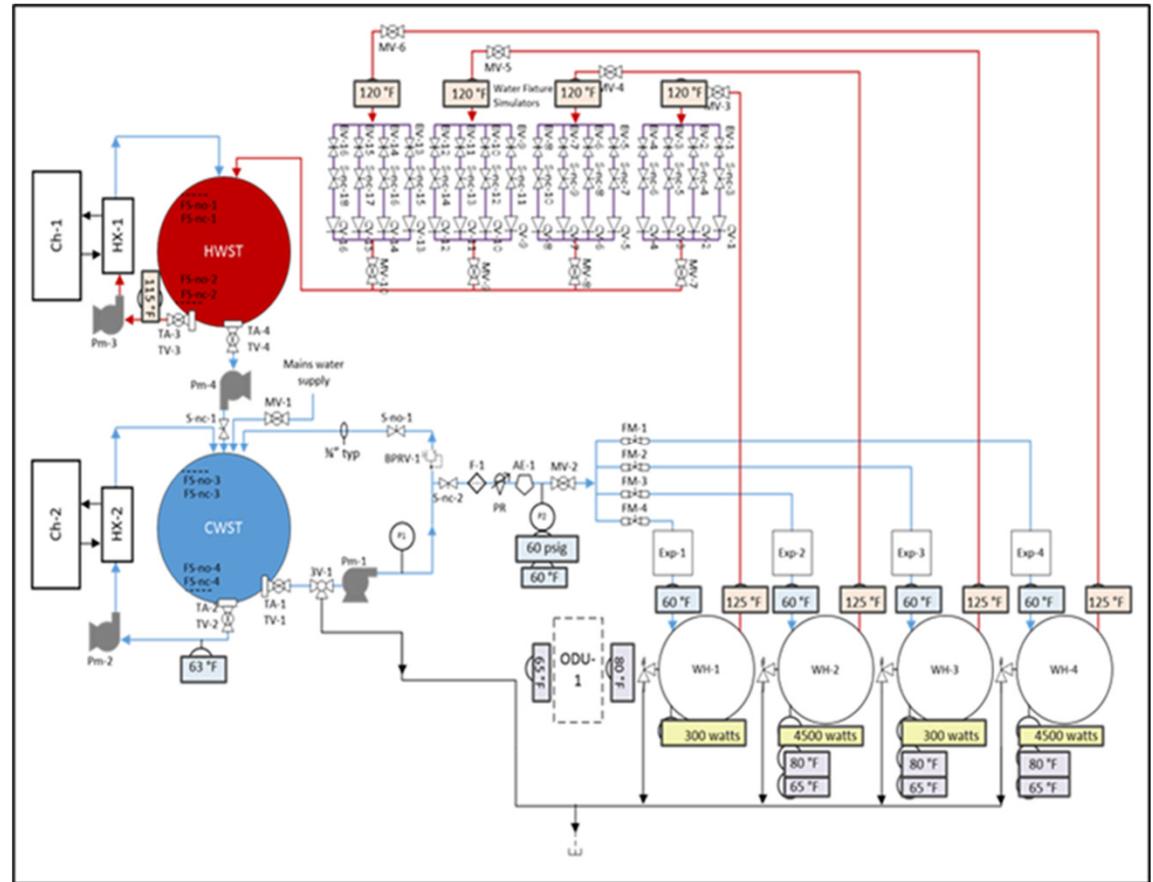
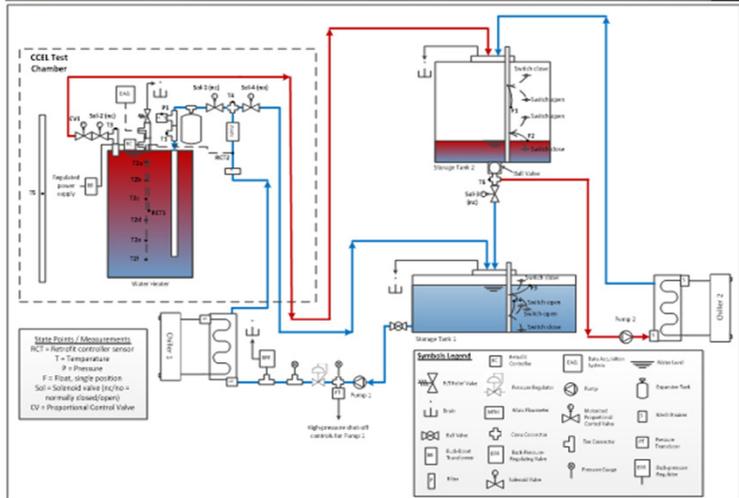
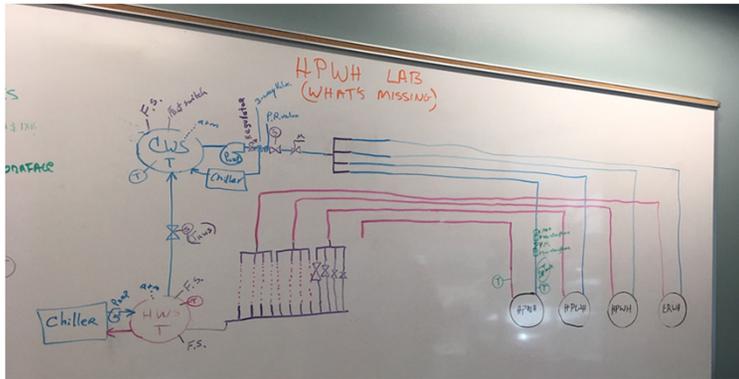
Communication



Opportunity



OADR-HPWH Lab Design Concept



Previous Testing Prototype Designs



SCE OpenADR HPWH Lab



Combining Demonstration & Performance



VEN Research Plan

- Identify VENs from the Alliance that may be compatible and cost effective
- Identify VENs that are not on Alliance list that may be compatible and cost effective
- Ideally find VENs that cover all 4 scenarios (embedded, add-on, cloud-based, HEMS)
- Reach out to manufacturers for additional information
 - Capabilities?
 - Cost
 - Installation assistance

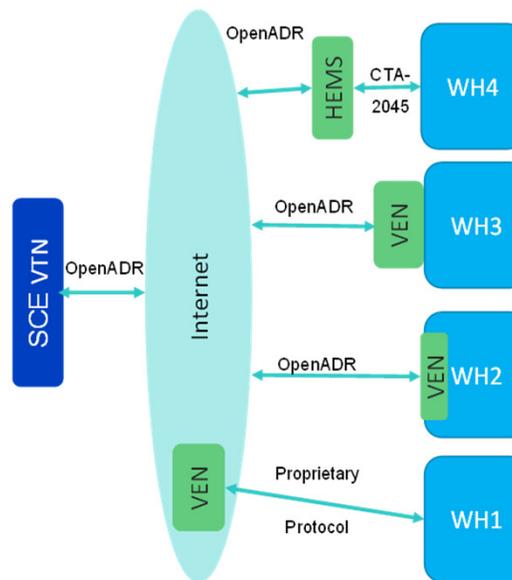


Drive Opportunities OpenADR Pathways

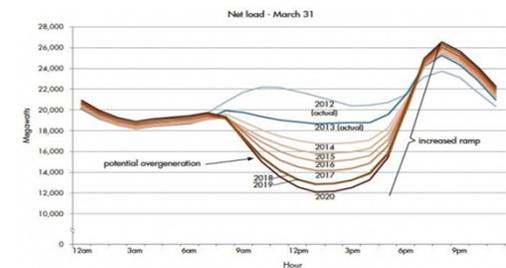
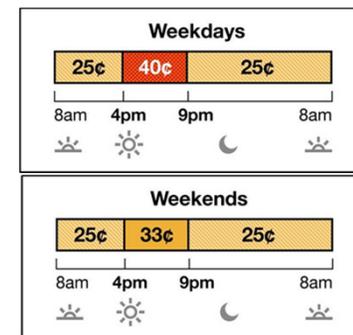
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Communication



Opportunity





THANK YOU

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