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Description:	Staff Workshop presentation on proposed changes to the 2022 Energy Code.
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2022 Pre-Rulemaking for Building Energy Efficiency Standards

Payam Bozorgchami, P.E.

January 26, 2021

Start Time: 9:00 AM

What We Will Covering Today

- **How Title 24, Part 6 is Developed**

- **Mazi Shirakh, P.E.**
  - Heat Pump Baseline for Residential Buildings

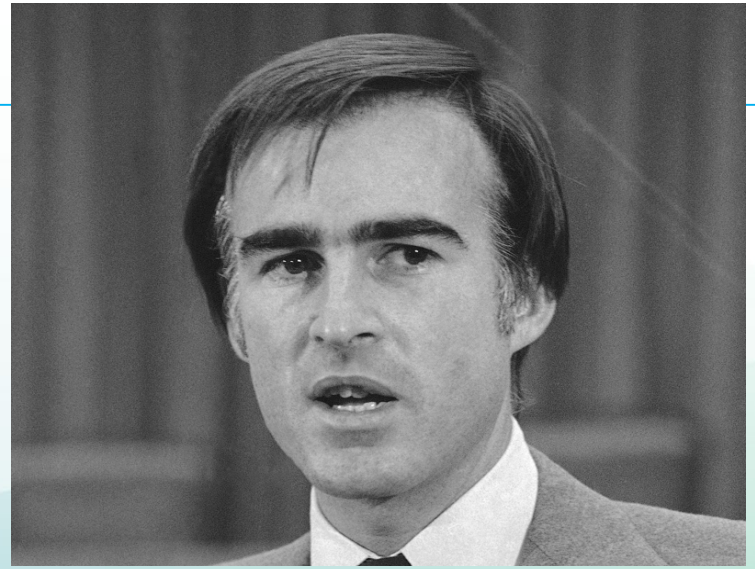
- **Enercomp, Inc.**
  - **Ken Nittler, P.E.**
    - Design Calculation

- **Danny Tam**
  - Energy Storage System Ready, Heat pump Space Heater Ready, Electric Cooktop Ready, and Electric Clothes Dryer Ready

- **Cleanup Language**
  - **Mazi Shirakh, Danny Tam**
    - Updates to Section 150.1(c)14 PV language and Exceptions
    - JA11 and JA12 updates

Authority & Process

- **Public Resources Code (PRC 25402):** Reduction of wasteful, uneconomic, inefficient, or unnecessary consumption of energy
  - (a)(1) Prescribe, by regulation, lighting, insulation, climate control system, and other building design and construction standards that increase the efficiency in the use of energy and water…
  - Warren Alquist Act Signed into law in 1974 by Governor Ronald Reagan and launched by Governor Jerry Brown in 1975 which mandates updates Building Efficiency Standards and requires the building departments to enforce them through the permit process.



Goals of the California Energy Code

1. Increase building energy efficiency cost-effectively
2. Contribute to the state's GHG reduction goals
3. Enable pathways for all-electric buildings
4. Reduce residential building impacts on the electricity grid
5. Promote demand flexibility and self-utilization of PV generation
6. Provide tools for local government reach codes

Process Used to Updated Energy Codes

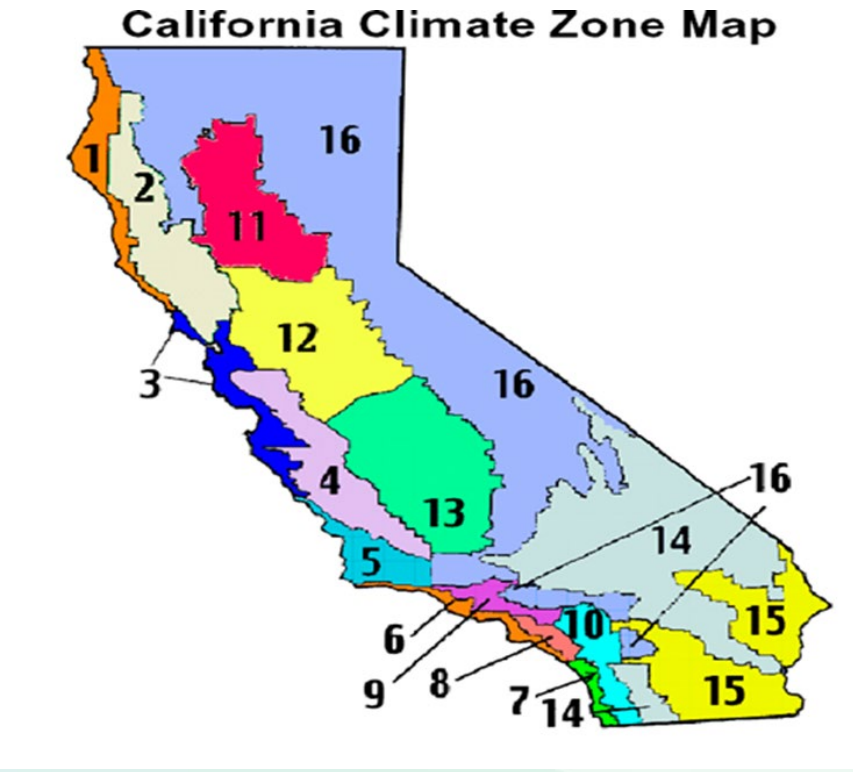
CEC staff, with input from utility partners and industry stakeholders, develop the triennial standards update

Opportunities for participation

- Utility-Sponsored Stakeholder Meetings
- CEC-Sponsored Workshops

Standards must be cost-effective

- Life-Cycle Costing Methodology
- Time Dependent Valuation (TDV)



2022 Standards Process

2022 STANDARDS UPDATE SCHEDULE	
DATE	**MILESTONES**
November 2018 - November 2019	Updated Weather Files
November 2018-December 2019	Metric Development
November 2018-July 2019	Measures Identified and approval
August 2019 to October 2020	Stakeholder meeting/workshop & final staff workshop
August 2020-October 2020	CASE Reports submitted to the CEC
March 2021	45-day Language Hearings
July 2021	Adoption of 2022 Standards at a Business Meeting
July 2021 to November 2021	Staff work on Software, Compliance Manuals, Electronic Documents Available to Industry
December of 2021	Approval of the Manuals
January 2022	Software, Compliance Manuals, Electronic Documents Available to Industry
January 1, 2023	Effective Date

Key Web-Links

2022 Title 24 Utility-Sponsored Stakeholder
http://title24stakeholders.com/

Building Energy Efficiency Program
http://www.energy.ca.gov/title24/

Comments to be submitted to:
https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=19-BSTD-03

NOTE: For this workshop comments To Be Submitted By February 11, 2021

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Comments For Todays Workshop

Due Date: February 11, 2021 By 5:00 PM

Comments to be submitted to:
https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=19-BSTD-03

Questions ?

2022 Building Energy Efficiency Standards Overview

Proposed Low-rise Residential Measures

Presenters: Mazi Shirakh, PE, and Danny Tam

January 26, 2021 Staff Workshop

2022 T24 Standards Building Decarbonization Team

Mazi Shirakh, PE
Building Decarbonization Lead
Bill Pennington
Senior Technical and Program Advisor
Danny Tam
Mechanical Engineer
Payam Bozorgchami, PE
Project Manager, Building Energy Efficiency Standards
Will Vicent
Office Manager, Building Standards Office
RJ Wichert
Mechanical Engineer

Consulting Team:
Bruce Wilcox
Ken Nittler
Energy + Environmental Economics (E3)
NORESCO
TRC

Building Decarbonization via Building Code (T24 Part 6, Part 11)

1. CEC Authority
   i. Adopt building energy performance standards – feasible, cost effective
   ii. Can adopt performance standards baselines that are based on or encourage heatpumps to achieve building energy efficiency
   iii. Can require PV, storage
   iv. Can also include “reach” standards in Part 11 that local governments can voluntarily adopt to further encourage efficient heat pumps.

Begin Transition to Heatpumps

1. **Key technology to achieve building decarbonization**
2. **Incremental steps over two cycles to allow markets to adjust:**
   i. Very low current installation rate
   ii. Limited builder and consumer experience
   iii. Builders worried about creating new supply chain availability and expertise and potential for customer complaints or even litigation
   iv. Less efficient at cold temperatures – potentially raises energy bills

2022 Heat Pump Baselines

To meet the State's decarbonization goals and objectives, set standard design (baseline) for both source energy (EDR1) and TDV (EDR2) on heat pump as follows:

- For climate zones 1,2,11,12,16: set standard design on HPWH
- For climate zones 3-10, and 13-15: set standard design on HPSH

In all 16 climate zones, the house can comply with any one of the following measures:

1. A heat pump water heater – additional purchase costs: $100 (50-gallon HPWH)-$500 (65-gallon HPWH)
2. A heat pump space heater – additional purchase costs: $100-$450
3. Dual-Fuel heat pumps and other efficiency measures

2022 Heat Pump Baselines

1. Start with the 2019 Standards mixed fuel prescriptive building

2. For 2022 Standards, standard design will include either a HPWH or a HPSH, depending on the climate zone – some CZs require additional features to ensure that the 2022 baselines (in TDV terms) are at least as stringent as the 2019 mixed-fuel baseline.

3. In all climate zones, the building can comply with either a HPWH or a HPSH. Other compliance options will also be available through the performance path

Compact = Compact Design

Standard Design by Climate Zone	
Climate	**Baseline Options**
01	HPWH with Compact
02	HPWH
03	HPSH
04	HPSH
05	HPSH with Compact
06	HPSH
07	HPSH
08	HPSH with Compact
09	HPSH with Compact
10	HPSH with Compact
11	HPWH
12	HPWH
13	HPSH
14	HPSH
15	HPSH with Compact,Windows
16	HPWH with Compact,DWHR

HPWH Hardware Costs

Home Depot online pricing shows little difference between a tankless water heater and a 50-gallon HP water heaters: https://www.homedepot.com/s/heat%2520pump%2520water%2520heater?NCNI-5

1. The HPWH is a JA 13 compliant, Tier 4 WH
2. May receive 2+ EDR2 credit
3. The HPWH does not need a flue and gas piping from the meter, $250+ installation savings

0.81 EF	0.93 EF	Tier 4, JA13

Rheem Performance Plus 9.5 GPM Liquid Propane Outdoor Tankless Water Heater

Shop this Collection

★★★★½ (450) Model# ECO200XLP3-1

Expert Installation Available

$1020.00

Limit 5 per order

✔ Free Delivery

Rheem Performance Platinum 9.5 GPM Natural Gas High Efficiency Indoor Tankless Water Heater

Shop this Collection

★★★★½ (302) Model# ECOH200DVLN-2

Expert Installation Available

$1299.00

Rheem Performance Platinum 50 Gal. 10-Year Hybrid High Efficiency Smart Tank Electric Water Heater

Shop this Collection

★★★★½ (1269) Model# XE50T10H45U0

Expert Installation Available

$1299.00

Get up to $300 in Rebates for 95671

✔ Standard delivery

⚠ Limited stock at nearby store
Truxel Rd | 3.6 miles away
Check nearby stores

Add To Cart

AC, HPSH, and DFHP Hardware Costs

ACWholesalers online pricing shows a difference of $66 for identical 3-ton gas/electric split system and DFHP
https://www.acwholesalers.com/cooling/air-conditioning-systems.html

Gas/Elect AC, 0.96 Furn	DFHP, 0.96 Furn	HPSH
Remove	Remove	Remove
		
$3,089.44	$3,155.20	$2,450.55
Goodman 3 Ton 14 SEER 96% AFUE Gas Electric Air Conditioner System	Goodman 3 Ton 14 SEER 96% AFUE Hybrid Dual Fuel Air Conditioner	Goodman 3 Ton 14.5 SEER Heat Pump Air Conditioner System
Factory-Direct	Factory-Direct	Factory-Direct
Model: GSZ140361 GMEC9608...	Model: GSZ140361 GMEC9612...	Model: GSZ140361 MBVC1600...
Item Number: 76067	Item Number: 76193	Item Number: 87172
Write A Review	Write A Review	Write A Review
Free Shipping	Free Shipping	Free Shipping
Add To Cart	Add To Cart	Add To Cart

Updating the Energy Design Rating

Current Reference Design Building (RDB):

1. The 2016 and 2019 Standards RDB is based on 2006 IECC requirements
2. This IECC RDB is “fuel neutral”, meaning the appliances change to match the proposed building appliances’ fuel type, resulting in calculation anomalies; TDV/source energy compliance is inconsistent with EDR compliance results and not always intuitive

The proposed 2022 RDB:

1. For 2022 Standards, the RDB will be a based on a mixed fuel 2006 IECC building, the most common type of building in California at the time – the other RDB features will be based on the 2006 IECC requirements
2. All buildings regardless of fuel type will get compared against the same RDB; similarly, as buildings features are updated over future standards cycles, they will get compared against the same 2006 IECC mixed fuel building
3. This removes all calculation inconsistencies and anomalies between TDV/source energy compliance and EDR compliance, resulting in a coherent metric for building performance

Questions?

2022 STANDARD AND REFERENCE DESIGN CALCULATIONS

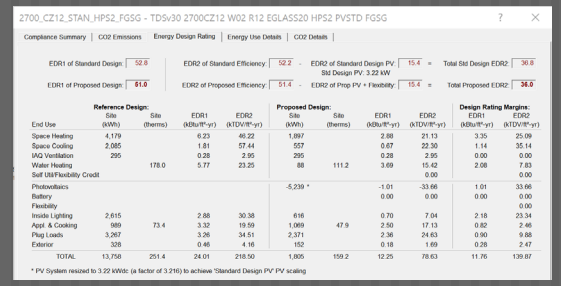
Standard Design by Climate Zone	
Climate	**Baseline Options**
01	HPWH with Compact
02	HPWH
03	HPSH
04	HPSH
05	HPSH with Compact
06	HPSH
07	HPSH
08	HPSH with Compact
09	HPSH with Compact
10	HPSH with Compact
11	HPWH
12	HPWH
13	HPSH
14	HPSH
15	HPSH with Compact,Windows
16	HPWH with Compact,DWHR

Low Rise Residential Workshop

01/26/2021

Ken Nittler, P.E.

Bruce Wilcox, P.E.


2700_CZ12_STAN_HPS2_FGSG - TDSv30 2700CZ12 W02 R12 EGLASS20 HPS2 PVSTD FGSG

Compliance Summary | CO2 Emissions | Energy Design Rating | Energy Use Details | CO2 Details

EDR1 of Standard Design: 52.8 — EDR2 of Standard Efficiency: 52.2 - EDR2 of Standard Design PV: 15.4 = Total Std Design EDR2: 36.8 (Std Design PV: 3.22 kW)

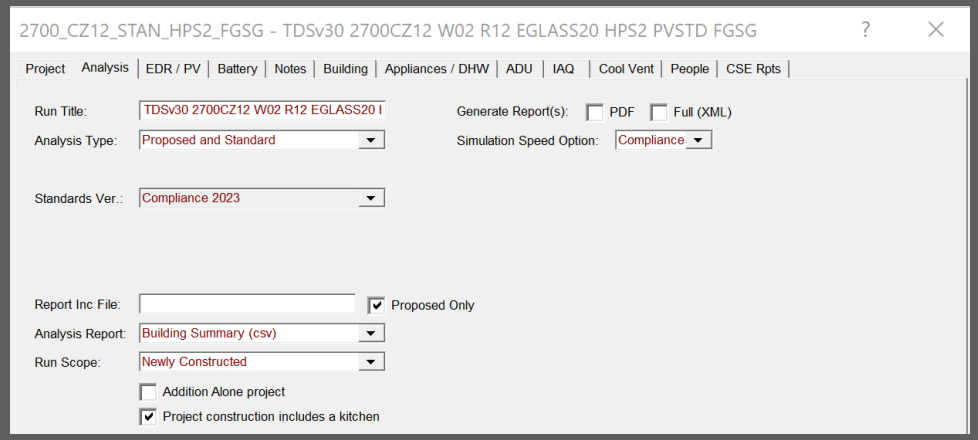
EDR1 of Proposed Design: 51.0 — EDR2 of Proposed Efficiency: 51.4 - EDR2 of Prop PV + Flexibility: 15.4 = Total Proposed EDR2: 36.0

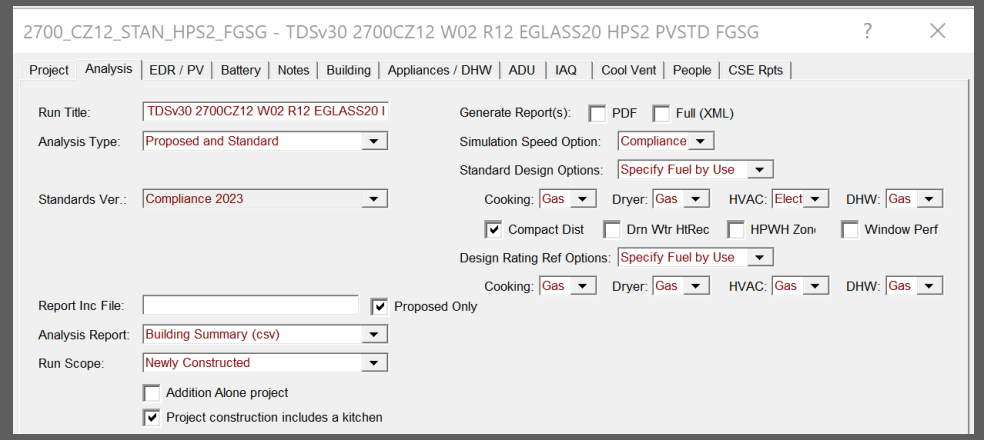
	Reference Design:				Proposed Design:				Design Rating Margins:	
End Use	Site (kWh)	Site (therms)	EDR1 (kBtu/ft²-yr)	EDR2 (kTDV/ft²-yr)	Site (kWh)	Site (therms)	EDR1 (kBtu/ft²-yr)	EDR2 (kTDV/ft²-yr)	EDR1 (kBtu/ft²-yr)	EDR2 (kTDV/ft²-yr)
Space Heating	4,179		6.23	46.22	1,897		2.88	21.13	3.35	25.09
Space Cooling	2,085		1.81	57.44	557		0.67	22.30	1.14	35.14
IAQ Ventilation	295		0.28	2.95	295		0.28	2.95	0.00	0.00
Water Heating		178.0	5.77	23.25	88	111.2	3.69	15.42	2.08	7.83
Self Util/Flexibility Credit								0.00		0.00
Photovoltaics					-5,239 *		-1.01	-33.66	1.01	33.66
Battery							0.00	0.00	0.00	0.00
Flexibility										0.00
Inside Lighting	2,615		2.88	30.38	616		0.70	7.04	2.18	23.34
Appl. & Cooking	989	73.4	3.32	19.59	1,069	47.9	2.50	17.13	0.82	2.46
Plug Loads	3,267		3.26	34.51	2,371		2.36	24.63	0.90	9.88
Exterior	328		0.46	4.16	152		0.18	1.69	0.28	2.47
TOTAL	13,758	251.4	24.01	218.50	1,805	159.2	12.25	78.63	11.76	139.87

* PV System resized to 3.22 kWdc (a factor of 3.216) to achieve 'Standard Design PV' PV scaling

CBECC-RES SOFTWARE REVISIONS

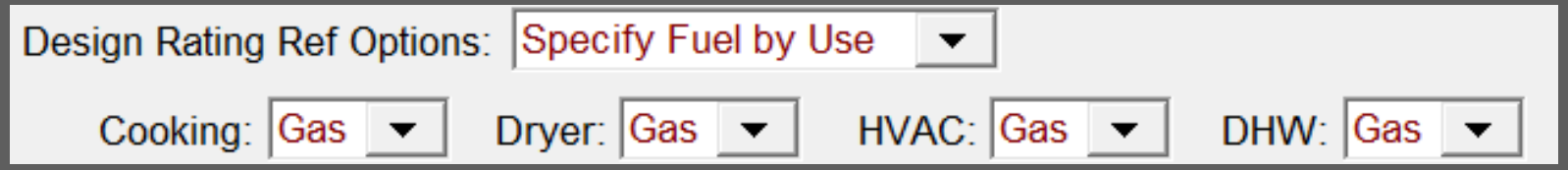
- CBECC-Res software was modified to support the study on standard design and reference design calculations for 2022
- Allows selection of fuel type in standard and reference runs
- Allows refinement of options for the standard design





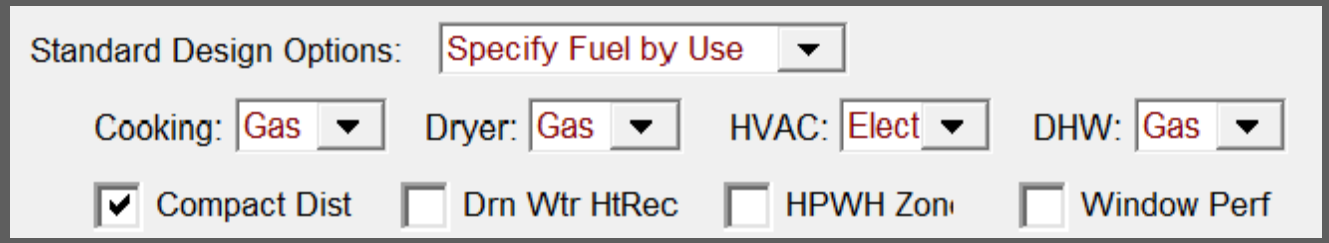
REFINEMENT OF REFERENCE DESIGN

- The reference design is used in EDR calculations to normalize compliance with a 2006 IECC compliant home
- With introduction of electric baseline in 2019 standards, the reference case changed with each fuel type complicating the calculations
- Moving to a single reference case does not affect compliance, as it is used to normalize the EDR of both the standard and proposed designs but it does change the EDR magnitude
- Mixed fuel was most common practice in the 2006 reference year and is proposed as the 2022 reference design in this study



STANDARD DESIGN DETERMINATION

- Started with mixed fuel case
- Switch to either a heatpump water heater (HPWH) or a heatpump space conditioning system (HPSH)
- Climate zones 1, 2, 11, 12 and 16 based on HPWH
- Other climate zones based on HPSH
- Slides in this presentation show HPWH as Case 1 and HPSH as Case 2



STANDARD DESIGN OPTIONS

- Add limited standard design options for a few climate zones to make sure 2022 source and TDV values saved energy over 2019 standards mixed fuel case
  - Some climate zones needed slightly more savings
  - Compact water heating piping satisfied the need in most cases
  - Climate zones 15 and 16 required more savings

Standard Design Options	
Feature	**Description**
Compact	Water heating compact design matching 2019 prescriptive requirements by climate zone
DWHR	Drain water heat recovery matching 2019 prescriptive requirements in zones 1 and 16
Windows	Triple glazed windows with 0.20 U-factor. 0.20 SHGC except in zones 1, 3, 5 and 16 0.32 SHGC
Location	Moves heatpump water heater location to conditioned space instead of garage

STANDARD DESIGN CHOICES

Standard Design by Climate Zone		
Climate	**Baseline**	**Options**
01	HPWH	with Compact
02	HPWH	
03	HPSH	
04	HPSH	
05	HPSH	with Compact
06	HPSH	
07	HPSH	
08	HPSH	with Compact
09	HPSH	with Compact
10	HPSH	with Compact
11	HPWH	
12	HPWH	
13	HPSH	
14	HPSH	
15	HPSH	with Compact,Windows
16	HPWH	with Compact,DWHR

STANDARD DESIGN SAVINGS

- 2019 Mixed Fuel – 2022 Standard using 2022 weather and TDV

	Case 1 - HPWH Standard			Case 2 - HPSH Standard		
Climate Zone	**Differences**			**Differences**		
2019 Mixed Fuel minus 2022 Standards Alternatives	CO2 Emissions (metric tons)	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)	CO2 Emissions (metric tons)	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)
01	0.58	3.09	0.30	1.18	6.18	3.12
02	0.55	2.90	2.07	0.68	3.48	4.41
03	0.55	2.97	2.85	0.35	1.84	2.88
04	0.53	2.87	3.95	0.36	1.83	2.25
05	0.56	2.97	2.49	0.26	1.31	0.57
06	0.53	2.83	6.05	0.13	0.66	0.61
07	0.53	2.86	5.58	0.08	0.39	0.56
08	0.53	2.79	6.27	0.10	0.52	0.23
09	0.52	2.79	5.44	0.17	0.89	0.95
10	0.52	2.73	5.55	0.23	1.14	0.78
11	0.49	2.66	4.13	0.61	3.20	3.28
12	0.52	2.79	3.74	0.58	2.97	3.46
13	0.49	2.65	5.00	0.40	2.06	0.93
14	0.49	2.55	3.97	0.45	2.11	0.03
15	0.44	2.34	6.57	0.04	0.19	0.12
16	0.62	3.31	0.73	1.38	7.15	0.67
Average	**0.53**	**2.82**	**4.04**	**0.44**	**2.25**	**1.55**

STANDARD DESIGN DETAILS

	Case 1 - HPWH Standard						Case 2 - HPSH Standard					
Climate Zone	**Options**						**Options**					
2019 Mixed Fuel minus 2022 Standards Alternatives	CO2 Emissions (metric tons)	EDR1	EDR2	Final EDR	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)	CO2 Emissions (metric tons)	EDR1	EDR2	Final EDR	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)
01	3.16	58.4	67.8	51.4	17.94	92.98	2.56	48.3	66.0	49.8	14.85	90.16
02	2.34	42.5	53.7	38.5	13.38	79.67	2.21	40.6	52.4	37.3	12.80	77.33
03	1.76	37.4	51.8	34.0	10.12	57.00	1.96	41.6	51.4	34.0	11.25	56.97
04	1.77	39.6	51.0	33.0	10.17	61.65	1.94	43.6	51.7	33.9	11.21	63.35
05	1.57	34.7	51.2	32.7	9.07	52.94	1.87	41.0	52.1	33.9	10.73	54.86
06	1.29	38.6	54.6	32.1	7.44	46.08	1.69	49.8	58.0	35.9	9.61	51.52
07	1.17	37.4	55.2	31.7	6.77	42.38	1.62	51.0	58.6	35.5	9.24	47.40
08	1.26	36.8	49.8	26.3	7.35	45.01	1.69	48.1	53.1	29.9	9.62	51.05
09	1.39	37.3	49.7	28.5	8.03	51.41	1.74	46.1	51.9	31.0	9.93	55.90
10	1.57	38.2	50.3	30.2	9.09	59.18	1.86	44.9	52.5	32.6	10.68	63.95
11	2.47	41.8	49.3	33.9	14.18	90.83	2.35	40.2	49.5	34.2	13.64	91.68
12	2.24	41.4	49.3	34.6	12.85	80.05	2.18	40.8	49.3	34.7	12.67	80.33
13	2.18	41.3	47.4	30.4	12.61	80.33	2.27	43.3	48.8	31.9	13.20	84.40
14	2.29	40.4	48.3	30.8	13.06	75.38	2.33	41.8	49.7	32.4	13.50	79.32
15	1.56	37.5	47.2	24.6	9.20	69.70	1.96	46.2	48.6	26.8	11.35	76.15
16	3.37	53.6	63.2	47.5	18.91	99.60	2.61	42.7	63.0	47.5	15.07	99.66
Average	**1.96**	**41.06**	**52.49**	**33.76**	**11.26**	**67.76**	**2.05**	**44.4**	**53.5**	**35.1**	**11.83**	**70.25**

COMPLIANCE STUDY

- Compliance alternatives were generated to help select the standard design choices to make sure there were adequate compliance choices
- Study based on 2700ft2 two story prototype
  - Standard prototype with equal orientations and prescriptive features
  - Proposed prototype with unequal orientations and builder selected 2019 compliance features
  - Proposed prototypes have
    - Glass distribution 20% front, 40% back, 25% left, 15% right
    - Front facing east
- Results vary by climate zone due to the mix of space heating, space cooling and water heating on the total energy use

COMPLIANCE ALTERNATIVES

- Compliance alternatives used to help determine the standard design choices

Compliance Alternatives	
Feature	**Description**
HPWH T3	Heatpump water heater tier 3
HPWH T3 Compact	Heatpump water heater tier 3 with compact design
HPWH T4	Heatpump water heater tier 4
HPWH T4 Compact	Heatpump water heater tier 4 with compact design
HPSH SEER14/EER11.7/HSPF8.2	Heatpump space heater minimum efficiency
HPSH SEER15/EER13/HSPF9	Heatpump space heater higher efficiency
DFHP SEER15/EER13/HSPF9/AFUE80	Dual fuel heatpump space conditioning higher cooling efficiency
DFHP SEER14/EER11.7/HSPF8.2/AFUE93	Dual fuel heatpump space conditioning higher heating efficiency
SEER15/EER13	Higher efficiency cooling and higher efficiency gas water heating
Base Climate Zone Features	
04	Wall R21+R5 Ceiling R30 Roof R19 SEER15/EER13 EF0.92
07	Wall R15 Ceiling R30 Roof R19 SEER14/EER11.7 EF0.92
10	Wall R21+R5 Ceiling R30 Roof R19 SEER14/EER11.7 EF0.92
12	Wall R21+R5 Ceiling R38 Roof R19 SEER15/EER13 EF0.92
All climate Zones	Roof R19 WHF Front90 Glass20/40/25/15 Window0.30/0.23 EF0.92

CLIMATE ZONE 4 TYPICAL HPSH CASE

- More alternatives comply with HPSH
- Source and TDV savings positive

Description	Case 1 - HPWH Standard and Gas Reference						Case 2 - HPSH Standard and Gas Reference					
	Differences						Differences					
	CO2 Emissions (metric tons)	EDR1	EDR2	Complies	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)	CO2 Emissions (metric tons)	EDR1	EDR2	Complies	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)
Standard	**HPWH**						**HPSH**					
CEC Equal Orientation												
HPWH T3	0.06	1.4	2.4	Yes	0.36	4.51	0.23	5.4	3.1	Yes	1.40	6.21
HPWH T3 Compact	0.08	1.7	2.8	Yes	0.43	5.38	0.23	5.4	3.1	Yes	1.40	6.21
HPWH T4	0.07	1.4	2.4	Yes	0.36	4.55	0.24	5.4	3.1	Yes	1.40	6.25
HPWH T4 Compact	0.08	1.7	2.9	Yes	0.44	5.40	0.24	5.4	3.1	Yes	1.40	6.25
HPSH SEER14/EER11.7/HSPF8.2	-0.10	-2.4	0.2	No	-0.62	0.01	0.07	1.6	0.9	Yes	0.42	1.71
HPSH SEER15/EER13/HSPF9	-0.07	-1.8	1.3	No	-0.46	2.10	0.10	2.2	2.0	Yes	0.58	3.80
DFHP SEER15/EER13/HSPF9/AFUE80	-0.09	-2.1	1.6	No	-0.54	2.61	0.08	1.9	2.3	Yes	0.50	4.31
DFHP SEER14/EER11.7/HSPF8.2/AFUE93	-0.11	-2.5	0.6	No	-0.64	0.77	0.06	1.5	1.3	Yes	0.40	2.47
SEER15/EER13	-0.45	-9.4	-0.4	No	-2.42	-1.07	-0.28	-5.4	0.3	No	-1.38	0.63

CLIMATE ZONE 11
TYPICAL HPWH CASE

- More alternatives comply with HPWH
- Source and TDV savings positive

Description	Case 1 - HPWH Standard and Gas Reference						Case 2 - HPSH Standard and Gas Reference					
	Differences						Differences					
	CO2 Emissions (metric tons)	EDR1	EDR2	Complies	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)	CO2 Emissions (metric tons)	EDR1	EDR2	Complies	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)
Standard	**HPWH**						**HPSH**					
CEC Equal Orientation												
HPWH T3	0.08	1.4	2.5	Yes	0.48	6.68	-0.04	-0.2	2.7	No	-0.06	7.53
HPWH T3 Compact	0.09	1.7	2.8	Yes	0.57	7.55	-0.04	-0.2	2.7	No	-0.06	7.53
HPWH T4	0.08	1.5	2.6	Yes	0.50	6.92	-0.04	-0.1	2.8	No	-0.04	7.77
HPWH T4 Compact	0.10	1.7	2.9	Yes	0.58	7.55	-0.04	-0.1	2.8	No	-0.04	7.77
HPSH SEER14/EER11.7/HSPF8.2	0.20	2.8	0.4	Yes	0.94	0.76	0.08	1.2	0.6	Yes	0.40	1.61
HPSH SEER15/EER13/HSPF9	0.26	3.9	2.4	Yes	1.32	6.02	0.14	2.3	2.6	Yes	0.78	6.87
DFHP SEER15/EER13/HSPF9/AFUE80	0.21	3.2	2.7	Yes	1.09	6.94	0.09	1.6	2.9	Yes	0.55	7.79
DFHP SEER14/EER11.7/HSPF8.2/AFUE93	0.17	2.6	1.0	Yes	0.86	2.38	0.05	1.0	1.2	Yes	0.32	3.23
SEER15/EER13	-0.40	-6.2	0.5	No	-2.11	0.95	-0.52	-7.8	0.7	No	-2.65	1.80

CLIMATE ZONE 1
UNIQUE HPWH CASE

- Limited cooling. More alternatives comply with HPWH
- Source and TDV savings positive

Description	Case 1 - HPWH Standard and Gas Reference						Case 2 - HPSH Standard and Gas Reference					
	Differences						Differences					
	CO2 Emissions (metric tons)	EDR1	EDR2	Complies	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)	CO2 Emissions (metric tons)	EDR1	EDR2	Complies	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)
Standard	**HPWH with Compact**						**HPSH**					
CEC Equal Orientation												
HPWH T3	0.05	1.1	2.7	Yes	0.33	4.79	-0.55	-9.0	0.9	No	-2.76	1.97
HPWH T3 Compact	0.07	1.5	3.5	Yes	0.47	6.34	-0.55	-9.0	0.9	No	-2.76	1.97
HPWH T4	0.07	1.4	3.4	Yes	0.43	6.15	-0.53	-8.7	1.6	No	-2.66	3.33
HPWH T4 Compact	0.09	1.8	4.1	Yes	0.55	7.32	-0.53	-8.7	1.6	No	-2.66	3.33
HPSH SEER14/EER11.7/HSPF8.2	0.69	11.8	2.9	Yes	3.61	4.90	0.09	1.7	1.1	Yes	0.52	2.08
HPSH SEER15/EER13/HSPF9	0.74	12.7	4.5	Yes	3.91	7.72	0.14	2.6	2.7	Yes	0.82	4.90
DFHP SEER15/EER13/HSPF9/AFUE80	0.69	12.0	6.6	Yes	3.68	11.53	0.09	1.9	4.8	Yes	0.59	8.71
DFHP SEER14/EER11.7/HSPF8.2/AFUE93	0.67	11.7	5.5	Yes	3.58	9.60	0.07	1.6	3.7	Yes	0.49	6.78
SEER15/EER13	-0.49	-8.4	1.3	No	-2.57	1.78	-1.09	-18.5	-0.5	No	-5.66	-1.04

CLIMATE ZONE 12
UNIQUE HPWH CASE

- Balanced energy use. More alternatives comply with HPWH
- Source and TDV savings positive

Description	Case 1 - HPWH Standard and Gas Reference						Case 2 - HPSH Standard and Gas Reference					
	Differences						Differences					
	CO2 Emissions (metric tons)	EDR1	EDR2	Complies	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)	CO2 Emissions (metric tons)	EDR1	EDR2	Complies	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)
Standard	**HPWH**						**HPSH**					
CEC Equal Orientation												
HPWH T3	0.07	1.4	2.3	Yes	0.41	5.42	0.01	0.8	2.3	Yes	0.23	5.70
HPWH T3 Compact	0.08	1.7	2.7	Yes	0.50	6.34	0.01	0.8	2.3	Yes	0.23	5.70
HPWH T4	0.07	1.4	2.5	Yes	0.43	5.71	0.01	0.8	2.5	Yes	0.25	5.99
HPWH T4 Compact	0.08	1.7	2.9	Yes	0.51	6.58	0.01	0.8	2.5	Yes	0.25	5.99
HPSH SEER14/EER11.7/HSPF8.2	0.13	2.0	0.8	Yes	0.60	1.42	0.07	1.4	0.8	Yes	0.42	1.70
HPSH SEER15/EER13/HSPF9	0.17	2.8	2.3	Yes	0.87	4.90	0.11	2.2	2.3	Yes	0.69	5.18
DFHP SEER15/EER13/HSPF9/AFUE80	0.12	2.1	2.6	Yes	0.63	5.74	0.06	1.5	2.6	Yes	0.45	6.02
DFHP SEER14/EER11.7/HSPF8.2/AFUE93	0.10	1.7	1.4	Yes	0.50	2.89	0.04	1.1	1.4	Yes	0.32	3.17
SEER15/EER13	-0.43	-7.4	0.1	No	-2.32	-0.16	-0.49	-8.0	0.1	No	-2.50	0.12

CLIMATE ZONE 15 UNIQUE HPSH CASE

- Limited heating. More alternatives comply with HPSH
- Source and TDV savings positive

Description	Case 1 - HPWH Standard and Gas Reference						Case 2 - HPSH Standard and Gas Reference					
	Differences						Differences					
	CO2 Emissions (metric tons)	EDR1	EDR2	Complies	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)	CO2 Emissions (metric tons)	EDR1	EDR2	Complies	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)
Standard	**HPWH**						**HPSH with Compact,Windows**					
CEC Equal Orientation												
HPWH T3	0.09	2.2	2.9	Yes	0.54	8.17	0.49	10.9	4.3	Yes	2.69	14.62
HPWH T3 Compact	0.09	2.4	3.0	Yes	0.58	8.42	0.49	10.9	4.3	Yes	2.69	14.62
HPWH T4	0.09	2.3	2.8	Yes	0.55	7.79	0.49	11.0	4.2	Yes	2.70	14.24
HPWH T4 Compact	0.09	2.4	2.9	Yes	0.58	8.12	0.49	11.0	4.2	Yes	2.70	14.24
HPSH SEER14/EER11.7/HSPF8.2	-0.40	-8.8	-3.2	No	-2.18	-9.43	0.00	-0.1	-1.8	No	-0.03	-2.98
HPSH SEER15/EER13/HSPF9	-0.33	-7.1	-0.7	No	-1.76	-2.40	0.07	1.6	0.7	Yes	0.39	4.05
DFHP SEER15/EER13/HSPF9/AFUE80	-0.33	-7.1	-0.7	No	-1.76	-2.29	0.07	1.6	0.7	Yes	0.39	4.16
DFHP SEER14/EER11.7/HSPF8.2/AFUE93	-0.40	-8.8	-3.2	No	-2.17	-9.31	0.00	-0.1	-1.8	No	-0.02	-2.86
SEER15/EER13	-0.32	-6.7	0.6	No	-1.65	1.41	0.08	2.0	2.0	Yes	0.50	7.86

CLIMATE ZONE 16
UNIQUE HPWH CASE

- Mountain climate. More alternatives comply with HPSH
- Source and TDV savings positive

Description	Case 1 - HPWH Standard and Gas Reference						Case 2 - HPSH Standard and Gas Reference					
	Differences						Differences					
	CO2 Emissions (metric tons)	EDR1	EDR2	Complies	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)	CO2 Emissions (metric tons)	EDR1	EDR2	Complies	Source Total (kBtu/ft2)	TDV Total (kTDV/ft2)
Standard	**HPWH with Compact,DWHR**						**HPSH with Windows**					
CEC Equal Orientation												
HPWH T3	-0.06	-1.0	-4.0	No	-0.35	-8.31	-0.82	-11.9	-4.2	No	-4.19	-8.25
HPWH T3 Compact	-0.03	-0.5	-2.8	No	-0.19	-5.91	-0.82	-11.9	-4.2	No	-4.19	-8.25
HPWH T4	-0.02	-0.2	-1.6	No	-0.07	-3.29	-0.78	-11.1	-1.8	No	-3.91	-3.23
HPWH T4 Compact	0.00	0.2	-0.5	No	0.05	-1.06	-0.78	-11.1	-1.8	No	-3.91	-3.23
HPSH SEER14/EER11.7/HSPF8.2	0.71	9.8	-3.3	No	3.47	-7.28	-0.05	-1.1	-3.5	No	-0.37	-7.22
HPSH SEER15/EER13/HSPF9	0.77	10.9	-1.5	No	3.83	-3.42	0.01	0.0	-1.7	No	-0.01	-3.36
DFHP SEER15/EER13/HSPF9/AFUE80	0.03	0.3	2.6	Yes	0.11	4.97	-0.73	-10.6	2.4	No	-3.73	5.03
DFHP SEER14/EER11.7/HSPF8.2/AFUE93	0.18	2.6	3.8	Yes	0.90	7.49	-0.58	-8.3	3.6	No	-2.94	7.55
SEER15/EER13	-0.53	-7.9	1.0	No	-2.78	1.53	-1.29	-18.8	0.8	No	-6.62	1.59

QUESTIONS???

2022 Building Energy Efficiency Standards Overview

Battery Storage Ready and All Electric Ready

Presenters: Danny Tam

January 26, 2021 Staff Workshop

Battery Storage Ready Measures

Applicable to newly constructed single family building

A. Requirement for a subpanel with a main service connection of at least 225A; higher capacity 320A and 400A panels also comply without a subpanel
B. Identification of at least 4 branch circuits for emergency use
C. Transfer switch ready

All-Electric Ready Measures

Applicable for single family and multifamily systems serving single dwelling

1. **Electric Circuits for Space Heating** – 240V, 30A circuit with termination 3-feet from air-handler; reserve double pole breaker in main panel

2. **Electric Circuits for Combined Cooktop/Oven** - 240V, 50A circuit with termination 3-feet from cooktop; reserve double pole breaker in main panel

3. **Electric Circuits for Clothes Dryer** - 240V, 30A circuit with termination 3-feet from clothes dryer; reserve double pole breaker in main panel

All-Electric Ready Measures (cont)

Applicable for clothes dryers serving multifamily common area

Electric Circuits for Clothes Dryer – Conductors or raceway installed and sized according to one of the following:

1. 24 amps at 208/240 volt per clothes dryer; or
2. 2.6 kVA for each 10,000 Btus per hour of rated gas input or gas pipe capacity; or
3. The electrical power required to provide equivalent functionality of the gas-powered equipment as calculated and documented by the responsible person associated with the project.

Questions?

2022 Building Standards

Cleanup Language

Cleanup Language

- Edits to Section 150.0(k) to clarify and streamline compliance with residential lighting requirements
  - Clarify that dimmers are not required in hallways, stairways, or other corridors

- Edits to Sections 150.0(o)1 to bring IAQ requirements inline with ASHRAE 62.2 IAQ requirements

2022 Building Standards Cleanup

1. New exception for PVs systems that are less than 1.8 kWDC per building
   - ✓ Addresses the ADU issue
2. Exception 1 – Clarify PV systems are not required to be larger than what can be installed in the available Solar Access Roof Area (SARA); clarifies what happens when SARA is greater than 80 square feet, but smaller than the area required for full NEM compliance
3. No Longer needed Exceptions to Section 150.1(c)14; items 1 and 2 above will replace:
   i. Exceptions 2 (CZ15)
   ii. Exception 3 (2-story buildings)
   iii. Exception 4 (3-story buildings)
4. New Exception for occupied roofs – As specified by Title 24, Part 2, section 503.1.4.
5. New Exception for areas with high snow loads
6. New Exception for low-slope roofs, which accounts for self-shading
7. Clarified Exception 5 for self-shading for high-slope roofs approved by planning departments prior to 1/1/2020

Cleanup Continued

JA 11- Qualification Requirements for Photovoltaic Systems

1. Clarify confusing system orientation language related to prescriptive (90 to 300 DFTN) and performance approach requirements
2. Clarify CFI1 (150-270 DFTN) and CFI2 (105-300 DFTN) requirements
3. Solar assessment tool - Amend language based on lessons learned from prior approval of solar assessment tools: create clear list of functions needed for approval
4. Clarify requirements for Solar Access Roof Area (SARA) calculations and criteria

Cleanup Continued

JA 12 - Qualification Requirements for Battery Storage Systems

1. Allow credit for “unpaired” battery storage systems
2. Clarify that roundtrip efficiency requirements are for prescriptive approach compliance only; performance modeled with actual RT efficiency
3. Add that minimizing GHGs may be a future control strategy for battery storage systems
4. Add control strategy requirements for unpaired battery storage systems; include only TOU and Advanced Demand Flexibility control strategies (not Basic)

Questions?

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Open for Comments

Comments on Todays Workshop

Due Date: February 11, 2021 By 5:00 PM

Comments to be submitted to:
https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=19-BSTD-03

Thank You!