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<tr>
<td><strong>Docket Number:</strong></td>
<td>19-BSTD-03</td>
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<tr>
<td><strong>Project Title:</strong></td>
<td>2022 Energy Code Pre-Rulemaking</td>
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<tr>
<td><strong>TN #:</strong></td>
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<tr>
<td><strong>Document Title:</strong></td>
<td>Wilcox Metrics</td>
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<tr>
<td><strong>Description:</strong></td>
<td>Residential Metrics and Measure Analysis</td>
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<tr>
<td><strong>Filer:</strong></td>
<td>Courtney Jones</td>
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<tr>
<td><strong>Organization:</strong></td>
<td>California Energy Commission</td>
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<td><strong>Submitter Role:</strong></td>
<td>Commission Staff</td>
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Residential Metrics and Measure Analysis

Bruce A, Wilcox, P. E.
Ken Nittler, P. E.
Agenda

- EDRs and 2022 CBECC-Res Performance Compliance
- Example comparison and prototype house for calculations
- Alternative 2022 Metrics
- Comparison of Alternative Metrics
  - Total TDV for a Mixed Fuel home
  - Total EDR2 for a Mixed Fuel home
  - Total TDV for an All Electric home
  - Total EDR2 for an All Electric home
  - CH4 (methane) leakage impact on measure savings for Mixed Fuel home
- Efficiency EDR2 Measure Savings using the 2022 Metric
  - Mixed Fuel
  - All Electric
- Flexibility Measure Total EDR2 Savings using Alternative Metrics
  - Savings for Increasing PV in an All Electric Home
  - Savings for adding a Battery in an All Electric Home
- Questions
EDR (Energy Design Rating) in CBECC-Res

- Reported for both Proposed and Standard Designs
  - Proposed Design is the building seeking a building permit
  - Standard Design is a version of that building which minimally meets the California Prescriptive Standards

- Calculated as the ratio of Energy Use of the Proposed or Standard Design to the Reference Design
  - Reference Design is a version of the Proposed Design that minimally meets the 2006 IECC (International Energy Conservation Code)
CBECC-Res 2022 Compliance

- One New EDR1 Criteria added
  - EDR1 is calculated in Hourly Source Energy

- Two 2019 Compliance Criteria remain as
  - EDR2 Efficiency – includes envelope, HVAC, DHW
  - EDR2 Total - adds PV, battery, demand response

- Proposed EDR < Standard EDR for All THREE Compliance Criteria to Pass
  - No tradeoffs between EDR1 and EDR2
  - Limited tradeoffs between EDR2 Efficiency and EDR2 Total
## 2022 CBECC-Res Compliance Summary

Complies if ALL three Compliance Margins are greater than or equal to 0

<table>
<thead>
<tr>
<th>Energy Design Ratings:</th>
<th>Compliance Margins:</th>
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<tbody>
<tr>
<td>Source (EDR1)</td>
<td>Efficiency (EDR2)</td>
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<tr>
<td>Standard Design</td>
<td>46.6</td>
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<tr>
<td>Proposed Design</td>
<td>44.9</td>
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</table>

Result: **COMPLIES**

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1. Efficiency measures include improvements like a better building envelope and more efficient equipment
2. Total EDR includes efficiency, photovoltaics and batteries
3. Building complies when all source, efficiency and total margins are greater than or equal to zero
Example Comparison of Residential Results

- Intended to illustrate combined impact of
  - 2022 Weather data
  - Alternative 2022 TDV Metrics

- All examples calculated for the 2700 ft² Prototype
  - 2 Story, 4 Bedroom

- 2 Cases
  - Mixed Fuel
    - Gas space, water heat, cooking, clothes drying
    - Electric cooling
  - All Electric
Alternative TDV Metrics (Time Dependent Valuation)

- TDV Metrics are sets of hourly values of Electricity, Natural Gas and Propane values
  - They include the cost to produce and distribute the energy for the representative weather year in each of the 16 climate zones

- Presenting 5 alternative TDV Metrics
  - 2019 - Current 2019 weather, TDV and rules
  - 2022 - Base 2022 proposed weather TDV and rules
  - 2022 with CH4 leak - includes (methane) leak for gas
  - 2022 15% RA - includes 15% retail adder for electric
  - 2022 15% RA with CH4 Leak - includes both electric and gas adders
Total TDV - Mixed Fuel – 2022 > 2019, CH4 is minor
Total EDR2 - Mixed Fuel - 2022 > 2019
## Total TDV - All Electric

<table>
<thead>
<tr>
<th>Climate Zone</th>
<th>Total kTDV/ft²</th>
<th>Electric/2019Pkg/StdPV</th>
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<tr>
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**Statewide**

Total TDV/ft²

- **2019**
- **2022**
- **2022 with CH4 Leak**
- **2022 15% RA**
- **2022 15% RA with CH4 Leak**
- **Statewide**
CH4 Leakage Impact on TDV – CH4 not included after this slide

Total kTDV/ft² Savings — Mixed/2019Pkg/StdPV minus Mixed/96afue/18seer/13eer/StdPV

- 2019
- 2022
- 2022 with CH4 Leak
- 2022 15% RA
- 2022 15% RA with CH4 Leak
- Statewide
Efficiency Measures EDR2 Savings - Mixed Fuel

Efficiency EDR2 Savings --- Comparison for Metric 2022

- Mixed/Triples/StdPV
- Mixed/0.92uef/StdPV
- Mixed/96afue/18seer/13eer/StdPV

Climate Zone

Statewide

March 26, 2020

Wilcox
Efficiency Measures EDR2 Savings - All Electric

Efficiency EDR2 Savings ---- Comparison for Metric 2022

Electric/Triples/StdPV
Electric/Sanden/StdPV
Electric/10.5hspf/18seer/13eer/StdPV

Climate Zone

01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 Statewide

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Savings for Increasing PV - All Electric

Total EDR2 Savings — Electric/2019Pkg/StdPV minus Electric/2019Pkg/MaxPV

Climate Zone

2019 2022 2022  15% RA Statewide

March 26, 2020

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Savings for Adding Battery - All Electric

Total EDR2 Savings ---- Electric/2019Pkg/StdPV minus Electric/2019Pkg/StdPV/Battery/Ranked/14

- 2019
- 2022
- 2022 15% RA
- Statewide

March 26, 2020

Wilcox
Questions?

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