<table>
<thead>
<tr>
<th><strong>Docket Number:</strong></th>
<th>19-DECARB-01</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project Title:</strong></td>
<td>Decarbonization</td>
</tr>
<tr>
<td><strong>TN #:</strong></td>
<td>233116</td>
</tr>
<tr>
<td><strong>Document Title:</strong></td>
<td>Building Decarbonization Coalition Comments - Presentation - Single-family Residential</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Filer:</strong></td>
<td>System</td>
</tr>
<tr>
<td><strong>Organization:</strong></td>
<td>Building Decarbonization Coalition</td>
</tr>
<tr>
<td><strong>Submitter Role:</strong></td>
<td>Public</td>
</tr>
<tr>
<td><strong>Submission Date:</strong></td>
<td>5/26/2020 11:26:05 AM</td>
</tr>
<tr>
<td><strong>Docketed Date:</strong></td>
<td>5/26/2020</td>
</tr>
</tbody>
</table>
Presentation - Single-family Residential

MAY 22 Building Decarbonization Workshop, Single-Family Panel, Building Decarbonization Coalition presentation

Additional submitted attachment is included below.
Figure 1: Decarbonization Targets Within the Building Sector

<table>
<thead>
<tr>
<th>Residential</th>
<th>Commercial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrofits</td>
<td>% GHG reduction below 1990 levels from the overall building stock:</td>
</tr>
<tr>
<td>2025: 20% GHG reductions from building sector</td>
<td></td>
</tr>
<tr>
<td>2030: 40% GHG reductions from building sector</td>
<td></td>
</tr>
<tr>
<td>2045: 100% GHG reductions from building sector</td>
<td></td>
</tr>
</tbody>
</table>

- Increase the share of high efficiency heat pumps for space heating from 5% of sales in 2018, to 50% in 2025 and 100% in 2030.
- Increase the share of high efficiency heat pumps for water heating from 1% of sales in 2018, to 50% in 2025 and 100% in 2030.
GOAL 1: Customers, contractors and policymakers are aware of and demand building decarbonization measures.

GOAL 2: Customers receive a good value from adopting building decarbonization measures.

GOAL 3: Building decarbonization provides a better value to contractors than fossil-fuels.

GOAL 4: Supply-chains and delivery agents are able to meet rising demand for carbon-free building technologies with a quality product.

GOAL 5: Policies are aligned to maximize customer awareness of and interest in building decarbonization, the customer, builder and contractor value proposition, and the industry’s ability to meet rising demand.
New Build
"..electric appliances have similar or lower costs than natural gas appliances..

"\ldots\text{estimated total installed cost increase in 2020 for electric appliances is } \ldots \text{ $185 to $418 for a new single-family home}\} * 

* Does not include eliminating gas infrastructure
Q: Have you built an all-electric home? (n=26)

Yes: 36%
No: 64%

Figure 5: All-Electric Experience

Lack of familiarity with heat pump technology
- "Not enough people are installing electric heat pumps, which is keeping cost high."
- "Heat pump water heaters are not in use long enough to see if they will work out."

Cooking is the biggest problem
- "Homeowners generally don’t care how homes are heated and how their water gets hot, but they do care about how they cook. Clients overwhelmingly want gas stoves."
- "Gas cooking is so imbedded in culture."

Costs
- "Cost of utilities to the occupants and more expensive to construct."
- "Almost 100 percent of the resistance is due to the cost of electricity. Until you can convince the consumer that all-electric homes are cheaper, they won’t buy them."

Figure 8: Barriers to All-Electric Construction

Q: How interested are you in building all-electric homes?

4% Very Not Interested
8% Not Interested
28% Neutral
60% Interested

Figure 14: Interest in Building All-Electric Homes
Existing Buildings
Stock Turnover

- Lighting
- Water Heater
- Space Heater
- Light-Duty Vehicle
- Heavy-Duty Vehicle
- Industrial Boiler
- Power Plant
- Residential Building

Years:
- 2015
- 2020
- 2025
- 2030
- 2035
- 2040
- 2045
- 2050
Emergency
“So why would [a plumber] want to learn something like that when he can put in his normal water heater he's always put in, and get several done in a day if he wanted to?”
Panel Upgrades and Wiring

Panels: $2,500-$4,000
220V Wiring: $300-$1,000
New Construction

• New Construction
  • Stop State funding for gas infrastructure expansion
  • Code compliance incentives
  • Technical support and training for builders
  • Consumer campaign
  • Emissions-based code
Recommendations

- Existing buildings
  - Clean Heat Initiative
  - Clean Cooking Initiative
  - Building electric infrastructure modernization
  - Consumer campaign

BOOK A FREE QUOTE AT: NSPOWER.CA/HEATPUMPS.CA
Cross-cutting

• Low-income electrification programs
• Electrification-friendly rates
• Financing
• Technology leadership standards
• Proceeding to transition state off of gas
Water Heating

Increase the share of high efficiency heat pumps for water heating from 1% of sales in 2018, to 50% in 2025 and 100% in 2030.
California’s Clean Energy Market Transformation Path

- **Ambitious Goals**: 1 Million Solar Roofs Initiative
- **Financial Incentives**: 2.167 Billion in Financial Incentives
- **Supportive Policies and Early Adopters**: Net-metering, streamlined permitting, local government reach codes
- **Performance Standards**: Mandatory Solar Panels for New, Single-Family Homes

Timeline:
- 2006
- 2007-2016
- 2020
California prepares to shift away from natural gas, while keeping power reliable and affordable

By Liane Randolph, Special to CalMatters
Thank you!
Appendix
Gas Infrastructure Costs

$6,000-$15,000

$750-$2,400

$270-$850

Every $1,000 increase in house price prevents 8,870 California families from affording

-NAHB, 2019
electric appliances have similar or lower costs than natural gas appliances.

estimated total installed cost increase in 2020 for electric appliances is … $185 to $418 for a new single-family home

* Does not include eliminating gas infrastructure
Figure 2: Survey Respondent Type

Figure 3: Construction Types

Figure 4: Survey Respondents Geographic Reach

Stakeholder Assessment of All-Electric Residential New Construction
August 1, 2019
Q: Have you built an all-electric home? (n=26)

Yes 36%
No 64%

Figure 5: All-Electric Experience

Lack of familiarity with heat pump technology
"Not enough people are installing electric heat pumps, which is keeping cost high."
"Heat pump water heaters are not in use long enough to see if they will work out."

Cooking is the biggest problem
"Homeowners generally don’t care how homes are heated and how their water gets hot, but they do care about how they cook. Clients overwhelmingly want gas stoves.”
"Gas cooking is so imbedded in culture.”

Costs
"Cost of utilities to the occupants and more expensive to construct.”
"Almost 100 percent of the resistance is due to the cost of electricity. Until you can convince the consumer that all-electric homes are cheaper, they won’t buy them.”

Figure 8: Barriers to All-Electric Construction

Q: Do you agree the construction of an all-electric home is practical today?

Figure 7: Practicality of All Electric Construction
Consumer Reports Prefers Induction
Top 6 of 8 Ranges for 2020 were electric, top 2 were **Induction**

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Model</th>
<th>Rating</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Induction</td>
<td>GE Profile PHS930SLSS</td>
<td>86</td>
<td>$2,432</td>
</tr>
<tr>
<td>Induction</td>
<td>Kenmore Elite 95073</td>
<td>84</td>
<td>$1,525</td>
</tr>
<tr>
<td>Gas</td>
<td>LG Signature LUTD4919SN</td>
<td>84</td>
<td>$3,000</td>
</tr>
<tr>
<td>Induction</td>
<td>LG LSE4617ST</td>
<td>82</td>
<td>$2,500</td>
</tr>
<tr>
<td>Induction</td>
<td>LG LSE4616ST</td>
<td>82</td>
<td>$1,700</td>
</tr>
<tr>
<td>Smoothtop</td>
<td>Whirlpool WGE745c0FS</td>
<td>82</td>
<td>$1,000</td>
</tr>
<tr>
<td>Gas</td>
<td>Samsung NY58J9850WS</td>
<td>81</td>
<td>$2,725</td>
</tr>
<tr>
<td>Induction</td>
<td>Frigidaire Gallery FGIF3036TF</td>
<td>81</td>
<td>$1,035</td>
</tr>
</tbody>
</table>
Q: Have you built an all-electric home? (n=26)

- Yes: 36%
- No: 64%

Figure 5: All-Electric Experience

Q: How interested are you in building all-electric homes?

- Very Not Interested: 4%
- Not Interested: 8%
- Neutral: 28%
- Interested: 60%
- Very Interested: 0%

Figure 14: Interest in Building All-Electric Homes

Lack of familiarity with heat pump technology

- “Not enough people are installing electric heat pumps, which is keeping cost high.”
- “Heat pump water heaters are not in use long enough to see if they will work out.”

Cooking is the biggest problem

- “Homeowners generally don’t care how homes are heated and how their water gets hot, but they do care about how they cook. Clients overwhelmingly want gas stoves.”
- “Gas cooking is so imbedded in culture.”

Costs

- “Cost of utilities to the occupants and more expensive to construct.”
- “Almost 100 percent of the resistance is due to the cost of electricity. Until you can convince the consumer that all-electric homes are cheaper, they won’t buy them.”

Figure 8: Barriers to All-Electric Construction
Recommendations

Conduct general awareness campaigns that demonstrate the features and benefits of all-electric homes, including providing:

- Information regarding true operating costs for all-electric homes.
- Support for hands-on experiences with induction cooking.
- Talking points on the features and benefits of all-electric construction that builders can use with their customers.
Existing Buildings
Contractor Value Proposition

• Cost at distributor or retail
• Ease of program use
Average Installed Cost of Gas WH and HPWH

**Gas Home**
- Gas Storage (existing buildings)
  - $1,000-$1,600
  - 0.63 UEF
- Gas Tankless (new construction)
  - $$$-$$$$$
  - $3,700-$5,700
  - 0.81 UEF

**Electric Home**
- Heat Pump
  - $$$-$$$$$
  - $2,100 to $7,900
  - 3.0 UEF
$450 Million California Building Electrification funding over the next 9-months
Panel Upgrades and Wiring

Panels: $2,500-$4,000
220V Wiring: $300-$1,000
Rising Gas Costs Lead to Downward Spiral of Gas System, Exposing Low-income Households

Aging gas infrastructure and rising gas commodity costs

Higher gas rates

Fixed costs allocated to fewer customers

Gas demand falls

Economic building electrification

Lower cost renewables, increasing electric demand, and better heat pumps

Climate policies

[Diagram showing the cyclical relationships among the factors mentioned.]
Induction Study

**Frigidaire FGF3036TF** - Electric Induction Cooktop
- Number of Elements: 4
- Cooktop Controls: Digital Button 1-9 (and power boost)
- Oven Type: Convection
- Tested Elements*: 9.4" 3.6 kW; 7.0" 2.8 kW
- Retail Price: $1,199

*Maximum Input Rate (kW) in power boost mode

**GE Profile PHS930SL2SS** - Electric Induction Cooktop
- Number of Elements: 4+1 warmer
- Cooktop Controls: Digital Touchpad 0-100% (5% Increments)
- Oven Type: Convection
- Tested Elements*: 11.0" 3.7 kW; 8.0" 2.5 kW
- Retail Price: $2,399

*Maximum Input Rate (kW)

**Frigidaire FFF3016USB** - Electric Resistance Coil
- Number of Elements: 4
- Cooktop Controls: Rotary Dial 1-9
- Oven Type: Standard Non-Convection
- Tested Elements: 8.0" 2.4 kW; 6.0" 1.5 kW
- Retail Price: $599

**Whirlpool WFE515S0ES1** - Electric Resistance Glass-Ceramic Top
- Number of Elements: 4
- Cooktop Controls: Rotary Dial 1-9
- Oven Type: Standard Non-Convection
- Tested Elements: 9.0" 2.5 kW; 6.0" 1.2 kW
- Retail Price: $599

**Samsung NX58H5600SS** - Gas Burner Range
- Number of Burners: 5
- Cooktop Controls: Analog rotary dials
- Oven Type: Convection
- Tested Burners: 3.9" 17 kBTU/h; 2.9" 9.5 kBTU
- Retail Price: $799

*Maximum Input Rate (kW) in power boost mode
Water Heat-Up Rate

![Water Heat-Up Rate Graph]

- **Threshold**
- **Induction A (Frigidaire)**
- **Induction B (GE)**
- **Induction C (Samsung)**
- **Resistance Coil (Frigidaire)**
- **Resistance Ceramic (Whirlpool)**
- **Gas Burner (Samsung)**
*calculated based on a single high-input element or burner heating 12 lb of water from 70 to 200°F in an 8 qt pot

Figure 10: Temperature Overshoot Results for 12-lb of Water