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<td>Document Title:</td>
<td>Agenda for Staff Workshop on Heating, Ventilation, and Air Conditioning Research and Development</td>
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<td>Description:</td>
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<td>Filer:</td>
<td>Anthony Ng</td>
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<td>Organization:</td>
<td>California Energy Commission</td>
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<td>Submitter Role:</td>
<td>Energy Commission</td>
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# Heating, Ventilation and Air Conditioning Research and Development Workshop

**December 21, 2017, 10:00-4:30 PDT**  
1516 9th St., Arthur Rosenfeld Hearing Room, Sacramento, CA 95814

<table>
<thead>
<tr>
<th>Topic</th>
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| 1. Welcome – Bradley Meister  
  a. Introductions  
  b. Purpose of Workshop/Workshop Format | 10:00 |
| 2. Panel One: Current State of HVAC Technologies Needed to Meet California’s GHG and GWP Refrigerant Challenges  
  a. Are electric heat pumps the answer? Why or why not?  
  b. What is preventing widespread adoption or use, for new construction and retrofits?  
  c. What other HVAC technologies have potential?  
  d. What is the commercial status?  
  e. What is preventing widespread adoption of these technologies for new construction and retrofits?  
  f. What research is needed to encourage widespread adoption?  
    i. Technology improvements  
    ii. Equipment cost  
    iii. Lack of operating data  
    iv. Cost effectiveness  
  g. What research is needed with respect to low GWP refrigerants for HVAC systems? And commercial refrigeration systems? | 10:30-12:30 |
| Presenters:  
  1) Mark Modera – Western Cooling Efficiency Center  
  2) Jason Meggs – California Air Resources Board  
  3) Ram Narayanamurthy – Electric Power Research Institute  
  4) Carl Hiller – Applied Energy Technology |       |
| 3. Panel Two – Manufacturer and customer perspective?  
  a. What do building owners want?  
    i. Residential  
    ii. Commercial  
    iii. Multifamily-low income  
  b. How are manufacturers positioning themselves to meet these needs?  
  c. First cost versus operating costs?  
  d. What is the time frame for replacement? | 1:30 3:00 |
| Presenters:  
  1) Sean Armstrong – Redwood Energy  
  2) Barry Giles – BRE America  
  3) Ram Narayanamurthy – Electric Power Research Institute  
  4) Rob Hammond – BIRA Energy  
  5) Ryohei Hinokuma – Daikin North America |       |
4. Panel Three – Future innovations needed in the 5-10 year time frame?
   a. Compressor-less Cooling?
   b. Improvements in heat exchangers
   c. Integrated low energy HVAC systems, with controls

   • Discuss the innovations needed?
   • What should be the focus of research in the near term?
   • What policy or regulatory changes needed?
   • What market changes will be needed to see these innovations realized?

Presenters:
1) Curtis Harrington – Western Cooling Efficiency Center
2) Fred Bauman – Center for the Build Environment
3) Jason Meggs – California Air Resources Board

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<th>5. Wrap up and Next Steps</th>
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<td>3:00-4:00</td>
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