Deployment Strategies to Overcome Barriers

Workshop on Modern Evaporative Cooling Technologies
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Goals of this Presentation

• Highlight deployment strategies that build momentum and overcome barriers

• Underscore key solution strategies discussed in prior presentation

• Highlight several near-term hybrid concepts not otherwise featured at this workshop

• Discuss the long range plan
Ex #1: Residential Evaporative Condensers

• The Technology
  ▪ Category: Residential
  ▪ Direct replacement for air-cooled condenser
  ▪ Retrofittable, requires addition of water line
  ▪ Several technologies with 5+ year demo record

• Benefit: 30-45% demand & energy savings in dry climates

• Major Barriers
  ▪ Past maintenance issues
  ▪ Market infrastructure
  ▪ Capital costs
  ▪ Lack of information
Ex #1: Getting it Moving

• The Partnership
  ▪ the largest US EC-condenser manufacturer
  ▪ Very large residential HVAC contractor
  ▪ Two Northern California utilities
  ▪ The WCEC, through contractor/Affiliate member

• The Plan
  ▪ Contractor responsible for marketing
  ▪ Utilities provide cash incentives
  ▪ Sale includes 3 year renewable maintenance program
  ▪ Program should achieve high volume to lower costs

• Status: “big/bold” program being developed
Ex #2: Dual Pre-Cooling for RTU’s

• The Technology
  ▪ Category: Non-res
  ▪ Direct condenser, indirect vent air evap pre-cooling
  ▪ Retrofittable, requires addition of water line
  ▪ Several technologies with 5+ year demo record

• Major Barriers
  ▪ Past maintenance issues
  ▪ Lack of information
  ▪ Capital costs

• Benefit: 25-30% demand & energy savings

SYSTEM SCHEMATIC

A - High quality condenser air pre-cooler
B - Pump & copper supply/return piping
C - Ventilation air precooler
D - Controls
Ex #2: Continued

- The Partnership
  - ICI, manufacturer of patented DualCool (open to others)
  - Energy Solutions, a utility “3rd Party” provider
  - PG&E, as 3rd party funding utility
  - Davis Energy Group for design and detailed monitoring
  - WCEC, for alliance-building and “maintenance maintenance”
  - 29 qualifying chain retailer alliance candidates

- The Plan: focus on chain retail
  - Utility provides cash incentives to build volume
  - ICI provides product, trains installers
  - DEG & WCEC provide technical support
  - Funded through ‘08, can grow if successful
Other Program Partnership Needs

- **Near-term:** Dedicated Vent Air ("DOAS") with RTU’s
- **Mid-Term:** DOAS with radiant ceilings and floors (new only)
- **Long-term:**
  - "Zero energy" cooling systems, combining PV with advanced cooling
  - building-integrated chilled water storage systems
  - heat-powered cooling with PVT solar components
Now and the Future

- Current air-cooled technologies are near practical limits
- Advanced evaporative systems are early in their evolution
- Potential average annual EER’s by category are shown below
- Systems with greatest potential face more barriers

<table>
<thead>
<tr>
<th>Type</th>
<th>EER Range</th>
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<tbody>
<tr>
<td>Air Cooled</td>
<td>7-13</td>
</tr>
<tr>
<td>Air Cooled Vapor Comp</td>
<td>13-25</td>
</tr>
<tr>
<td>Water Cooled Hybrid</td>
<td>11-90</td>
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<tr>
<td>Packaged Hybrid</td>
<td>25-150</td>
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<tr>
<td>Building Integrated</td>
<td></td>
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<tr>
<td>Res</td>
<td>Near Term</td>
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<td>-----------</td>
</tr>
<tr>
<td>Non-Res</td>
<td>Near Term</td>
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</tbody>
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New

Existing
The Water Barrier

• The big two-headed barrier:
  ▪ Water use quantity
  ▪ Water-related maintenance

• What’s Needed:
  ▪ “cradle to grave” analysis tool vs. base case: source/storage/treatment/cooling/discharge
  ▪ Credible comparative studies of treatment options by application & system type
  ▪ Partnership with stakeholders (water & waste utilities, landscape expertise, urban foresters, etc.)
Conclusions: Overcoming the Barriers

• Near-term: find the “low-hanging watermelons”, assemble implementation partnerships, begin growing the market, focus on maintenance, incorporate in standards ASAP

• Mid-term: find best technologies now in advanced R&D, develop calibrated models, analyze and proceed to early implementation, then standards

• Long-term: identify key needs (materials, concepts, integration), support full R&D cycle, proceed to modeling and early implementation, then standards

• Comments & Questions????