E3T Multifamily Building
TAG Final Meeting

October 11, 2016
Today’s Agenda

9:00 – 9:10  Logistics and agenda overview  Karen Janowitz
9:10 – 9:20  Overview of high level scores  Rob Penney
9:20 – 10:00  ET scores and comments  Rob Penney
10:00 – 11:20  Design Guidelines Panel  Spencer Sator
11:20 – 11:30  Meeting end, thank you  Jess Kincaid
# Controls Scores

<table>
<thead>
<tr>
<th>Ranking per criteria</th>
<th>Bi-Level Stairwell Lighting Controls</th>
<th>Advanced Lighting Controls for Parking Garages</th>
<th>Variable Speed Drive Pool Pumps and Controls</th>
<th>Hot Water Recirculation Controls</th>
<th>Building Automation Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENERGY SAVINGS</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>NON-ENERGY BENEFITS</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>TECH READINESS</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
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<tr>
<td>EASE OF ADOPTION</td>
<td>1</td>
<td>2</td>
<td>3</td>
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<tr>
<td>OVERALL VALUE</td>
<td>1</td>
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<tr>
<td>TOTAL RANKING</td>
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</tbody>
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| TOTAL AVERAGE SCORE (scale of 1-5) | 4.14 | 4.04 | 3.71 | 3.23 | 2.99 |

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**EASE OF ADOPTION**

**TECH READINESS**

**OVERALL VALUE**

**TOTAL RANKING**

**ENERGY SAVINGS**

**NON-ENERGY BENEFITS**

**TOTAL AVERAGE SCORE (scale of 1-5)**
## HVAC Scores

<table>
<thead>
<tr>
<th>Ranking per criteria</th>
<th>Ductless Mini-Splits</th>
<th>Energy Recovery Ventilation</th>
<th>Heat Recovery Ventilation</th>
<th>Ducted Mini-Splits</th>
<th>Inverter-Driven Packaged Terminal Units</th>
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<tbody>
<tr>
<td>ENERGY SAVINGS</td>
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### TOTAL AVERAGE SCORE (scale of 1-5)
- **Ductless Mini-Splits:** 3.88
- **Energy Recovery Ventilation:** 3.83
- **Heat Recovery Ventilation:** 3.68
- **Ducted Mini-Splits:** 3.29
- **Inverter-Driven Packaged Terminal Units:** 3.08
# Design & Airtightness Scores

<table>
<thead>
<tr>
<th>Ranking per criteria</th>
<th>Airtightness</th>
<th>Net Zero Energy Ready</th>
<th>Passive House</th>
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<tbody>
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<td>ENERGY SAVINGS</td>
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<td>1</td>
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**TOTAL AVERAGE SCORE (scale of 1 to 5)**

<table>
<thead>
<tr>
<th></th>
<th>3.53</th>
<th>3.35</th>
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Controls

Bi-Level Stairwell Lighting Controls
- Pros – cost savings, well established, required in some codes

Advanced Lighting Controls for Parking Garages
- Pros – cost savings good
- Cons – commissioning, security benefits questionable, savings for underground garages not as good

Building Automation
- Pros – non-energy benefits, reduced maintenance costs
- Cons – occupant engagement, unproven energy savings, retrofit costs prohibitive, challenging proper configuration
- Needs – training, pilot studies, qualified service providers
Hot Water Recirculation Controls

• Pros – savings for gas systems, water savings, mature technology
• Cons – very few electric systems (BPA), water temp and circulation problems
• Needs – compare savings with EE unit water heaters, plumber training

VSD Pool Pumps and Controls

• Pros – simple installation, already required in some codes, energy savings
Ductless Heat Pumps
- Pros – proven, reliable energy savings & performance, adds AC
- Cons – aesthetics

Energy Recovery Ventilation
- Pros – possibly higher energy savings than HRV, improved IAQ, necessary for tight buildings
- Cons – cost, occupant issues, difficult for retrofits
- Needs – research, more manufacturers, proper installations

Heat Recovery Ventilation
- Pros – cost effective in cold climates with high utility rates, improved IAQ
- Cons – cost, savings can vary
Ducted mini-splits
• Pros – more versatile than DHP is some situations, comfort, cost savings
• Cons – higher installation costs, installer learning curve, need space for ducts

Inverter-driven Packaged Terminal Units
• Pros – estimated energy savings, good if no gas available, less equipment outside and cost (compared to DHP), better than PTAC
• Cons – Needs additional research to prove performance
Airtightness
• Pros – cost savings, NEBs, improved IAQ, tenant retention
• Cons – depends on good ventilation, stack effect in taller buildings,
• Needs – training, repeated verification

Net Zero Energy Ready
• Pros – cost savings, lower GHG, improved IAQ, reduced maintenance, great for new construction
• Cons – inconsistent standards
Design Approaches (continued)

Passive House

- **Pros** – well documented, cost savings, improved IAQ, NEBs, resilience during power outages, tenant retention
- **Cons** – high costs, conflicting data on energy use, better savings with larger envelope-to-floor ratio buildings, installers need to be 3rd party certified and trained
Question to be addressed:

What role can/do utilities have in encouraging the use of design guidelines for multifamily buildings?
Panelists

Jonathan Heller, Ecotope
Nehemiah Stone, Stone Energy Associates
Phoebe Warren, Seattle City Light
Sean Denniston, New Buildings Institute

Moderator
Spencer Sator, Livingston Energy Innovations
– In the short term we are considering multifamily measures for:
  • High efficiency new buildings
  • Stand alone heating measures
– We are also incorporating suggestions we have heard during the TAG into short-term and long-term planning regarding:
  • Adding new measures
  • Ensuring that any program platform can support the technologies recommended as part of the TAG
Thank You to TAG Members

• Great TAG – enthusiastic members
  – Industry experts with stellar reputations.
  – Good representation for utilities, implementers, designers and building operator/owners.
• TAG generated a significant number of new technologies – 26.
• TAG members agreed to extend their participation for both the number of webinars from 2 to 3; as well as the length of the webinars by 15 minutes
  – There was very little drop off during the additional discussions following the webinar even with the longer length.
• Scored significantly more technologies and strategies (13)
• High response rates for the scoring (58% to 67%)
BPA and WSU would like to thank all the TAG members for the dedication, time and willingness to share their expertise to shape the future Energy Efficiency research agenda.