Prototype Case Study: 50% WHES Cold Climate

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ConSol
www.bira.ws

Residential Building Energy Efficiency Meeting 2010
Building Science, Research, Analysis, & Implementation

BIRA (ConSol Lead):
• Established 2002
• Over 80 team members
• Project Description
• Prototype Overview
• Project Summary
• Key Results
Kennecott Land, Salt Lake County, Utah
Objectives

– Test 50% BA prototype strategy
– Showcase energy efficient measures
– Show value of evaporative cooling in this climate to stakeholders
– Work with Utilities and Building community to show value of solar
– Begin to create a market for High Performance homes in Salt Lake Valley

Partners

– Kennecott Land
– Gold Medallion Homes
– Rocky Mountain Power
– University of Utah
– NREL
– Salt Lake County
– City of South Jordan
– PVT Solar
– Oasys Evaporative Coolers
– Utah Clean Energy
Kennecott Land

Represents 40% of Salt Lake County developmental land
200,000 homes to be built over the next 50-75 years
93,000 acres

75,000 planning area
- 34,000 preserved open space
- 41,000 new communities

Commitment to Energy Efficiency & Sustainability
Daybreak Showcase Homes
Gold Medallion Homes

Northern Utah’s first builder to commit to building 100% ENERGY STAR Certified Homes,

2010 EVHA Silver Award Winner

2010 Energy Champion Award

Committed to Energy Efficiency
<table>
<thead>
<tr>
<th>Features</th>
<th>Kennecott Minimum Guidelines</th>
<th>40% WHES Cold BA Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation</td>
<td>R-19 Wall R-40 Ceiling</td>
<td>R-21 batts, 2x6, 16&quot;o.c. R-49 Ceiling</td>
</tr>
<tr>
<td>Windows</td>
<td>0.35 U-value SHGC NR</td>
<td>0.32 U-value 0.30 SHGC</td>
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<tr>
<td>Cooling</td>
<td>SEER 13</td>
<td>SEER 15</td>
</tr>
<tr>
<td>Heating</td>
<td>0.90 AFUE</td>
<td>0.92 AFUE</td>
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<tr>
<td>Ducts</td>
<td>R-6 in Unconditioned Space</td>
<td>Ducts in Conditioned Space</td>
</tr>
<tr>
<td>DHW</td>
<td>0.60 EF</td>
<td>0.80 Tankless Water Heater</td>
</tr>
<tr>
<td>Lights</td>
<td>-</td>
<td>100% CFL’s</td>
</tr>
<tr>
<td>Appliances</td>
<td>ENERGY STAR®</td>
<td>ENERGY STAR®</td>
</tr>
</tbody>
</table>
| Information | • 2,654 sq ft  
• 3 stories  
• 3 beds  
• 2.5 baths |

| Building Features | • Structurally Integrated Panels (SIPs) for walls  
• SIPs Roof  
• Low emissivity windows  
• Evaporative Cooler (OASys)  
• Hydronic furnace  
• Ducts in conditioned space  
• Condensing Gas water heater  
• 100% Fluorescent lighting  
• Photovoltaic Thermal Panels (PVT) |

| WHES | 53.6% without PV |

| HERS Index | 42 |
Gold Medallion House Monitoring Points

Whole House
- Basement- Temperature
- Main Floor- Temperature and RH
- Upstairs- Temperature and RH
- Outside - Temperature and RH
- Whole house Power
- PV production
- DHW
- Hydronic Furnace –Power, Flow rate, and temperature
- PV

PVT
- Temperatures- bottom and top of underside of PV
- Air handler
- Glycol Pump
- Glycol Tank
- Glycol Loop (Attic)
- Glycol Loop (Basement)
- PVT Fan
- Damper position
- Controller
- Wind Speed
- Wind direction

OASys
- OASys Intake
- OASys Supply
- OASys Exhaust
Energy Savings- BEopt simulation
<table>
<thead>
<tr>
<th>Features</th>
<th>2006 IECC</th>
<th>Kennecott</th>
<th>Typical</th>
<th>Prototype</th>
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<tbody>
<tr>
<td>Insulation</td>
<td>R-19 Wall</td>
<td>R-19 Wall</td>
<td>R-21 Wall</td>
<td>SIPs 6.5”  R-50 Ceiling</td>
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<tr>
<td></td>
<td>R-30 Ceiling</td>
<td>R-40 Ceiling</td>
<td>R-50 Ceiling</td>
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<tr>
<td></td>
<td>R-13 Basement</td>
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<tr>
<td>Windows</td>
<td>0.35 U-Factor</td>
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<td>0.318 U-Factor</td>
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<td>SHGC NR</td>
<td>0.302 SHGC</td>
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<tr>
<td>Cooling</td>
<td>SEER 13</td>
<td>SEER 13</td>
<td>SEER 15</td>
<td>OASys Hybrid Air Conditioner</td>
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<tr>
<td>Heating</td>
<td>0.78 AFUE</td>
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<td>0.925 AFUE</td>
<td>Hydronic Heating</td>
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<tr>
<td>Ducts</td>
<td>R-6</td>
<td>R-6 in Unconditioned Space</td>
<td>Ducts inside</td>
<td>Ducts inside</td>
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<tr>
<td>DHW</td>
<td>NG 0.67 EF</td>
<td>0.60 EF Tankless</td>
<td>0.80 EF Tankless</td>
<td>90% EF condensing gas water heater</td>
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<tr>
<td>Lights</td>
<td>0% Fluorescent</td>
<td>-</td>
<td>20% Fluorescent</td>
<td>100% Fluorescent</td>
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<tr>
<td>Appliances</td>
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<td>ENERGY STAR®</td>
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<tr>
<td>Photovoltaic Systems</td>
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<td>2.0 kW photovoltaic-thermal (PVT) system</td>
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</table>
The Numbers Don’t Lie

Cooling Equipment Energy Usage - Peak Day 103 degrees

- Oasys**
- 13 SEER A/C*

* Based on BEopt Data - Peak Day July 5th
** OASys Data Based on RealTime Data, July 7th
PVT
Successful Project Completion Required:

• Organizing and monitoring the incorporation of the advance design elements
• Developing and meeting milestones with partners
• Providing a mechanism for information exchange
• Ensuring proper installation and commissioning of systems
Next Steps

• Work with Kennecott Land and Builders to develop next generation strategies

• Continue to share findings with utilities, and state and local agencies to incentivize energy efficiency and renewables.

• Continue with partnerships developed during parade of homes
Keys to Success are Strong Partners

• Kennecott Land
• Gold Medallion Homes
• Rocky Mountain Power
  • University of Utah
  • NREL
• Salt Lake County
• City of South Jordan
  • PVT Solar
• Oasys Evaporative Coolers
  • Utah Clean Energy
Results

• Prototype research results encouraged electrical utility to consider increasing evaporative cooling rebate from $750 to $1000
• Salt Lake County has agreed to build affordable homes at 50% WHES level.
• OASys distributors in Utah went from zero to three distributorships in a two year period.
• Other builders are installing solar and higher efficiency measures and seeing success
Garbett Homes PVT community: 1st PVT Community
For More Information

BIRA – www.BIRA.ws
Kennecott Land- www.Daybreakutah.com
Gold Medallion Homes- www.goldmedallionhomes.com
PVT Solar – www.pvtsolar.com
Oasys – www.oasysairconditioner.com
SIPS – www.SIPA.org
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Thank You!