Signals Affecting Commercial DSM
Overview

• Group14
• Aligning Signals
  • DSM and Buildings Codes
  • DSM and Technology
  • DSM and Community Initiatives
New Construction Rebates and Energy Codes

Annual Energy Cost Savings

- After DSM
- DSM
- CODE

$/sf/hr → $0.10 $0.20 $0.30 $0.40 $0.50 $0.60
Building Codes requiring more efficiency

**Percent Energy Efficiency Improvements of ASHRAE Standard 90.1**

As determined by quantitative analyses contracted through the U.S. Department of Energy (DOE)

ASHRAE Standard 90.1-2016 improves both source and site energy use efficiency by over 40 percent compared to the 1989 edition of the standard. Figure by Daniel Overbey.
2018+/2021+ Energy Codes

Annual Energy Cost Savings

- After DSM
- DSM+
- DSM
- New Code
- Old Code

$/sf/yr

$0.10 $0.20 $0.30 $0.40 $0.50 $0.60
DSM and Technology

- Glazing: U/SHGC
- Lights
- HVAC:
  - part-load performance of cooling equipment,
  - evaporative cooling
  - ice storage
- DR controls
Climate Change Initiatives

Denver and Boulder
• 100% Renewable electricity 100%
• EV’s by 2035: 30% Denver, 45% Boulder
• 80% reduction Denver, Carbon Neutral in Boulder by 2050

New Mexico
• 45% reduction by 2030

Reno
• 40% reduction by 2030
• 80% reduction by 2050

Salt Lake City
• 100% Renewable Energy by 2030
• 80% Reduction by 2040
DSM and Community Initiatives

Denver Green Buildings Ordinance (Green Roof) 11/2018
- New and existing buildings
- Compliance options - green roof, 5-12% energy efficiency, renewables, green building certification

Colorado Senate Bill 19-236 (2019)
Social Cost of carbon emissions $46/ton

Energize Denver Benchmarking Ordinance
All buildings over 25,000 SF report energy performance.

Electrification
Buildings Electric Vehicles

DENVER
80 x 50 Climate Action Plan
Denver Green Buildings Ordinance

Annual Energy Cost Savings

- Green Bldg
- DSM Green Bldg
- After DSM
- DSM+
- New Code

$/sf/yr
Benchmarking & Beyond

• Growing benchmarking requirements
  • Utilities provide auto upload to Energy Star
• Boulder includes RCx, energy audits, lighting upgrades, etc.
  • Coordinated effort with utility DSM programs and grants
• Future could be EUI targets
### Benchmarking & DSM

97,600 sq.ft. building

<table>
<thead>
<tr>
<th>Equipment</th>
<th>ECO Name</th>
<th>Estimated Xcel Rebate ($)</th>
<th>Simple Payback w/ Rebate (Years)</th>
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</thead>
<tbody>
<tr>
<td>AHU-1</td>
<td>Install VFDs on AHU SF and RF</td>
<td>10,400</td>
<td>3.8</td>
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<tr>
<td>Controls</td>
<td>Convert Controls to Full DDC</td>
<td>28,086</td>
<td>14.0</td>
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<tr>
<td>Lighting</td>
<td>Upgrade to LED Lighting</td>
<td>10,645</td>
<td>4.2</td>
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<tr>
<td>Roof</td>
<td>Roof Replacement</td>
<td>0</td>
<td>163.4</td>
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<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>49,131</strong></td>
<td><strong>10.1</strong></td>
</tr>
</tbody>
</table>

*Reduce energy costs more than 20%*

1. Benchmark building – Energy Star score of 64
2. Energy audit/ project development
3. Xcel Energy DSM rebates (~10% of total project cost)
4. PACE financing for $520,000 in upgrades
Electrification Example

740,000 sq.ft. building

Electric resistance heat increases costs by $0.58/sq.ft., 49% higher total cost
Heating Costs

Cost to Heat with Electricity and Natural Gas

- Electric heat pump heat (tariff designed to encourage electric heat from 12pm-6am)
- Electric heat pump heat ($20/kW peak winter plus $0.04/kWh)
- Electric heat pump heat (flat rate)
- Electric resistance heat (flat rate)
- Natural gas to heat

$/kWh

$0.000 $0.020 $0.040 $0.060 $0.080 $0.100 $0.120 $0.140 $0.160
Rebates and Electrification

Good time for electric heat – consider tariffs and rebates to encourage use.
Cost of Carbon Emissions and DSM

2020: Social Cost of Carbon Emissions is $46/ton CO2 for ERP

Cost of Electricity: Energy + Social Cost of CO2 Emissions
Wrap Up

Aligning Signals
- rebates, local initiatives, regulations, tariffs, technology
- Realize Goals/Objectives/Outcomes
- Collaboration
Sue Reilly, PE, LEED AP  
*Principal / Energy Team Leader*  
Group14 Engineering, PBC  
(720) 221-1073  
sreilly@group14eng.com

Celeste Cizik, PE, CEM, PMP, LEED AP  
*Principal / Existing Buildings Team Leader*  
Group14 Engineering, PBC  
(720) 382-1705  
ccizik@group14eng.com