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<td>Presentation - Impacts of 2022 Metrics on Nonresidential and High Rise Residential Building Performance Compliance</td>
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<td><strong>Description</strong>:</td>
<td>Presentation by Roger Hedrick of Noresco</td>
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<td><strong>Filer</strong>:</td>
<td>Patty Paul</td>
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Impacts of 2022 Metrics on Nonresidential and High Rise Residential Building Performance Compliance

October 17, 2019
Roger Hedrick
Large Suite of Simulations
- Eight Building Types - Large, Medium and Small Office, Large and Medium Retail, Small School, Warehouse, High-Rise Residential
- 16 Climate Zones
- New 2022 Weather Files

Effects of Switching to Electric Heat
- Multiple system types
- Mix of gas heat and electric heat

Effects on Selected Efficiency Measures
- Reduced LPD, Increased heating efficiency, Increased cooling efficiency, Increased residential water heating efficiency

Effects on Envelope Tradeoffs
- Reduced opaque Insulation, Reduced glazing SHGC, Increased glazing U-factor, Increased WWR (Office and Residential)

Grid Harmonization Signals
- Increased cooling efficiency vs. PV
Four metrics
- TDV MI (Mid-IEPR)
- TDV Pol (Policy)
- Src MI (Source Mid-IEPR)
- Src Pol (Source Policy)

Look at Electrification, Efficiency Measures, Envelope Tradeoffs, and Grid...
Large Office - Gas VAV (VAV with chillers and gas boilers) is used in the baseline.

For electric heat systems (WSHP and Elec VAV), TDV compliance is limiting criterion.

For gas heat system (four-pipe fan-coil), Source is limiting criterion.
Small Office - SZAC (Single Zone A/C with gas furnace) is used in the baseline

Similar Trends -
for electric heat systems (WSHP, heat pumps and VRF), TDV compliance is limiting criterion,
for gas heat systems (SZVAVAC, GasPVAV, FPFC), Source is limiting.
Medium Retail - SZVAVAC (Single Zone VAV A/C with gas furnace) is used in the baseline.

Similar Trends except for SZAC. SZAC is constant volume fan, so the reduced compliance margin is primarily due to increased fan energy, so TDV is the limiting criterion.
High-Rise Residential - FPFC (Four-Pipe Fan Coil) is used in the baseline in the dwelling units

Similar trend again

Water heating is significant, so electric water heating gives large Source benefit
EFFICIENCY MEASURES

Large Office - Change in compliance for different measures
- Relative to VAV with hot water or electric resistance reheat
- Don’t compare magnitude of different measures - arbitrary changes used
- Look at differences between TDV and Source for each measure

Trading off envelope - Source provides larger penalty than TDV, except for SHGC increase
GRID INTEGRATION - PV

- Large Office - Cooling efficiency increase vs. adding PV
  - PV sized to provide equal kWh

- TDV and Source both show much larger impact from increased cooling efficiency than PV - Source more than double, TDV more than 1.5
Analysis in CSE, “Simple” control algorithm

Source impact for PV and battery systems that provide the same TDV savings

Battery systems provide much larger Source savings than PV systems - 2.8 to 10 times
CONCLUSIONS

- TDV is limiting criterion for all-electric designs
- Adding Source energy imposes new limiting criterion for gas heating designs
- Trading off envelope efficiency in a design will result in large Source energy penalty
- Both metrics give similar signal when comparing PV to cooling efficiency, reducing value of PV - but particularly for Source energy
- Source energy magnifies value of battery storage compared to PV