

# NYC Pilot: *Buildings as Batteries*® Opportunities and Challenges

A presentation to the IEEE ISGT NA 2020  
by Vincent Cushing and William Hederman  
February 19, 2020



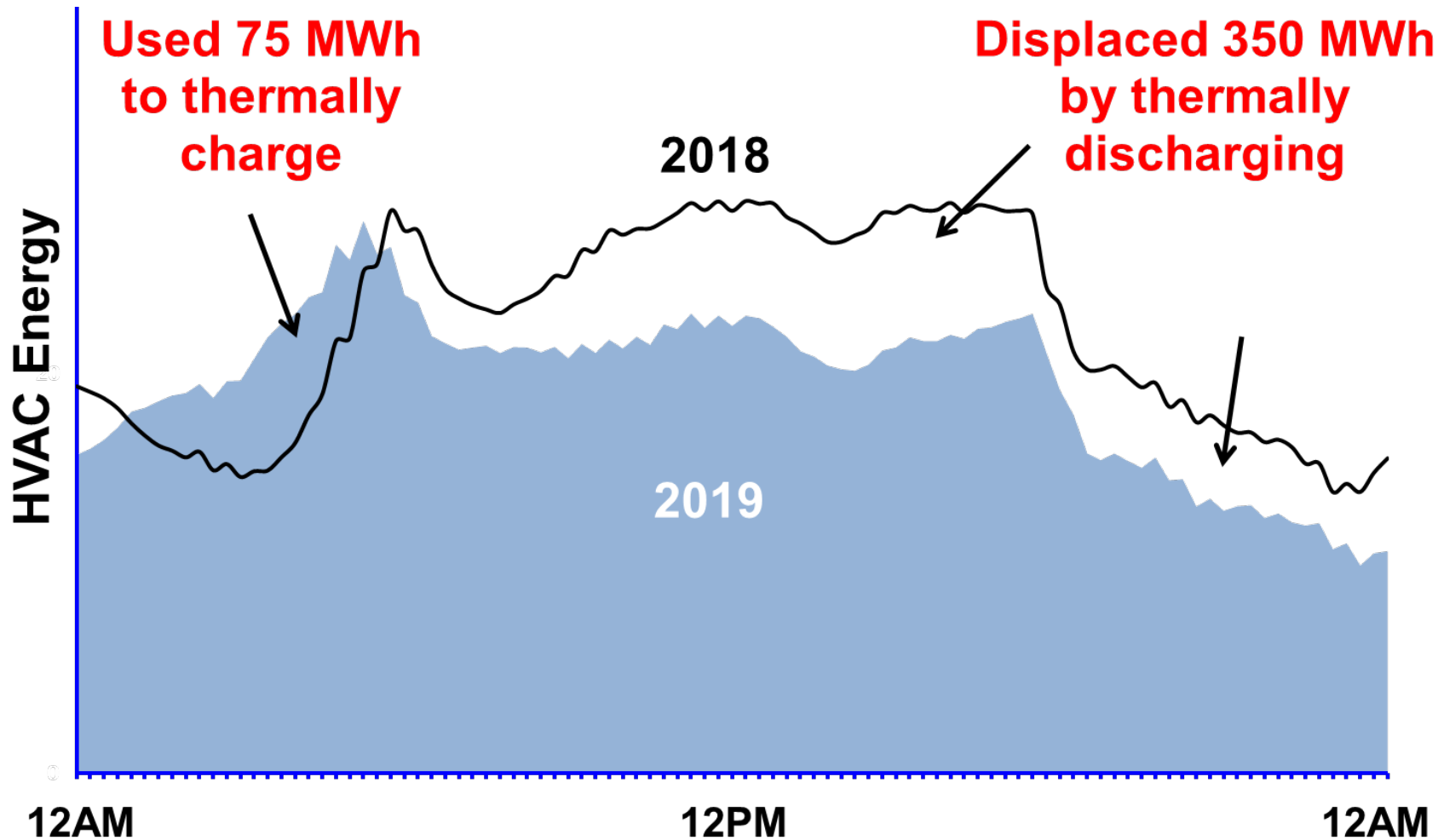
# *Buildings as Batteries*<sup>®</sup>

Reduced HVAC energy 20%, peak 30%  
... in sophisticated LEED Gold building.

Opportunities: Building/grid integration.  
Grid-scale energy storage.  
Multi-disciplinary RD&D.

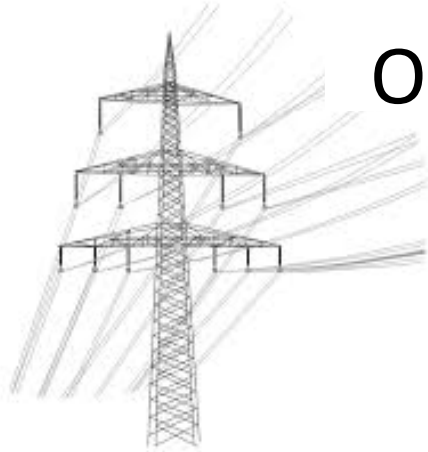
Challenges: Institutional hurdles.

# Reduced energy by 20%, peak by 30%



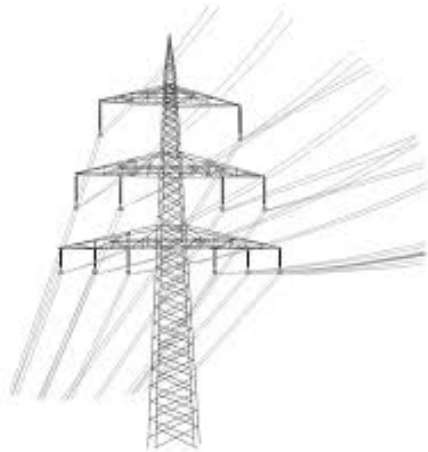
# Large, untapped \$\$\$ opportunity!

Optimized individually



Optimized as one

20-40% better  
economy, emissions,  
efficiency



# Grid-scale energy storage \$\$\$\$\$

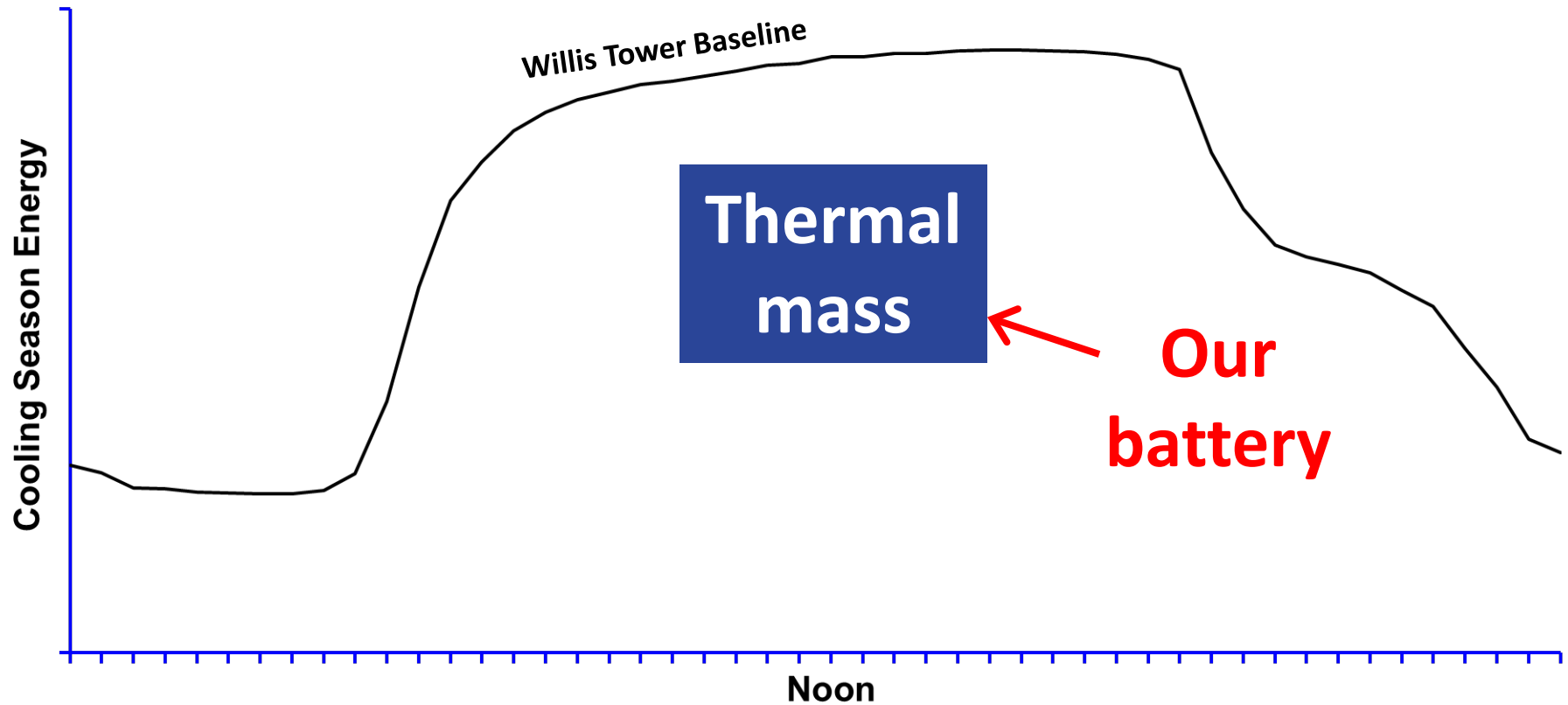
“A portfolio of large commercial buildings, acting in coordination, is a significant energy asset in a grid-congested urban market.”

“P2P Transactions with Demand Flexibility for Increasing Solar Utilization”: blockchain, PV, ConEd Non-Wires.

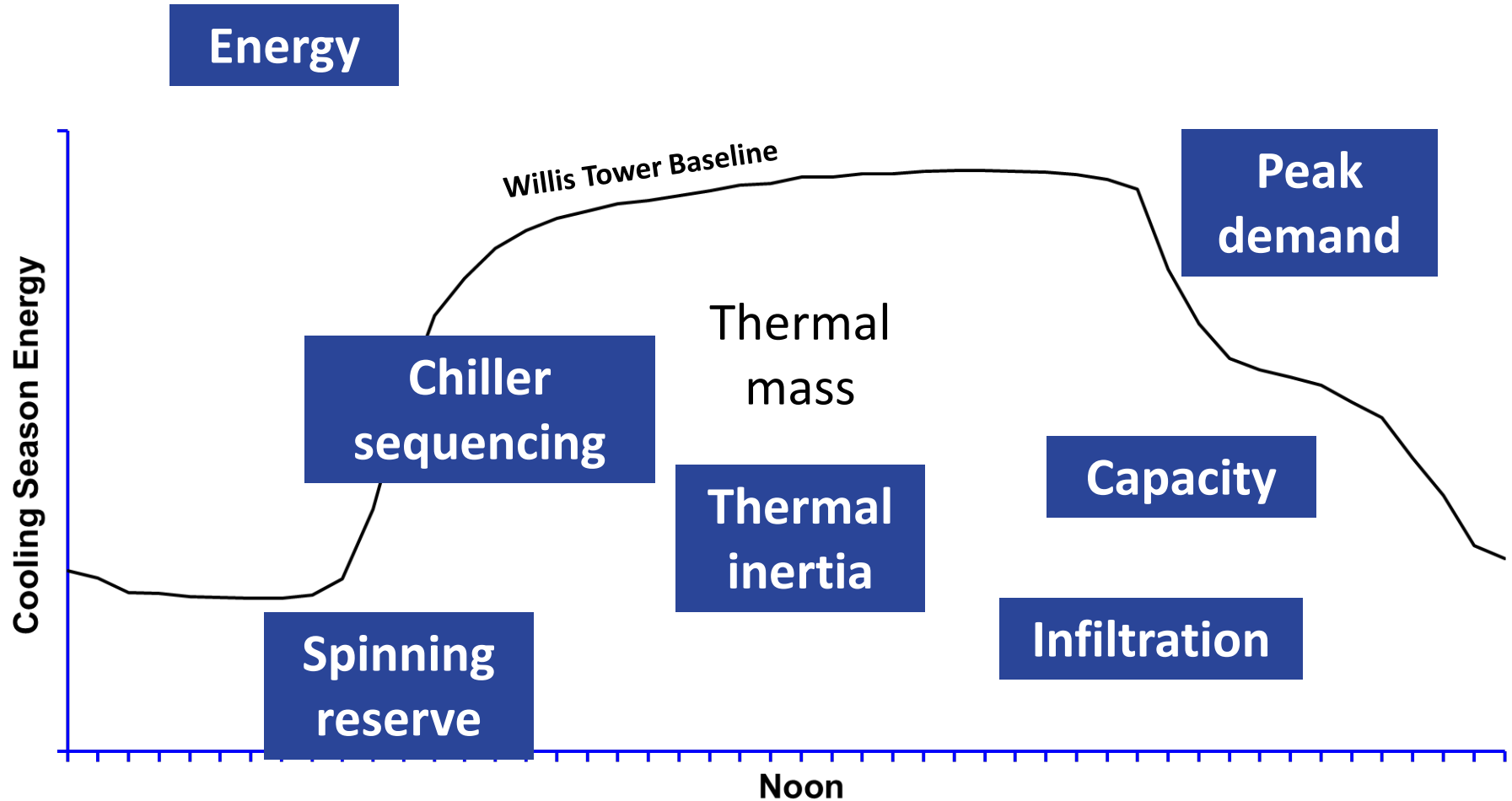
“Multi-objective Deep Reinforcement Learning Control”: rapid building energy models for scale deployment.

U.S. Department of Energy, Univ. of Colorado Boulder,  
Penn State Univ., National Renewable Energy Laboratory,  
Univ. of Pennsylvania.

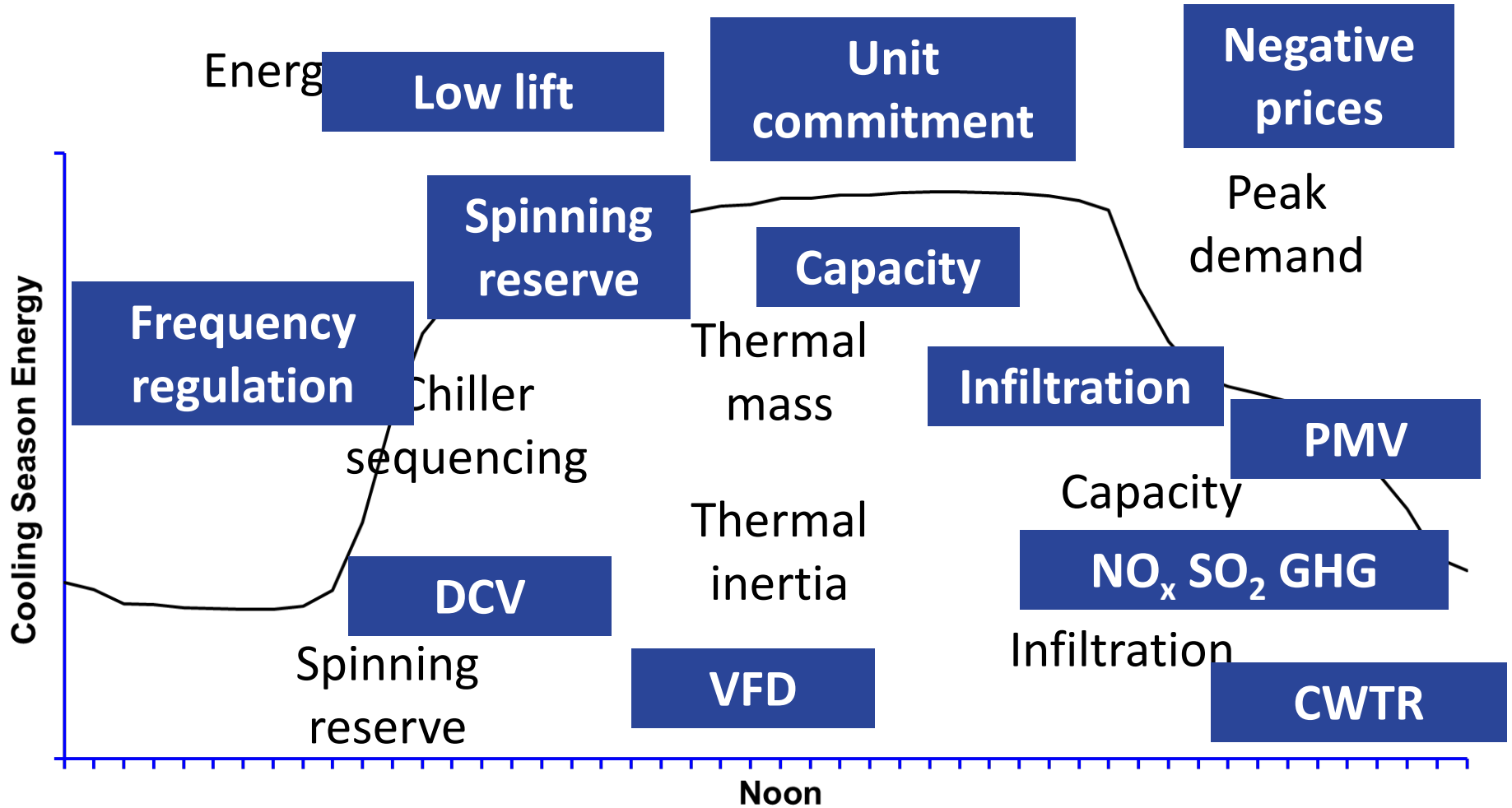
# Multi-disciplinary RD&D!



# Multi-disciplinary RD&D!

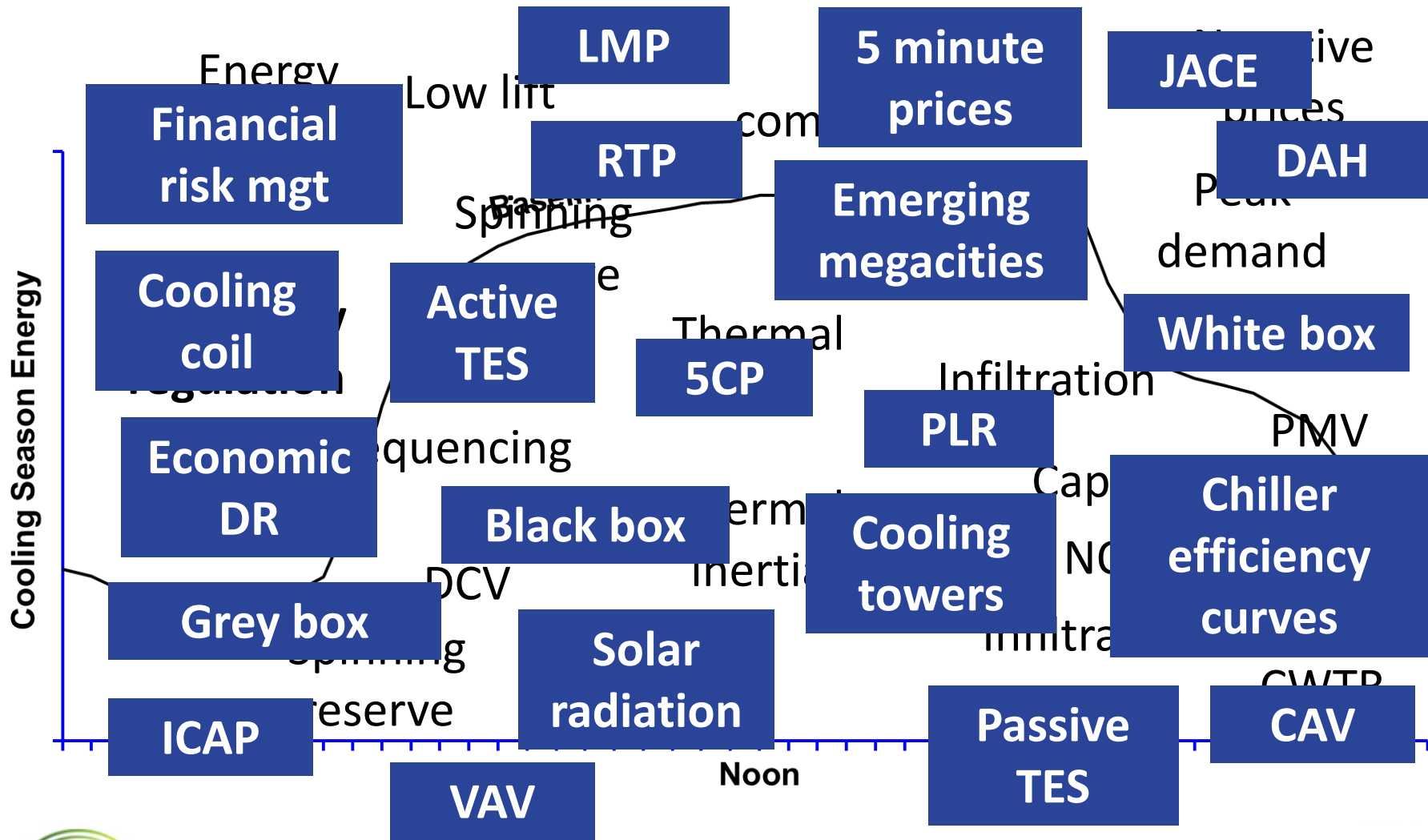


# Multi-disciplinary RD&D!





# Multi-disciplinary RD&D!



# Institutional hurdles

~~Fixed~~ → Hourly prices

~~Site~~ → Source efficiency

~~3<sup>rd</sup> world~~ → Rigorous carbon metric  
w/ unit commitment

~~Capital subsidies~~ → Performance incentives  
M&V certification

~~Incumbents~~ → Stop entry barriers

“All kWhs  
are not the  
same!”

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Building Technology Office  
Solar Energy Technology Office*



# *Buildings as Batteries<sup>®</sup>*

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