



Intelligent Efficiency Conference

Track A: Integrating Distributed Resources

1A Enabling the Virtual Power Plant

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Enabling Buildings as a Grid Resource**

Buildings Offer Enormous Grid Services Potential...



There are more than 5 million commercial, industrial and institutional buildings across the United States

Lodging	Healthcare	Office Space	Warehouse	Education	Other
158,000	157,000	1,012,000	796,000	389,000	3,806,000



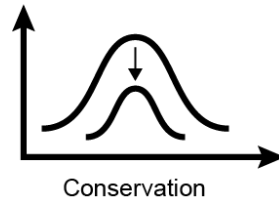
188GW of peak reduction potential*

Opportunities in Buildings: From the Grid's Point of View



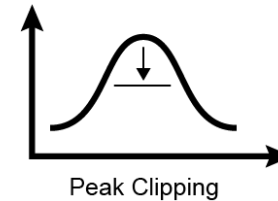
Version 1.0 Energy Efficiency

- Use less energy over time
- Unscheduled
- One-time incentives
- Not controllable



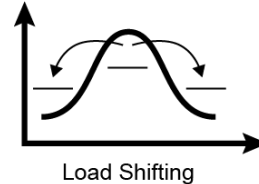
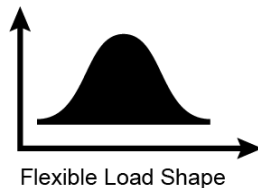
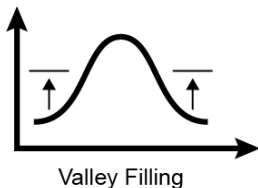
Version 2.0 Demand Response

- Sacrifice-type curtailment
- Few times per year
- On/off



Version 3.0 Grid Resource

- Non-sacrifice
- Utility dispatched (“hand to throttle”)
- Frequent/daily

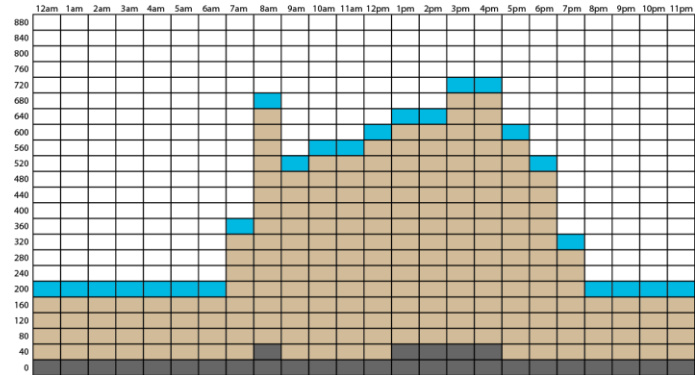


Activating Buildings as Grid Resources



Unaffected Load

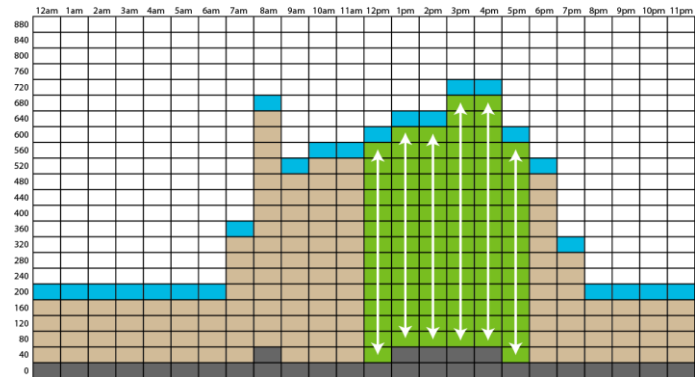
- Core building equipment
- Storage and advanced controls
- Response algorithms
- Replicated over a portfolio of buildings



Unaffected load profile of a building

Grid Services Enabled

- Capacity
- Energy
- Ancillary Services



Building delivering capacity to the grid

Questions?

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