

# Deep Flexibility Through Energy Parks with Thermal Energy Storage

Fast, cheap and  
flexible - how we  
can go further with  
more flexibility

Eric Gimon

ENERGY  
INNOVATION   
POLICY & TECHNOLOGY LLC®



# QUESTIONS FOR THE ESG AUDIENCE

Are you thinking about the full range of possible flexible loads? Not just “DR” which backs off 0.5%-3% of the time?

Challenge for ESG community: how would you adjust interconnection and market rules for dispatchable flexible loads with wide range of behavior (making them potential grid **assets** not **liabilities**)?

## Three ways (cheap, fast, fungible) for flexibility to create grid-industry win-wins



3 cent power



Industry able to access very cheap grid electricity by being very flexible -- dispatchable load with low load factor (25% - 60%). Thermal Battery



Speed to power



Industry co-located in an energy park able to interconnect faster because it acts as a local grid resource. Data center energy park as virtual battery



Sector coupling



Commodity industry able to access variable pricing creates arbitrage between electricity and tradeable commodity. Opportunistic electrolysis for green steel

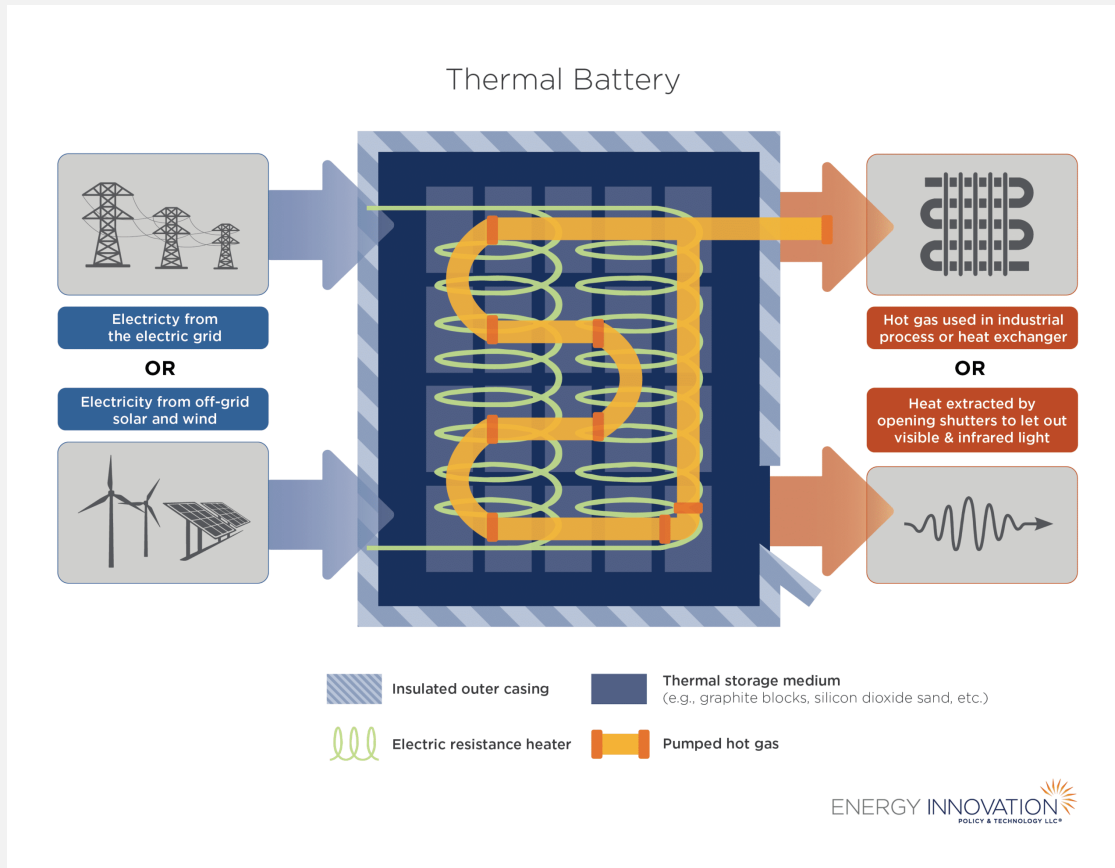
# 3 Cent Power Example: Thermal Batteries

Why 3 ¢ power? That's what it takes to compete with gas!

@ 80% efficiency 3¢ power corresponds to ~ \$7 per MMBtu gas.

Compare in California PG&E Territory:  
Large Industrial Tariff: 25-35 ¢/kWh  
Direct Access Customers: 12-24 ¢/kWh

Bundled Industrial Gas: \$5-9/MMBtu  
Wholesale + Transport: \$3.5-6.5/MMBtu

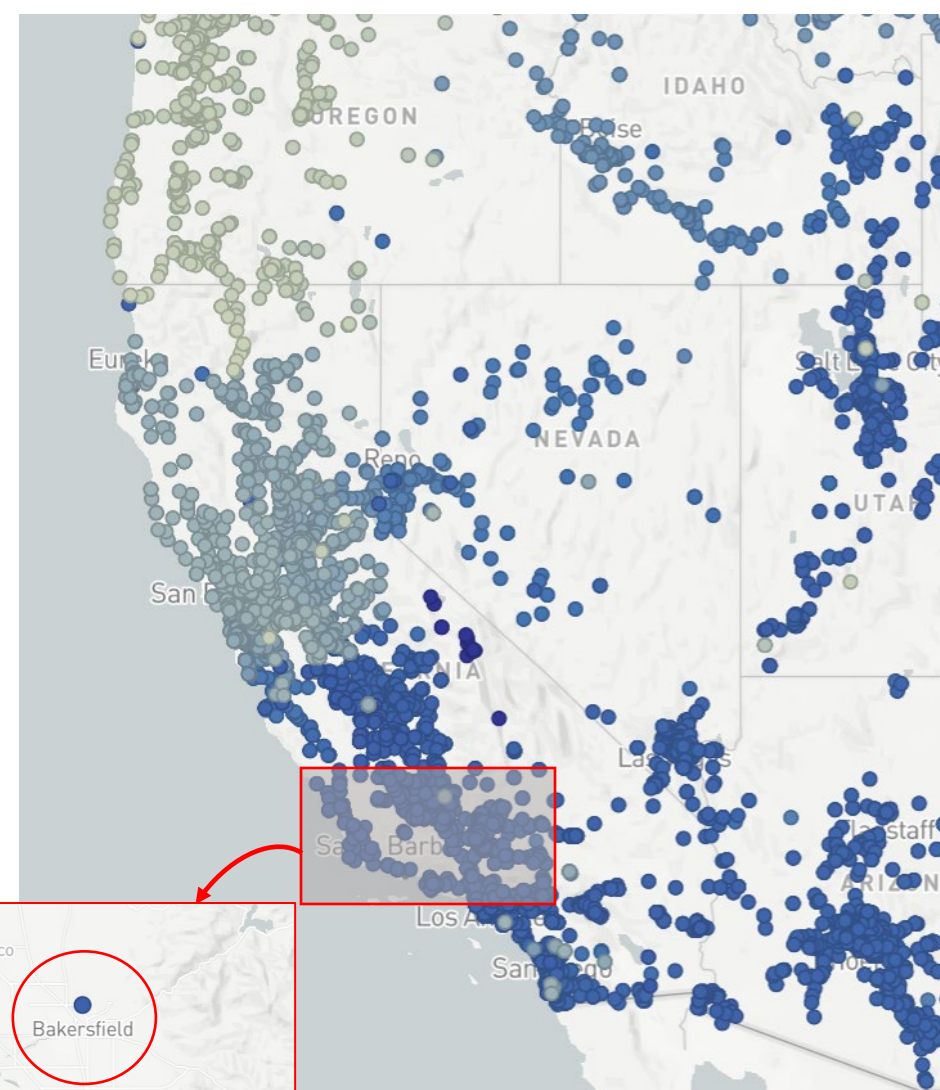
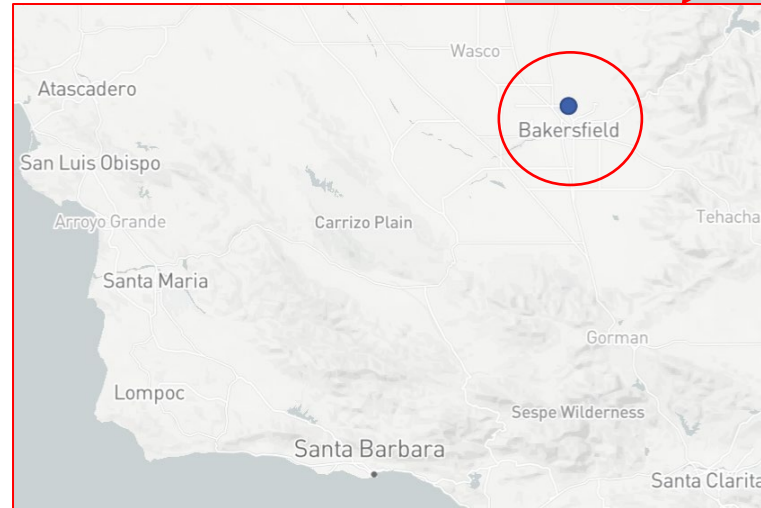


# Solution: Treat the Thermal Battery as a nodal controllable grid resource

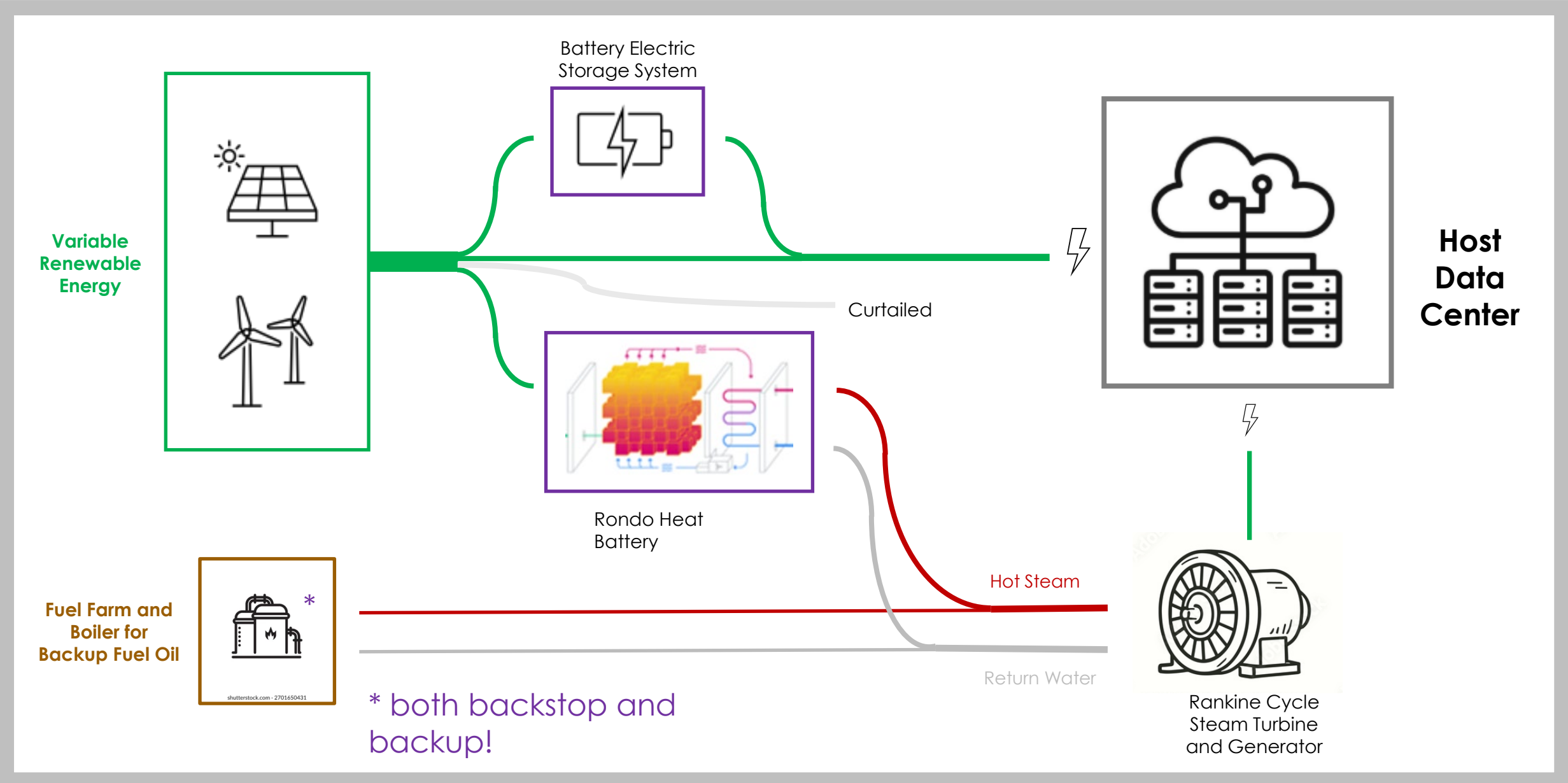
- Direct access rate: **\$120-240/MWh**
- Mean real-time 5min LMP for 2022-2025: **\$46/MWh**
- Thermal battery buying at system energy price: **\$27/MWh**
- Thermal Battery buying at local LMP price with congestion: **\$15/MWh**
- Higher-voltage Transmission Access Charge (TAC): **~ \$20/MWh**  
*(reduce for a dispatchable load?)*

*Imagine treating a controllable load like a dispatchable generator...*

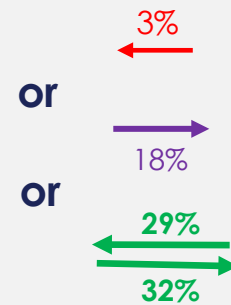
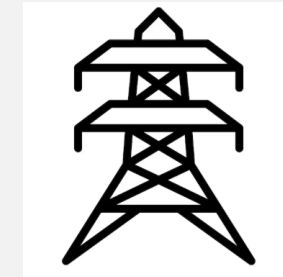
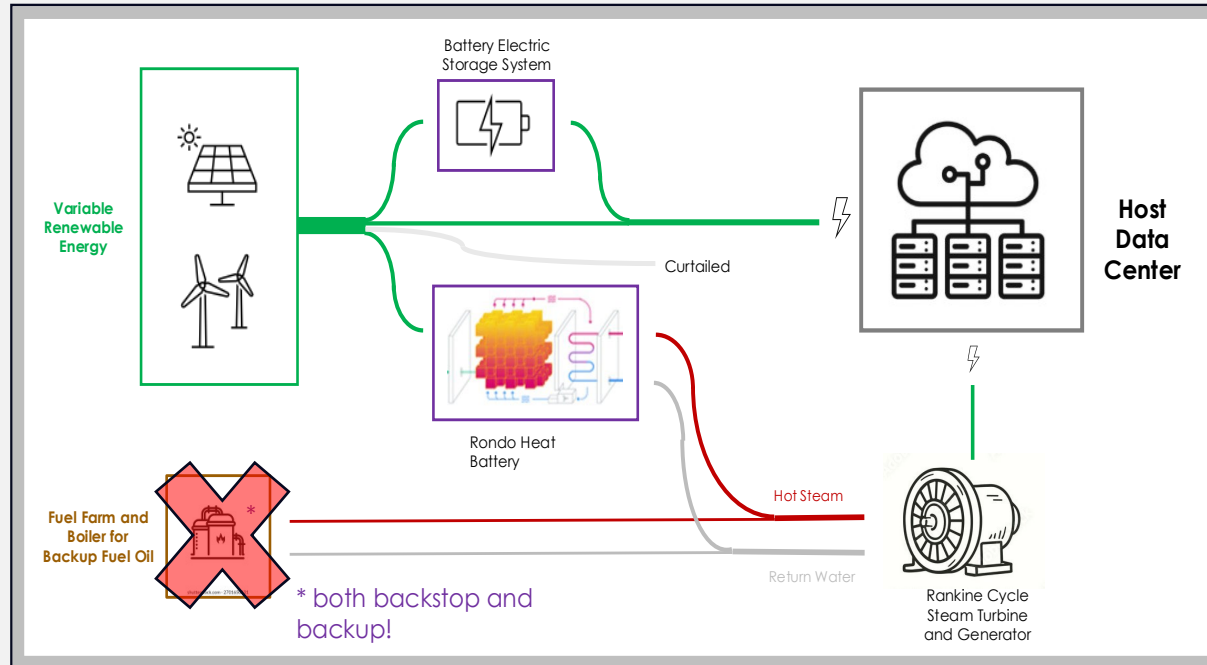
Nodal price data from KERNPWR\_1\_B courtesy of gridstatus.io



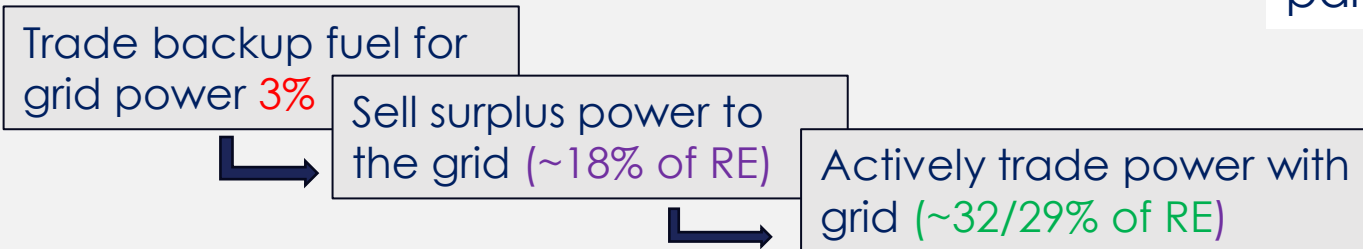
# Speed-to-Power example: 97%+ Low Carbon Data Center



# Speed to Power: Connect Data Center as Virtual Battery

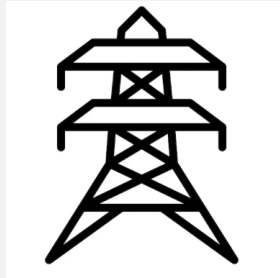


With right non-firm injection and withdrawal rights, off-grid data center clean energy park becomes a **virtual battery** for the grid!

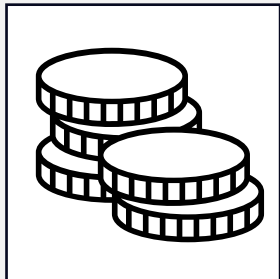


*Could a flexible attribute of clean energy park be fully recognized in interconnection studies?  
Could **hosting capacity increase**?*

# Two Main Barriers to Win-Win Flexibility Solutions

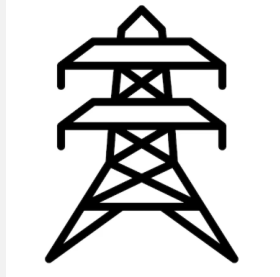


**Dispatchability of loads is typically not considered in interconnection studies**

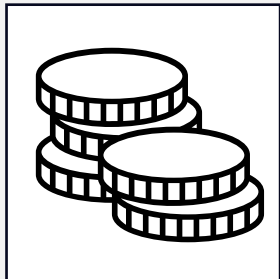


**Loads don't always have direct access to nodal pricing. T&D costs need to recognize value of flexibility**

# Solutions for Win-Win Flexibility Solutions



**Study and credit  
dispatchability of loads and  
hybrids in interconnection  
studies**



**Create dispatchable load  
tariffs or provide direct access  
to nodal pricing with T&D  
discount.**



# Thank you

ENERGY  
INNOVATION   
POLICY & TECHNOLOGY LLC®

**Eric Gimon**

**[ericg@energyinnovation.org](mailto:ericg@energyinnovation.org)**

**[www.energyinnovation.org](http://www.energyinnovation.org)**

This work is accessible under the [CC BY license](#). Users are free to copy, distribute, transform, and build upon the material as long as they credit Energy Innovation for the original creation and indicate if changes were made.

