

Everything You Ever Wanted to Know About Resilience… *but were afraid to ask*..

aka "Getting the Resilience Rules Right…

Electric Security Advisory Panel
Expert Workshop VIII - Tokyo, Japan

June 15, 2018

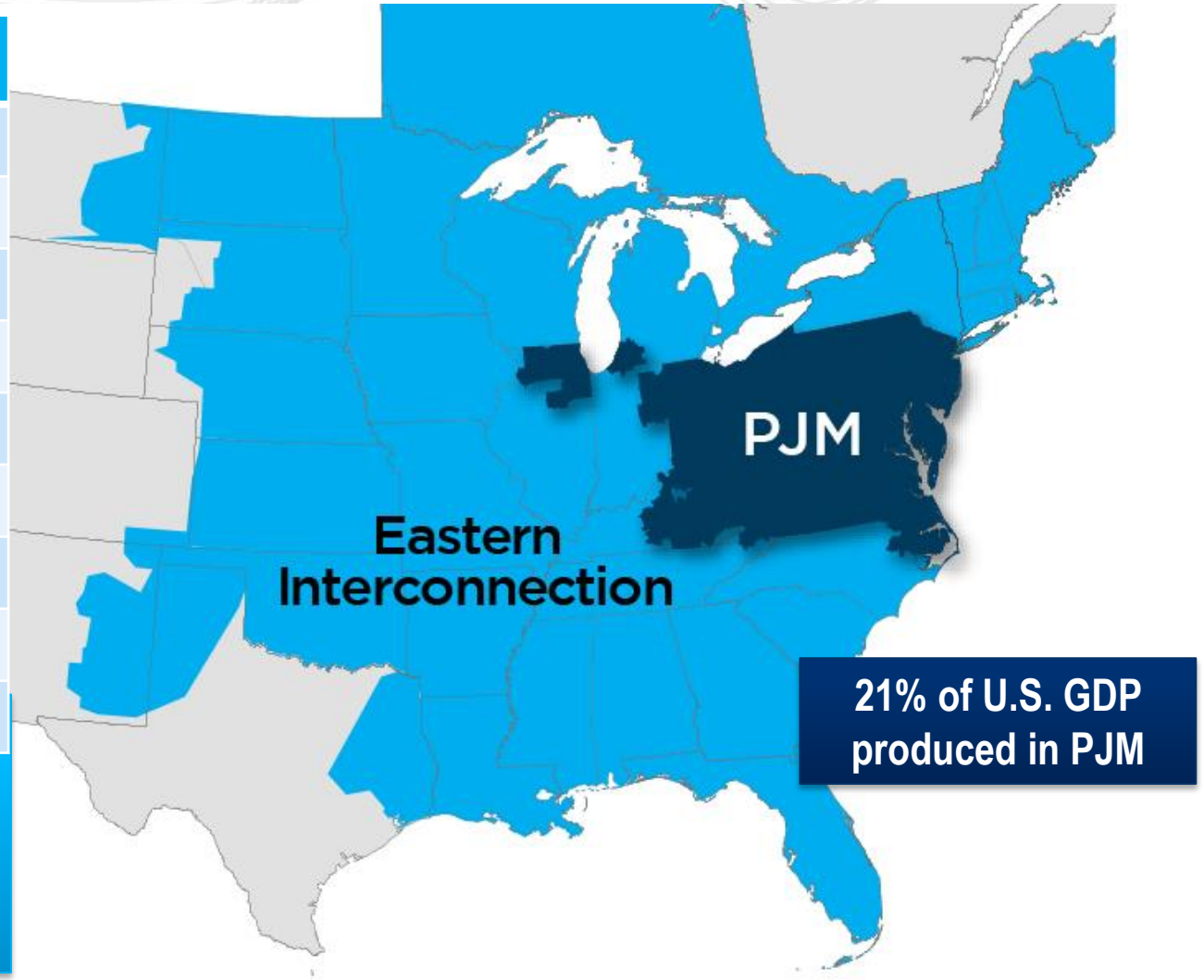
Craig Glazer
Vice President, Federal Government Policy
PJM Interconnection

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PJM as Part of the Eastern Interconnection

Key Statistics	
Member companies	1,040+
Millions of people served	65
Peak load in megawatts	165,492
MW of generating capacity	178,563
Miles of transmission lines	84,042
2017 GWh of annual energy	773,522
Generation sources	1,379
Square miles of territory	243,417
States served	13 + DC

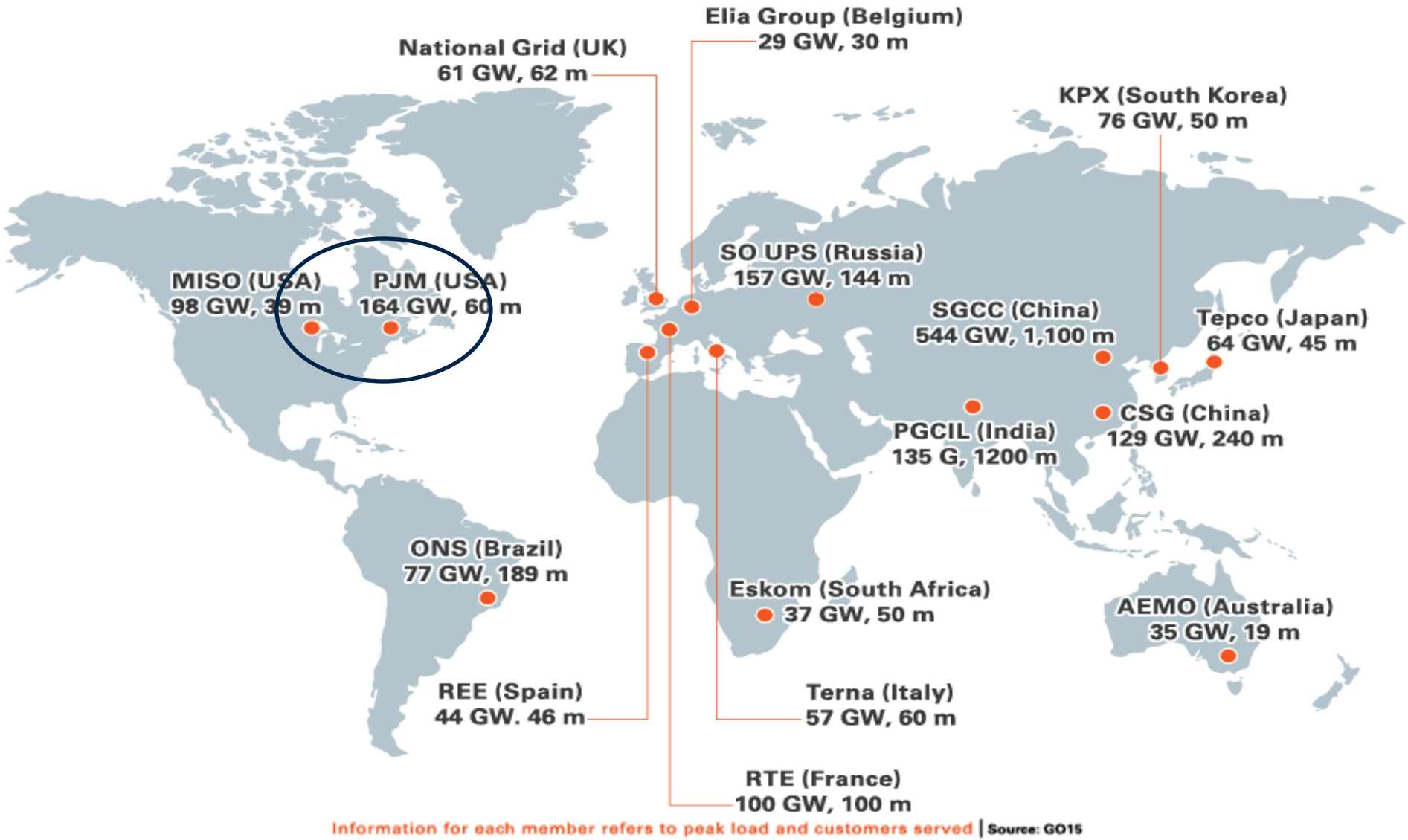
- 27% of generation in Eastern Interconnection
- 28% of load in Eastern Interconnection
- 20% of transmission assets in Eastern Interconnection



As of 2/2018

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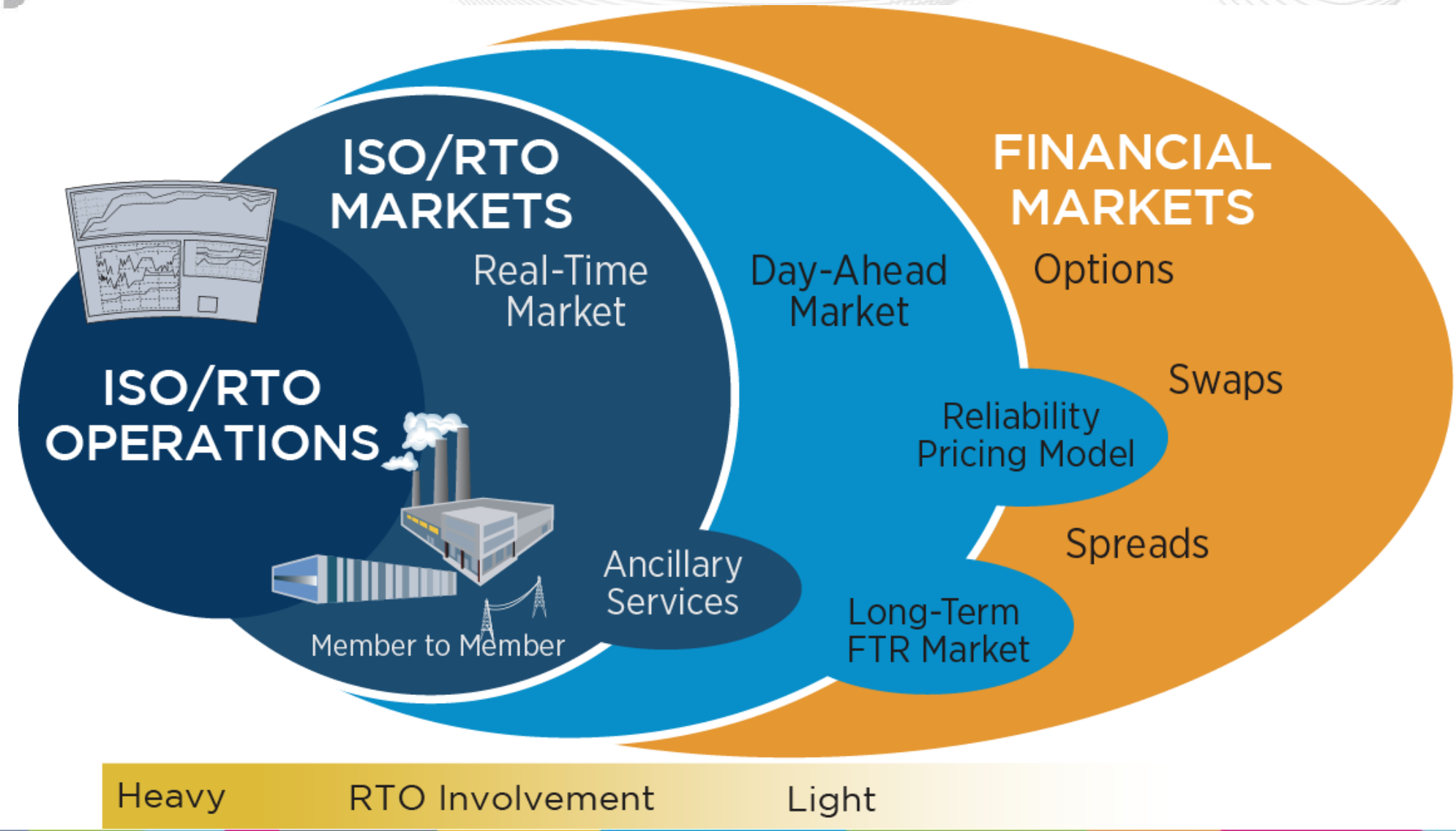
Major Grid Operator Comparison



Information for each member refers to peak load and customers served | Source: GO15

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Evolution of Markets



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RESILIENCE 101:

Starting with the Basics…

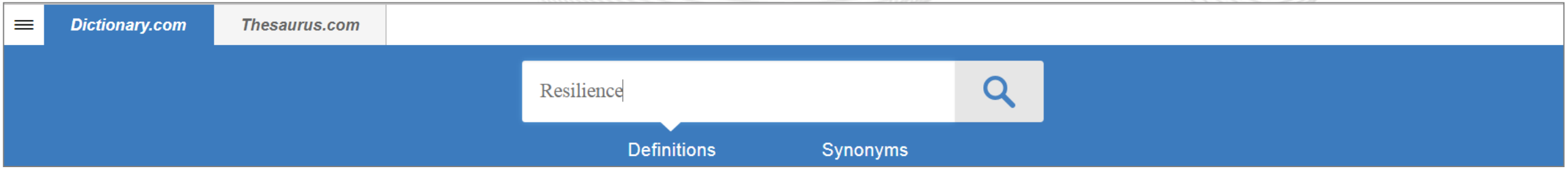
Mrs. Gould's admonition:

> **"*If you don't know what it means, look it up in the dictionary*!"**



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Resilience – Dictionary Definition



1. The power or ability to return to the original form, position, etc., after being bent, compressed, or stretched; elasticity.

2. Ability to recover readily from illness, depression, adversity, or the like; buoyancy.

Synonyms:
“flexibility” “recoil” “snap” “pliancy”

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Resilience – PJM Definition

- "The ability to withstand or reduce the magnitude and/or duration of disruptive events, which includes the capability to identify vulnerabilities and threats, and plan for, prepare for, mitigate, absorb, adapt to, and/or timely recover from such an event

- Key elements:
  - Identify
  - Plan and prepare for
  - Timely recover from



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Planning – Key Reforms

- Resilience 1.0 – Consider enhancing resilience under existing planning criteria – range of possibilities do “no harm” (i.e. don’t make an existing problem worse)
- Opportunistic – incorporate resilience as a factor in our selection among Order 1000 competitive proposals
- Resilience 2.0 – address resilience as a stand-alone driver

Related Reforms

- Developing resilience measurement tools – Resilience criteria would require new analytical procedures and tools assess vulnerabilities
- Develop resilience indices
- Interconnection coordination with natural gas pipelines



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Operations – Key Reforms

- Dual fuel requirements for black start and critical load
- Behind the meter resources: visibility and dispatchability
- Gas/electric coordination
  - Real time modeling of contingencies
  - Consistency in information sharing
  - Triggers for conservative operations



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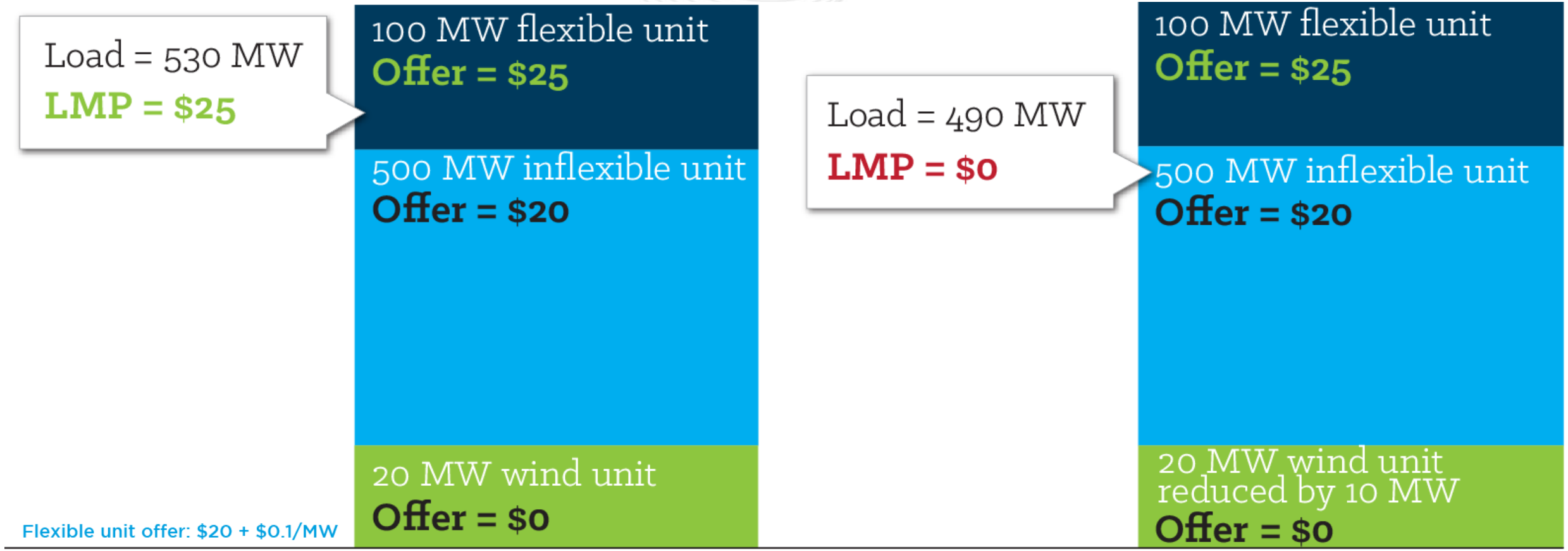
Markets – Key Reforms

- Identification and valuing of reliability attributes
- Pricing reforms to reflect value of all units needed to serve load
- Shortage pricing signals



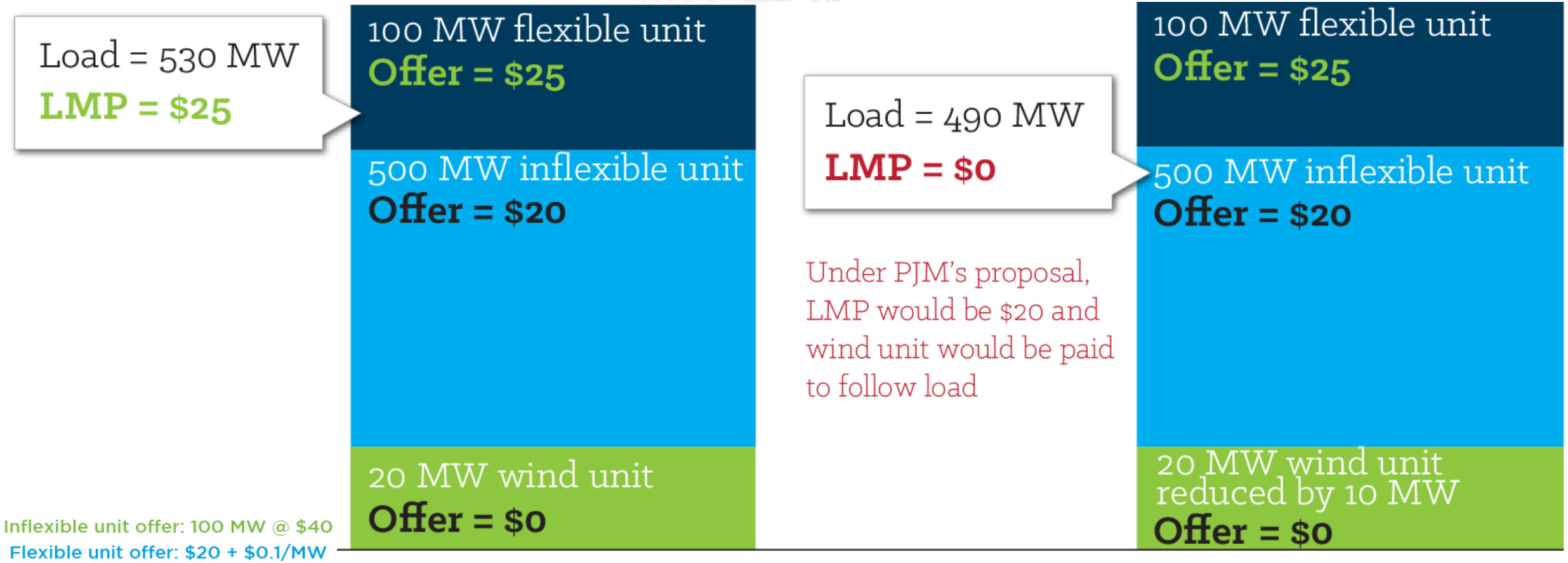
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Value of Base Load Resources is not Transparent Today



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Value of Base Load Resources is not Transparent Today



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System Restoration – Key Reforms



- Identification of critical load
- Gas Coordination of restoration plans
- Coordination with telecommunications and water utilities
- Enhancing restoration resources – black start needs, behind the meter resources etc.

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An added Complication:

Who Decides?



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Who Decides?

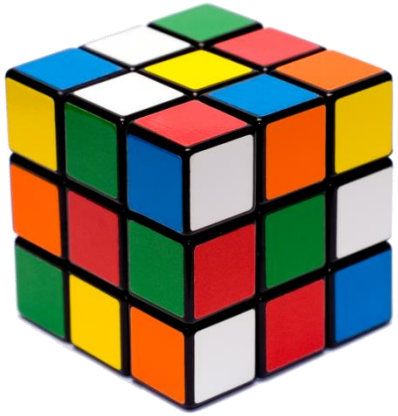
- States
  - State Energy Policies (governors/legislators)
  - State PUCs
- FERC
- Environmental agencies
- Department of Energy
- Congress
- US Supreme Court
  - Demand response case
  - Hughes case



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Resilience: An actionable goal or a new fad?









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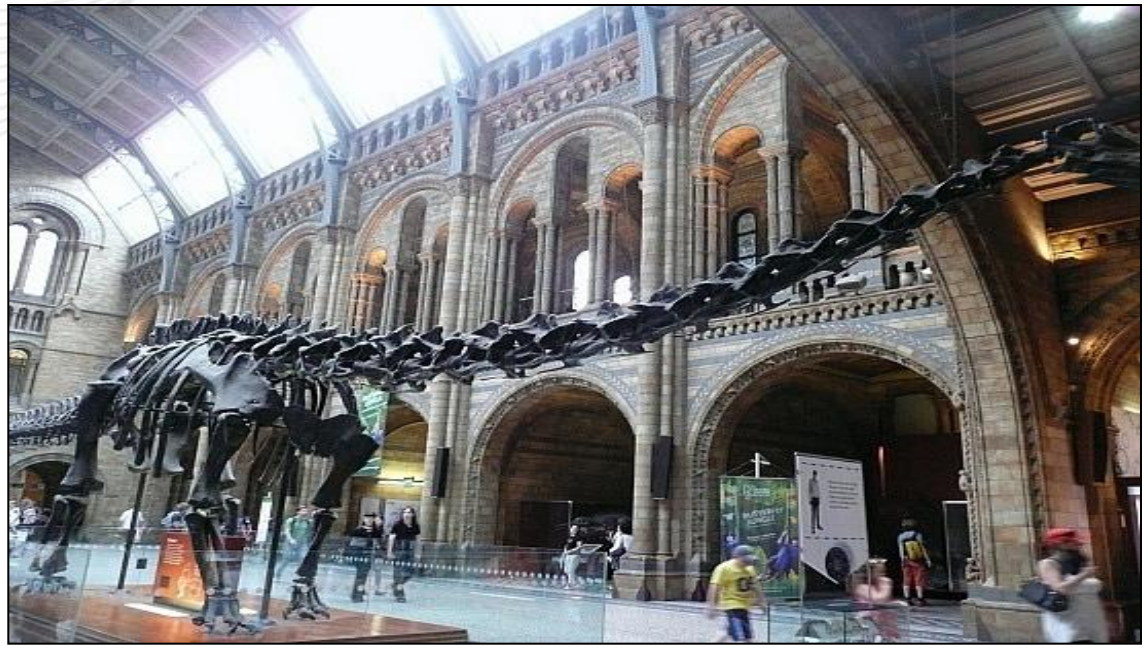
The Goal of a Resilient Future Grid…



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Or…a passing buzzword relegated to the ash heap of history





The choice is ours….

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Let's talk….

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