

Power Markets for Reliability (and Resilience)

RFF/R St. Webinar
June 18, 2018

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Standard Economic Policy Framework

Markets vs Regulation

Markets More Efficient

Regulation More Efficient



Competitive structure

Non-competitive structure

Market structure characteristics:

- Many buyers and sellers
- Perfect information
- No transactions costs
- All firms price takers
- Homogeneous product
- Free entry and exit

Structural imperfections/failures:

- Market Power (few suppliers)
- Public good (free rider)
- Externality
- Principal-agent
- Poor information
- Transactions costs
- Barriers to entry or exit



Cures to match the disease:

Appropriate Policy Instruments based on degree of competition

Light-handed

Command-and-control



Low Market Failures

Significant Market Failures

Posting contract prices

Mandatory technology standards

Quantity standard

Unregulated sales,
Price set by supply
And demand

Bidding restrictions

Performance standards

Cost-of-service with
Obligation to serve
(RMR)

Scarcity pricing as
Proxy for demand

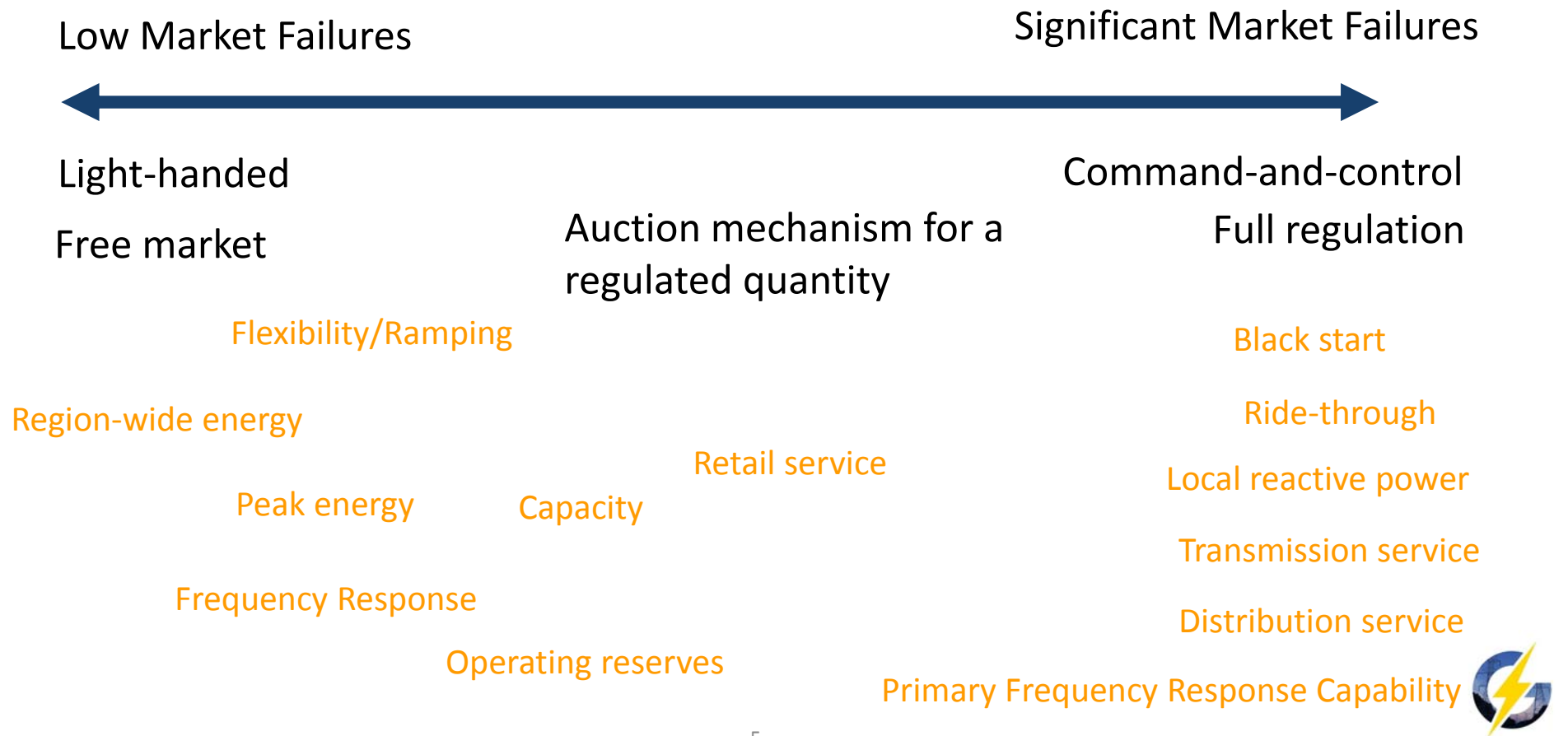


Market Imperfections in Electricity Services

Electricity Service	Market Imperfection/Failure
Distribution, transmission	Natural monopoly, externality
Region-wide energy	Mostly competitive with limited market power
Peak energy	Mostly competitive, public good, limited market power
Local energy	Market power
Frequency support	Public good
Reactive power support (localized)	Market power, public good
Operating reserves	Public good
Ride-through	Transactions costs, public good
Flexibility/ramping	Public good
Retail service	Limited natural monopoly/scale



Appropriate Regulation of Electricity Services



How Resilience Changes This Analysis

- It doesn't
 - Resilience is mainly about distribution, to some extent transmission
 - Not generation
 - Essential Reliability Services are still the same
 - No such thing as “resiliency services”
 - HILF events already part of reliability, resource adequacy
 - Contingency planning
 - Probabilistic assessment of supply



Are All Plausible Threats Being Considered?

- Appropriate for reliability to periodically review threats
 - Growing Threats
 - Polar vortices
 - Hurricanes, wild fires
 - Physical attack, incl. EMP
 - Cyber attack
 - Pre-existing threats that still need attention
 - GMD
 - Common mode failures
- But generation-related products and services are still the same and should be regulated with the appropriate instrument based on the same criteria as have been used



Current Legitimate Reliability Issues with Generation

being considered by NERC and RTOs

- Common mode failures affecting multiple generators that are getting credit for having uncorrelated outages
- Peak energy supply in Northeast/Midwest winter Polar Vortices
 - If gas and transmission import constraints
- Ride-through capability and settings on inverter based technologies
- Inertia/Fast Frequency Response adequacy with declining amounts of synchronous generation



Market Design for Reliability, Resilience, Efficiency

- FAST
 - Short dispatch intervals handling fast ramps
- FAR
 - Large regional central dispatch netting out variability and managing congestion, operating on an expanded grid
- FULL
 - Set of products: Short-term energy, flexibility, frequency and voltage support (Essential Reliability Services)
- FAIR
 - Technology neutral
 - Allow all potential suppliers to offer
 - Compensate delivered services, not “attributes.”

