

# Designing Competitive Energy Markets

Dr. Judith Cardell  
Office of Economic Policy  
Federal Energy Regulatory Commission  
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judith.cardell@ferc.fed.us

## Overview

- ⌘ Evolution of US electric power industry
- ⌘ Federal regulation
- ⌘ Designing competitive markets
- ⌘ Example: Mid-Atlantic region
- ⌘ Impediments to competition
- ⌘ Conclusions

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## Power Industry Evolution

- ⌘ Technology
  - ☐ 1920s isolated systems, economies of scale
  - ☐ 1960s economies of scale run out, aerospace technology brings the gas turbine
- ⌘ Policy
  - ☐ 1920s owners request regulation in exchange for protection from competition - franchise monopoly
  - ☐ 1970s consumers notice prices too high and demand competition (industrial sector)

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## Energy Legislation

- ⌘ 1935: Federal power act and public utility holding company act (FPA and PUHCA)
- ⌘ 1978: Public utility regulatory policy act (PURPA)
- ⌘ 1992: Energy policy act (EPACT)
- ⌘ 1996: FERC Orders 888 and 889
  - ☐ FERC jurisdiction for wholesale transactions comes from Federal authority for interstate commerce

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## Energy Legislation

- ⌘ Legislation—promulgated by Congress, tends to lag behind actual events and popular sentiment (intent not always clear)
- ⌘ Agency policies—FERC, EPA, FTC...—tend to lag behind Congressional actions
- ⌘ What *does* policy accomplish?—Policy makers set the *specific* agenda for the *general* changes pushed by other groups.

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## Regulation

### ⌘ What FERC does

- ☑ Approve transmission and wholesale energy rates
  - ☑ Price regulation
  - ☑ Rates must be “just and reasonable,” FPA §205 (Federal Power Act, section 205)
- ☑ Approve transfers of ownership or control of regulated facilities
  - ☑ Filing must be “consistent with the public interest,” FPA §203
- ☑ Reactive rather than proactive, but provide guidance

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## Deregulation?

- ⌘ Removing regulatory oversight from a highly concentrated, vertically integrated industry will not result in a competitive market.
- ⌘ In this situation, competitive markets must be intentionally designed and created.
- ⌘ The regulatory role changes, but will not disappear until ... ?

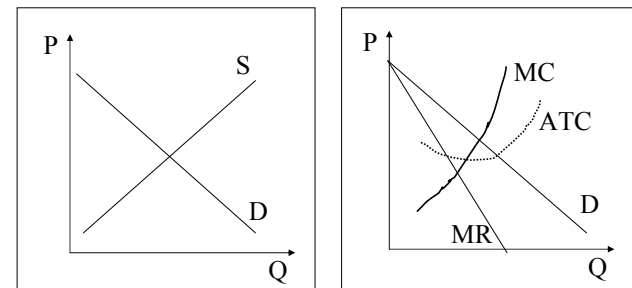
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## Back to Basics

### ⌘ Characteristics of a competitive market



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## Introducing Competition

- ⌘ Economic issues
  - Design a market place
  - Mitigate market power - a tremendous problem
- ⌘ Technological constraints
  - Update existing system operation software to accommodate *more* players who are *competing*
  - Create new software for internet-based marketplace
- ⌘ State and Federal jurisdiction battles

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## Market Design

- ⌘ Identify market participants
- ⌘ Identify products
- ⌘ Design the marketplace (idealized goal)
  - Where will trades occur?
  - How will price be determined?
  - How will participants interact?
- ⌘ Design the transition period
- ⌘ Address impediments to competition

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## The Previous “Marketplace”

- ⌘ The participants
  - Electric utilities
  - Native, captured load
- ⌘ The product
  - Bundled electric energy (kWh), including transmission service
- ⌘ The marketplace
  - None

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## Power Industry Structure: Which Segments are Competitive?

- ⌘ Generation
  - Can be competitive
  - Public goods, joint products (ancillary services)
- ⌘ Transmission network
  - Natural monopoly (common carrier)
  - Public goods
  - The control of transmission affects the operation of the energy market
  - \* Can not direct or control power flows \*
- ⌘ Distribution (state jurisdiction)

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## Power Industry Players: Who Wants Competition?

### ⌘ Interested in competition

- Large industrial customers
- Energy marketers
- Independent generation owners
- Federal regulators

### ⌘ Only moderately interested

- Vertically integrated utilities (IOUs)
- Municipal and public power utilities
- Retail customers - benefits small and dispersed
- Environmental advocates
- State regulators

## Market Design: Products

### ⌘ What are the “unbundled” products?

- Transmission
- Energy
- Capacity
- Ancillary services: frequency and voltage support, energy reserves (joint products with energy)

### ⌘ How should the products be marketed?

- Should there be a single energy, capacity and services market, or
- Should there be many separate markets?

## Market Design: Marketplace

### ⌘ Where and how will buyers and sellers meet?

- How provide incentives for participation? Force participation?

### ⌘ Create a centralized or decentralized market?

- Require participants to interact through a central facility (internet-based trading floor)?
- Require participants to find their own bilateral trading partners?
- Allow both methods to be used?

## Market Design: Information

### ⌘ Understanding system design

- The market rules are new to everyone
- People lack information on how to behave and what to expect from others

### ⌘ Access to data

- Buyers need price transparency
- Regulators need data to assess extent of competition
- Everyone needs technical data, which may now be

## Market Design: Price

### ⌘ How is price determined?

- Allow market based prices?
- How will market prices be determined *before* a market exists? (The current situation.)
- Allow a central authority to set a price cap? Even if set very high, it may be viewed as a security blanket.
- Use a theoretical competitive price as a reference point?

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## Market Design: Public Goods

### ⌘ Defining public goods: Ancillary services

- Non-rival consumption
- Non-excludability, free-riders

### ⌘ Determining quantity

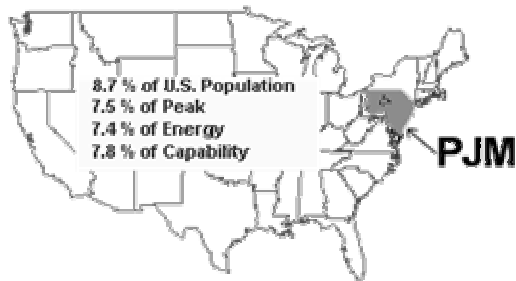
- Market forces alone will not achieve the efficient level of supply (frequency & voltage support, reserves)
- Who determines quantity required for each service and how?
- Who pays for the services?

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## Example: Mid-Atlantic Region



*PJM is the largest centrally dispatched control area in North America.*

PJM is the market center and system operator for the Pennsylvania, New Jersey and Maryland electric utilities.

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## Example: Mid-Atlantic Region

### ⌘ Players

- Local electric utilities
- Residential customers
- Industrial customers
- Regulators, state and Federal
- Electric utilities external to PJM

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## Example: Mid-Atlantic Region

### ⌘ Products

- ☒ Generation
  - ☒ Energy - kWh, what you see on your bill
  - ☒ Capacity - MW
  - ☒ Ancillary services - services provided by generators that are required for transmission service
- ☒ Transmission
  - ☒ Transmission capacity - essentially transportation
  - ☒ Ancillary services - provided by generators, yet part of transmission service

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## Example: Mid-Atlantic Region

### ⌘ New industrial structure

- ☒ New *independent* system operator (ISO) runs the transmission system
- ☒ Generation is competitive and deregulated

### ⌘ New players

- ☒ The PJM system operator, [www.pjm.com](http://www.pjm.com)
- ☒ Energy marketers and independent generation owners
- ☒ Merchant branch of regulated utilities (affiliates)

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## PJM Energy Market

### ⌘ The ISO operates a central market facility

- ☒ Day-ahead energy and capacity markets
- ☒ Hour-ahead energy markets, and
- ☒ Spot energy markets
- ☒ Ancillary services automatically included by ISO

### ⌘ Participants can join the ISO markets or set up bilateral transactions on their own

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## PJM Marketplace Design

### ⌘ The “Marketplace” is an internet site that simulates the market and contains:

- ☒ Price
  - ☒ Nodal (locational) energy prices for 1600 nodes
  - ☒ Transmission rates (regulated)
  - ☒ Ancillary services, a mix of regulatory oversight and market bidding
- ☒ Quantity: Transmission availability

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## PJM Competitive Issues

### ⌘ Ancillary services

- ☒ Players in the centralized energy spot market must supply ancillary services if technically capable
- ☒ Preventing withholding helps mitigate market power

### ⌘ Market power (for all products)

- ☒ Independent monitoring unit files reports
- ☒ Alternative dispute resolution
- ☒ Formal complaint process
- ☒ Regulatory oversight as a backstop

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## FERC Design Method: Transition to Competition

### ⌘ Determine time allowed for transition period

- ☒ Currently 5 to 6 years is common

### ⌘ Determine rules during the transition period

- ☒ Rights and obligations of participants
- ☒ Entry process for new participants

### ⌘ Create non-governmental monitoring groups that all participants trust, and that report to government regulators

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## Impediments to Competition

### ⌘ Participants lack experience

### ⌘ Designers lack experience

### ⌘ General lack of information and data

### ⌘ Conflicting objectives

- ☒ Incumbents resist change
- ☒ Entrants demand immediate change
- ☒ State regulators protect ratepayers (a.k.a. voters)
- ☒ Regulatory capture: regulators know and identify with the utilities

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## Incentives to Incumbents

### ⌘ In exchange for accepting mitigation, and to avoid long court battles, regulators offer incentives

### ⌘ Company incentives (bribes)

- ☒ Allow companies to recover their capital costs more quickly (stranded costs)
- ☒ Allow market based rates for some products early
- ☒ Bribes evolve into entitlements!

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## What Has Changed?

- ⌘ Assume I wanted to build a generator pre-1996
- ⌘ Pepco could prevent me from using the transmission system - no “open access”
- ⌘ I could not sell to Pepco’s retail load
- ⌘ I could not buy transmission capacity to sell elsewhere
- ⌘ There was no facility for price clearing to set energy prices

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## Currently in PJM

- ⌘ Transmission owners must let competitors in the energy market connect to their transmission system
- ⌘ Transmission owners must post prices and availability of transmission service and not favor their energy marketing affiliates (moderately successful)
- ⌘ PJM provides real time market-based energy prices
- ⌘ More participants facilitates bilateral trading
- ⌘ I still can not serve retail load

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## Summary

- ⌘ Enabling legislation
- ⌘ Respond to industry and political winds
- ⌘ Offer guidance to industry
  - ☒ Define products, new market structures, and participants’ responsibilities
  - ☒ Design the implementation, transition period
  - ☒ Provide for market monitoring
  - ☒ Ensure access to data and information
  - ☒ Prevent market power abuse

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## Summary: Market Power

- ⌘ Traditional, vertically integrated monopolies
  - ☒ Have market power by definition
  - ☒ Want to use their private property as they see fit
- ⌘ Must create competition
  - ☒ Simply removing regulatory oversight is not enough
- ⌘ Mitigate market power
  - ☒ Difficult to identify (prove) who has market power
  - ☒ Design methods to mitigate market power

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# Conclusions

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## ⌘ Competitive markets

- ☒ Promote the efficient use of resources
- ☒ Incompatible with market power, so some regulation must persist

⌘ FERC's role is to facilitate market development, but not to design and impose a single structure for all regions, even if it is theoretically ideal.