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Midwest ISO Functions and Stakeholder Process

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RTO functions

From FERC Order 2000:

- Manage open access transmission
- Reliability
- Energy Market
- Planning

Open Access Transmission, Energy and Operating Reserve Markets Tariff ("Tariff")

- Divided into Modules, Schedules, Attachments, Rate Schedules
- 3,000+ pages
- 80+ Tariff-related filings made with FERC in 2010
- eTariff – baseline filing successfully submitted to FERC in July 2010

Midwest ISO Tariff (cont'd)

- **Module A – Definitions; Ancillary Services; Billing & Payment;**
- Limitations of Liability; Creditworthiness; Dispute Resolution
- • **Module B – Point-to-Point Transmission Service (Firm and**
- Non-Firm); Network Integration Transmission Service
- • **Module C – Day-Ahead Markets; Reliability Assessment**
- Commitment; Real-Time Markets; Financial Transmission
- Rights
- • **Module D – Market Monitoring Plan; Market Mitigation**
- • **Module E – Resource Adequacy**
- • **Module F – Coordination Services**

Midwest ISO Tariff (cont'd)

- **Schedules 1-36: Ancillary Services; Point-to-Point and** Network Integration Transmission Service; Cost Adders; Emergency Demand Response; Blackstart Compensation
- **Attachments A-RR: Form Agreements for Transmission** Service and Study Agreements, Rate Formulas, List of Customers and Grandfathered Agreements; Compensation for Rescheduling Transmission Outages
- **Rate Schedules: Transmission Owners Agreement;** Coordination Agreements

Items to cover

- Market design, pricing, redispatch
- LMP, FTRs, uplifts, RSG, ELMP
- Concerns with markets
- Dispatchable Intermittent Resources (DIR)
- Scarcity pricing
- Seams issues

Context: Items to Think About

- Who is exposed to the Midwest ISO markets?
- Market efficiency goals
  - Is use of MCP, ELMP, FTRs, headroom, uplifts and RSG the best market design?
  - How do we best ensure the right type of resource in the right place at the right time?
- Who is responsible for resource adequacy?
- Why so complicated (and so many rules)?
  - Reliability overshadows other goals
  - Market power exercise and mitigation

Market Design - Prices

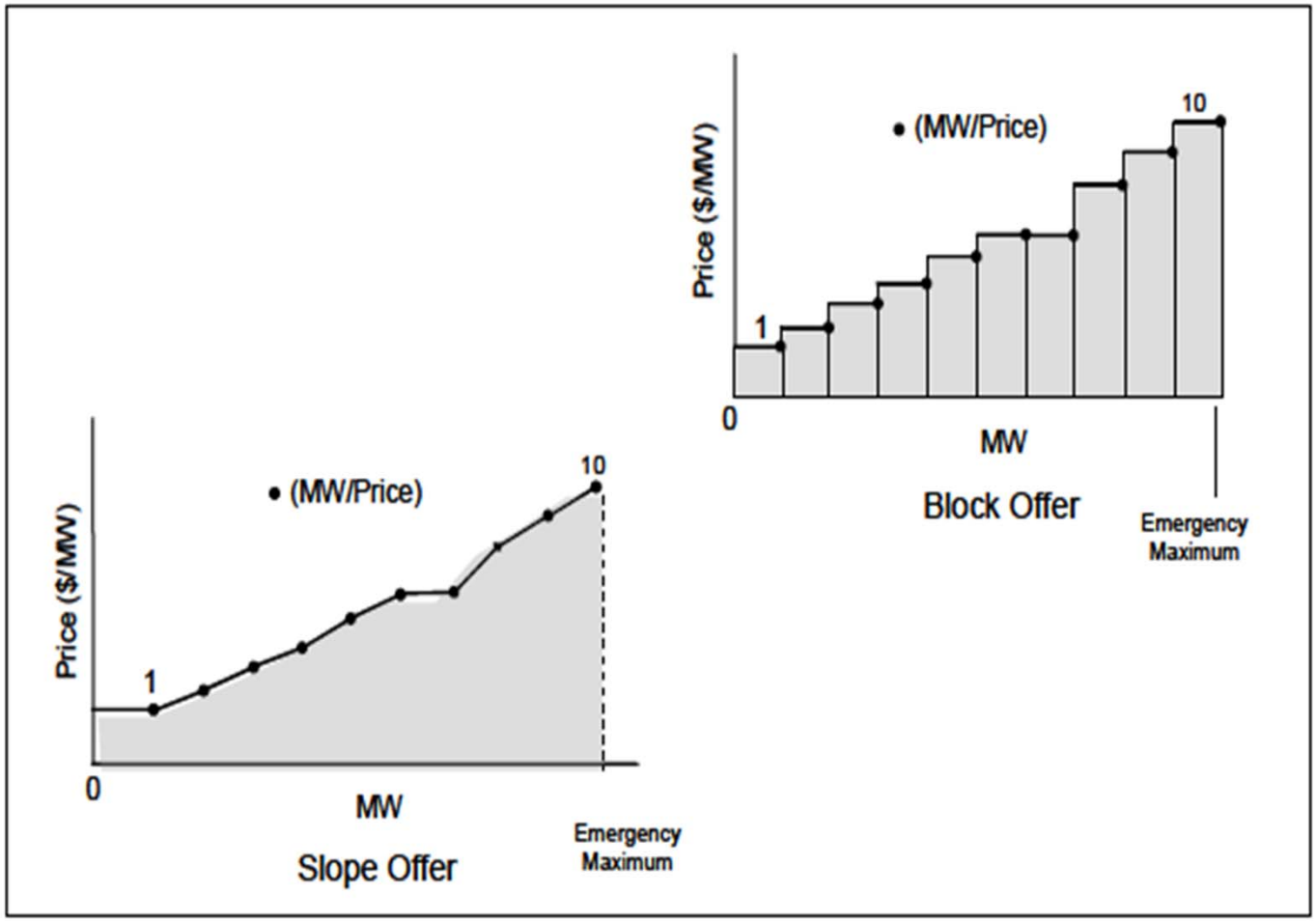
- Day Ahead hourly prices and Real Time 5-minute prices (DART)
  - DART energy, regulation, contingency reserve markets
  - DA is financial, RT is physical
  - Suppliers offer, Load Serving Entities (LSEs) bid in each
  - One market clearing price applies to all cleared
  - Market Clearing Price (MCP) is marginal, or variable cost of marginal resource
  - Goal is efficient use of resources
  - Virtual supply and load can participate
  - About $40 billion per year market transactions

Market Design - Prices

- Day Ahead (DA) and Real Time (RT) prices
  - No requirement for MPs to use market prices
  - Can self schedule own resources or contract for resources
  - May want to participate in market to use resources of others dispatched by MISO when cheaper.
  - Exposure to cheaper regional resources reduces costs.
  - Exposure to RT prices is a matter if what, where, and when.

Market Design - Prices

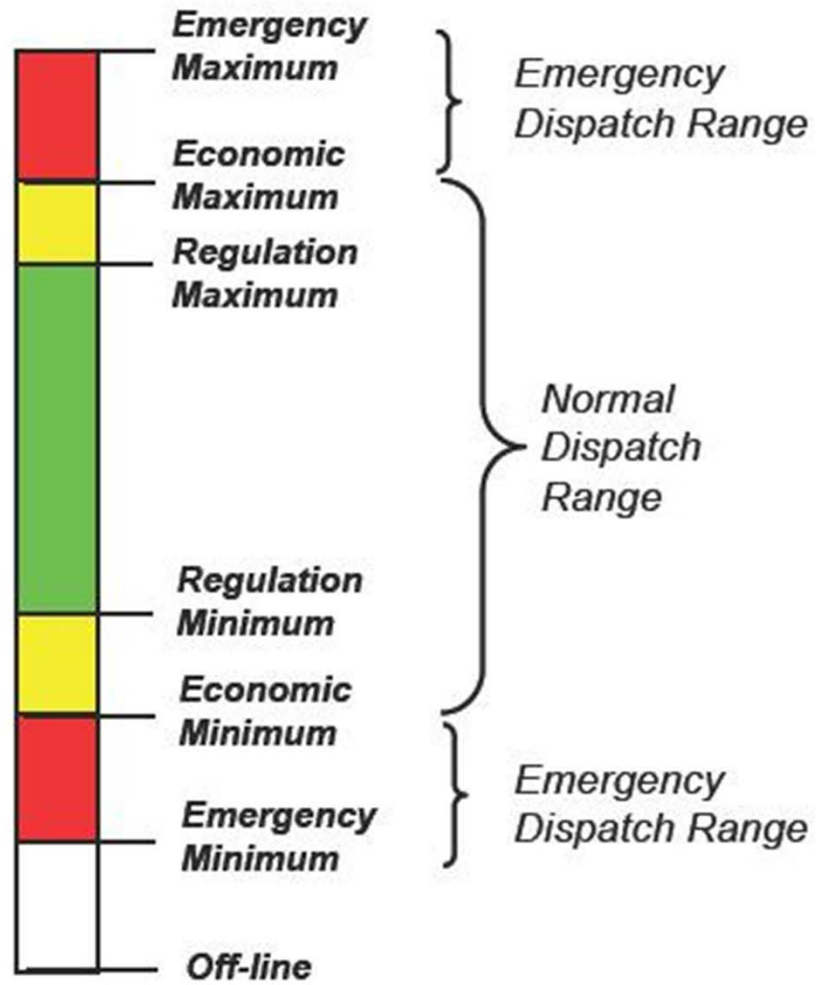
Exhibit 4-11: Types of Energy Offers



Market Design - Prices

- Hourly Dispatch Limits

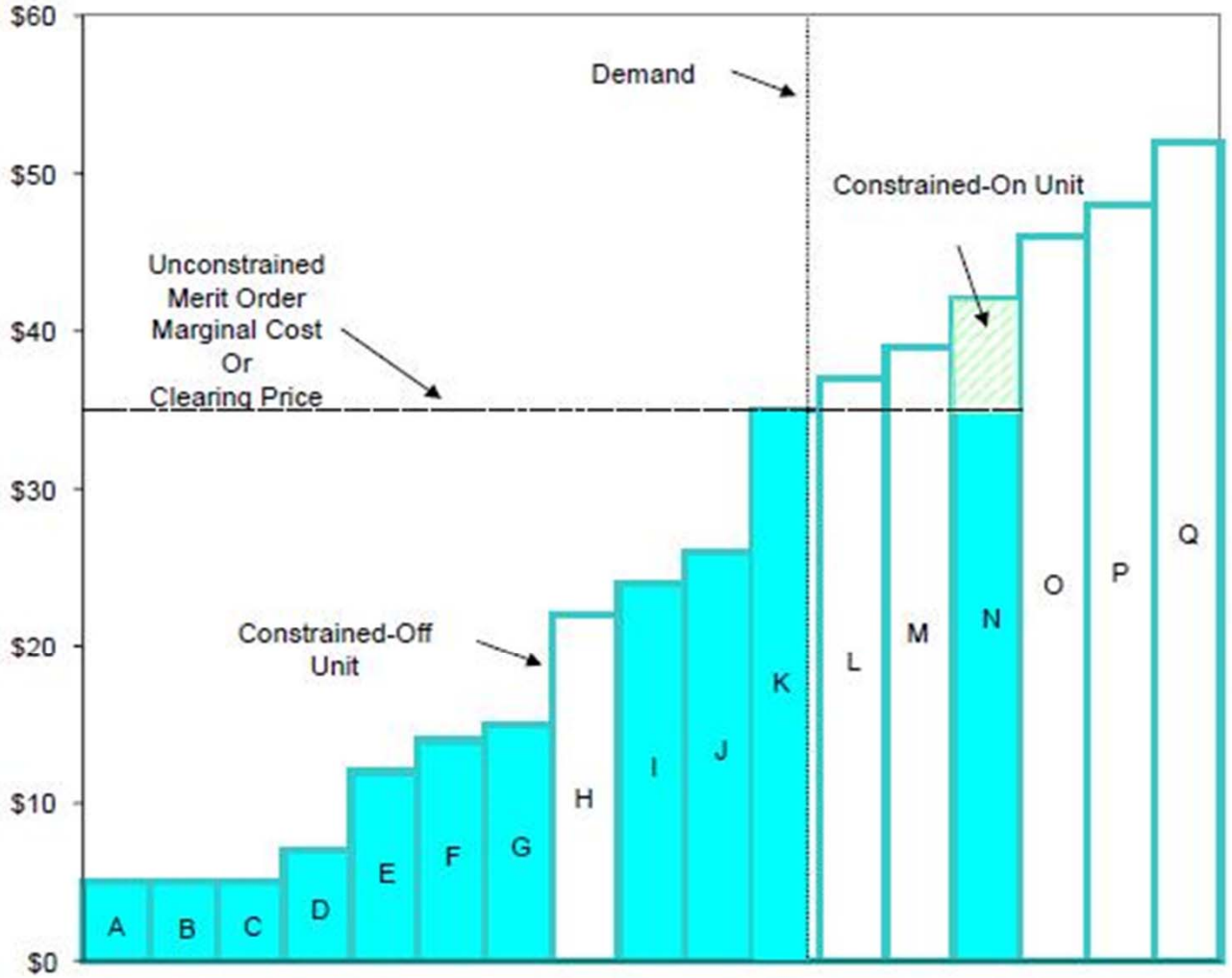
Emergency Maximum
≥
Economic Maximum
≥
Regulation Maximum
≥
Regulation Minimum
≥
Economic Minimum
≥
Emergency Minimum



Market Design - Redispatch

- RT Market Redispatch every 5 minutes also addresses transmission constraints
  - Must Run resources and need for uplift
  - Resource efficiency less than perfect economic goal
  - Significant improvement in transmission efficiency
  - More efficient than Transmission Line Loading Relief (TLRs)
  - Resource reimbursed thru MCP and uplift (RSG)

Market Design - SCED



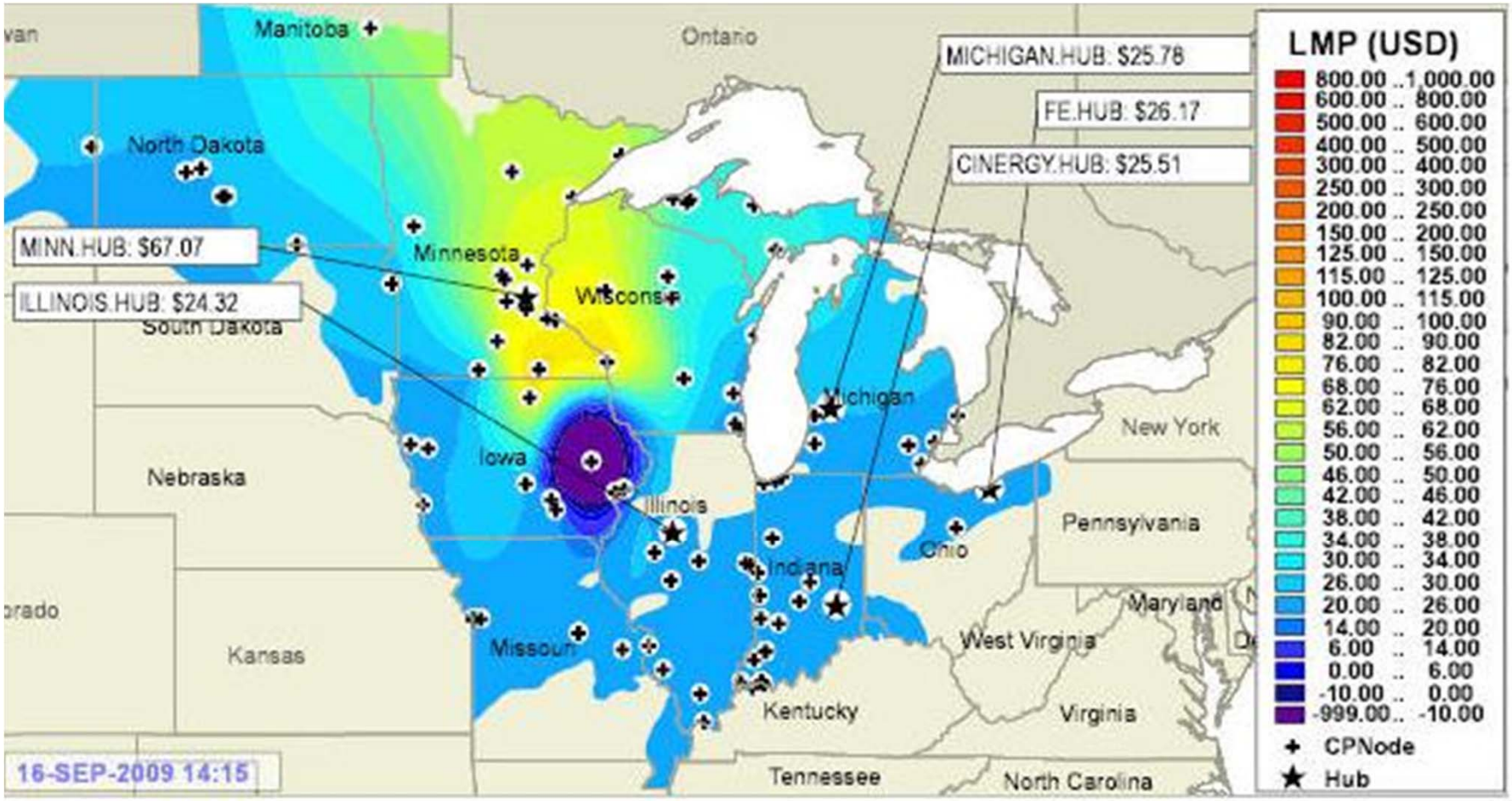
Redispatch raises costs

Units H & N are the most cost-effective to constrain off and on to relieve the constraint

Market Design – LMP

- Locational Marginal Price is used as price paid by buyers and is paid to sellers
- LMP = market clearing price + marginal congestion + marginal loses
  - lowest dispatch cost for serving an increment of load (1 more MW) at each location, given redispatch requirements
  - is locational, so represents marginal costs to move power between locations
  - Is economically efficient
  - Provides a transparent value for congestion
- LMP map on MISO, MISO/PJM web sites

Market Design - LMP



Market Design – FTRs, ARRs

- Financial Transmission Rights (FTRs) are path-specific financial credits or charges
- Auction Revenue Rights (ARRs) are financial rights to FTR auction revenues
- Both used to financially hedge cost of congestion.
- FTRs are directional
- Considering similar items for RA construct
- See presentation on OMS web site

Market Design - Concerns

- Why uplifts?
  - RSG
  - ELMP
  - PVMWP
- Barriers to efficiency
  - Headroom, ramp requirements
  - ELMP and out of market payments

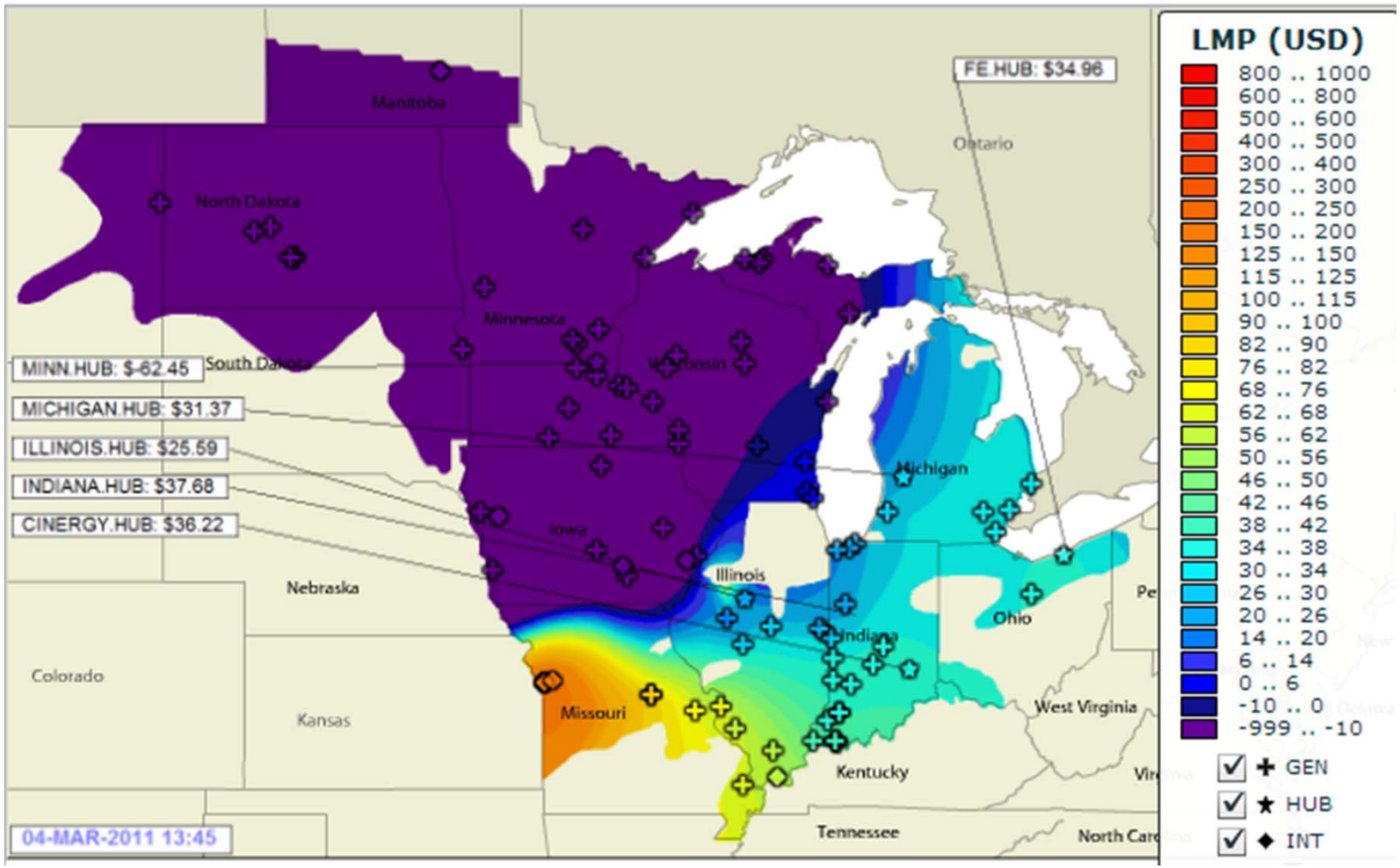
Market Design - ELMP

- Extended LMP (ELMP) proposed to improve price signals in markets.
- Price at a location to reflect the cost of the most expensive action that must be taken to meet requirements (energy demand, AS requirement) at a location and time.
- LMP does not do this for block loads, demand response, or brief shortages.
- ELMP also reduces uplifts

Market Design - DIR

- Response to increase in non-dispatchable Intermittent Resources (IRs) such as wind generation
  - Manually curtailing wind farms
  - Market prices become negative with excess generation
- Requires certain IRs to register as Dispatchable Intermittent Resources (DIR)
  - offer into market same as other generation (forecast max = ecomax, is only dispatchable in the down direction)
  - eligible for make-whole payments.
  - must provide a rolling 1-hour forecast in 5-min increments.
- 2/28/11 FERC Order approves eff 3/1/11.

Market Design - DIR



Market Design - Scarcity

- Where all available resources are insufficient to meet load, scarcity results, and MCP goes to scarcity price.
- Scarcity price is a controversial price cap
- Same market symptoms as exercise of market power, except no withholding of resources.

Market Design - Seams

- Market-to-market error problems, loop flows, capacity portability leads to renewed interest in seams issues
- Seams agreements with 9 market and non-market neighbors

  https://www.midwestiso.org/Library/Agreements/Pages/SeamsAgreements.aspx
- Midwest ISO starts seams initiative
  - Market to market coordination of interchanges
  - Broader regional markets

  https://www.midwestiso.org/WhatWeDo/StrategicInitiatives/Pages/Seams.aspx
- Midwest ISO Seams Management Working Group

Further Education

- What RTOs Do and Why
  http://www.misostates.org/WhatRTOsDoAndWhyJan2005.pdf
- Grid Expansion and Investments
  http://www.misostates.org/GridExpansionandInvestmentJan2005.pdf
- RTO Markets and Resource Adequacy
  http://www.misostates.org/RTOMarketsandResourceAdequacy2005.pdf
- Financial Transmission Rights Primer
  http://www.misostates.org/FinancialTransmissionRightsPrimer13Mar2009.pdf
- Virtuals Primer
  http://www.misostates.org/Virtual%20Primer%20OMS%20041709_1.pdf

Reference Section

- Business Practices Manuals

  https://www.midwestiso.org/Library/BusinessPracticesManuals/Pages/BusinessPracticesManuals.aspx

- Tariff

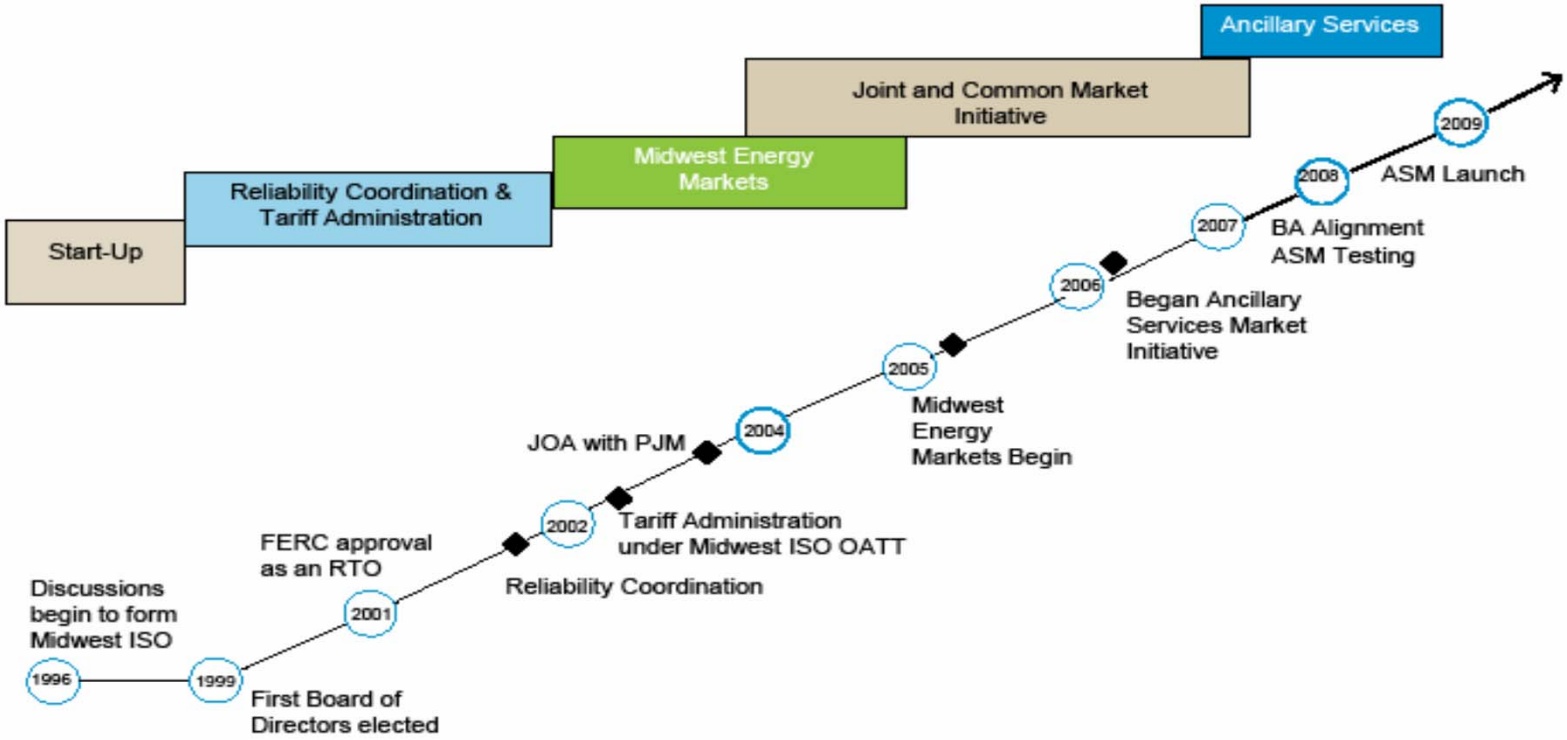
  https://www.midwestiso.org/Library/Tariff/Pages/Tariff.aspx

Reference Section

Midwest ISO Carmel control room

Reference Section

Midwest ISO Evolution



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Energizing the Heartland

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Reference Section

Market Design – MCP vs PAB

Single MCP		**Pay as Bid**
Close -	Marginal Cost	- Bids would vary
Efficient -	Short & Long Term	- Less efficient
Incentive for -	DR	- harder to use to mitigate
Apparent -	Anticompetitive behavior	- Not apparent
Common worldwide -	Use	- not common
More -	Price volatility	- Less