

Advancing Renewable Alternatives

FERC/RTO Training Session
Institute for Policy Integrity
New York University School of Law
June 15, 2011

Abigail Krich
President, Boreas Renewables

About Boreas Renewables

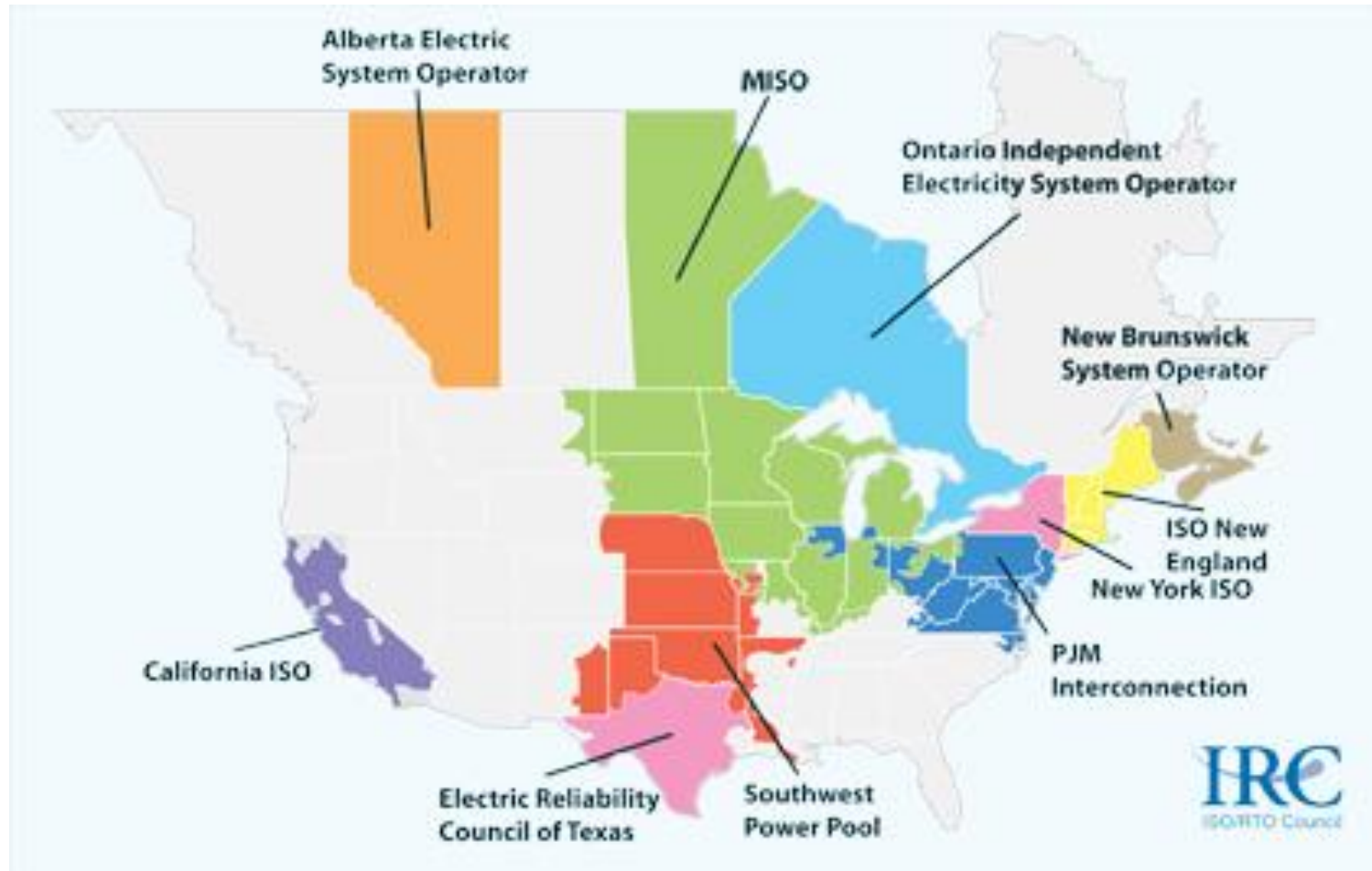
- Assist and advise project developers
 - Wind project planning
 - Interconnection process
 - Forward Capacity Market
- Renewable energy advocacy
 - Regional system planning
 - ISO-NE stakeholder process
 - Market rule design

Advancing Renewable Alternatives Outline

Survey of ISO/RTO approaches to:

- Wind Integration Studies
- Interconnection Queue Reform
- Capacity
- Transmission Cost Allocation
- Wind Forecasting
- Market Integration

ISO/RTO Map



Wind Integration Studies

SPP

- Wind Integration Task Force (WITF) Wind Integration Study
- Released January 2010
- 10%, 20%, 40% wind energy
- Besides transmission upgrades “there would be no significant technical barrier or reliability impacts to integrating wind energy levels up to 20% of the generation mix.”

Wind Integration Studies

ISO-NE

- New England Wind Integration Study (NEWIS)
- Released December 2010
- 2.5% - 24% wind energy
- “Considering that wind generation primarily displaces natural-gas-fired generation in New England, the overall CO₂ production declines by 25% with 20% wind energy penetration”

Wind Integration Studies

CAISO

- Integration of Renewable Resources
- 20% RPS (33% ongoing)
- Released August 2010
- “There appears to be sufficient flexible generation available to operate with a 20 percent RPS if the ISO is not blocked from doing so due to an excess of non-dispatchable generation (including imports).”

Wind Integration Studies

NYISO

- NYISO 2010 Wind Generation Study
- Final Report: September 2010
- 5% to 12% wind energy
- “The study determined that almost 9% of the potential upstate wind energy production will be ‘bottled’ or not deliverable because of local transmission limitations.”

Wind Integration Studies

MISO

- Regional Generation Outlet Study (RGOS)
- Released November 2010
- Transmission planning study to meet state RPS requirements at lowest per MWh cost
- “Midwest ISO has identified the next, most immediate step to transmission investment: a set of robust Candidate MVPs designed to address current renewable energy mandates and the regional reliability needs of its members. Viable for near-term development, these projects represent \$5.8B (2010 USD) of capital investment”

FERC Technical Conference 2007

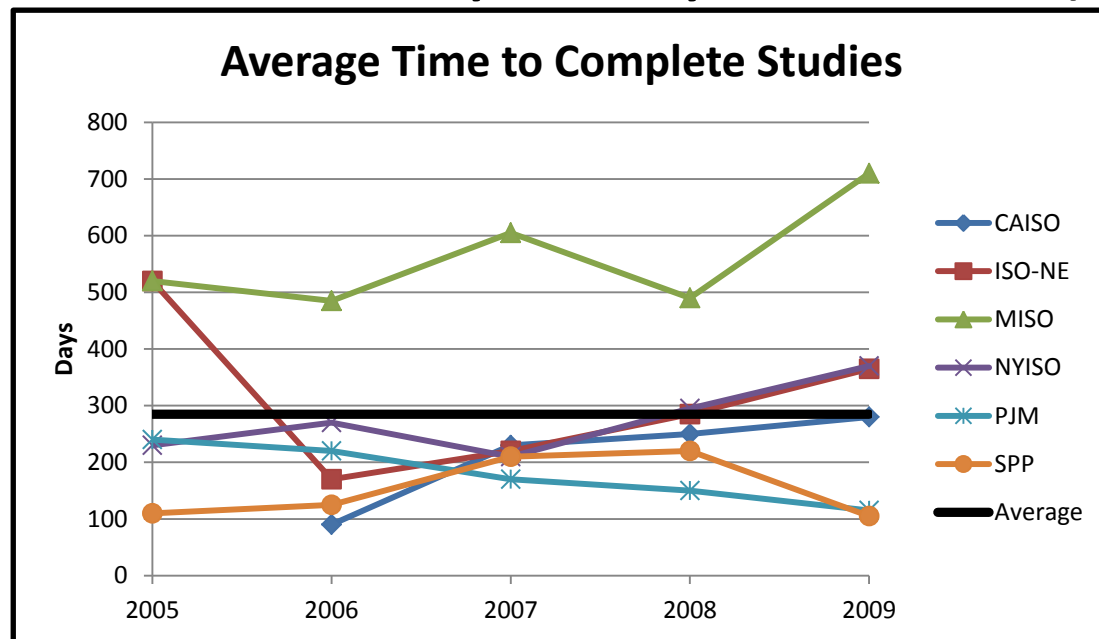
Interconnection Queuing Practices

- Need for change with interconnection queue backlogs building, processing times reaching 800 days
- Required all RTOs and ISOs to file status reports on efforts to improve queue processing
- Allowed RTOs and ISOs to propose tailored solutions rather than imposing a single, standard queue reform

2010 ISO/RTO Metrics Report

Average Study Duration

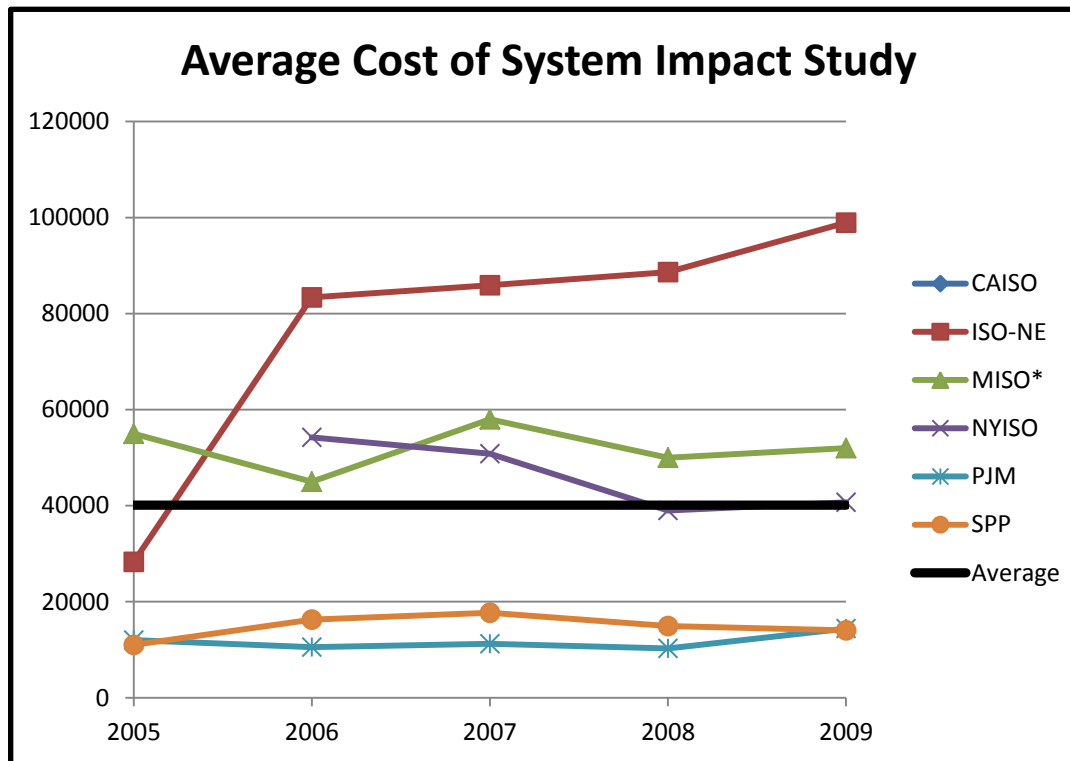
- Average time to complete a single study just under a year (blend of Feasibility, System Impact, and Facility Study durations)



2010 ISO/RTO Metrics Report

System Impact Study Costs

Ranges from about \$10,000 to \$99,000



* MISO gave average for all study types without differentiating between Feasibility, System Impact, and Facility Studies

Recent Interconnection Queue Reform

- CAISO, MISO, NYISO, PJM moved from a serial process to a cluster or group study process
- MISO, SPP, (NYISO) moved from a first-come-first-served process to a first-ready-first-served process
- ISO-NE has increased deposit levels throughout interconnection process

Capacity / Resource Adequacy

Spectrum of approaches to Resource Adequacy

		LSE Resource Adequacy Requirement All with bilateral capacity market	
		Forward Requirement	Short-Term Requirement
Type of Residual Capacity Market	No Centralized Capacity Market	CAISO	SPP
	Voluntary Centralized Capacity Market		MISO
	Mandatory Centralized Capacity Market	PJM, ISO-NE	NYISO

Source: The Brattle Group

Capacity

PJM Reliability Pricing Model

- Wind and solar can participate
- 3 year rolling average of capacity factor from 2 – 6 pm from June – August.
- Class average used if insufficient operational data
 - Currently 13% for wind, 38% for solar
 - Wind reduced from 20% in 2008 based on operational experience

Capacity

PJM Reliability Pricing Model

- Wind must offer 85% of its capacity in auction
- Wind/solar exempt from availability penalties
- New wind/solar exempt from minimum offer price mitigation rule (MOPR)
- Auction for 2014/2015 held in May
 - virtually all capacity increase came from new renewables, DR, EE
 - over 9,000 MW existing, mostly coal, did not clear

Capacity

NYISO Installed Capacity Market

- Existing wind capacity value:
 - Summer: average capacity factor 2 – 6 pm previous June – August
 - Winter: average capacity factor 4 – 8 pm previous December – February
- New onshore wind: 10% summer, 30% winter
- New offshore wind: 38% summer/winter

Capacity

ISO-NE Forward Capacity Market

- All intermittent resources can qualify
- Existing: 5 year rolling average
 - Summer: 1 – 6 pm June - September
 - Winter: 5 – 7 pm October – May
- New: claim a summer/winter capacity based on 1 year of on-site data
- 23% summer, 42% winter average so far

Capacity

ISO-NE Forward Capacity Market

- Only intermittents receive payment for extra winter capacity
- Exempt from availability penalties
- If actual performance significantly below obligation, must cover or submit restoration plan

Capacity SPP

- LSE's procure capacity through self-supply or bilateral contracting
- SPP oversees but does not enforce
- Standard wind capacity valuation?

Capacity CAISO

- Capacity requirement comes from CPUC
- CAISO bilaterally procures capacity deficiencies
- Monthly capacity values
 - 3 year rolling average capacity factor from 12 – 6 pm on weekdays
- Class average used if insufficient data

Capacity

Midwest ISO Resource Adequacy Construct

- Planning Resource Credit (PRC) standardized capacity product
- 2009/2010 – All wind assigned 20%
- 2010/2011 – All wind assigned 8%
- Capacity value of each resource not evaluated separately
- Non-wind intermittents: 3 year rolling average capacity factor for 3 – 5 pm June – August
- Must be deliverable to qualify

Transmission Cost Allocation

FERC

“Efforts to integrate new resources, including significant amounts of location-constrained generation, into existing transmission systems and to address renewable portfolio standards and other regulatory policies challenge existing cost allocation and transmission planning protocols.”

- FERC Order Accepting Tariff Revisions (Docket ER10-1069-000)

Transmission Cost Allocation

ISO-NE

- Pool Transmission Facility reliability or economic efficiency upgrades regionally allocated by load share
- All generator interconnection network upgrades paid for by generator triggering need
 - Very lumpy
 - Problem of free riders
 - No guarantee of deliverability

Transmission Cost Allocation

CAISO

- Revised Transmission Planning Process (RTPP)
 - Policy-driven planning
 - Preemptively design upgrades in anticipation of RPS resource development
 - Coordination with GIP to mitigate massive generator interconnection network upgrade costs
 - Focus on globally optimum plans
 - Can be rate-based if RPS enabler (PU Code)

Transmission Cost Allocation

SPP

- Highway/byway cost allocation by voltage
 - Above 300 kV 100% regionally allocated
 - Between 100 kV and 300 kV 33% regionally allocated, 67% to local zone
 - Under 100 kV allocated to local zone
- “Priority” projects approved in April
 - SPP says will facilitate 3,200 MW wind

Transmission Cost Allocation

SPP

- Network upgrades for wind interconnection
 - If designated to serve load within zone
 - Highway/byway methodology applies
 - If designated to serve load in different zone
 - Above 300 kV follows highway/byway
 - Below 300 kV 67% allocated regionally, 33% allocated to customer (load)

Transmission Cost Allocation

NYISO

- Reliability and economic efficiency upgrades regionally allocated
- Interconnection upgrades allocated to generator(s) through class year interconnection studies

Transmission Cost Allocation

MISO

- Multi-Value Projects (MVP)
 - Spreads cost of large, regionally beneficial upgrades
 - Reduce cost of interconnection
- Generator interconnection upgrades allocated 90% to generator, 10% regionally

Transmission Cost Allocation

PJM

- Reliability
 - Above 500 kV allocated regionally
 - Below 500 kV and over \$5M zonal allocation based on distribution factors
 - Below 500 kV and under \$5M to local zone
- Economic
 - Above 500 kV allocated regionally

Forecasting CAISO

- Centralized forecast since 2004
- Day ahead and hour ahead forecasts
- Working on a short term event predictor with DOE and BPA
- Paid for by \$0.10/MWh fee on all intermittent resources plus \$0.03/MWh from CAISO

Forecasting NYISO

- Centralized forecast since 2008
- Used for dispatching intermittents since 2009
- Short term: updated every 15 min
- Long term: updated twice a day
- Paid for by wind projects
 - \$500 plus \$7.50/MW per month

Forecasting MISO

- Centralized forecast since 2008
- Used to enable Dispatchable Intermittent Resource (DIR) program
- Short term: updated every 5 min
- Long term: updated every hour
- Funded by MISO

Forecasting PJM

- Centralized forecast since 2009
- Short term: updated every 10 min
- Long term: updated every hour
- Funded by PJM

Forecasting ISO-NE

- Preparing to implement a centralized forecast
- Likely to begin in 2012
- Funding undecided

Market Integration

CAISO

- Wind sold through bilateral contracts
- Can take real time price
- Can schedule day ahead or real time and face 10-minute imbalance energy charges
- Or can join Participating Intermittent Resource Program (PIRP)
 - Protects against imbalances
 - Uses centralized forecast
 - Deviations netted on monthly basis, settled at monthly average price

Market Integration

PJM

- If capacity resource, must bid in Day Ahead market. Can update hourly
 - Default price offer is \$0/MWh. Others must be approved by PJM. Negative pricing allowed.
 - PJM dispatches economically, curtails for congestion based on economic offers.
- If deviations greater than 5 MW, charges apply

Market Integration

NYISO

- Day Ahead market optional for intermittents
 - Treated like any other resource if participates, buys shortfall at real time price
- Negative pricing allowed
- Wind not allowed to provide regulation service or operating reserves

Market Integration

NYISO

- Real time economic dispatch
 - Centralized forecast used as upper limit
 - May be dispatched down, overgeneration charge if instruction not followed
 - Paid for overgeneration when not dispatched down
 - Exempt from undergeneration charges

Market Integration

ISO-NE

- Day Ahead market optional
- Settle at real time nodal price for deviations from Day Ahead schedule
- ISO-NE considering dispatchable wind

Market Integration

MISO

- Intermittent
 - Must offer day ahead if capacity resource
 - Optional otherwise
 - Subject to imbalance charges from DA to RT

Market Integration

MISO

- Dispatchable Intermittent Resource (DIR)
 - Participate fully in MISO's economic dispatch
 - Can be dispatched up to forecasted limit based on offer price and system conditions
 - Cannot supply operating reserves or other ancillary services
 - Make whole provisions if dispatched up or down unprofitably in RT
 - Once DIR, cannot revert to Intermittent
 - All wind will be DIR after March 1, 2013

Market Integration

SPP

- No centralized energy market, only energy imbalance market
- May 2011 added requirement to GIA that wind must be capable of curtailing output by no more than 50 MW in 5 minute period.
- SPP asked FERC this month for Tariff revision to allow software curtailment of non-dispatchable resources with uninstructed deviation charges during congestion event

Questions?

Abigail Krich

Boreas Renewables

Krich@BoreasRenewables.com