

Challenges to Enhancing Trade in Clean Electricity and Ancillary Services

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Agenda

- Powerex Overview
- Definitions
- Clean Energy – Why is it a Challenge?
- Needs & Possible Solutions
- Conclusion

BC HYDRO
and
powerex





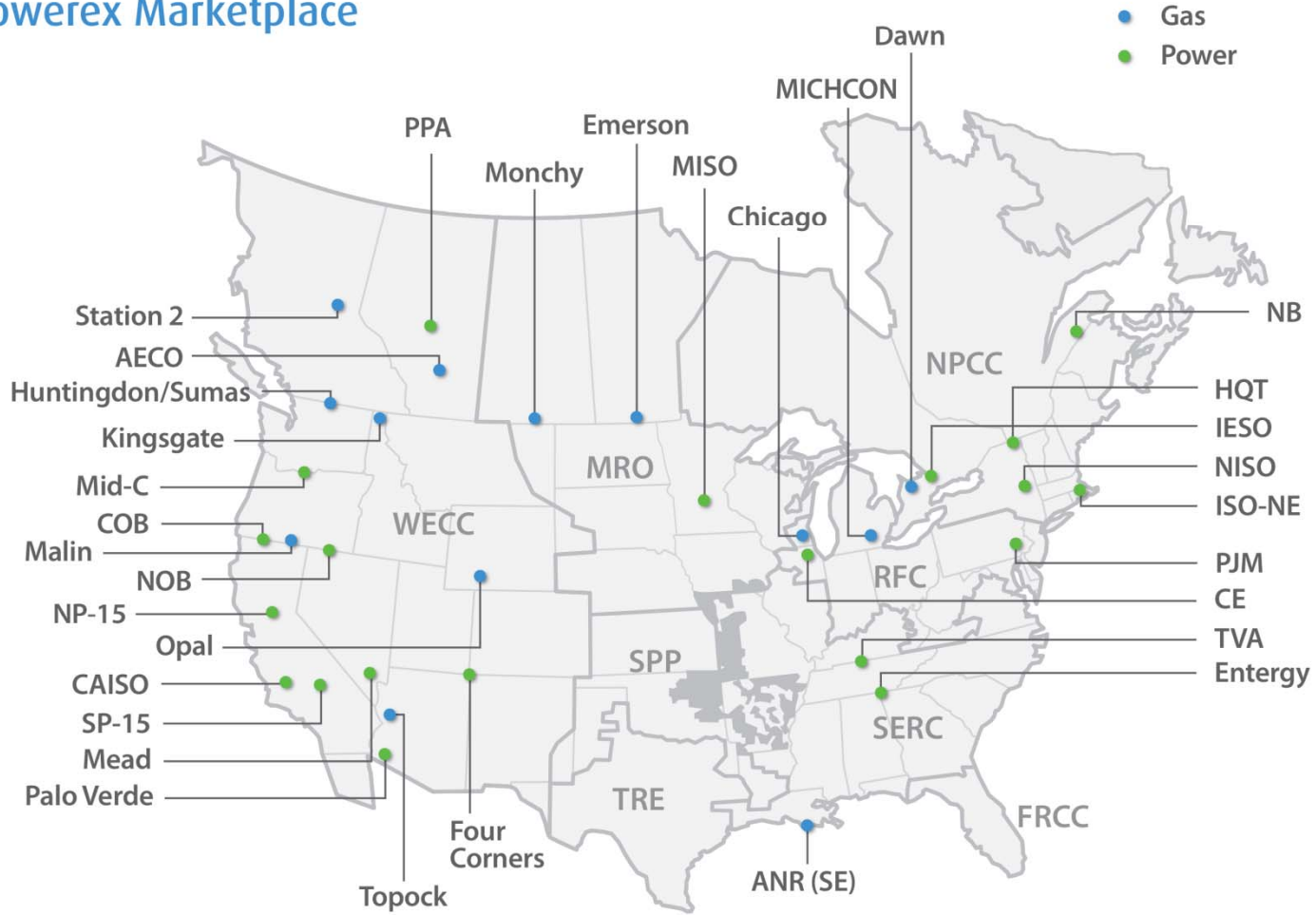
Powerex Overview

- Wholly owned subsidiary of BC Hydro incorporated in 1988
 - Buys and sells power, renewable energy products and natural gas in North America
- Approx. 170 employees and 250 customers
- Annual gross revenues increased from \$150 million in 1997 to \$2 billion today
- Transacts at market based rates
- Subject to regulation by FERC, NEB, DOE and various state and provincial bodies

Our Business Today



Powerex Marketplace

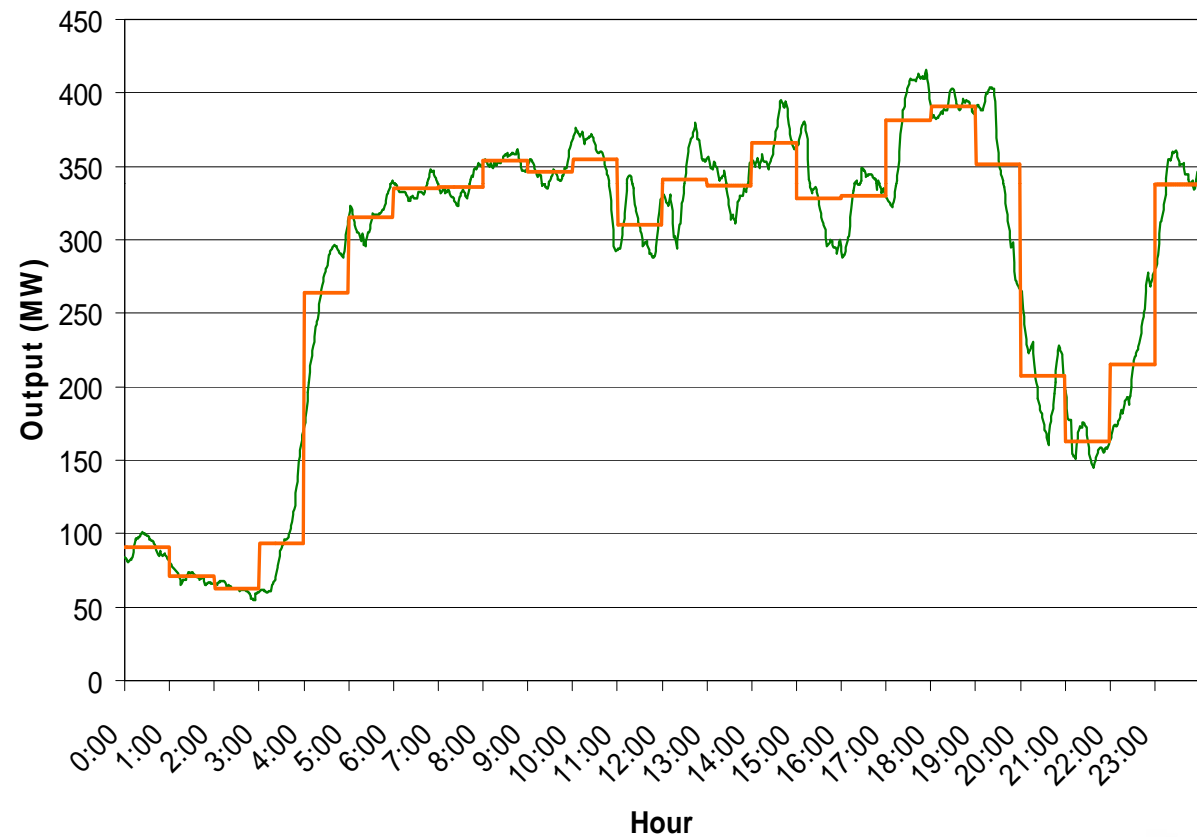


Definitions

- HOURLY ENERGY MARKET – electricity delivered at a constant rate over any given hour
- DAILY MARKET ENERGY – electricity delivered at a constant rate over specific periods (all 24 hours, 16 heavy load hours, 8 light load hours)
- BALANCING AUTHORITY – An area in which the system operator must keep supply & demand in balance at all times, including exchanges with other balancing authorities
- SCHEDULING – The activity required to have electricity transferred from one balancing authority to the another

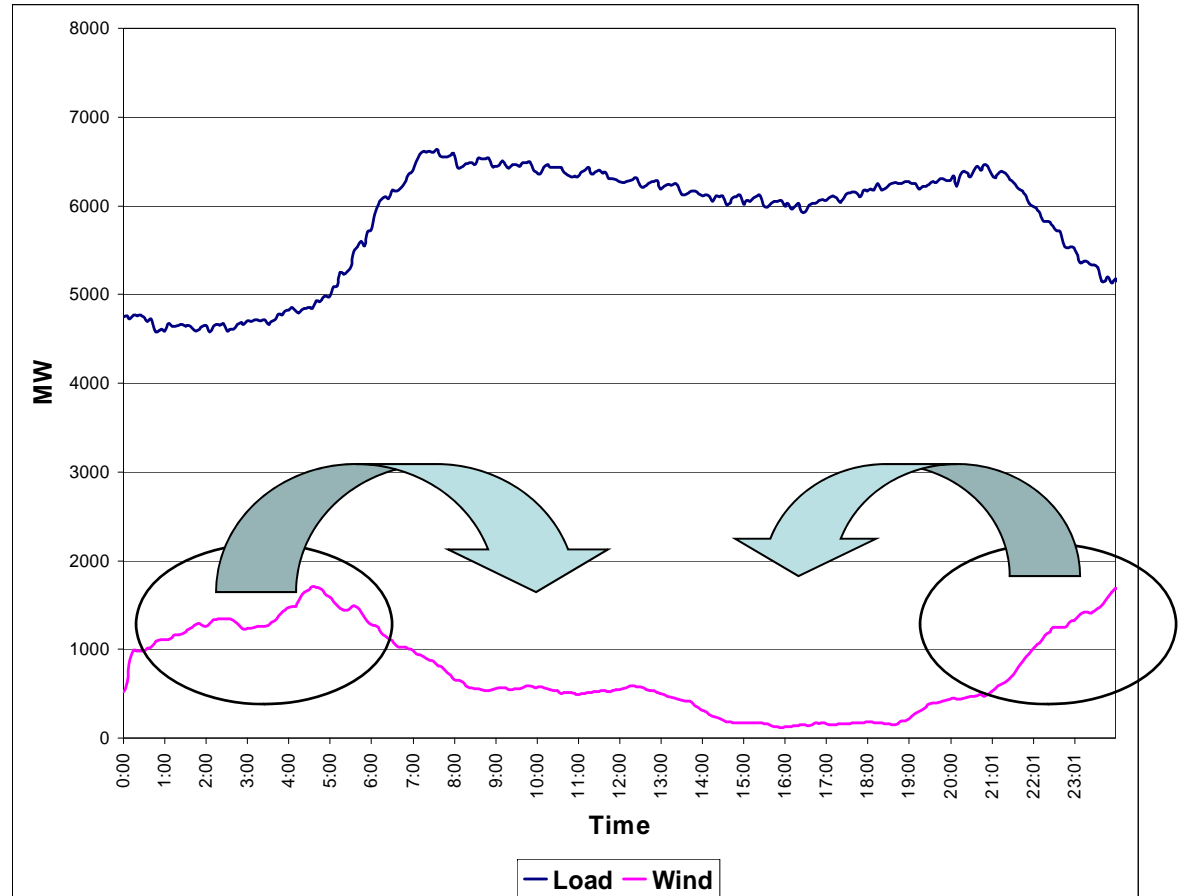
FIRMING – What is it?

- The conversion of uncertain output into certain hourly output that can be scheduled between balancing authorities



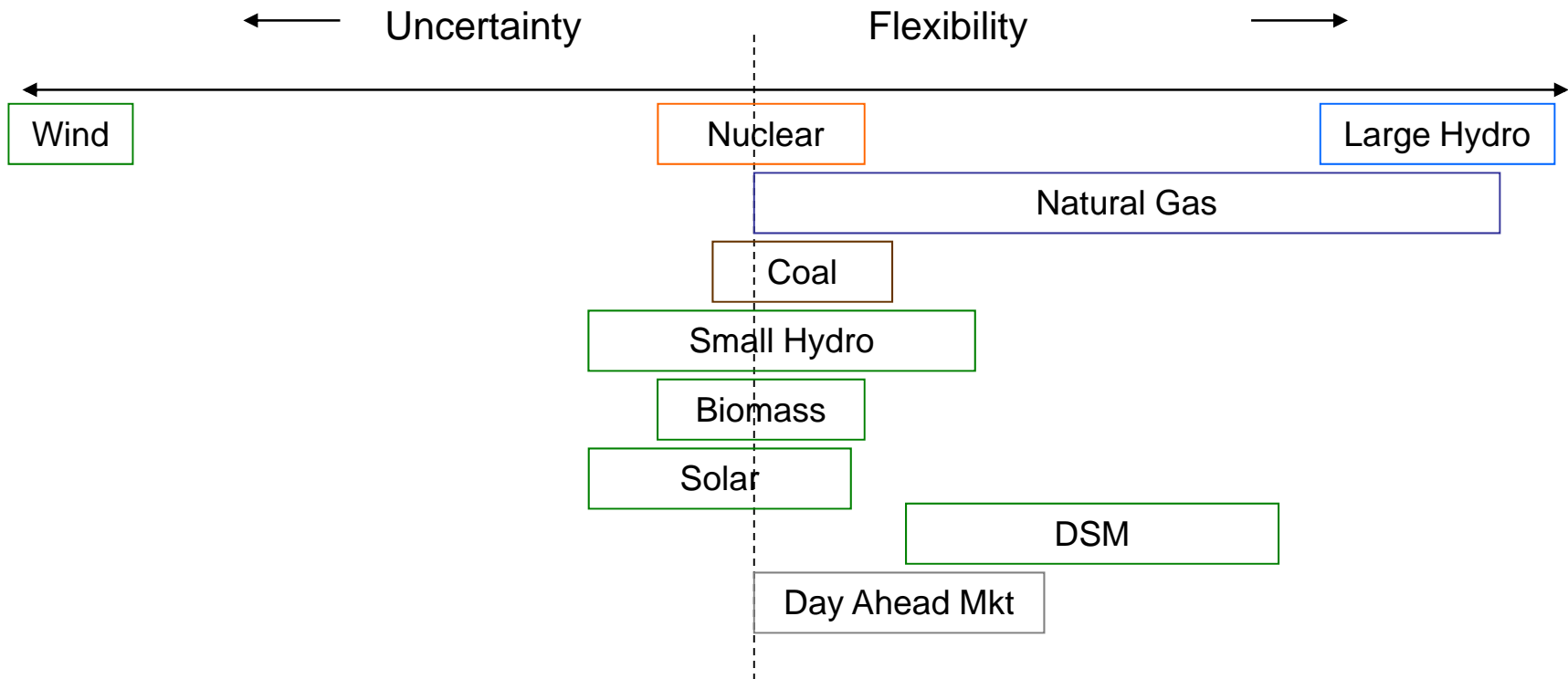
Shaping – What is it?

- The challenges associated with *receiving* hourly output in one period and *delivering* the output in periods matching demand.



Dispatchability

– The ability to change the output of a generator as desired with certainty



Challenge #1 – Agreeing on Definitions

- Most rules for what constitutes “renewable generation” are jurisdiction specific
- Some include geographic exclusions or deliverability restrictions (e.g., requiring simultaneous generation and delivery)
- **Implications:**
 - **Segmenting the markets reduces buyer’s options, trade opportunities, and market liquidity**
 - **The least cost solution is likely not being delivered**

Challenge #2 –Resource Uncertainty

- Common characteristic of most renewables is lack of dispatchability and/or limits on available energy
- Wind, and solar to a lesser degree, have both dispatchability and energy challenges
- **Implications:**
 - **Intermittent resources (after a certain threshold) increase the need for dispatchable resources to be available to reliably integrate the intermittents into the system**
 - **Intermittent resources are best thought of as energy displacement products**

Challenge #3 – Market Structure

- Intermittent resources are trying to “fit” into a market structure designed for base-load reliable generation and dispatchable generation
 - Market energy is flat, intermittent energy is volatile
- Balancing authorities that are sending out intermittent energy need to firm that energy for scheduling
- **Implications: either a suite of products must be procured to convert intermittent resources into an equivalent market product (i.e., firming & shaping, ancillary services) or an energy only market option needs to be developed or both**

Challenge #4 – Transmission Rules

- Current system is designed to move firm (dispatchable) energy to load
- In order to allow more intermittent resources on the system in the short term some balancing authorities:
 - Allow parties to expropriate transmission capacity paid for by existing firm transmission rights holders (e.g., overselling firm, over scheduling, premature release of transmission rights & re-purchase requirements, etc)
 - Seek to expand sharing mechanisms (e.g., regulation sharing, altering reserve sharing criteria) in order to capture resources from neighbouring balancing authorities on a non-market basis
- **Implications: incentives that will be necessary to achieve long term solutions are undermined**
 - **Existing transmission rights holders face increasing costs and/or reduced service quality**
 - **Market signals identifying the need for dispatchable capacity are suppressed**

Challenge #5 – Reliability

- Converting an intermittent product into a firm product can have reliability impacts unless the appropriate reliability framework is in place
- Some markets (i.e. NYISO) have explicit capacity mechanisms to ensure peak firm load can be met. Many do not.
- Appropriate mechanisms must be in place to ensure there is enough reliable and dispatchable generation available to meet peak firm load
- Balancing authorities which permit partially “firmed” intermittent resources to serve firm load may jeopardize reliability
- **Implication: the reliability framework must have clear accountability with appropriate deterrents to ensure load is not impacted by integrating intermittent resources**

What do we need?

- Market signals and tariff rules that:
 - Support least cost solutions to the challenges
 - Allow intermittent resources to efficiently displace fossil energy
 - support investment in dispatchable capacity
 - encourage (not erode) entities confidence in signing up for transmission capacity so they can derive full value from that capacity. This will support new construction.

Capacity Products

- Dispatchable Capacity has many uses:
 - Operating reserves, regulation, load following
 - for intermittent resources: generation following, resource adequacy
- Currently, each product is segmented and, if being traded, has to be separately reserved on the transmission grid
- Trade is often restricted due to lack of intra-hour scheduling and dynamic intertie capability
- Need to enhance ability to move dispatchable capacity between Balancing Authorities
- To incent development, these need to be commercial products

Transmission solutions

- Ensure firm transmission rights holders can utilize their rights in all scheduling time frames, including intra hour
- Enabling intra-hour scheduling between Balancing Authorities to allow market participants to provide load/gen following and ramp products
- Increase dynamic inertia capability to allow market participants to provide regulation products
- Market participants can create larger geographic diversity by scheduling across multiple BAs than trying to grow BAs ever larger

Market Adjustments

- Need to facilitate an energy only market so that intermittent resources can access liquid markets with an “energy-only” product displacing dispatchable energy resources already online
- Clarity on reliability reserves:
 - The obligation should clearly rest with the load balancing authority, the BA’s need to know the reliability reserves are there when needed
 - With intra-hour scheduling the load BA can acquire the most economic mix of operating reserves from within or outside the BA

Conclusions

- The Canadian-US electricity market is integrated to a high degree and we need to seek alignment on definitions and rules to maximize the benefits of trade
- Canada has a lot of hydro resources (large and small) that will be an important source of capacity products for the market
- Transparent market signals are needed to provide the correct incentives for the development of dispatchable capacity necessary to reliably integrate high levels of intermittent resources
- Bigger isn't necessarily better – BA's should focus on reliability and creating the framework for market solutions/efficiencies
- The transmission rules need to evolve to meet the demands of intermittent resources and allow the market to provide solutions
- Firm transmission rights must have value or customers won't sign the contracts necessary to support new construction