Using Competitive Markets to Achieve Policy Objectives

How the Systems Built for Fossil Plants Can Evolve to Support the Clean, Distributed Grid of the Future

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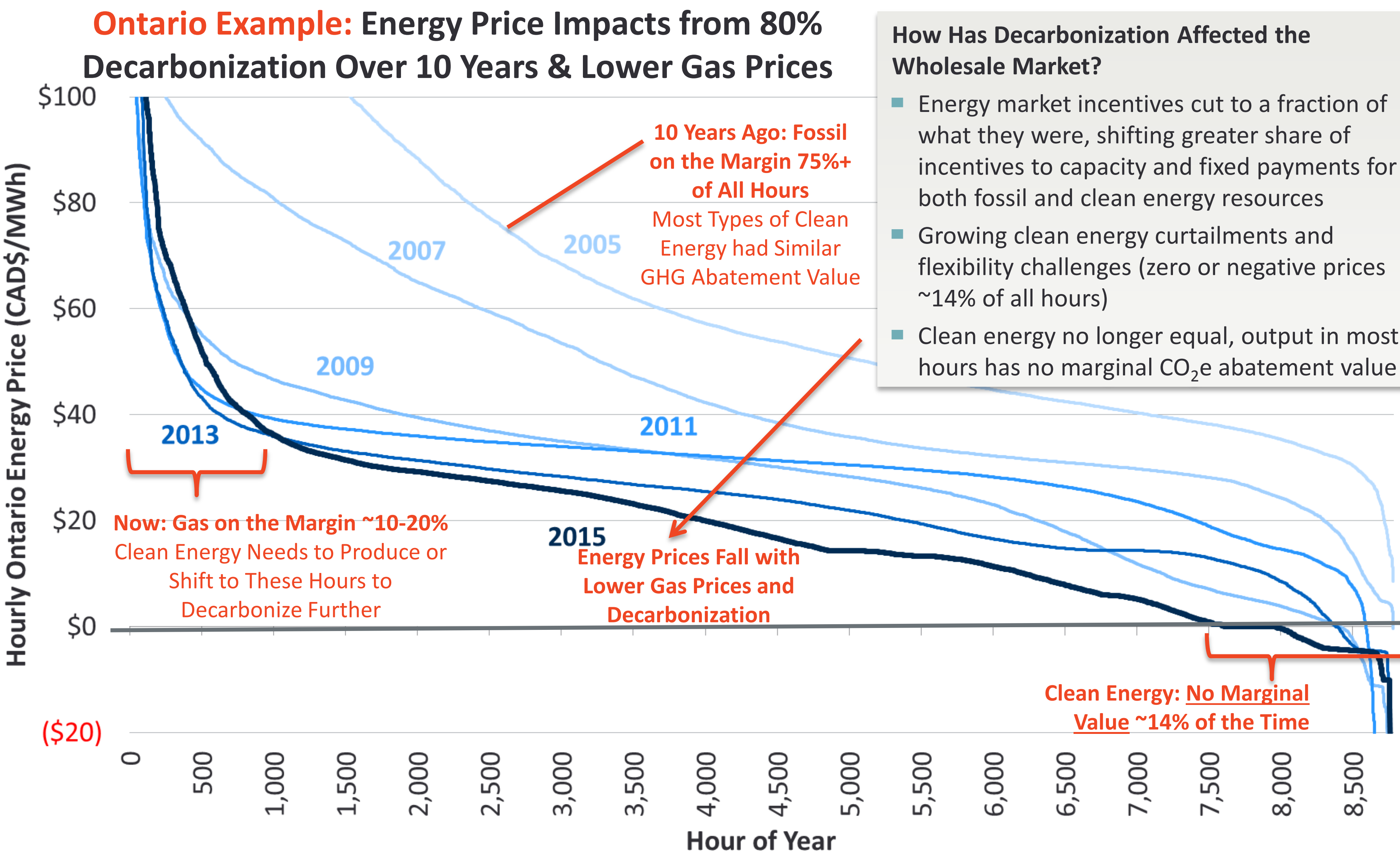
Using Markets to Achieve Policy Objectives

- To date, wholesale electricity markets have been designed to do one thing: maintain reliability at lowest system cost
- Many examples of how markets have enabled competition and innovation to achieve this objective at low costs. Example: capacity markets attract a variety of unexpected solutions, including new generation, at surprisingly low prices
- But markets will only do what they were designed to do. Market outcomes will not necessarily satisfy policymakers if their objectives are not considered in the design
- Some policy objectives, such as decarbonization, have fundamental two-way interactions with the investment and operating decisions governed by market forces
- This creates a significant opportunity to achieve policy objectives more cost-effectively by integrating them into wholesale market designs

Should Markets Incorporate Policy Objectives?

Examples of State Policy Objectives	How Objectives Are Reflected in Wholesale Markets
▪ Minimize societal costs ▪ Maintain reliability	▪ Already achieved through wholesale markets
▪ Fuel diversity ▪ Minimize customer costs	▪ Indirectly supported through existing wholesale markets (at the cost-minimizing level)
▪ State jobs and GDP ▪ Encouraging nascent industries/technologies ▪ Preserving state control	▪ Not presently incorporated into wholesale market designs, two-way interactions usually manageable
▪ Greenhouse gas reductions ▪ Clean energy	▪ Not presently incorporated into wholesale market designs, and two-way interactions are significant ▪ **Should markets be designed to achieve these policy objectives at least cost?**

What Might the Future Look Like with a Large Share of State-Supported Clean Energy?



How Has Decarbonization Affected the Wholesale Market?

- Energy market incentives cut to a fraction of what they were, shifting greater share of incentives to capacity and fixed payments for both fossil and clean energy resources
- Growing clean energy curtailments and flexibility challenges (zero or negative prices ~14% of all hours)
- Clean energy no longer equal, output in most hours has no marginal CO_2e abatement value

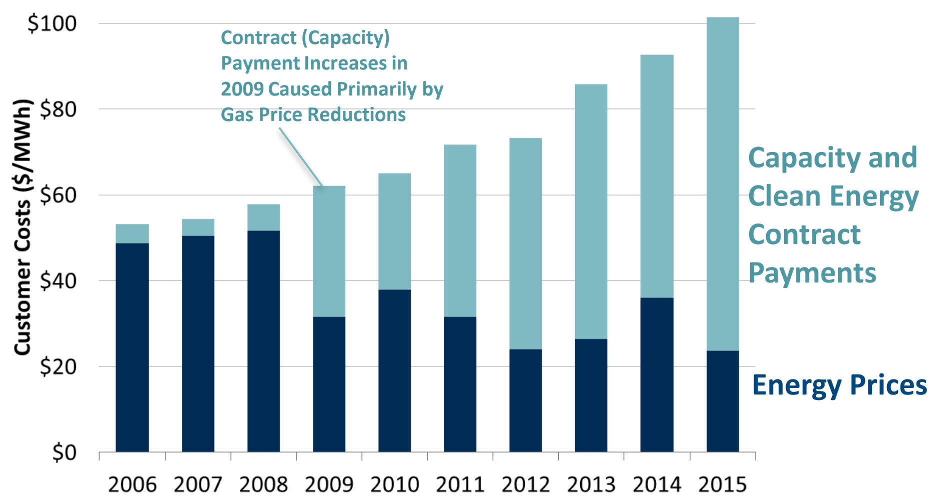
Sources and Notes:

Data from Monitoring Report on the IESO-Administered Electricity Markets for May-Oct 2015, and ABB, Inc., Energy Velocity Suite (2016).

Out-of-Market Contract & Clean Energy Payments

- At low clean energy penetration levels:
  - Out-of-market payments have modest impacts on prices or regulatory uncertainties
  - Markets can meet the remainder of energy and capacity needs at least cost
  - Markets and policies can coexist in relative harmony
- At high penetration levels:
  - Energy market prices continue to fall
  - Targeted clean energy subsidies, along with other economic conditions like low gas prices, contribute to degraded economic viability existing clean energy (e.g. existing nukes and hydro)
  - Requires ever more state intervention to retain existing clean energy and build new clean energy, with markets relegated to a minor residual role
- Eventually with 80% decarbonization, the majority of supply would be out-of-market:
  - Lack of resource neutrality contributes to growing system and customer costs
  - Lose the benefits of markets to deliver least-cost solutions through competition and innovation

Ontario Example: Escalating Out-of-Market Payments and Total Customer Costs



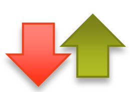
Ontario is Now Pursuing Major Reforms in Response to Escalating Customer Costs and Inefficiencies:

- "Market Renewal" to enhance the scope, efficiency, and flexibility of the market
- Bringing out-of-market payments into the market, e.g. with CO_2e cap-and-trade and a capacity market
- Adopting resource-neutral approaches to replace targeted contracts and subsidies

Source for Ontario Data :
Brattle Market Renewal Benefits Case report for IESO.

What Would the Future Look Like if Markets Are Used to Achieve Decarbonization Objectives?

In a market designed to achieve decarbonization, value will shift in ways that favor cleaner and more flexible resources and reduce incentives for fossil plants

Market	Prices & Market Value	Market Implications
Energy		▪ Lower energy prices on average and in most hours ▪ But much higher on-peak prices, driven by CO_2 pricing for remaining fossil, scarcity pricing, and demand response ▪ Greater price volatility and spread create opportunities for more flexible resources and storage
Ancillary & Flexibility		▪ Need for greater quantities and new types of ancillary services and flexibility products ▪ Higher prices needed to sustain flexible gas plants or attract new flexible resource types
Capacity		▪ Value may go up or down ▪ Down if additional clean energy contributes to excess capacity supply for a period, or if more capacity resources attracted by other value streams ▪ Up if new fossil plants are needed for capacity, but only a small portion of their capital costs can be recovered from other markets
Carbon Abatement		▪ Some form of CO_2 pricing and/or clean energy payments introduced ▪ Value must be large enough to attract new clean resources

Can States Use Market Mechanisms to Achieve Decarbonization Goals?

First-Best: Carbon Emissions Pricing

- The most economically efficient way to support decarbonization objectives is to price the emissions externality
- Approaches: cap-and-trade, tax, ISO carbon charge
- Broadest, most resource-neutral approach will identify least-cost abatement options and spur innovation
- But many challenges to implementing carbon pricing quickly

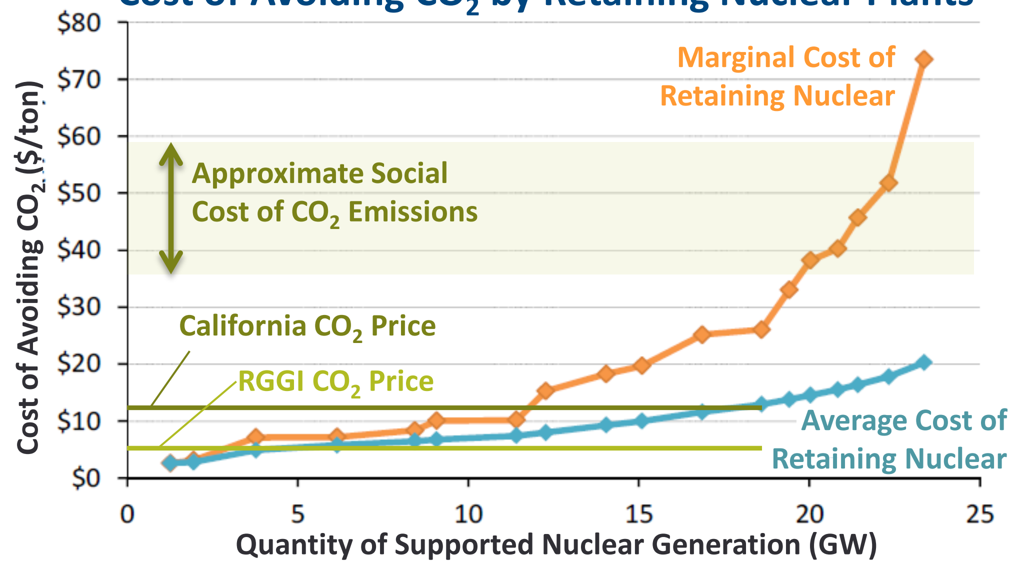
Alternatives Likely Needed in the Interim

- Even if carbon pricing is ideal, it may take time to agree on and to implement
- Alternative resource-neutral, market-based procurements or clean energy mechanisms can be developed in lieu of or to supplement CO_2 pricing
- In the meantime, states are turning to less market-oriented approaches to retain existing clean energy from nuclear plants. In many (not all) cases these would likely be the least-cost opportunities for avoiding CO_2, and the plants would be economically viable under a market-based approach

Challenges with Carbon Pricing

- Hard for individual states to implement on their own (but even harder to agree on common price/quantity)
- Market seams issues
- Concerns about transitional customer cost effects (though they may increase or decrease)
- In some regions, CO_2 prices needed to attract new clean energy may higher that politically feasible levels over the policy timeframe for decarbonization
- Clean energy investors see high regulatory risk; may need some kind of contractual assurance

Cost of Avoiding CO_2 by Retaining Nuclear Plants



Sources and Notes:
http://www.brattle.com/system/publications/pdfs/000/005/012/original/Power_Market_Prices__Nuclear_Generation___Greenhouse_Gas_Policy.pdf?1401482976
https://www.epa.gov/climatechange/social-cost-carbon

ISOs are Starting to Pursue Integrated Solutions

	Solutions Proposed or Implemented: PJM	New York	New England	Potential Outcomes
Policy Perspective	• Continued RECs • IL ZEC program to support nuclear • Potential for nuclear support in PA, OH, and NJ	• Continued RECs • ZEC support to nuclear	• Continued RECs • MA, CT, RI clean energy procurements	• Collateral impacts on market • Potential for higher system costs and unintended consequences (e.g. induce existing clean energy retirements)
Existing Market Participant Perspective	• Minimum offer price rule • Proposal to "protect" capacity prices from state-supported capacity	• Stop the ZECs • Minimum offer price rule (currently only for subsidized new fossil fossil)	• Offer review threshold price • Proposals to "protect" capacity prices from clean energy impacts	• Attract unneeded new fossil investments in a region aiming to decarbonize • Force customers to "pay twice"
Integrated Perspective	• Grid 20/20 discussions on interactions between markets and policy	• Studying CO_2 pricing to complement RECs and ZECs	IMAPP discussing: • ISO-administered CO_2 Pricing • In-market forward clean energy mechanism	• Accommodate, support, and achieve policy objectives through competitive markets

How Can Market Designs Evolve to Support a Cleaner System with More Variable Energy?

Market	Potential Design Enhancements
Carbon Abatement	• Carbon pricing (tax, cap-and-trade, RTO pricing) • Market-based, resource-neutral clean energy procurements
Energy	• Enhanced unit commitment and price formation • Administrative scarcity pricing • Increased demand participation in long-term • More granular pricing, dispatch, and settlement intervals • Enhanced look-ahead SCUC/SCED • Enhanced pricing and de-commitment during oversupply conditions • Improved intertie coordination, pricing, and granularity • Better accommodation of emerging and distributed technologies
Ancillary Services	• New flexibility products to reflect changing reliability needs • Enable participation by demand and new technologies • Privatized incentives for managing variability • Enhanced price formation through scarcity pricing and co-optimization
Capacity	• Proper accounting of the capacity value of variable energy resources (declines with penetration) • Enabling all technology types and avoiding overly restrictive qualification rules (incentivize performance through strong energy and ancillary prices, or performance incentives) • MOPR targeted only toward intentional price suppression • Change reliability modeling and requirement approaches to consider the growing impact of variability-driven reliability challenges (as opposed to peak load driven) • Flexible resource requirements (only if enhanced energy/ancillary markets are insufficient)

Takeaway: Messages for a Path Forward

Markets have demonstrated that they can achieve their design objectives at low cost by harnessing competition and innovation. This successful approach can be applied toward new policy objectives such as decarbonization

- **Messages for State Policymakers:**
  - Resource-specific and technology-specific procurements tend to be higher cost and lead to less competitive outcomes (see Ontario example)
  - Extensive out-of-market policies can have unintended consequences if market impacts are not considered, such as contributing to existing clean energy retirements
  - Technology-neutral, market-based mechanisms can achieve well-defined policy objectives cost effectively by harnessing competition and encouraging innovation
- **Messages for Market Design:**
  - States have many policy objectives, but only in select cases do the markets need to be "protected" (e.g., protections against manipulative price suppression)
  - Other policy objectives can be achieved through market mechanisms (e.g., by pricing emissions externalities)
  - Until there are in-market opportunities for states to achieve their objectives, they will continue to rely on out-of-market mechanisms
- **Many states are moving to a cleaner energy future. Integrating their policy objectives into the wholesale market design will**

Presenter Information

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Dr. Kathleen Spees is a Principal at The Brattle Group with expertise in designing and analyzing wholesale electric markets and carbon policies. Dr. Spees has worked with market operators, transmission system operators, and regulators in more than a dozen jurisdictions globally to improve their market designs for capacity investments, scarcity and surplus event pricing, ancillary services, wind integration, and market seams. She has worked with U.S. and international regulators to design and evaluate policy alternatives for achieving resource adequacy, storage integration, carbon reduction, and other policy goals. For private clients, Dr. Spees provides strategic guidance, expert testimony, and analytical support in the context of regulatory proceedings, business decisions, investment due diligence, and litigation. Her work spans matters of carbon policy, environmental regulations, demand response, virtual trading, transmission rights, ancillary services, plant retirements, merchant transmission, renewables integration, hedging, and storage.

Kathleen earned a B.S. in Mechanical Engineering and Physics from Iowa State University. She earned an M.S. in Electrical and Computer Engineering and a Ph.D. in Engineering and Public Policy from Carnegie Mellon University.

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