

IESO Market Renewal Program Request for Sub-Committee



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IESO MRWG Meeting

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Prepared for IESO MRWG

July 19, 2017

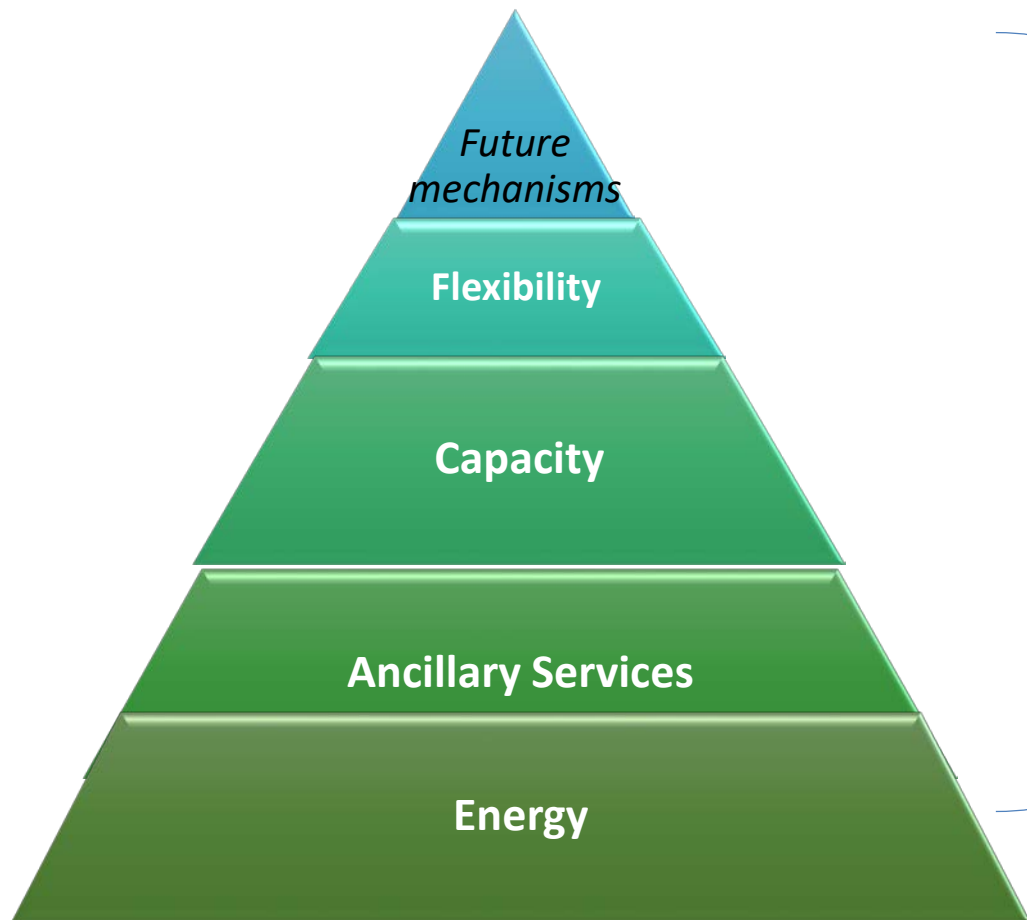
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Effective Integration of Renewable, Non-Emitting, Distributed Energy, and Demand-Side Resources

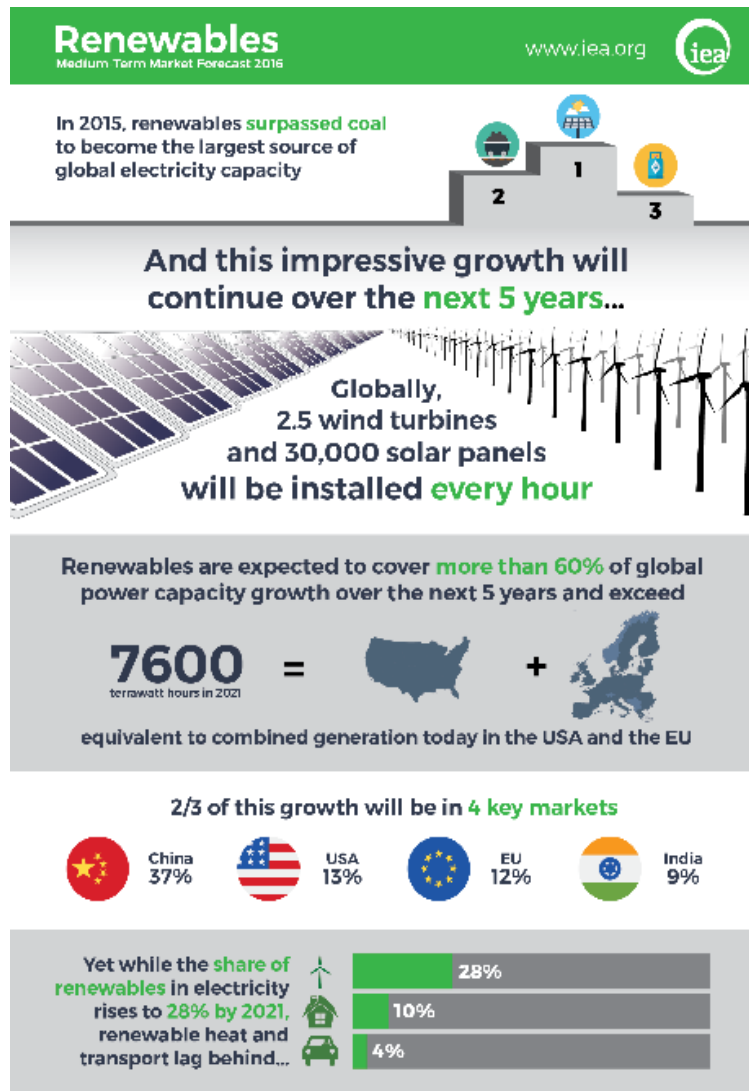
- Renewable Consortium requests formation of a MRWG Sub-Committee to explore potential future mechanisms to effectively develop (including uprates) and integrate low carbon emitting resources including renewables, distributed energy resources (DERs), conservation and demand management (CDM), and other non-emitting resources (e.g., nuclear, storage, etc.) within the re-design of Ontario's wholesale electricity market
 - Sub-Committee will provide advice and recommendations to MRWG, and where applicable provide inputs to high-level designs for SSM and ICA and other MRP workstreams (e.g., operability)
- Renewable Consortium membership to date:
 - BluEarth Renewables
 - Boralex
 - Brookfield Renewable Power
 - EDF EN
 - EDP Renewables
 - Enbridge
 - ENGIE
 - H2O Power
 - Kruger Energy
 - NextEra Energy
 - Pattern Energy
 - Suncor
 - Canadian Wind Energy Association
 - Canadian Solar Industries Association

Effective Integration of Renewable, Non-Emitting, Distributed Energy, and Demand-Side Resources

- MRP package of interrelated building blocks must account for and factor in:
 - Ontario's already low emitting resource mix (i.e., attributes, operational characteristics, costs)
 - Government environmental and electricity policies, goals, and objectives
 - Increasing uptake of low carbon emitting resources (DERs, CDM, renewables, others (e.g., storage) and their attributes, operational characteristics, costs)



Rapidly Increasing Renewable Generation Supply



- Renewable generation (mainly wind and solar) growing faster than any other energy source, and their costs are becoming competitive with fossil fueled generation (International Energy Agency (IEA))
- Renewable generation projects to account for half of growth in global energy supply over next 20 years
- Changing supply mix towards low carbon emitting resources is forcing new thinking, re: wholesale electricity market design and rules

Increasing Renewable Generation, DERs, CDM, Other Resources Leads to 'Clean Energy Paradox'

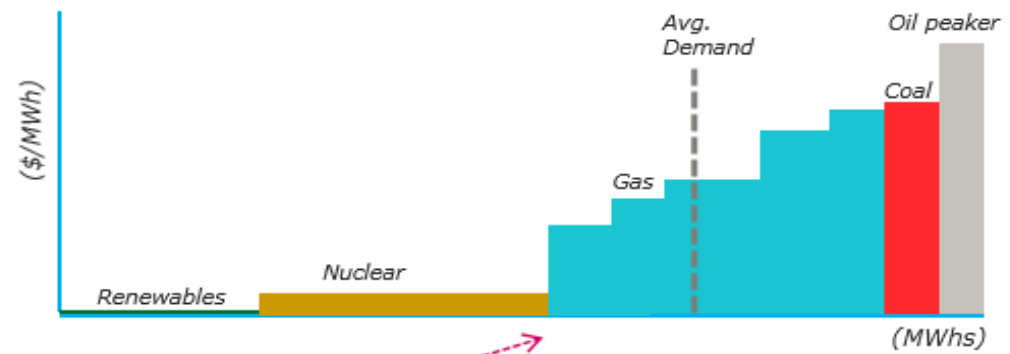
- Clean Energy Paradox (Rolando Fuentes, Kapsarc)
 - Global 'vicious circle' – 'out of market' mechanisms (e.g., contracts, etc.) support development of renewable generation, etc. depressing wholesale electricity spot prices, therefore increasing need to financially support all generation resources
 - Theoretically, if renewable generation supplied 100% of electricity demand, wholesale energy spot prices would trend towards \$0/MWh (due to very low fuel costs), deterring investment and requiring out of market payments
 - Therefore breaking down scheduling/dispatch logic/wholesale energy prices (e.g., negative), and requiring higher capacity payments (capacity market revenues, 'out of market' revenues (e.g., contracts)) to recover fixed costs
- Paradox is facilitated by these factors:
 - Technological advances and declining costs
 - Customer choices and economics leading to declining electricity demand (e.g., DERs, CDM)
 - Government policies and programs
 - Wholesale market design from a different era (fossil fueled generation, etc.) and wholesale energy spot prices structured around marginal costs (i.e., fuel costs)

Clean Energy Paradox Dispatch and Spot Price Implications

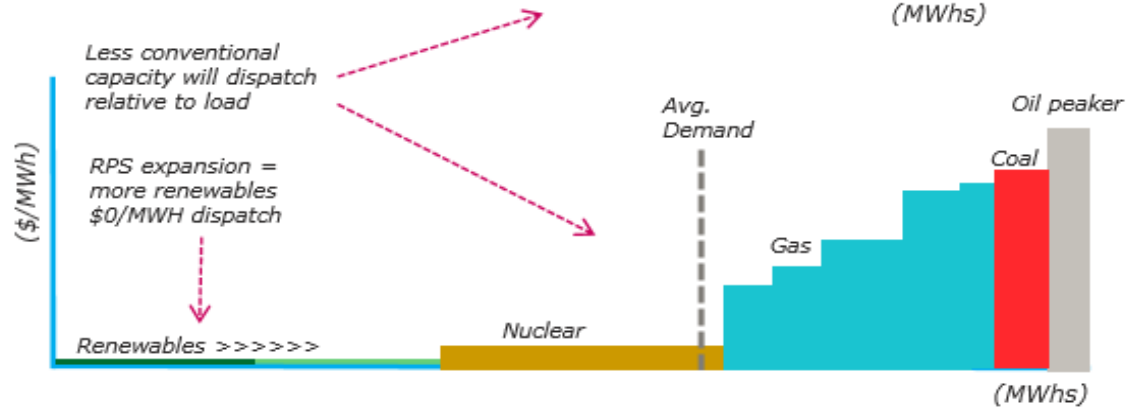
– nrg Aug 11, 2016 presentation to NEPOOL IMAPP Meeting

- New England Power Pool's (NEPOOL's) Integrating Markets and Public Policy (IMAPP) consultation assessing potential changes to wholesale electricity market towards advancing state public policy objectives
 - Graphs below show implications of Clean Energy Paradox

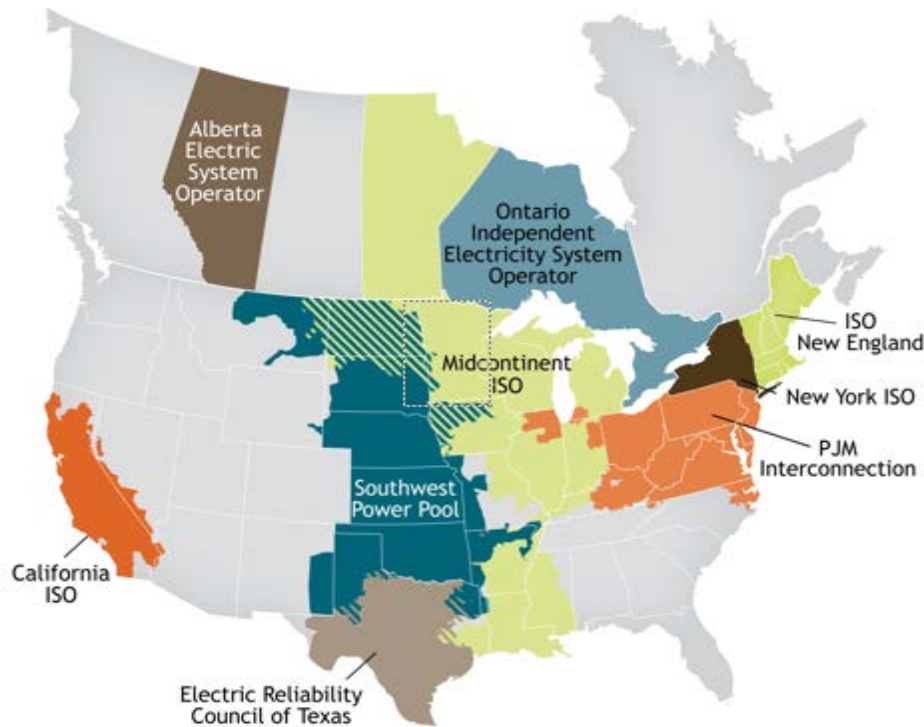
Today:
Status quo
daily dispatch



Tomorrow:
Ever-expanding
RPS 'merit
order' impact
on daily dispatch



Wholesale Electricity Market Design – Evolution to a New Paradigm?



- Nine wholesale electricity markets characterized by: real-time energy (and day-ahead in U.S.); ancillary services; transmission/congestion rights; some with capacity
- Emerging major long-term issues without consensus:
 1. Are markets adequately accommodating public policy goals, and what potential market design changes would further enable deployment of resources that achieve goals of reliability, affordability, and resource mix?
 2. What are the market impacts of environmental regulations that further constrain deployment of fossil fueled generation?
 3. What are the market impacts of integrating higher levels of renewable generation with low marginal costs?
 4. Are today's market designs adequate to acquire flexible resources needed to better integrate increasing levels of variable (wind and solar) generation at reasonable costs?

Leadership may be coming from Government and Regulators

- U.S. Department of Energy (DOE) (see Forward in *The Future of Centrally-Organized Wholesale Electricity Markets* (March 2017))
 - "...provision of electricity ... undergoing significant changes ... implications are unclear ... current level of discussion and debate surrounding these changes is similar in magnitude to ... discussion and debate in ... 1990s on ... electricity industry restructuring ... today's discussions ... arisen from a range of challenges and opportunities created by new and improved technologies, changing customer and social expectations and needs, and structural changes ... key factors driving current discussions include continued low load growth ... and policies and regulations ... approaches may require reconsideration and adaptation to change"
- U.S. Federal Energy Regulatory Commission (FERC) May 1-2, 2017 technical conference scope
 - States' policy objectives prioritizing certain resources or resource attributes
 - Can objectives be achieved through existing or modified market mechanisms
 - Policy implications for wholesale electricity markets depending on whether policy objectives can be achieved through markets, focusing on market outcomes and market participants' ability to make long-term decisions
 - Long-term alternatives to reconcile competitive market framework with state policies, including objectives that such solutions seek to achieve and market design principles that should guide wholesale market rules needed to implement those solutions

Wholesale Electricity Markets and Consultations Reconciling Markets and Environmental Public Policy Objectives

- NEPOOL IMAPP
 - IMAPP started in latter half of 2016, focused consultation identifying and exploring potential changes to the ISO-NE wholesale electricity market that could be implemented to advance state public policy objectives in New England (most comprehensive consultation to date compared to NYISO and PJM)
 - Concepts presently being discussed (energy and capacity markets)
 - Forward Clean Energy Market
 - Carbon price/fee/adder (carbon shadow price)
 - Two-tier pricing
 - Zero emissions credits
 - PPAs/procurement contracts
- NYISO began discussing 'integrating public policy' and wholesale electricity market design in their Market Issues Working Group in the latter half of 2016 with a focus on New York's decarbonization goals and carbon costs
 - NYISO expected to consult on potentially adding carbon constraints to energy scheduling/dispatch, carbon pricing
- PJM started to discuss similar issues in summer of 2016 leading to formation of the Capacity Construct/Public Policy Senior Task Force (CCPPSTF)
 - CCPPSTF created to conduct an assessment of PJM's capacity market in an effort to ensure potential state public policy initiatives and capacity market objectives are not at odds
 - CCPPSTF will identify characteristics of a well-functioning capacity market, as well as potential public policy initiatives states could take regarding resource adequacy, fuel diversity, public, and environmental policies
 - PJM expected to consult on changes to capacity market and changes to calculation of negative energy prices



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