The Role of the System Operator in Tracking Generator Emissions in New England

National Summit on Smart Grid and Climate Change

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Main Objectives

- Describe the role of the ISO
- Explain how the ISO gathers and analyzes emissions data
- Highlight the transition of the generation fleet in New England

The Role of ISO New England

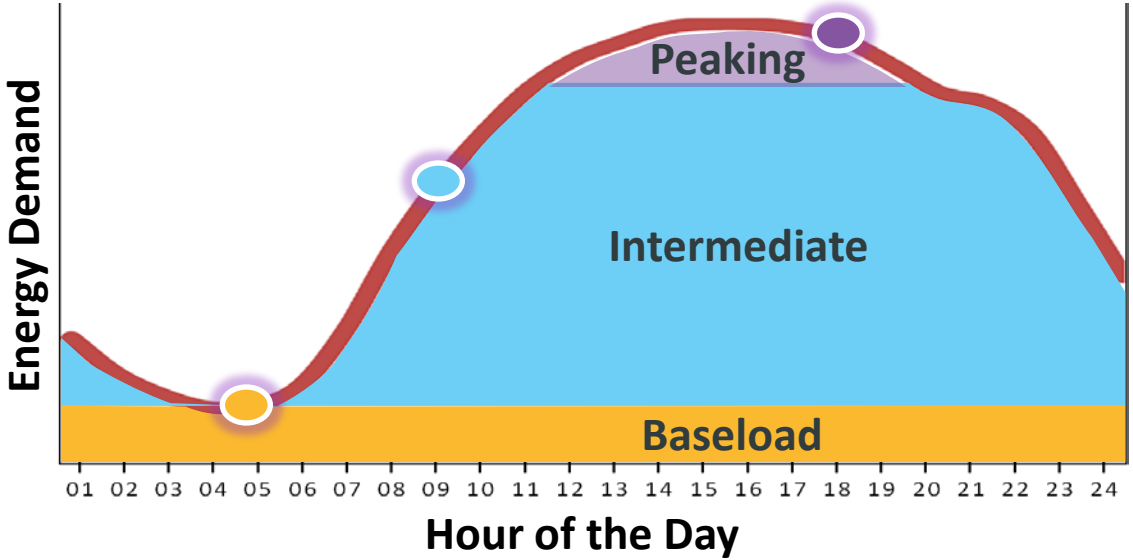
- **Regulated by** the Federal Energy Regulatory Commission
- **Reliability Coordinator and Planning Coordinator** for New England under the North American Electric Reliability Corporation
- Two decades of experience **overseeing** New England's restructured power system
- **Independent** of companies in the marketplace and neutral on technology

The ISO Uses Wholesale Market Data to Gather and Analyze Generator Emissions

- The last generating resource dispatched by the ISO to meet system demand in a given period is considered "**marginal**" in the wholesale market
  - This resources sets the locational marginal price (LMP)
- The ISO uses this data to calculate the emissions profile of the marginal resources

The Marginal Unit Changes as Demand Changes

- Reflects economic dispatch and transmission constraints



The ISO Reviews Emissions Data with Stakeholders and Publishes an Annual Electric Generator Emissions Report

Report analyzes NO_x, SO_2 and CO_2 emissions in two ways:

- Marginal Emissions Analysis
  - Annual and High Electric Demand Days (HEDD) Emission Rates (lb/MWh)
  - Heat Rates (MMBtu/MWh)
- System Emission Analysis
  - System-wide and by State (kTons)
  - Emission Rates (lb/MWh)

Source: ISO New England Inc., "Electric Generator Air Emissions Report;" http://www.iso-ne.com/system-planning/system-plans-studies/emissions.

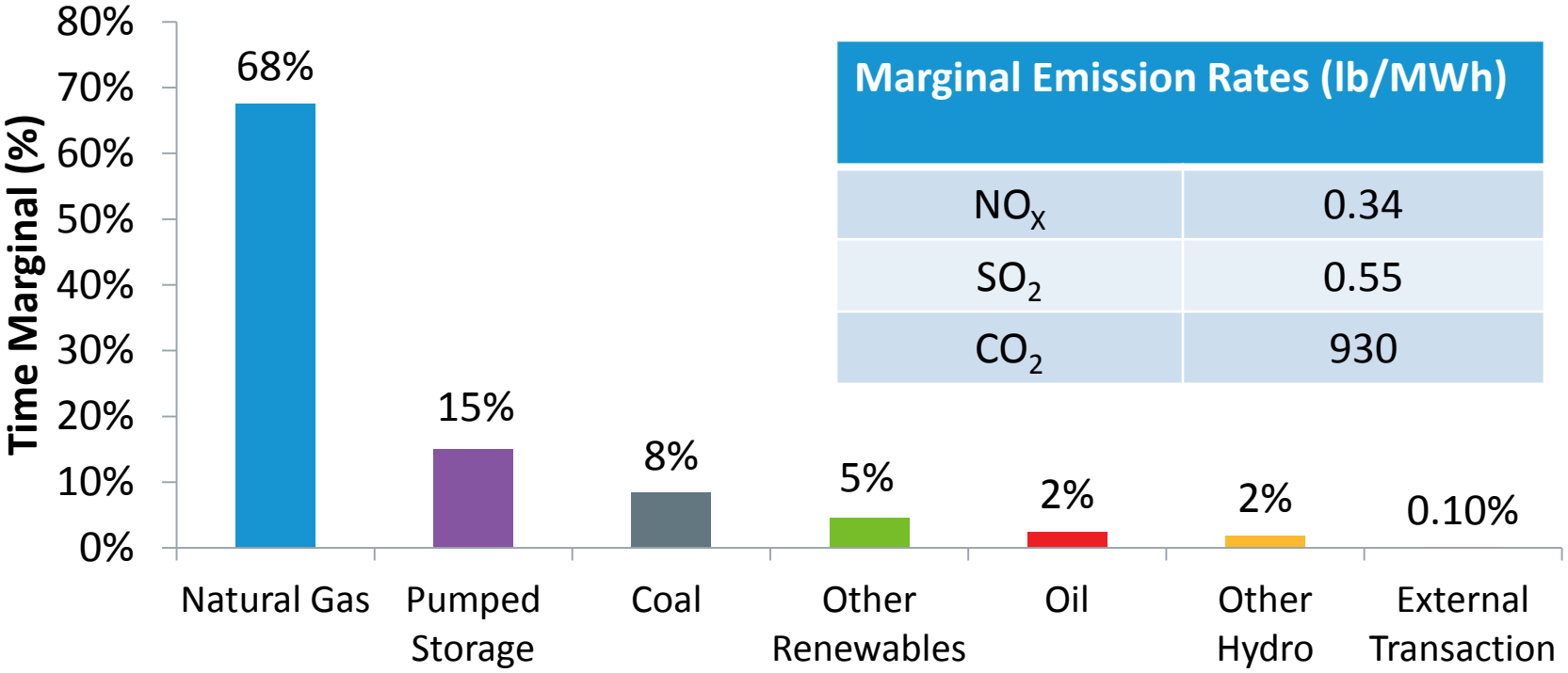
Application of the Data

The ISO-NE Marginal Emissions Analysis has several uses:

- MA Department of Environmental Protection calculates Renewable Energy Certificates (RECs) in certain circumstances
- Third parties estimate avoided emissions for alternative energy proposals (e.g., wind farm) or technology deployments (e.g., plug-in hybrid electric vehicles)

Marginal Resource by Fuel Type: Percentage of Time

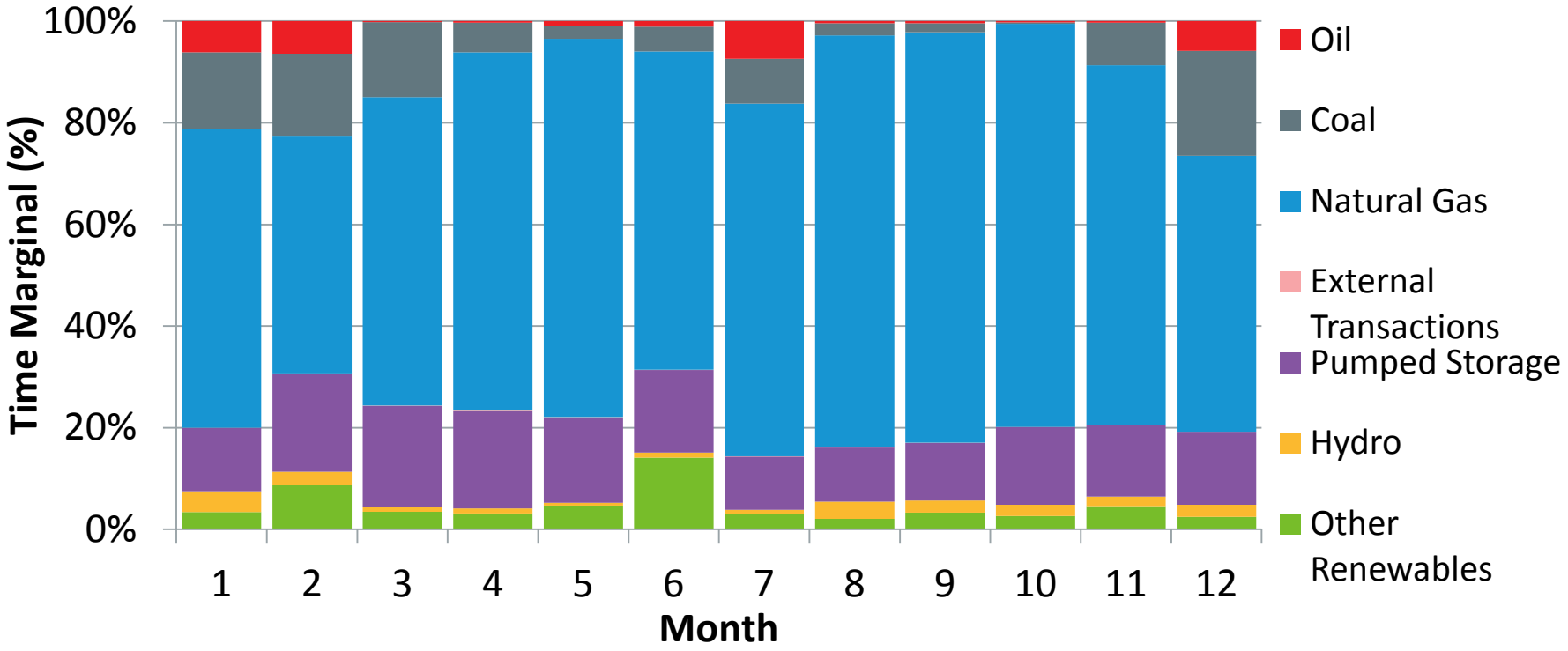
Annual (2013)



Marginal Emission Rates (lb/MWh)	
NO_X	0.34
SO_2	0.55
CO_2	930

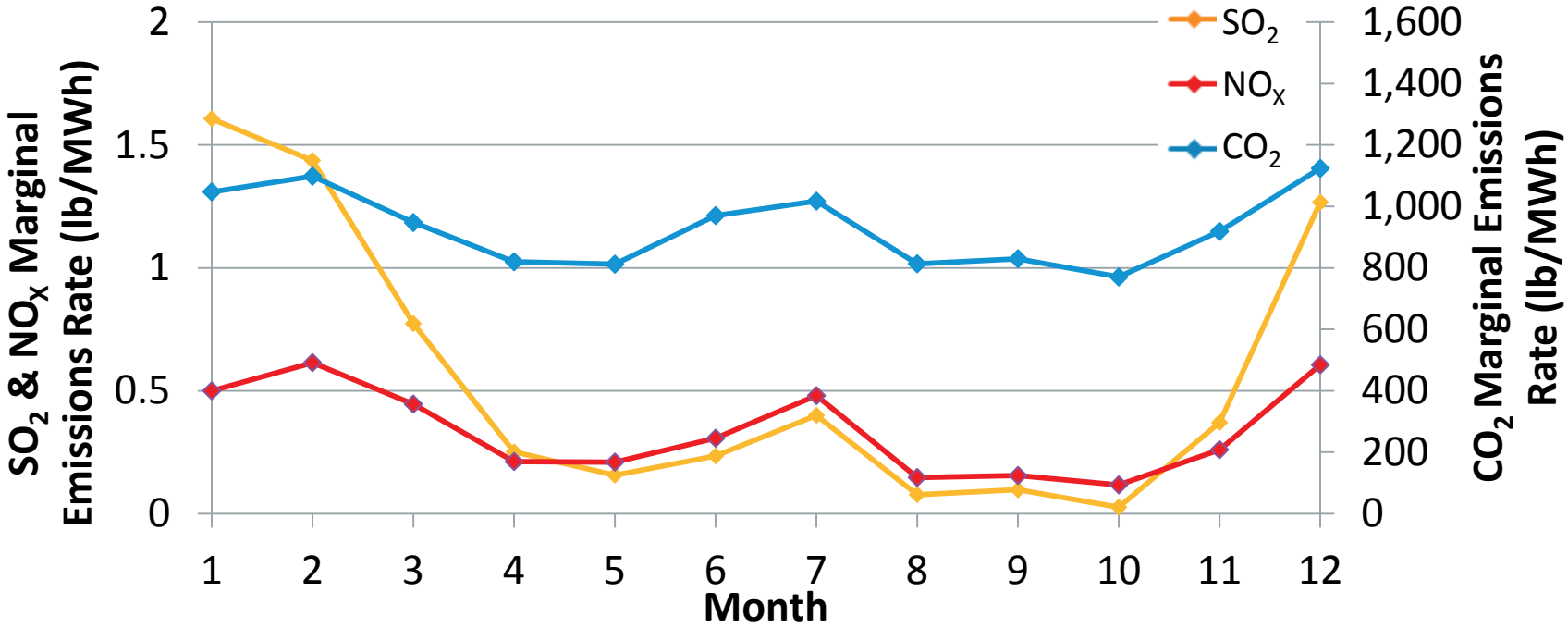
Marginal Resource by Fuel Type: Percentage of Time

Monthly (2013)



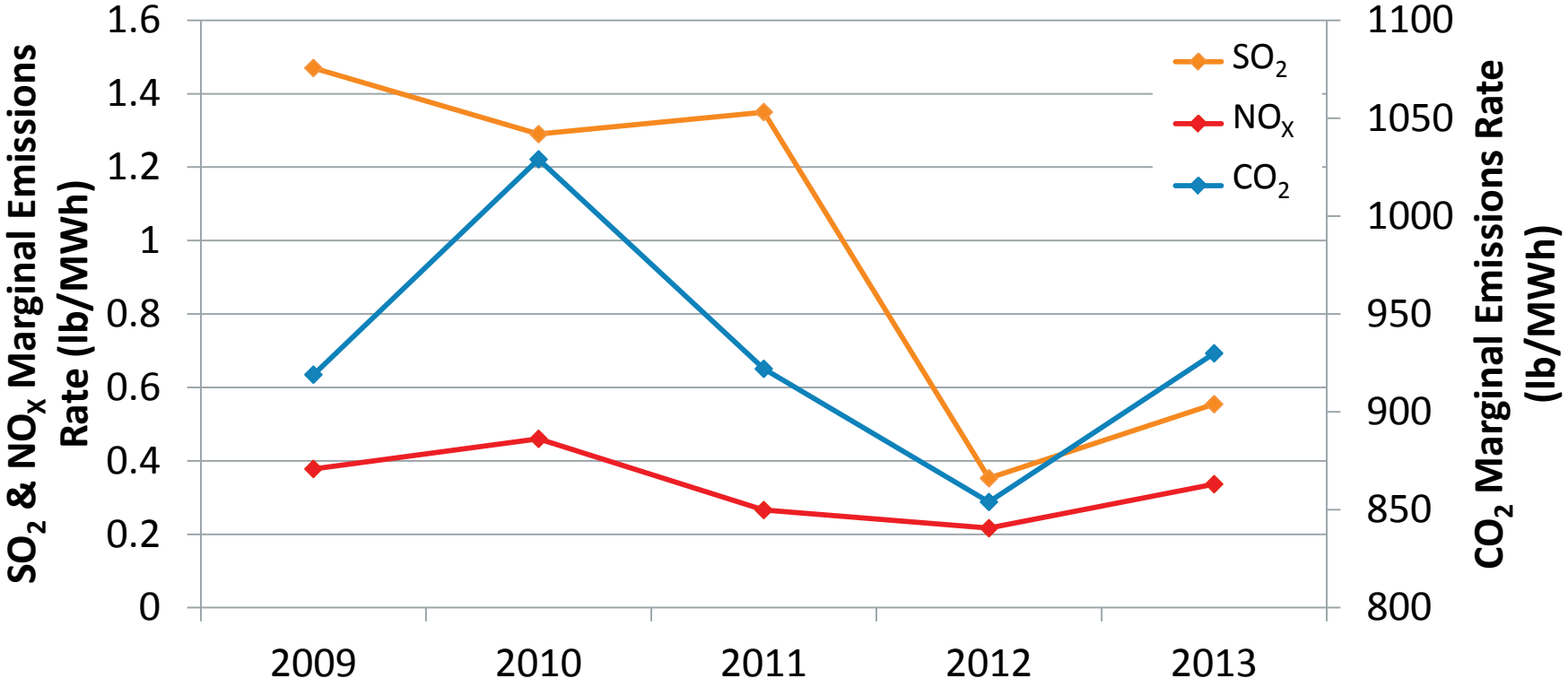
Marginal Emission Rates Vary by Season

Monthly (2013)



Marginal Emission Rates Vary by Year

Annual (2009 – 2013)

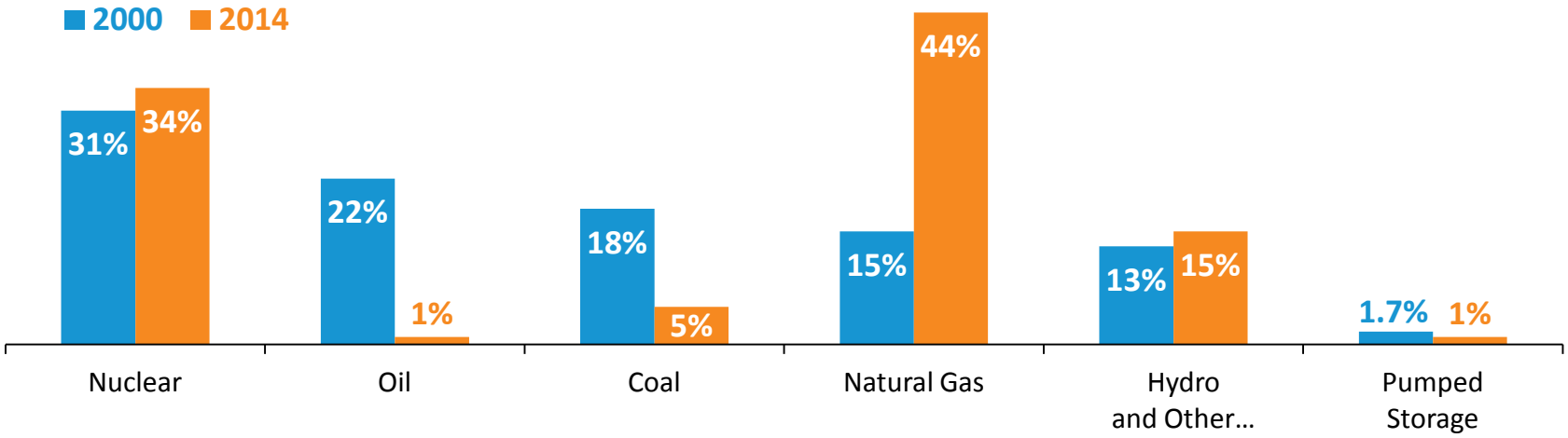


Considerations for Use of This Methodology

- What type of energy is being replaced?
  - On-peak vs. off-peak
  - High Electric Demand Days
  - Air emitting or non-air emitting
- Using historical analysis for future prediction
  - Load levels affect unit dispatch and marginal units
- Data sources and assumptions
  - What are they?
  - Where do you get them?

New England Has Seen Dramatic Changes in the Energy Mix: From Oil and Coal to Natural Gas

Percent of Total **Electric Energy** Production by Fuel Type
(2000 vs. 2014)



Source: ISO New England Net Energy and Peak Load by Source

Other renewables include landfill gas, biomass, other biomass gas, wind, solar, municipal solid waste, and miscellaneous fuels

Power Plant Emissions Have Declined with Changes in the Fuel Mix

Reduction in Aggregate Emissions (ktons/yr)

Year	NO_x	SO_2	CO_2
2001	59.73	200.01	52,991
2013	20.32	18.04	40,901
% Reduction, 2001–2013	**⬇ 66%**	**⬇ 91%**	**⬇ 23%**

Reduction in Average Emission Rates (lb/MWh)

Year	NO_x	SO_2	CO_2
1999	1.36	4.52	1,009
2013	0.36	0.32	730
% Reduction, 1999–2013	**⬇74%**	**⬇ 93%**	**⬇ 28%**

Source: 2013 ISO New England Electric Generator Air Emissions Report, December 2014

Conclusion

- ISO New England has a long history of gathering and analyzing emissions data and making this information available to state regulators/policy makers, market participants and other interested stakeholders

Questions

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