2018 ISO-NE Electric Generator Air Emissions Report

Draft Results

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RESOURCE ADEQUACY

Outline

- Report Background
- 2018 System Conditions
- New England System Emissions
  - Total (kTons)
  - Rates (lb/MWh)
- New England Locational Marginal Unit (LMU)
  - Percent Marginal by Fuel Type (Non-Load-Weighted)
- **NOTE**: *Marginal emissions using both non-load-weighted and load-weighted analyses are under review and will be presented separately to EAG*

Annual Electric Generator Air Emissions Report

Background

- NO_X, SO_2 and CO_2 Emissions
  - Total emissions by state (in kTons) and annual system emission rates
  - ISO New England generators, not including behind the meter generators
- Marginal Emission Rates
  - Locational Marginal Unit (LMU), LMP-based method of identifying marginal units
- Data Sources
  - U.S. EPA Clean Air Markets Database (CAMD)
    - 2018 included 34% of total power plant emissions for NO_X, 66% for SO_2, and 73% for CO_2
  - For units without U.S. EPA CAMD emissions
    - NEPOOL Generator Information System (GIS) monthly data
      - Together, greater than 93% of emissions data for all three emission types came from a combination of CAMD and GIS data
    - U.S. EPA's latest eGRID database or historically assumed emission rates based on unit type and age

Overall Summary

2017 to 2018

- New England System
  - Energy generation in 2018 was 1% higher than in 2017
    - The average Q1 winter temperature, which was approximately the same as in 2017, was relatively warm. The average summer temperature was slightly higher than normal, but the average for July and August was significantly warmer than normal.
  - Generation from coal, other renewables, and nuclear declined in 2018, while generation from the remaining categories increased. The greatest percentage changes were in coal generation, which decreased by 34%, and in oil-fired generation, which increased by 57%.

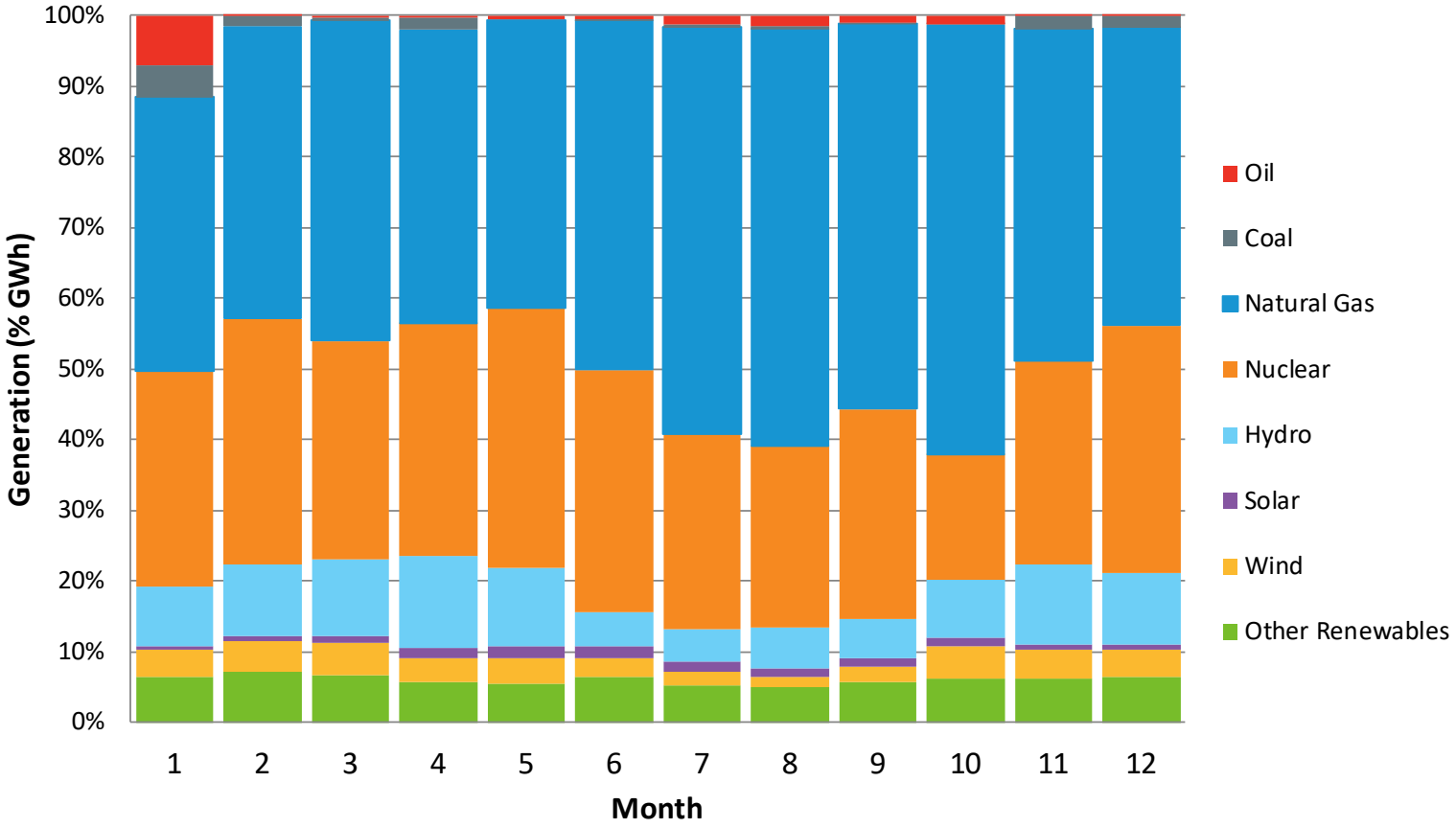
- System Emissions (ktons and lb/MWh)
  - Total system emissions increased for both NO_X and SO_2, but decreased for CO_2
    - ktons of NO_X and SO_2 increased by 2.0% and 24.0%, respectively, while CO_2 decreased by 2.5%
      - The increases were primarily driven by the increase in oil-fired generation
    - The SO_2 rate increased by 25.0%, while the CO_2 rate decreased by 3.5%. There was no change in the NO_X rate.

2018 SYSTEM CONDITIONS

2018 in Summary

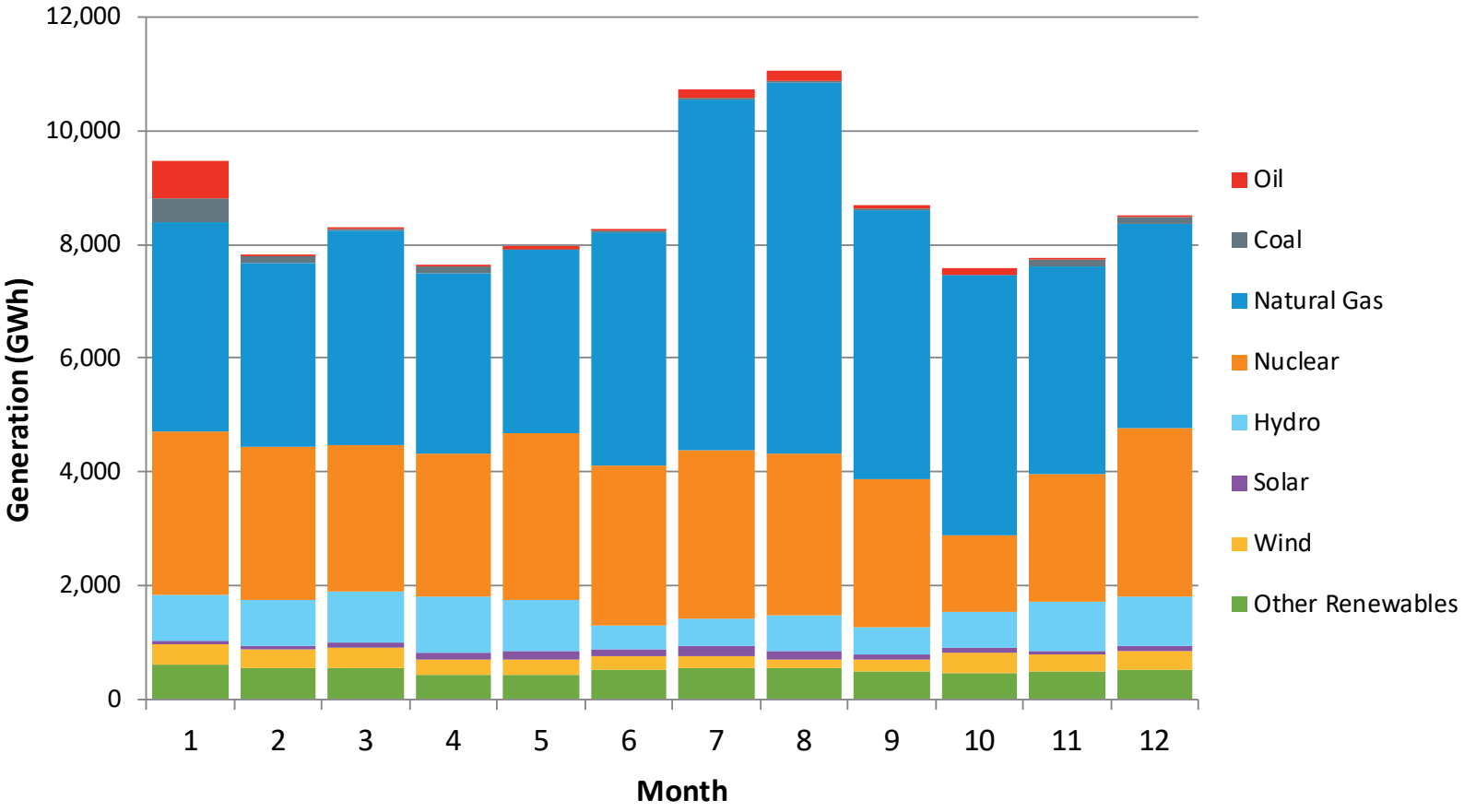
- Net Energy for Load increased 1.9%
  - 121,220 GWh in 2017 to 123,472 GWh in 2018
- System Generation increased 1.1%
  - 102,564 GWh in 2017 to 103,740 GWh in 2018
- Net Flow Over External Ties increased 5.7% (importing)
  - 20,373 GWh in 2017 to 21,536 GWh in 2018
- Summer Peak Demand increased 8.4%
  - 23,968 MW in 2017 vs. 25,980 MW in 2018
- Energy Generation by Primary Fuel Types (from 2017 to 2018)
  - Decrease in coal, other renewables, and nuclear generation
    - Coal: - 572 GWh (-34%)
    - Other Renewables: -486 GWh (-7%)
    - Nuclear: -153 GWh (-0.5%)
  - Increase in natural gas, oil, PV and wind, and hydro generation
    - Natural gas: + 1,318 GWh (+3%)
    - Oil (residual fuel oil): + 460 GWh (+57%)
    - PV and Wind: + 435 GWh (+10%)
    - Hydro: + 147 GWh (+2%)

2018 Monthly Generation by Fuel Type (% GWh)



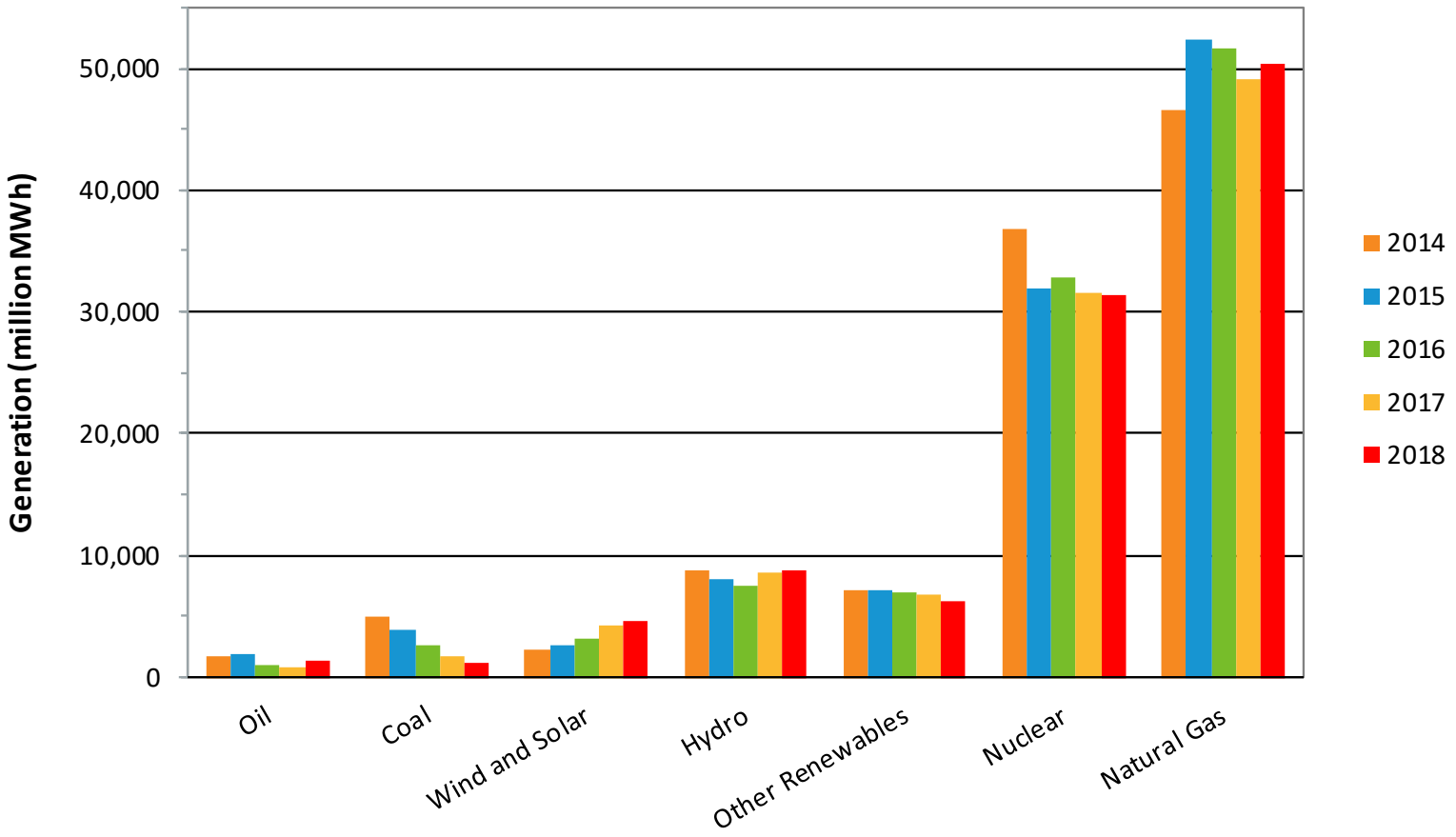
Note: ISO New England generators, not including behind-the-meter (BTM) generators, such as BTM PV

2018 Monthly Generation by Fuel Type (GWh)



Note: ISO New England generators, not including behind-the-meter generators

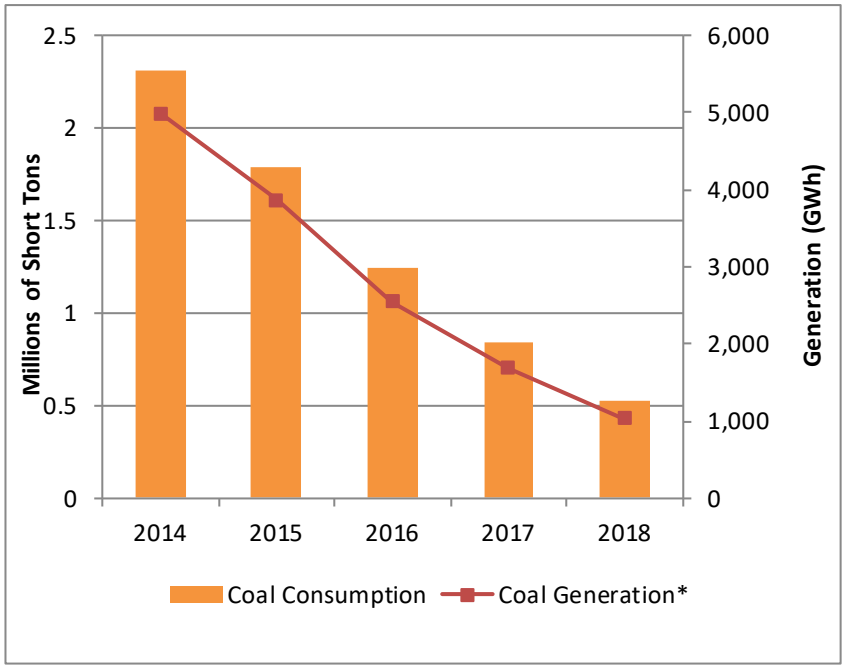
2014 – 2018 Generation by Fuel Types (MWh)

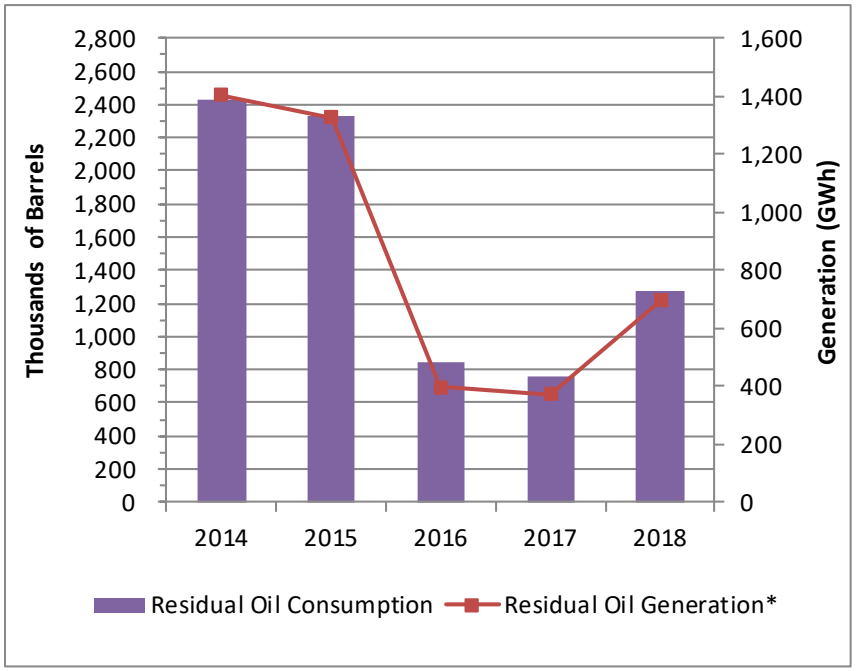


Based on Primary Fuel Type of generators from the 2018 CELT Report

2014 – 2018 New England

Coal and Oil Consumption vs. Generation

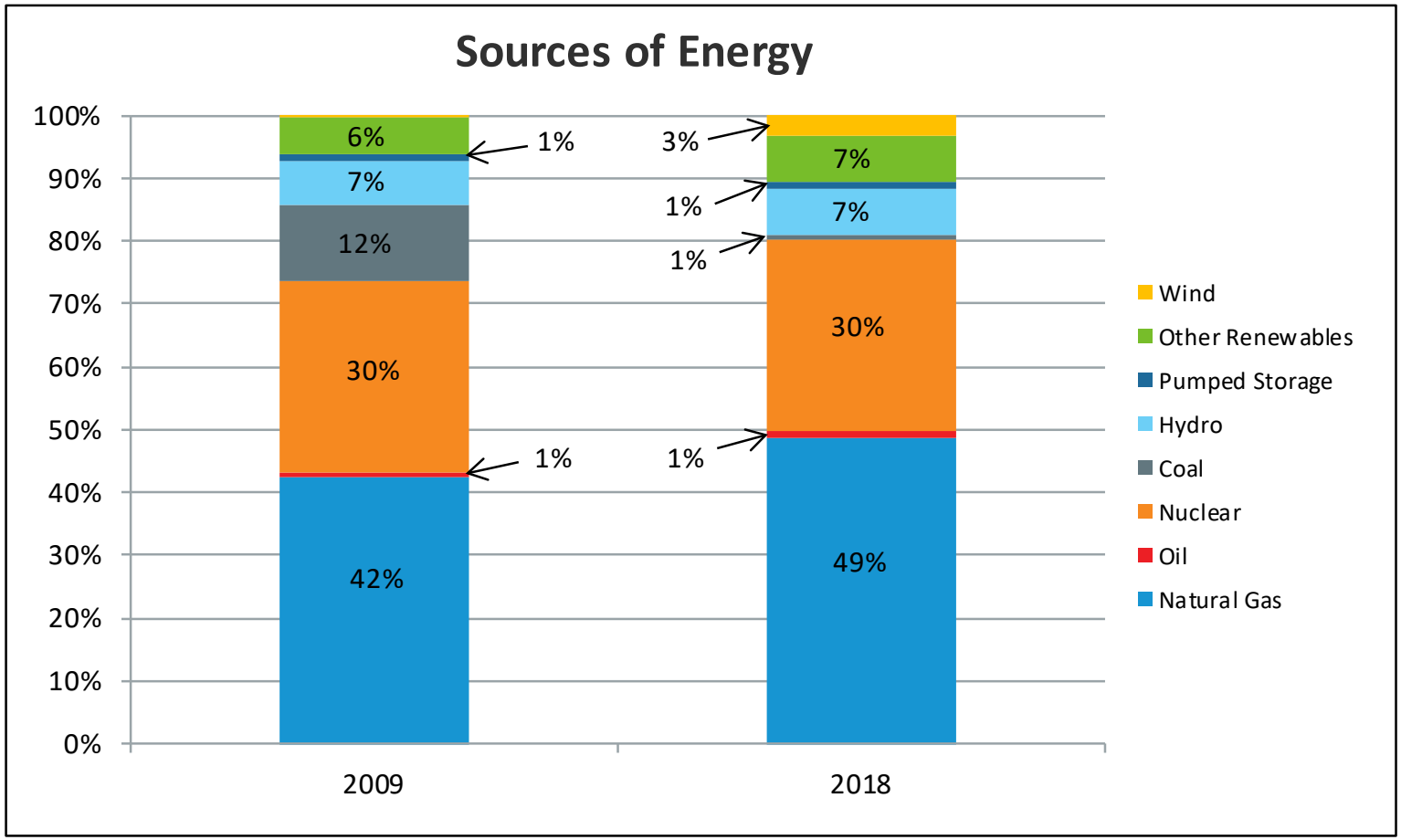




* Both fuel consumption and generation data are from EIA-923 Schedule 1, located at http://www.eia.gov/electricity/data/eia923/

Shift in New England's Generator Fuel Mix

2009 to 2018



119,437 GWh **103,713 GWh**

2018 ISO NEW ENGLAND SYSTEM EMISSIONS

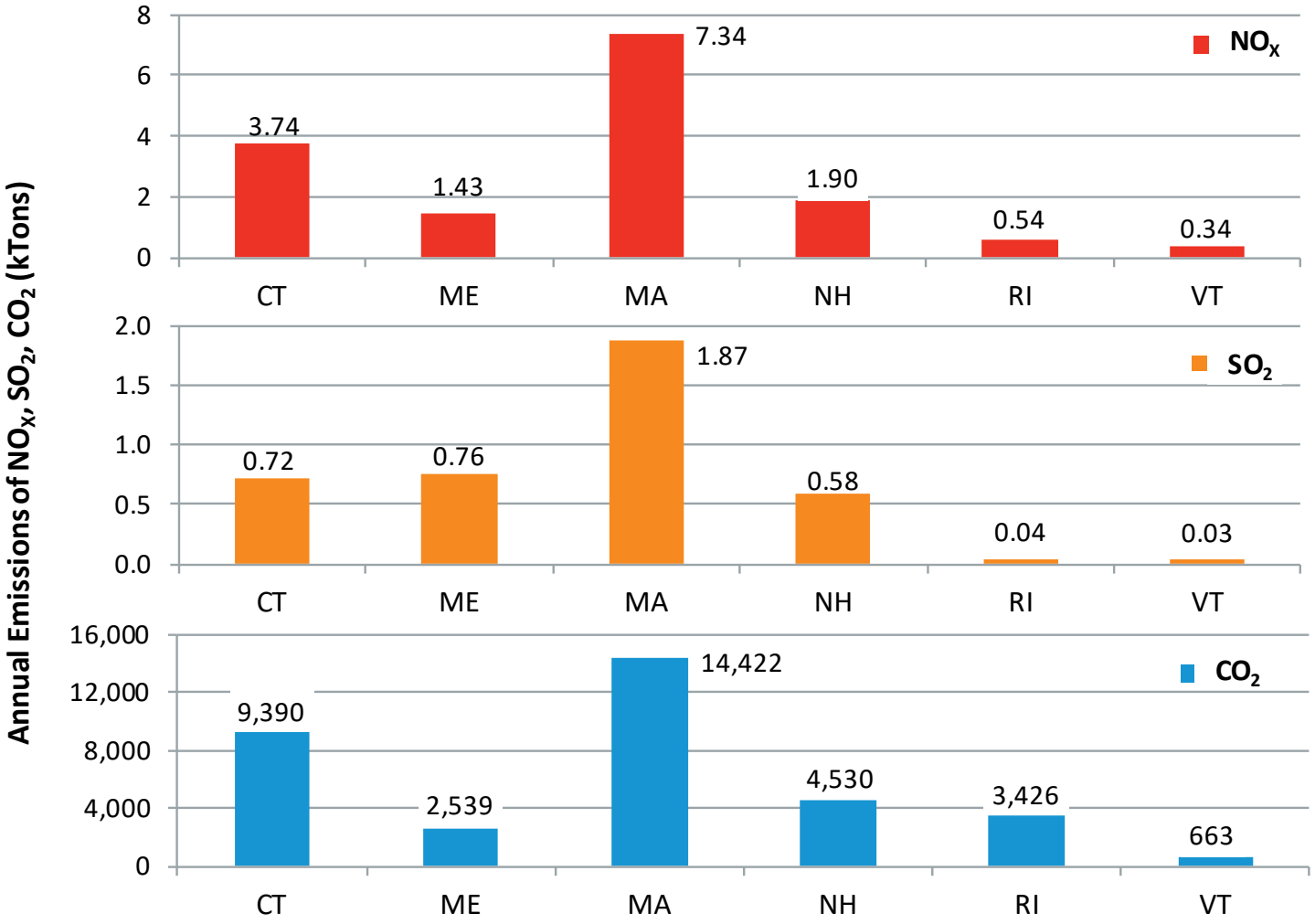
2017 & 2018 Total System Emissions and Emission Rates

Total System Emissions			
	2017 Emissions (kTons)	2018 Emissions (kTons)	Total Emissions % Change
NO_X	15.30	15.61	2.0
SO_2	4.00	4.96	24.0
CO_2	34,969	34,096	-2.5

	2017 Emission Rate (lb/MWh)	2018 Emission Rate (lb/MWh)	Emission Rate % Change
NO_X	0.30	0.30	0.0
SO_2	0.08	0.10	25.0
CO_2	682	658	-3.5

2017 ISO-NE Annual System Emissions

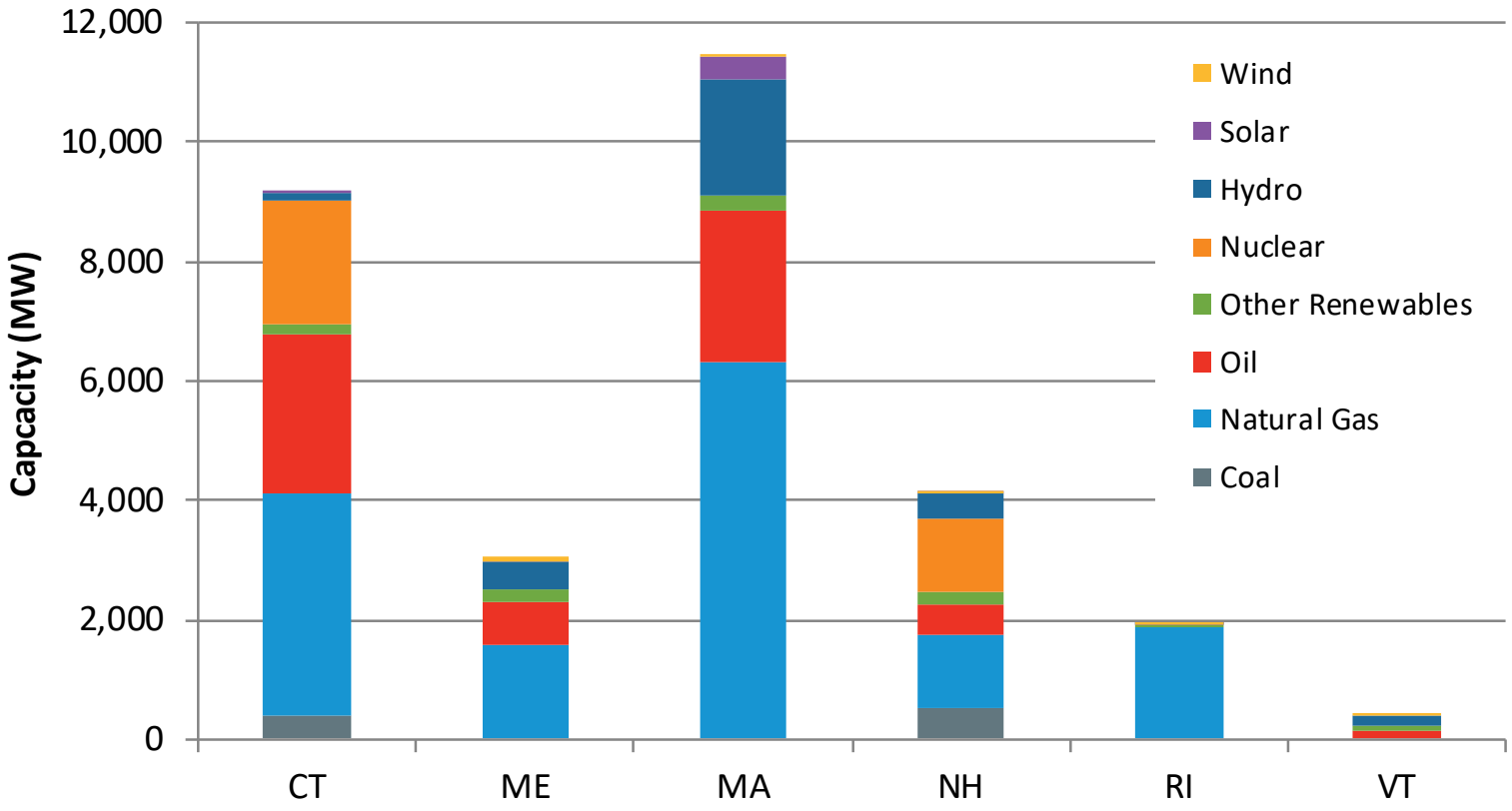
By State (kTons)



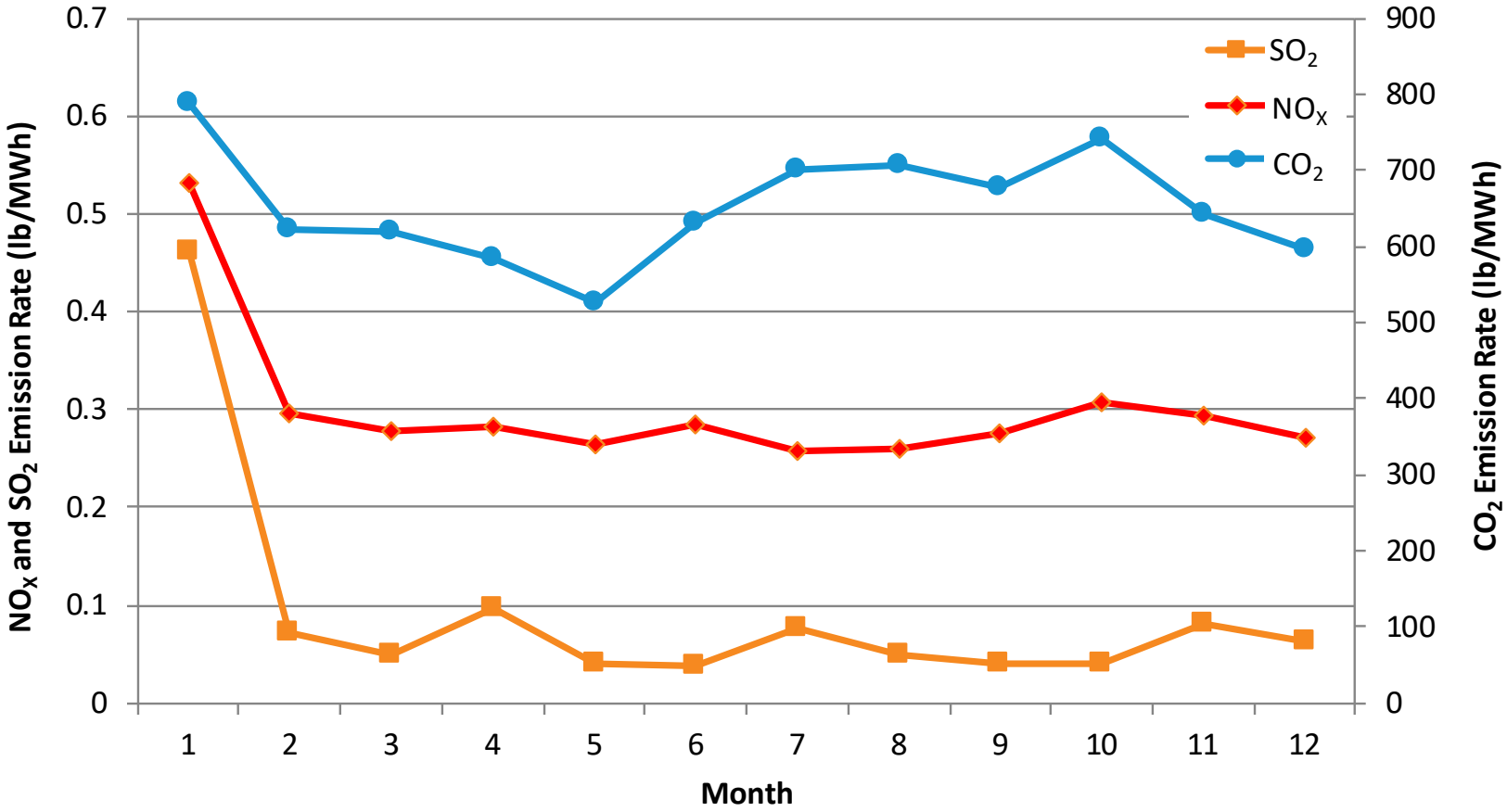
2018 ISO-NE Annual System Emissions

By State (kTons)

2018 New England Summer Claimed Capability by State (MW)

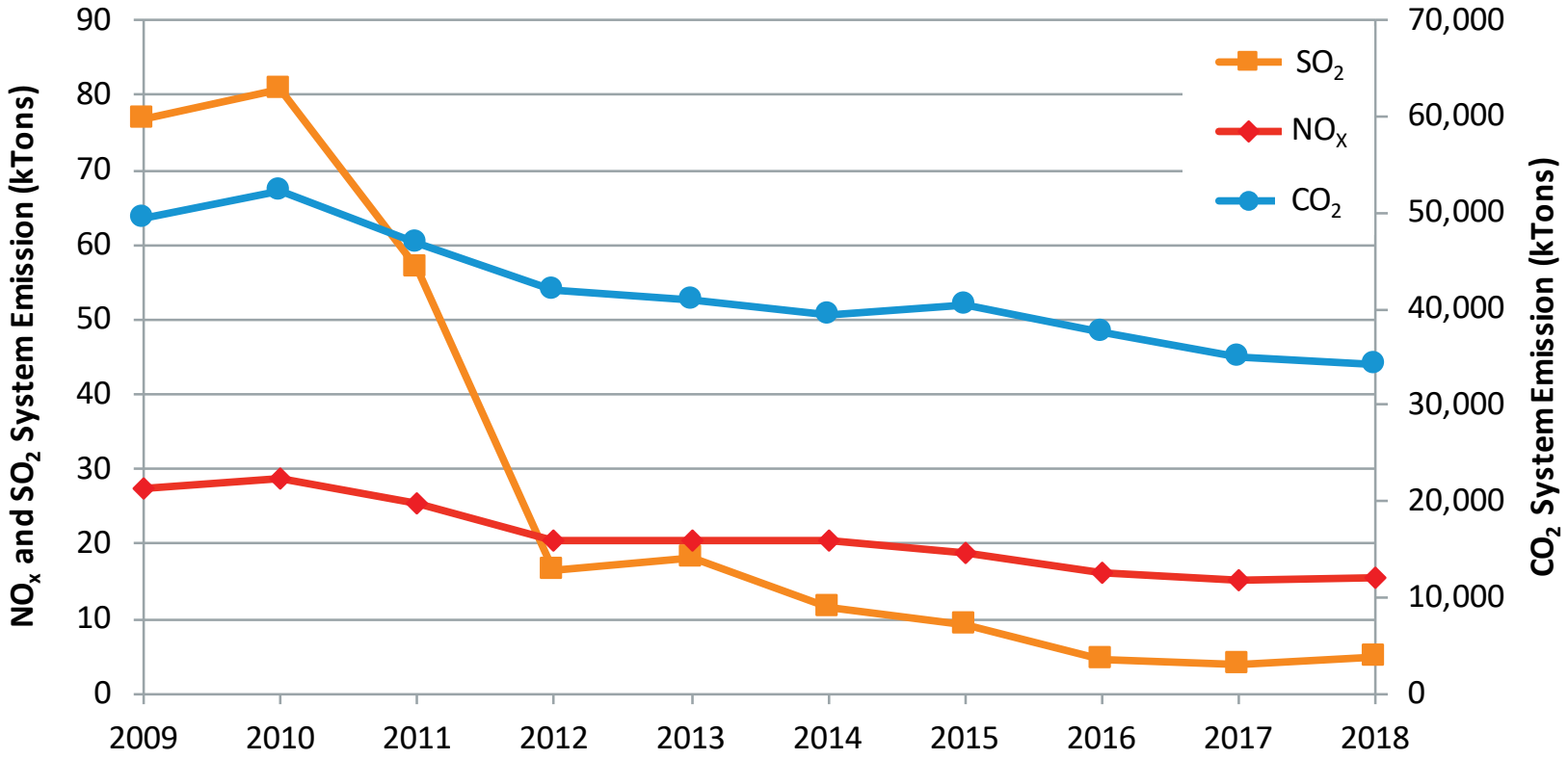


2018 ISO-NE Average Monthly System Emission Rates (lb/MWh)



See Slides 7 and 8 to compare to monthly generation by fuel type

2009 – 2018 ISO-NE Annual System Emission (kTons)



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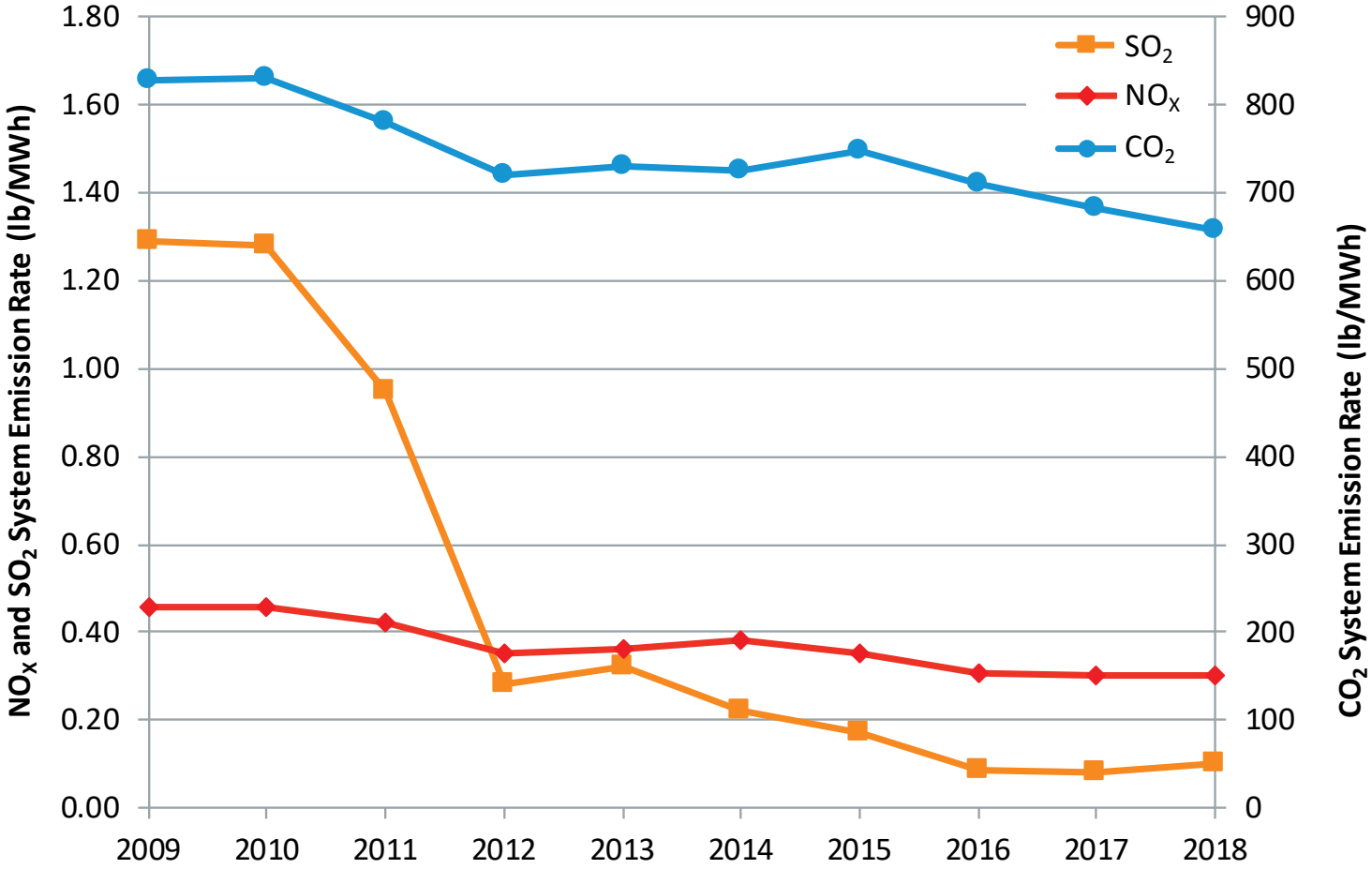


2018 ISO NEW ENGLAND MARGINAL EMISSIONS ANALYSIS

Locational Marginal Unit (LMU)

- *Non-Load-Weighted Percent Marginal by Fuel Type*

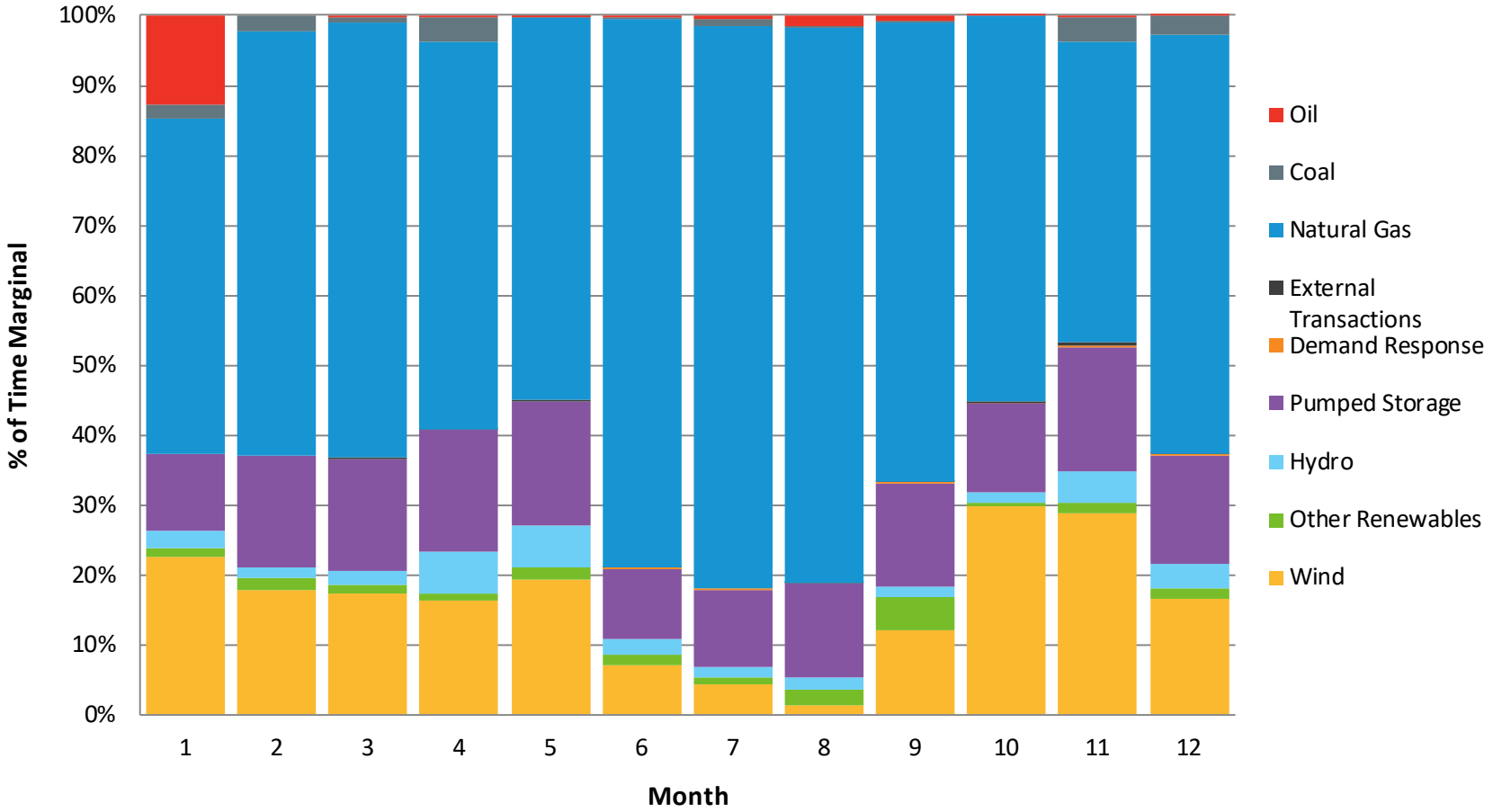
Marginal Emissions Analysis

Overview

- Locational Marginal Units (LMUs) are identified by Locational Marginal Price (LMP)
  - Based on historical real-time generation dispatch records
- Marginal emissions calculated for two scenarios:
  - All LMUs
  - Emitting LMUs

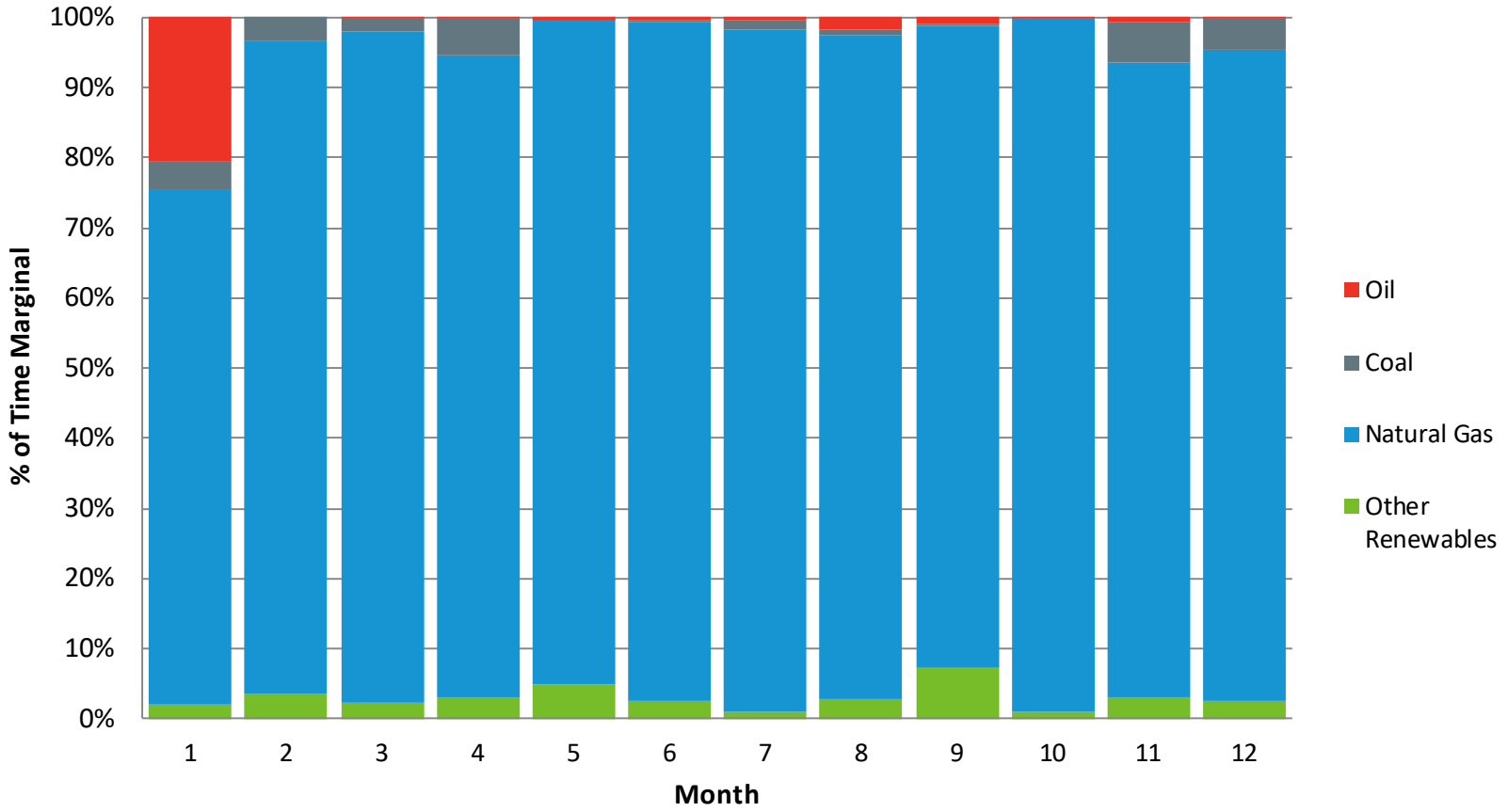
2018 Monthly Percent of Time Unit Types Are Marginal

All LMUs – Non-Load-Weighted



2018 Monthly Percent of Time Unit Types Are Marginal

Emitting LMUs



Next Steps

- Complete calculations of marginal emissions using both non-load-weighted and load-weighted analyses
- Post results for stakeholder review
- Schedule an EAG meeting in coming weeks to discuss results

Questions