Historic Data for Discussion of the PJM Regulation Requirement

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Agenda

- Education Review
  - Peer Regulation Requirements
- Historic Metrics
  - Regulation Signal Saturation
  - Drivers of Need
- Discussion

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Education Review: Peer Regulation Requirements

	PJM	ISO NE	MISO	ERCOT	SPP	CAISO	NYISO
Interval	Periodic (On- or Off-Ramp), Hours Shift Seasonally	Hourly	Hourly	Hourly	Hourly	Hourly	Hourly
Dependencies	Season, Fixed MW values (800 MW On-Ramp, 525 MW Off-Ramp)	Historic control performance	Predicted next-day operating conditions before DA market close	Net load variability, recent regulation utilization level, magnitude of installed wind capacity	Load forecast, intermittent resource forecast	Floor of 350 MW Reg Up/Down, Forecasted Load	Fixed values
Derivation of the Regulation Requirement	Fixed values are based on previous requirements (i.e. percentage of peak load)	Calculated using historical hourly load and control performance	Calculated using predicted hourly load and anticipated system conditions	Calculated using 5-minute net load variability, recent utilization of regulation, and short-term load forecast error, all adjusted using current installed wind capacity	Calculated using the magnitude and variability of load and intermittent resource forecasts	Calculated as percentage of forecasted load in real-time	Fixed values are based on peak loads during historic hours, week/weekend days, and seasons

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Education Review: Peer Regulation Requirements

- PJM is unique in its predetermined hourly requirements
- Parameters that influence peer requirements include
  - Installed renewable capacity (ERCOT)
  - Load forecasts or actuals (ISO-NE, MISO, ERCOT, SPP, CAISO, NYISO)
  - Renewables forecasts or actuals (ERCOT, SPP)
  - Historic control performance (ISO-NE)
  - Other system conditions

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Historic Signal Saturation

- *In this section:*
  - Historic Instances of Signal Saturation >30 minutes
  - Signal Saturation >30 min Across Ramp Hours and Seasons
- Signals outside +/-99% TREGA, TREGD, or TREG for multiple intervals are considered saturated for our purposes
- Will explore saturation of REGA, REGD, and coincident saturation
- Captures **January 1, 2017 through July 1, 2022**
- Color code represents timing of each instance:

During Off-Ramp Hours
During On-Ramp Hours

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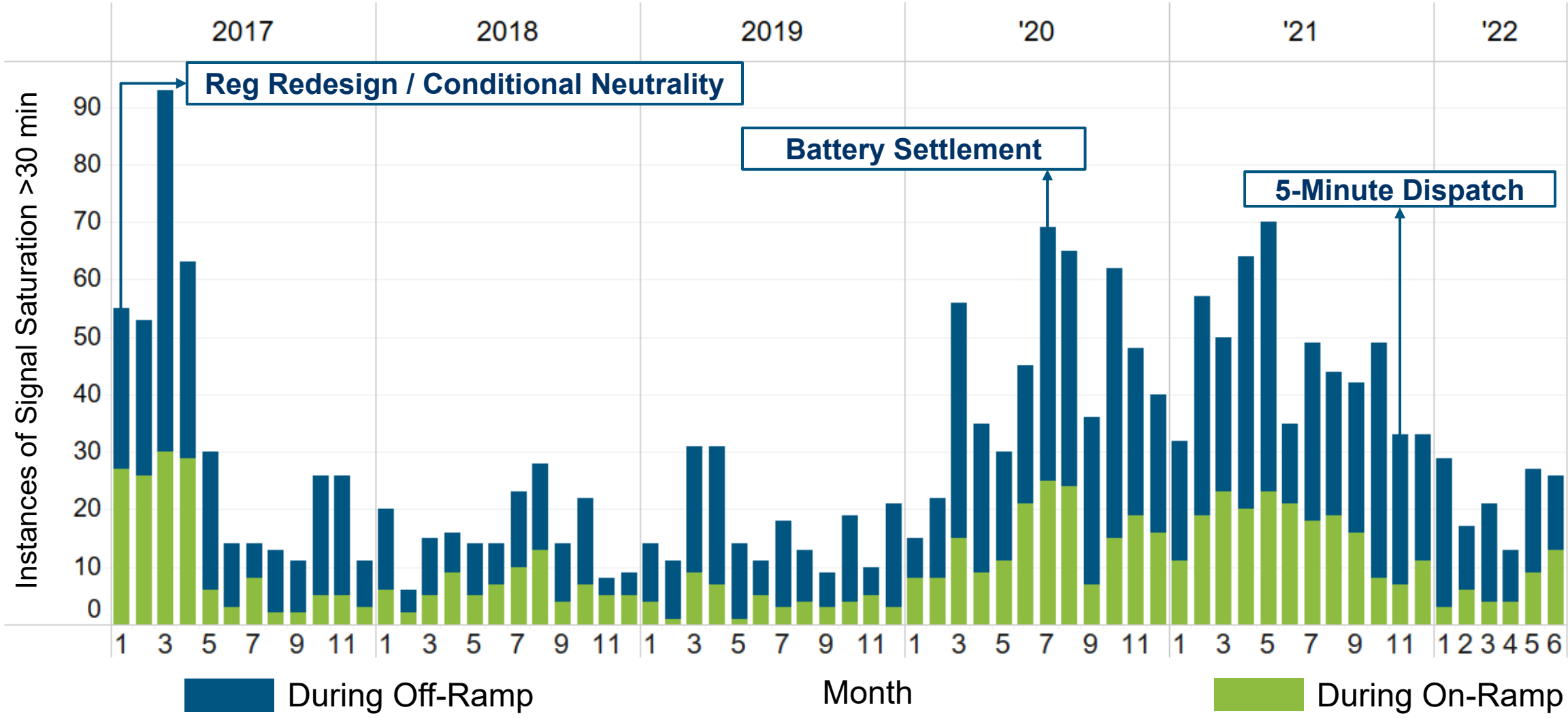
REGA Signal Saturation Over Time

January 1, 2017 - July 1, 2022



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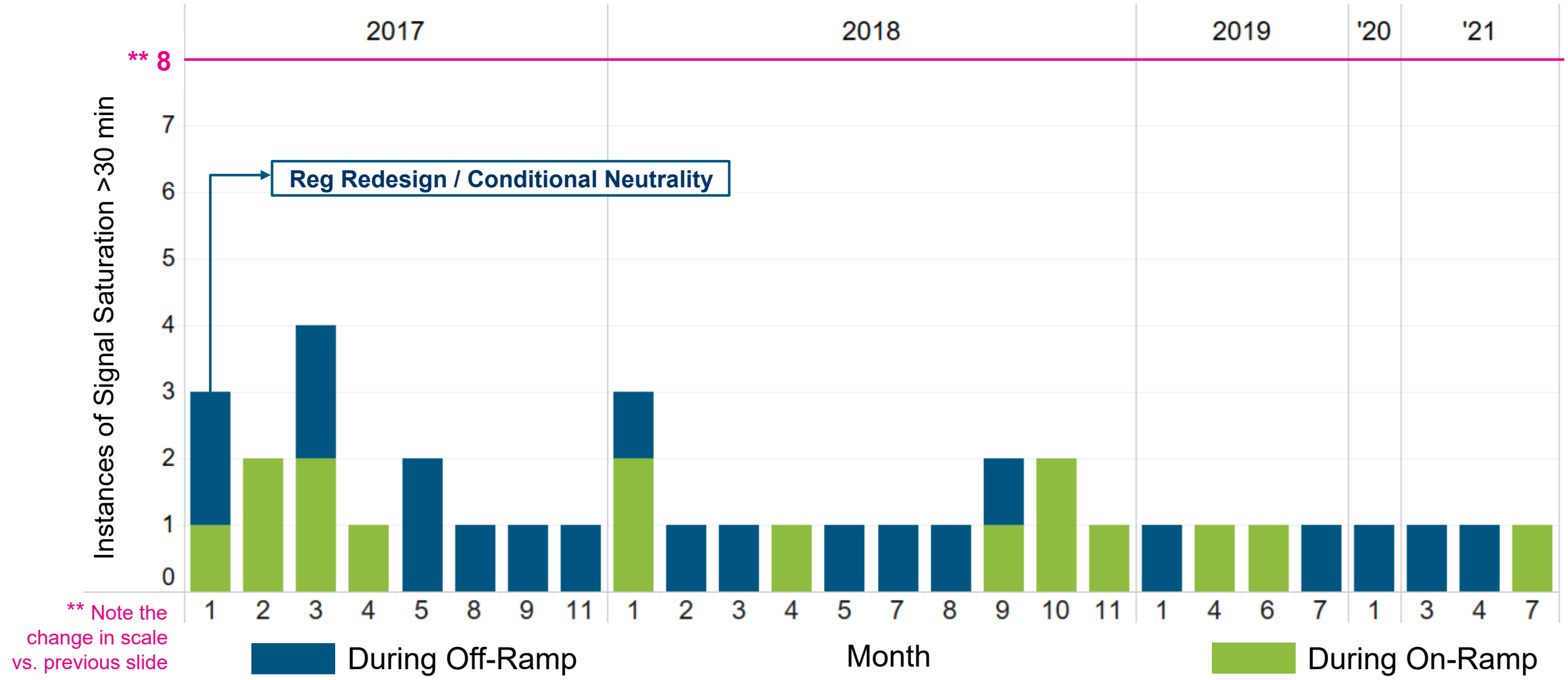
REGD Signal Saturation Over Time



** Note the change in scale vs. previous slide

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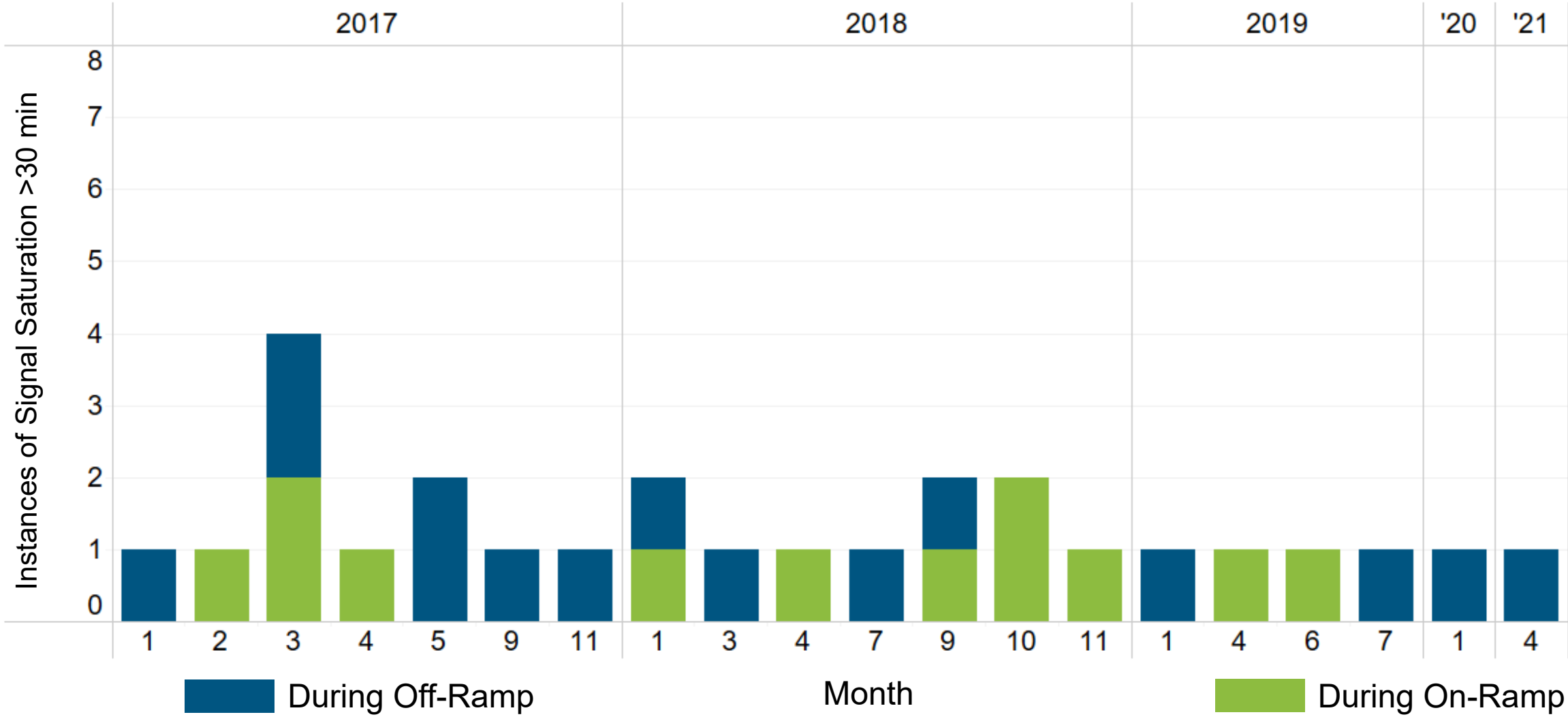
Coincident Signal Saturation Over Time



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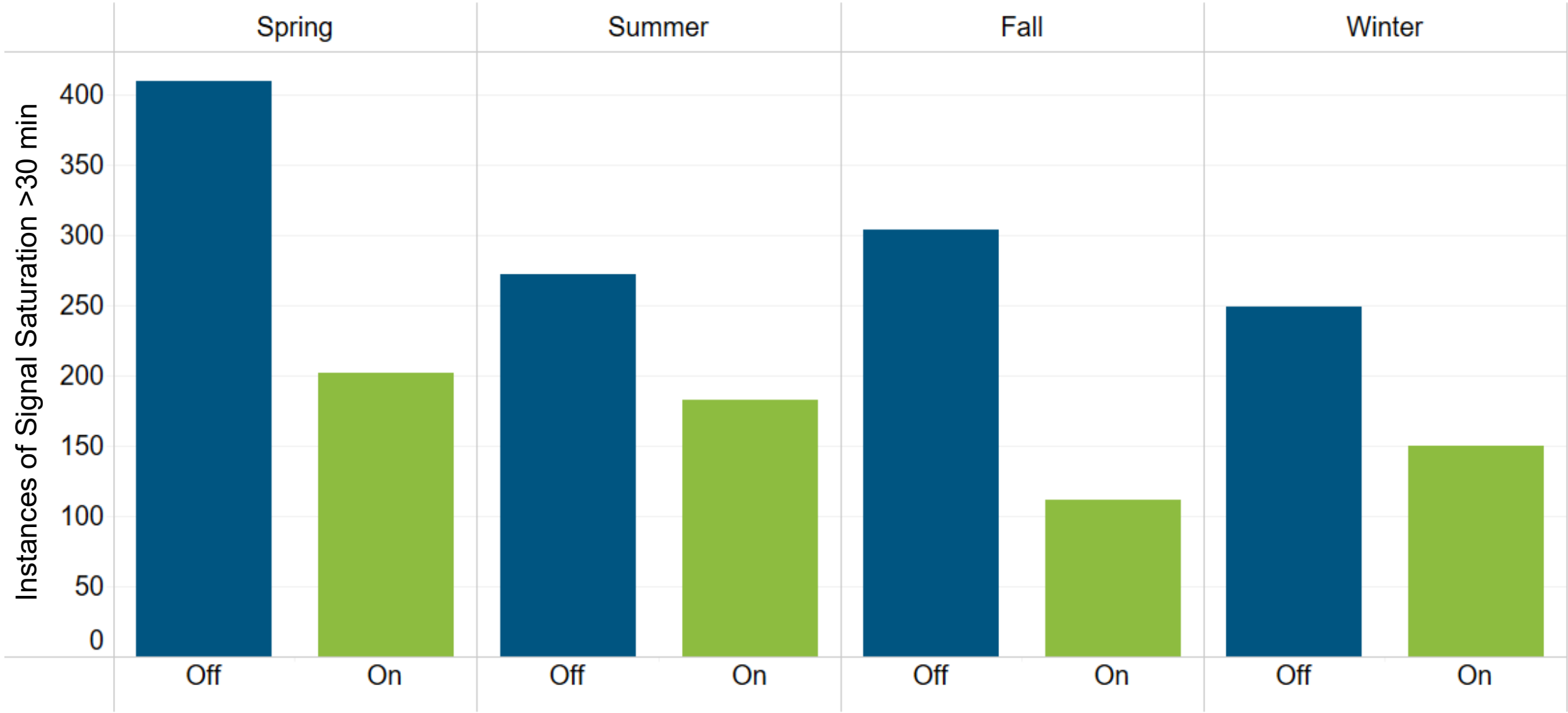
REGA Signal Saturation by Season and Ramp Hour



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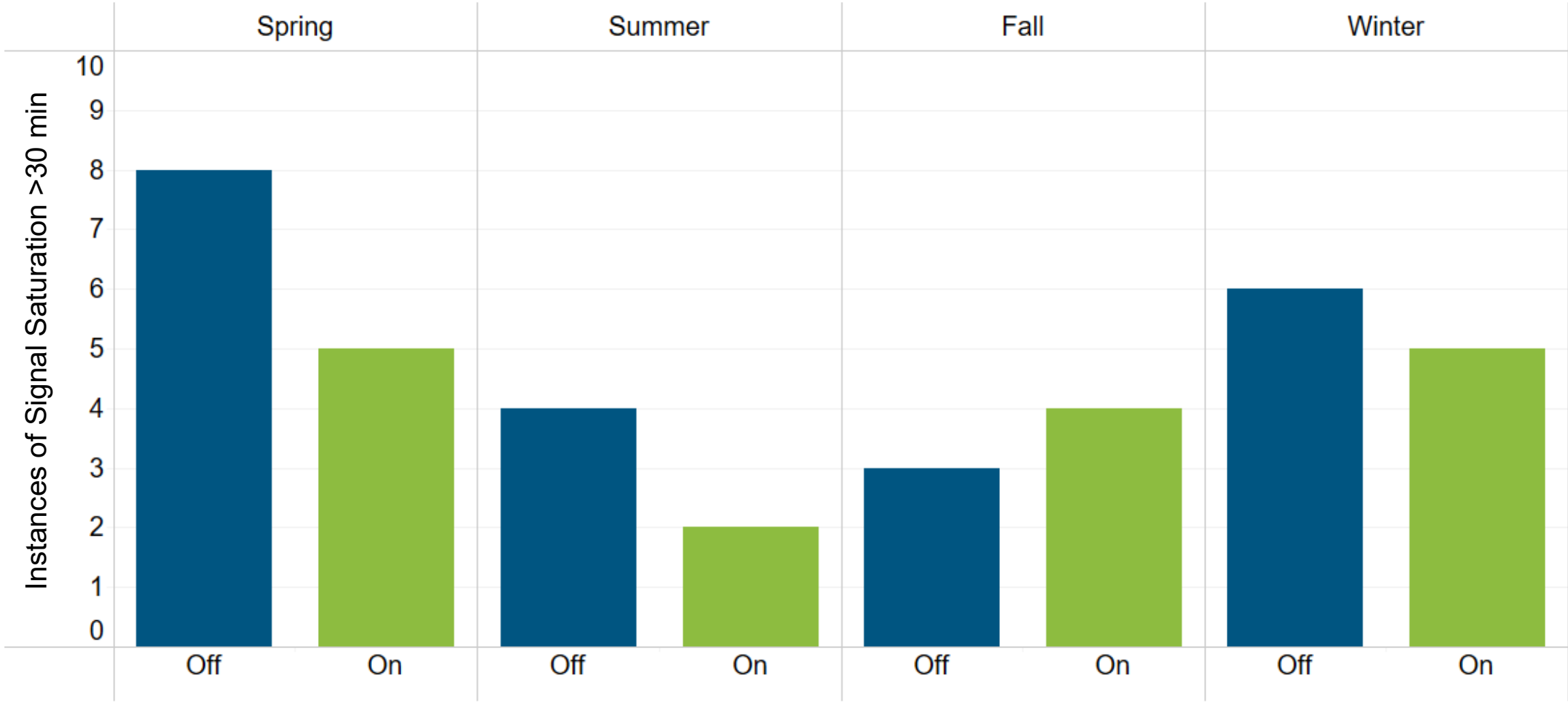
REGD Signal Saturation by Season and Ramp Hour



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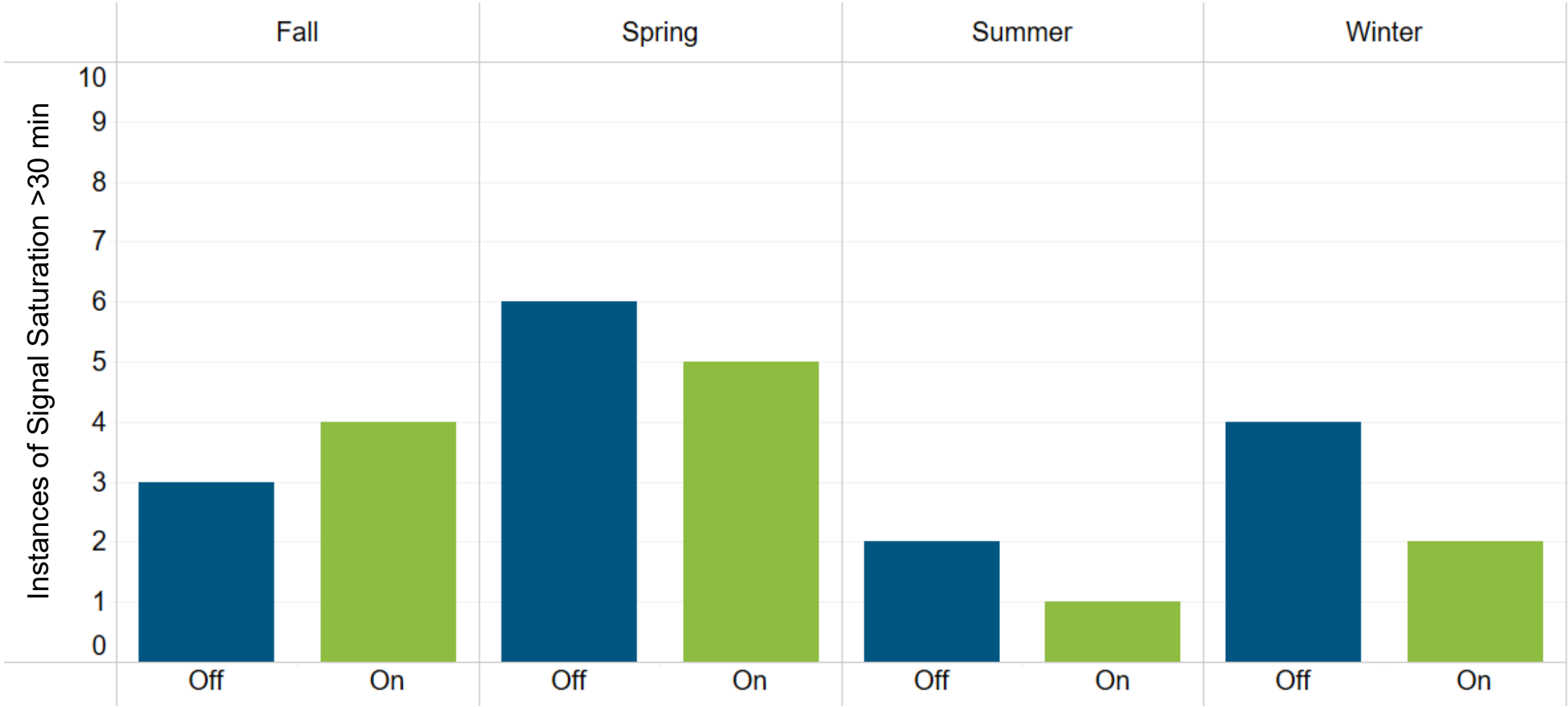
Coincident Signal Saturation by Season and Ramp Hour



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Driving Factors

- **ACE** – variability and volatility in ACE drives need for regulation, itself is influenced by various factors
- **Interchange** – change in imports/exports over short periods of time, forecasted or otherwise
- **Load** – change in load over short periods of time (ramp), can be discussed as “net” load (gross minus wind, solar)
- **Renewables** – growth of installed MW over time and the resulting variable output

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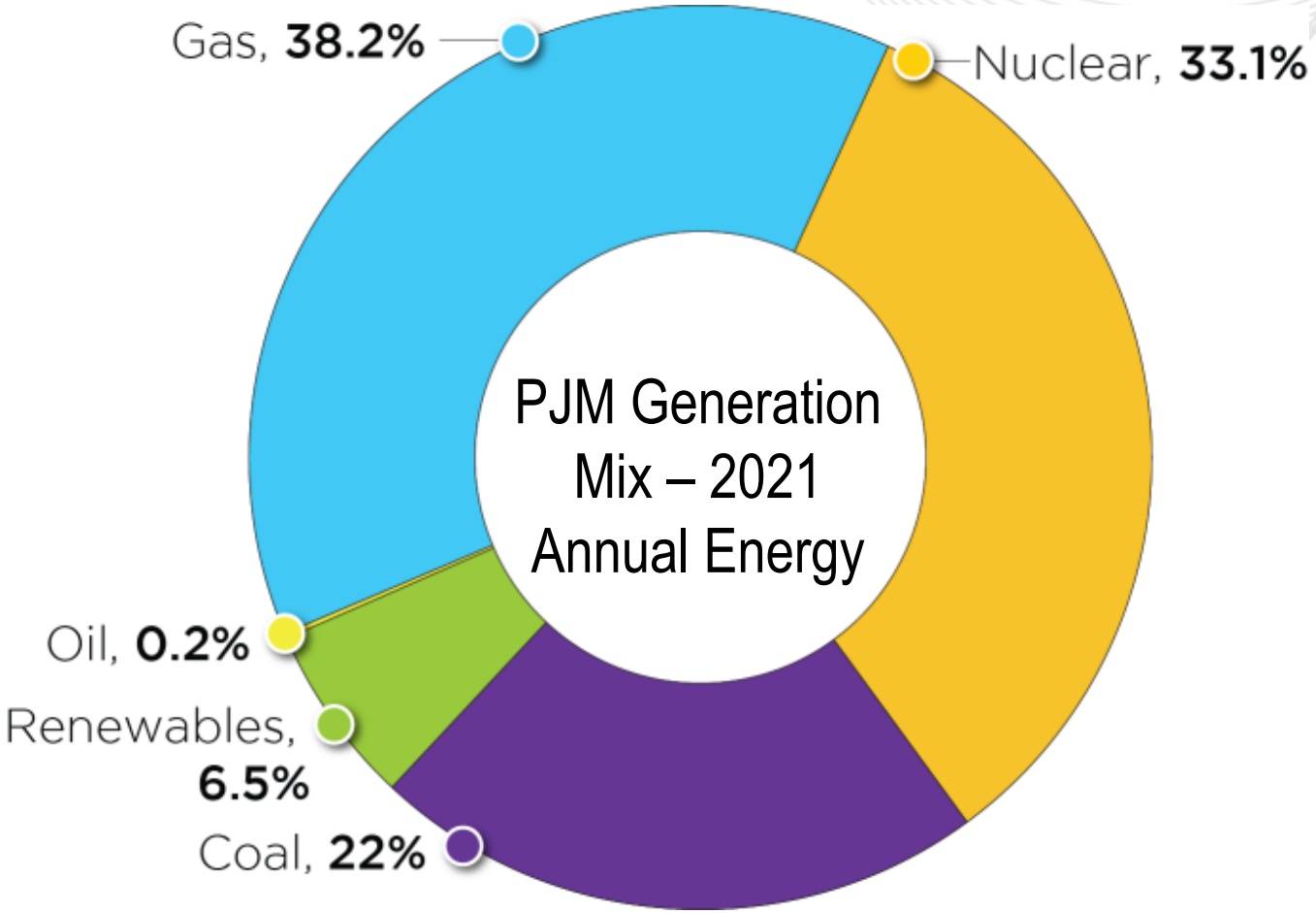
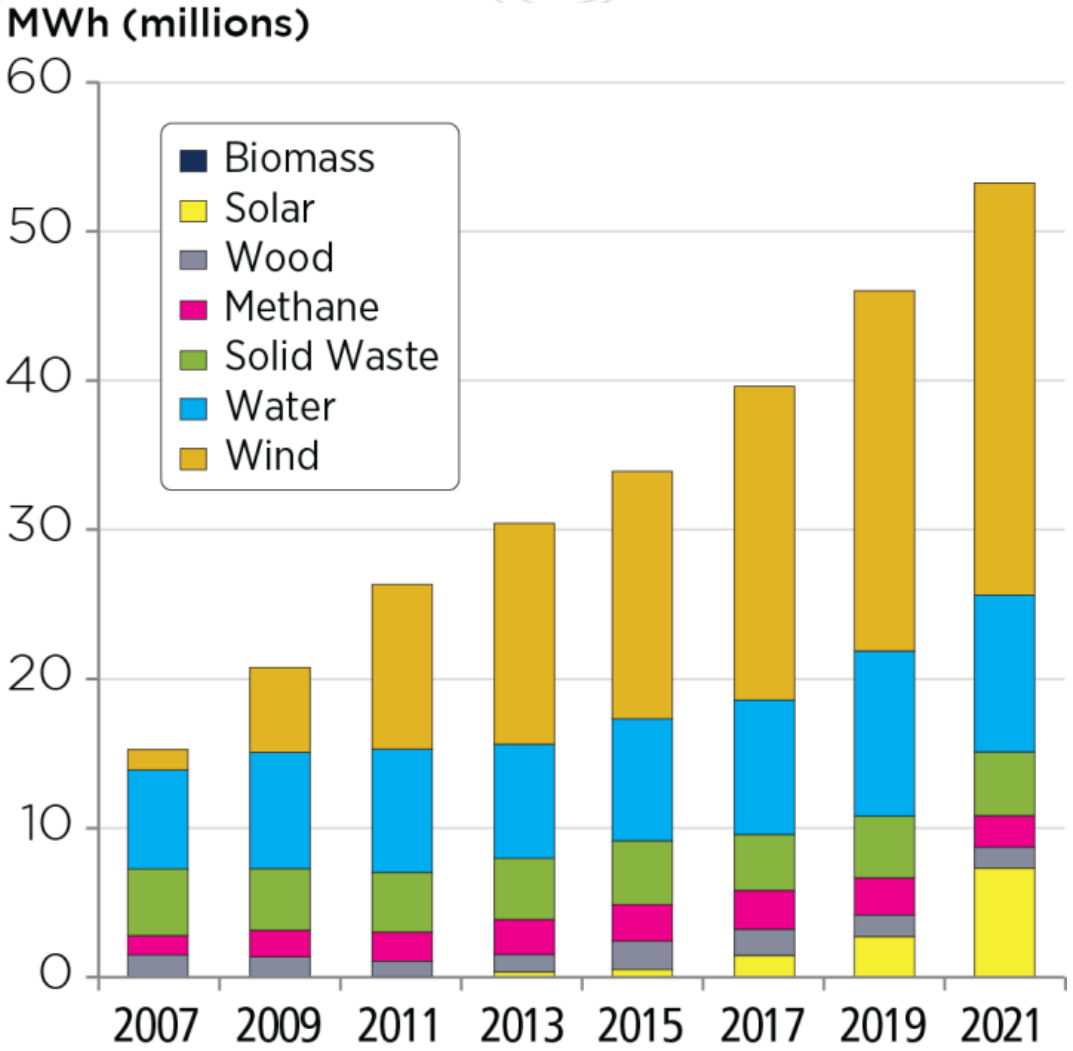
Installed Percentage of Renewable Energy

As of December 2021



As of 12/2021



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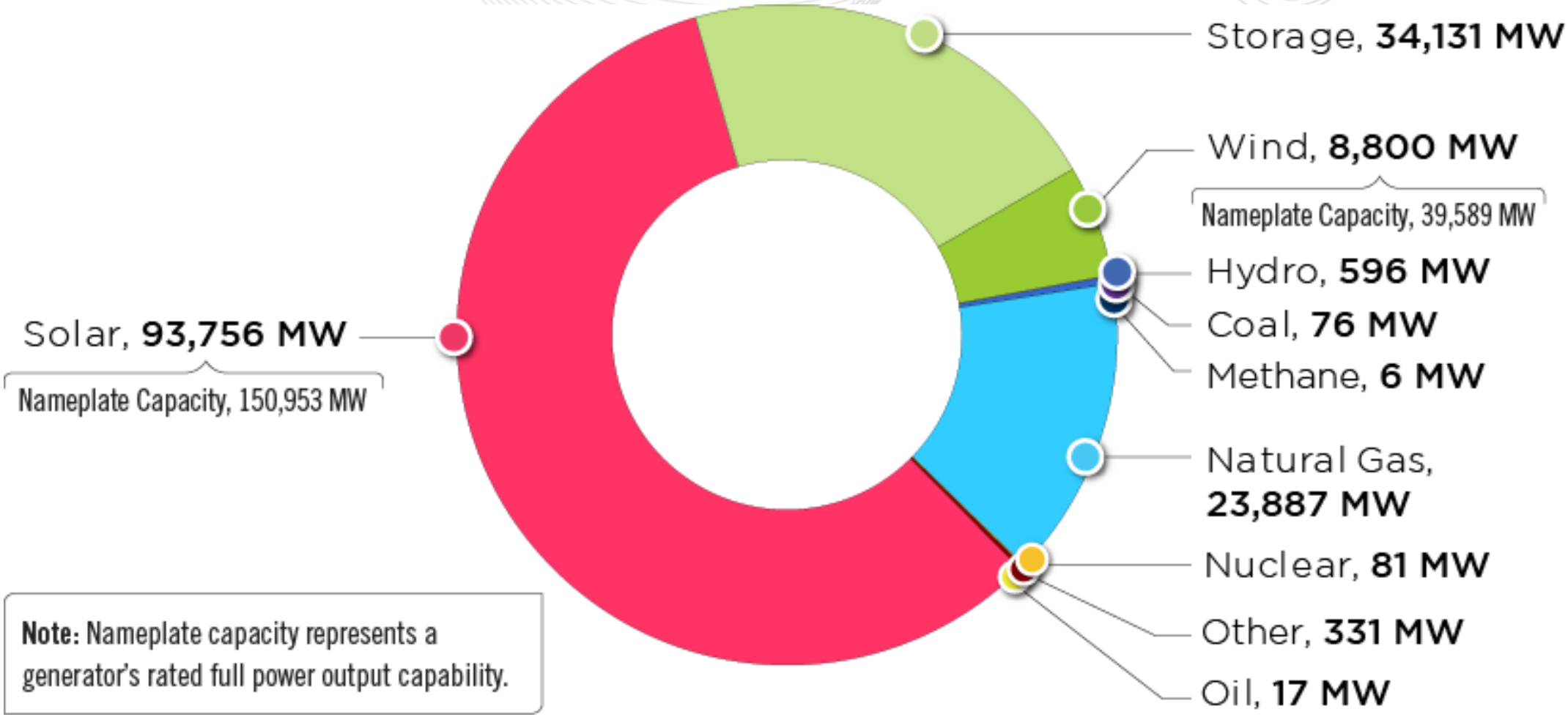
Queued Capacity Interconnection Rights

As of December 2021



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- What might potential alternatives look like? How do they compare to the status quo?

  "Dynamic determined by expected system conditions (hourly or daily), formulaic combination of multiple factors" (Matrix)

  - Develop an hourly requirement the captures system conditions throughout the day
    - Potential MIN/MAX range
  - Formulaic approach using historic daily net load variation
  - Formulaic approach using forecasted hourly load changes and variable renewable output
  - Annual adjustments using planned intermittent capacity

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