Seasonality Construct– Alberta Market Analysis & Jurisdictional Review

July 10,2017

Outline

- Background and Motivation
- Jurisdictional Review
- Alberta Load Analysis
- Wind Seasonality Analysis
- Gas Generation Analysis

Recap of Other Jurisdictions Review

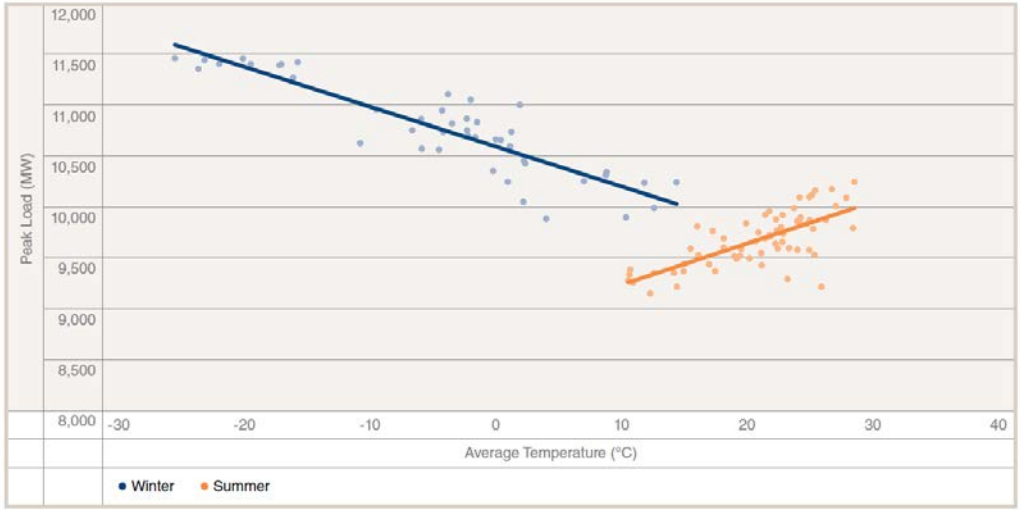
- **PJM:** As of the May 2017 capacity auction for the 2020/2021 delivery year, all PJM capacity resources must meet the Capacity Performance requirement of year round availability.
- **ISO-NE** has an annual construct and is implementing the **"Pay-for-Performance"** feature that is intended to support resource adequacy and improve performance during reliability events in all seasons.
- **MISO** Seasonal Market:
  - LOLE criterion (events/year) of 0.1 for summer and 0.01 for winter and establish 'separate' summer and winter Planning Reserve Margin requirements.
  - Use of seasonal outage rates.
  - Single auction to procure capacity for the entire year with seasonal offers or one offer for the entire year.
  - Expected implementation: 2018/19.

Alberta Load Seasonality

- Seasonality is the pattern that re-occurs over a set period of time
- Temperature exerts a strong influence on load.
- Alberta Internal Load (AIL) tends to increase as the temperature becomes more extreme.
  - Dual peak system: Winter Peak and Summer Peak

Seasonal Load

- On winter weekdays, a decrease of one degree Celsius increased peak load by an average of 41 MW.
- During summer weekdays, an increase of one degree Celsius increased peak load by an average of 42 MW.
- Seasonal peaks in Alberta load are usually set during periods of extreme temperatures.



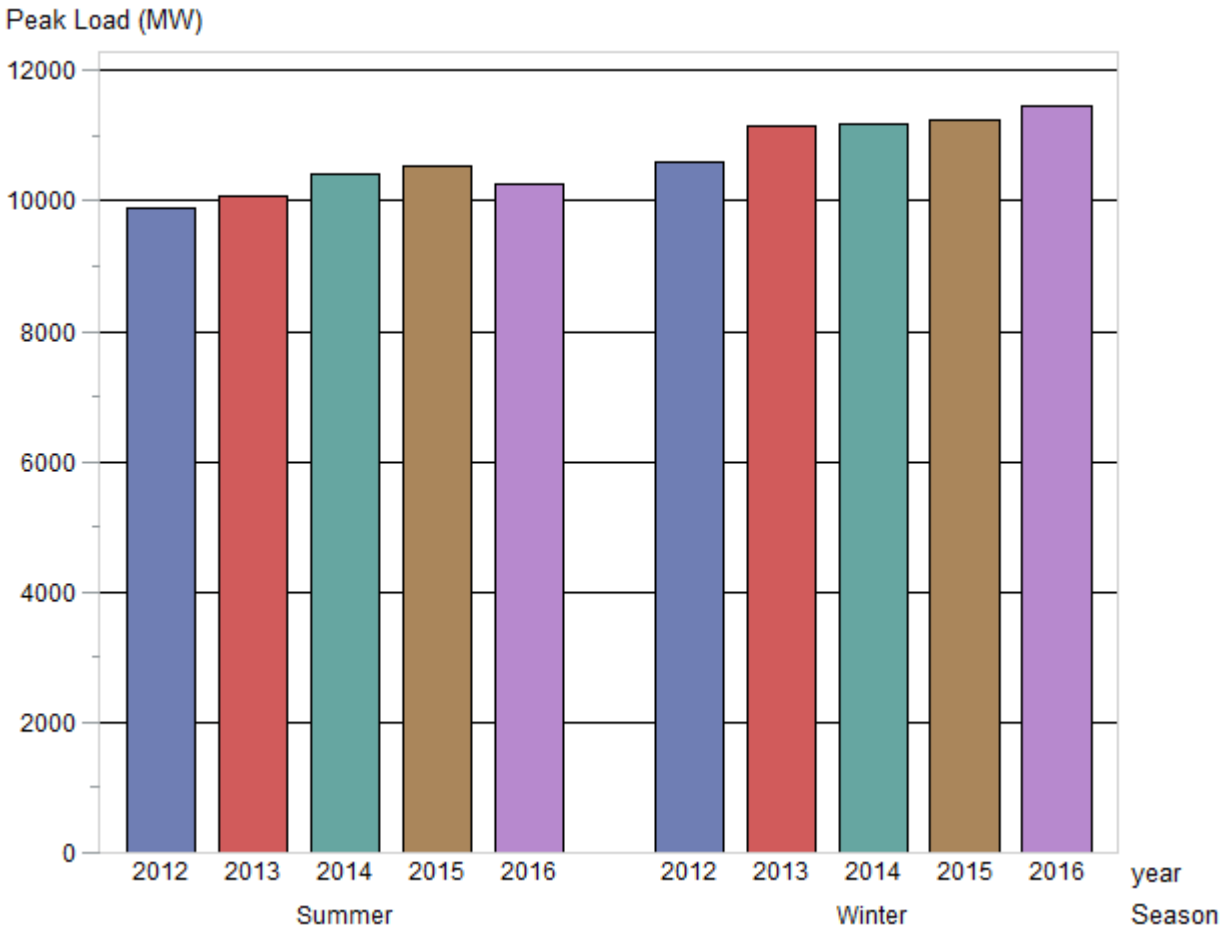
Source: AESO 2016, Annual Market Statistics

Seasonal Peak Load

- summer peak load in 2016 is three per cent below the 2015 summer peak

Dec. 16, 2016: a new record high

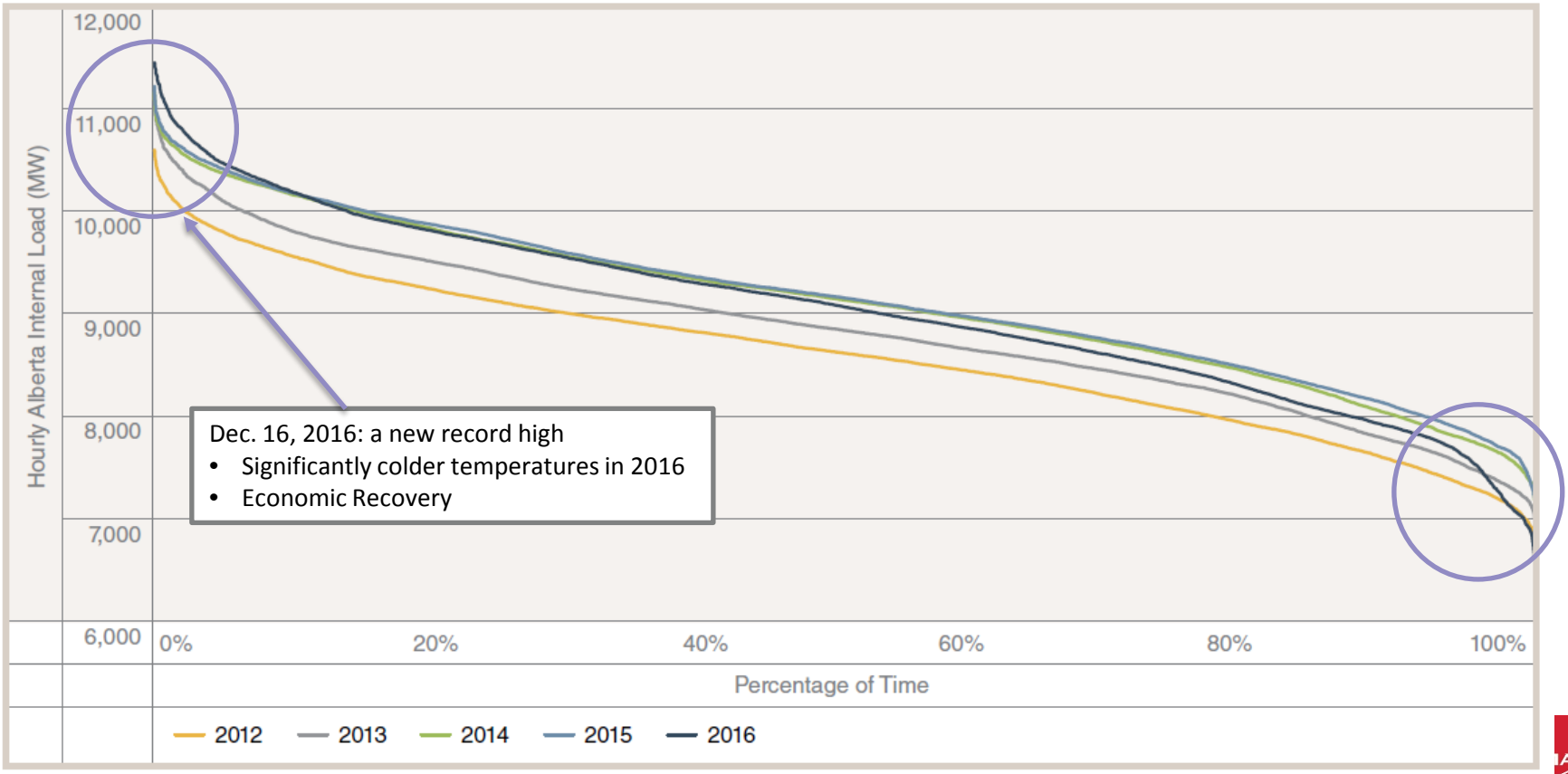
- Significantly colder temperatures in 2016
- Economic Recovery



Historical ETS data. Identical results can be found in AESO 2016, Annual Market Statistics

Annual Duration Curves

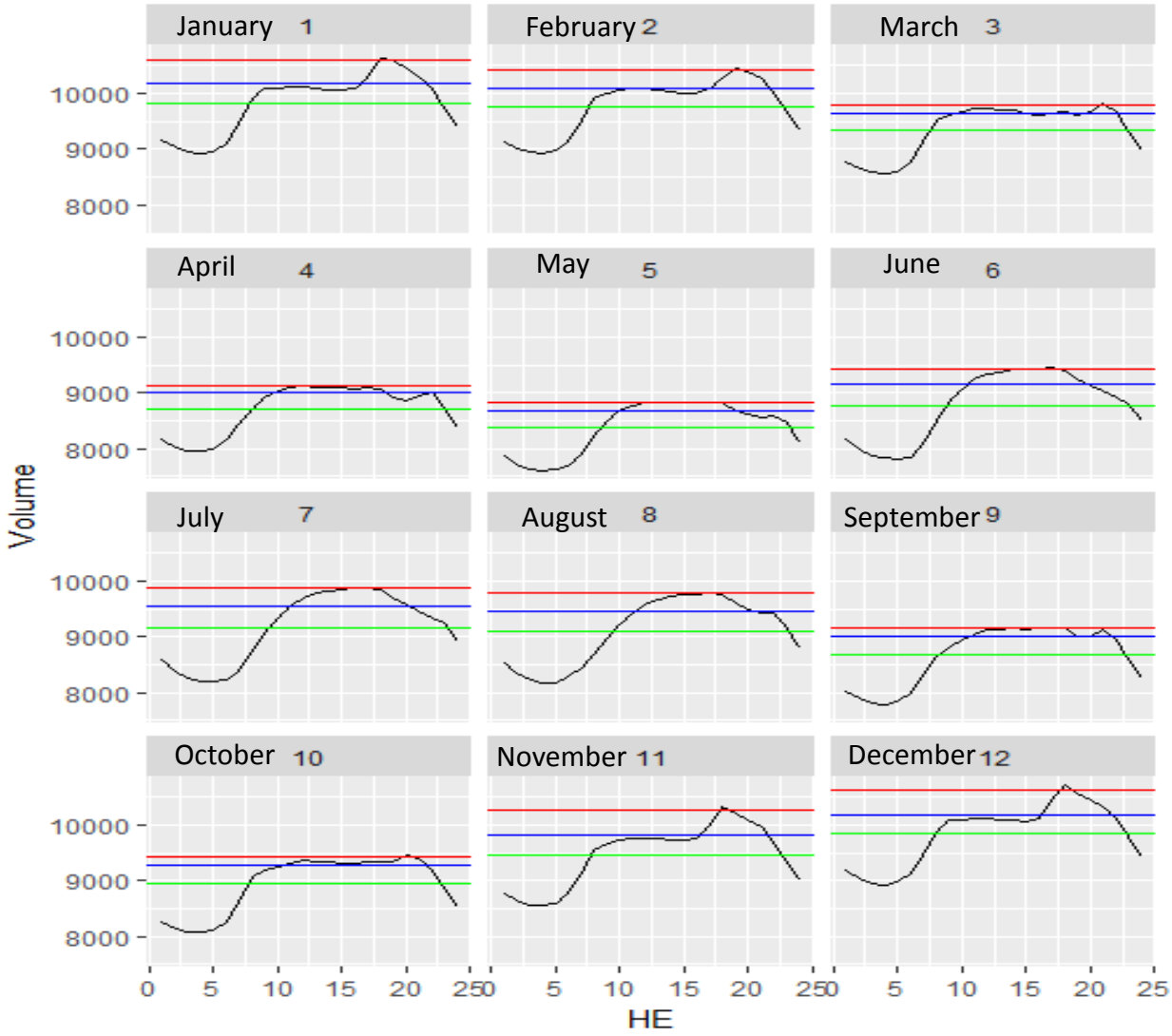
- AIL reached a higher peak and a lower point in 2016 than in any other year.



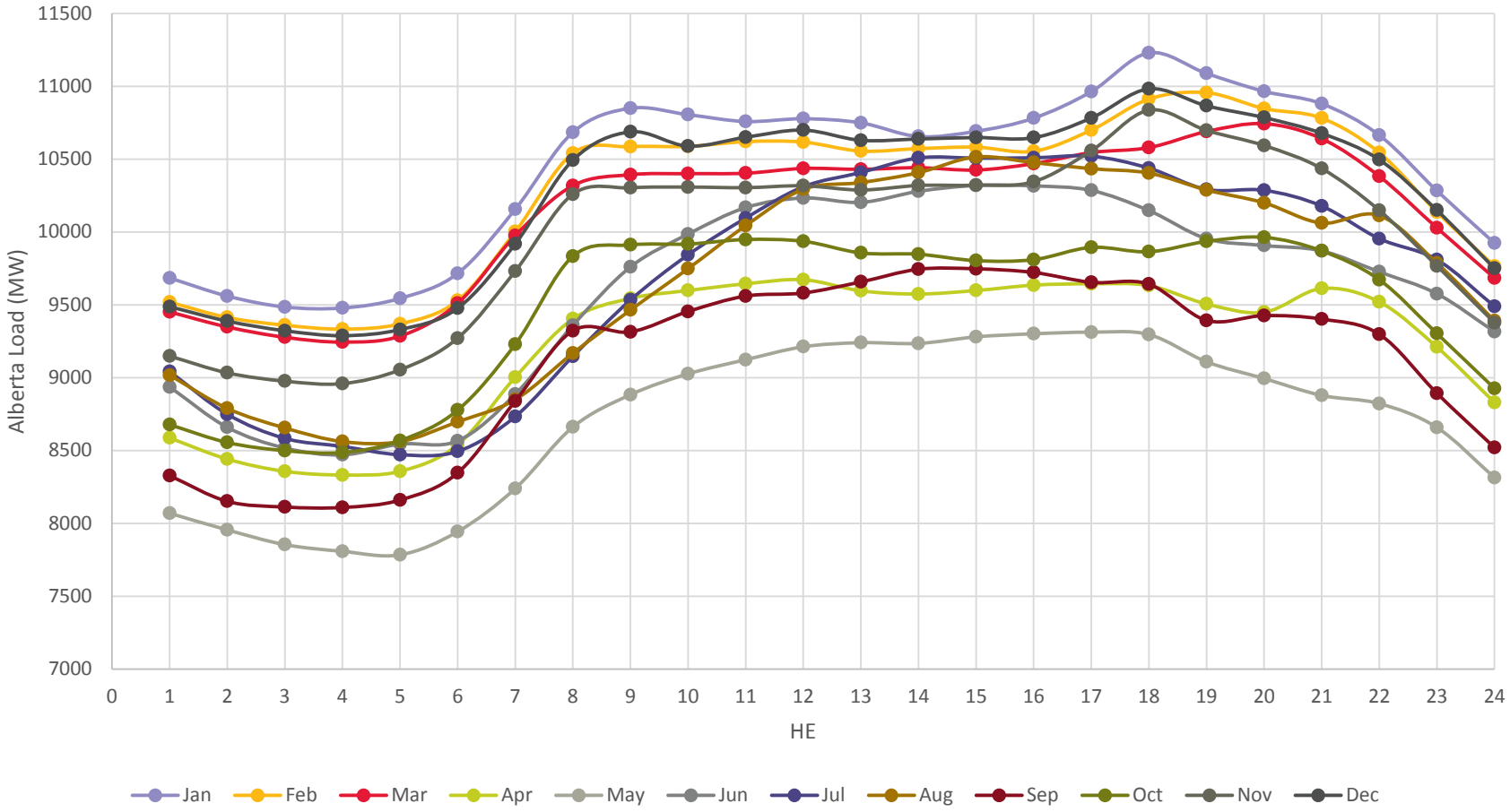
Source: AESO 2016, Annual Market Statistics

Alberta Monthly Net Load Distribution

- No unpredictable ramping requirements in the off-peak or on-peak

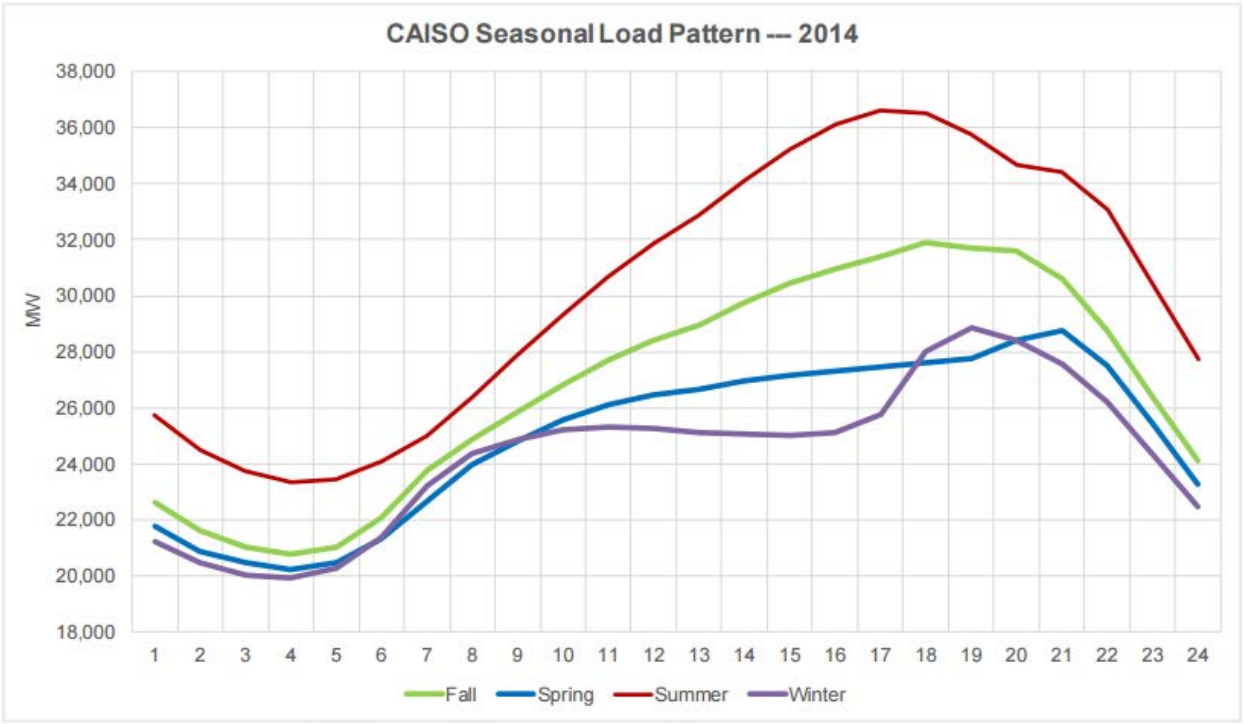


AIL: Average Load By Hour by Month for 2015-2016



Other Jurisdictions

- The coincident peak in CAISO occurs at different times depending on the season

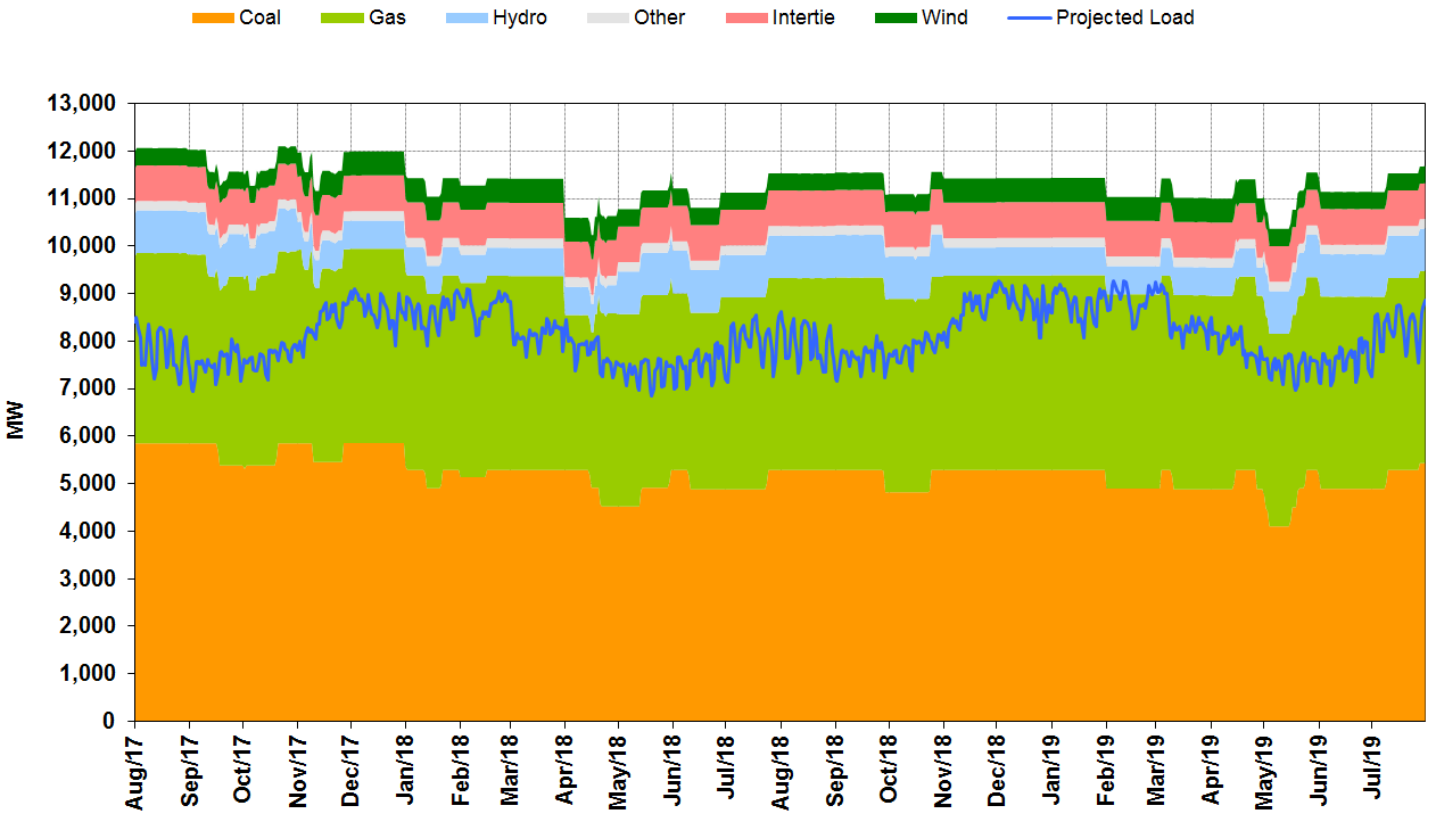


Up to a 4-hour spread across the year

Spring: Mar, Apr & May (HE 21)	Fall: Sep, Oct & Nov (HE 20)
Summer: Jun, Jul & Aug (HE 17)	Winter: Dec, Jan & Feb (HE 19)

AIES Daily Peak Demand and Available Supply

- The supply cushion is the difference between the daily available firm supply minus daily peak demand.

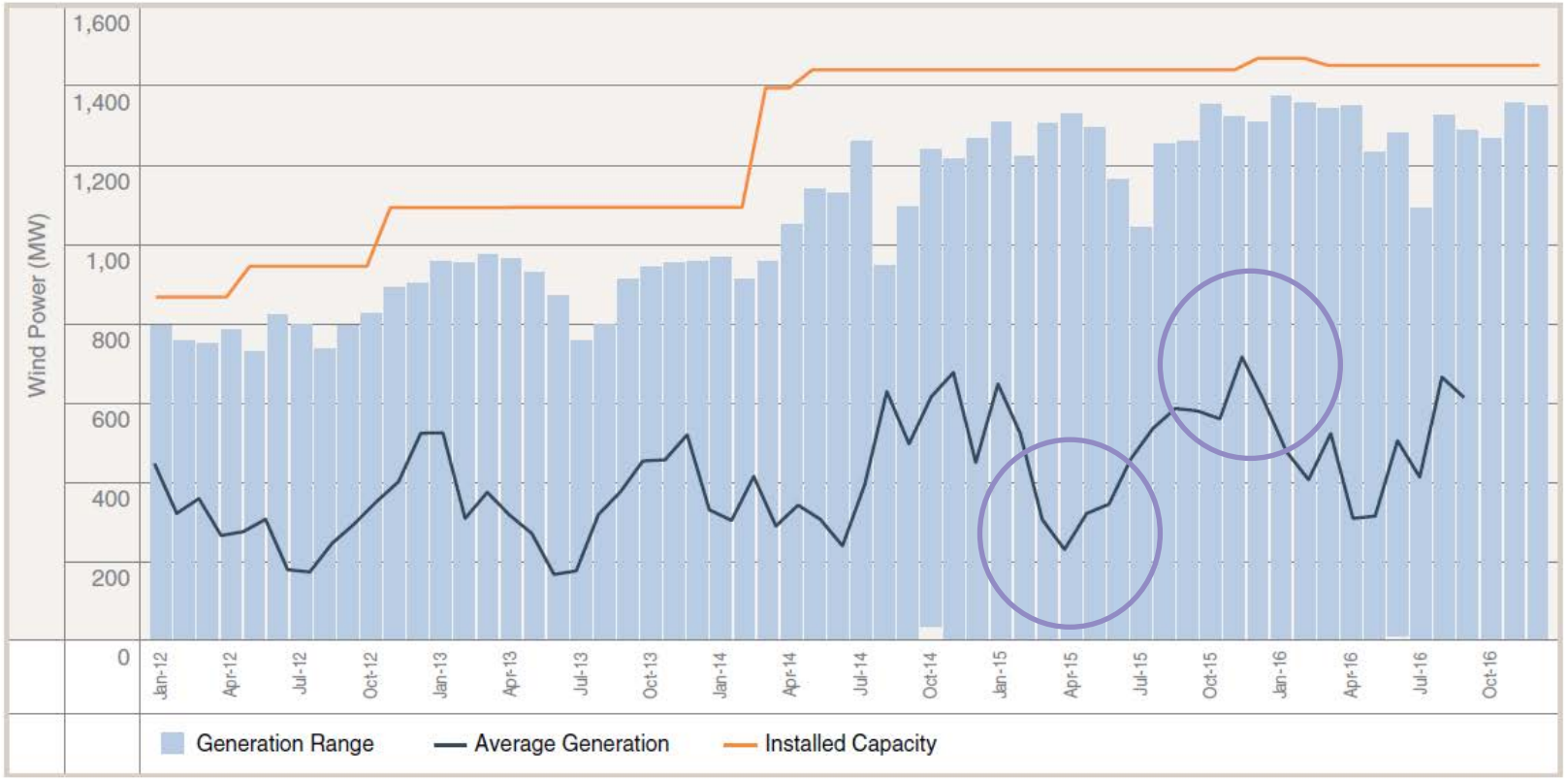


Outage information as of Jul 17, 2017

Source: AESO 2017, Long Term Adequacy Metrics-Aug 2017

Wind Generation is Seasonal

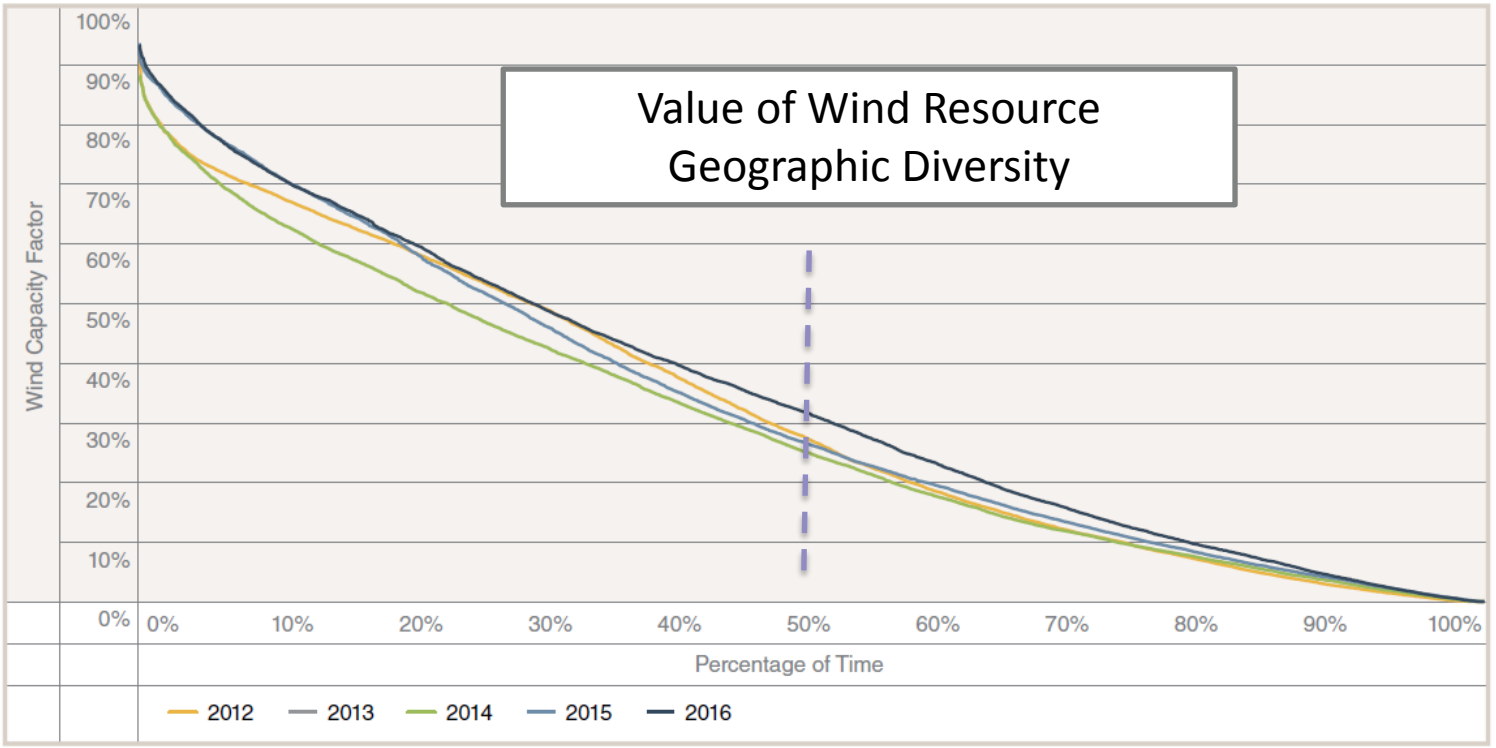
- The monthly average of wind generation exhibits a predictable seasonal pattern: peaking in winter and falling in summer.



Source: AESO 2016, Annual Market Statistics

Wind capacity factor remains constant

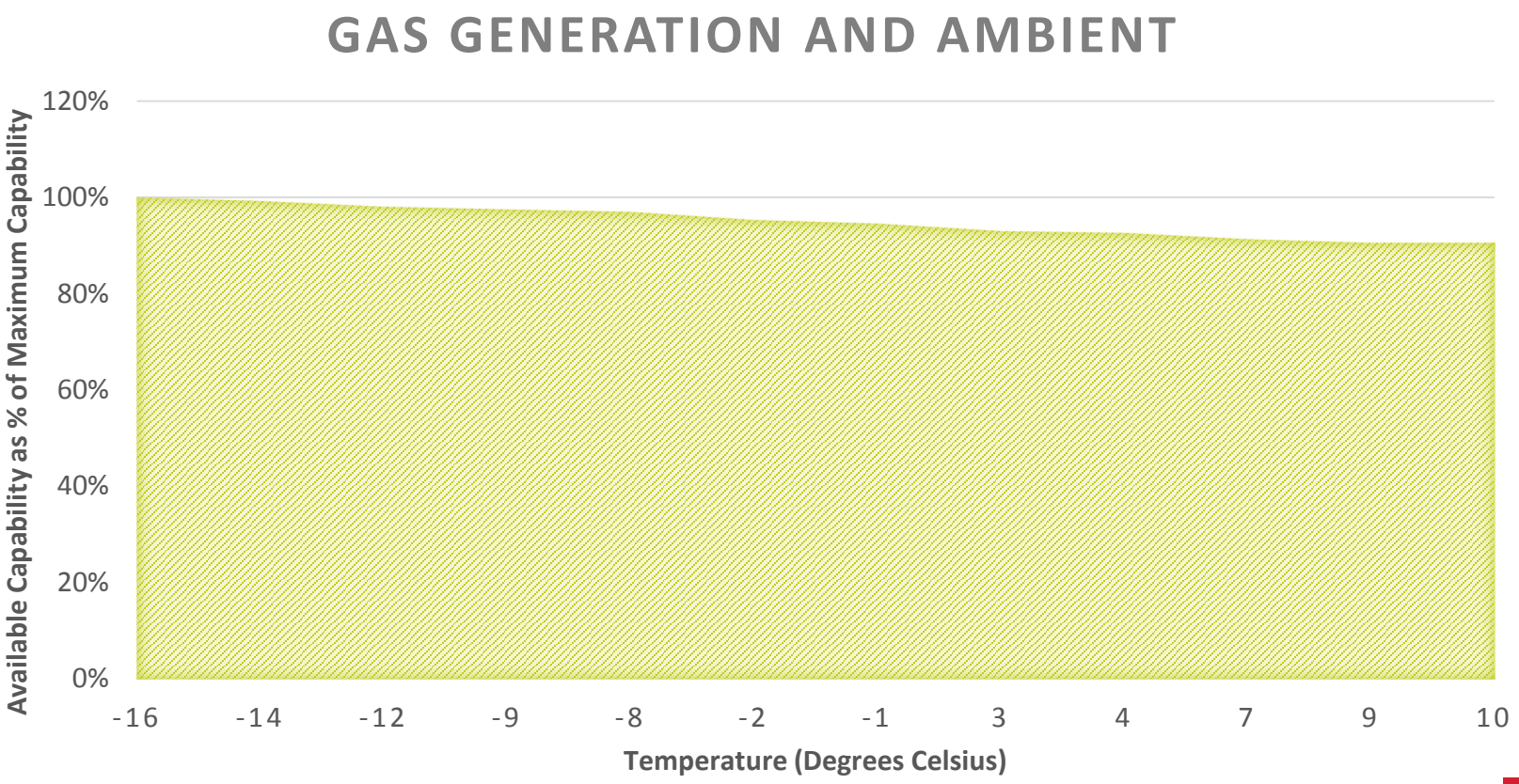
- The duration curves for the capacity factor of wind generation remained relatively constant over the last five years.
- The capacity factor of wind generation averaged 35 per cent over 2016



Source: AESO 2016, Annual Market Statistics

Gas Generation Seasonality

- Weighted Average of Available Capacity as % of Maximum Capacity.
- Fairly predictable gas generation seasonality.



Key Points

- Alberta market is a relatively small market in MW terms.
- Incorporating separate seasonal demand curves is more complicated.
- Current supply related seasonality factors are fairly predictable.
- Seasonality demand factors are also predictable.
- Previous presentation shows what other jurisdictions are addressing seasonality through other market mechanisms such as “pay-for-performance” - similar to ISO-NE, and proposed PJM approach.

Seasonality in Other Jurisdictions: Additional Details

Seasonal Objectives

- **Seasonal effort undertaken to enhance reliability through providing visibility into non-summer resource adequacy risk**

- **Goal of seasonal model**
  - Provide visibility into non-summer timeframes with potential resource adequacy risk
  - Accurately represent capacity available to serve non-summer peaks
  - Improve efficiencies by reducing unneeded must offer requirements
- **Barriers to achieving the goal:**
  - Current resource adequacy construct focuses on summer timeframe
  - Variations may be observed between expected capacity availability in winter and actual performance during extreme conditions
  - Resource portfolio changes and a reduction in resources
- **Present outcome:**
  - Lack of visibility in non-summer months may lead to unseen risk

Source: Seasonal Considerations, Joint LOLEWG / SAWG, MISO, December 2nd and 3rd, 2015

Seasonality in Other Jurisdictions: Additional Details

MISO

Design Options

Status Quo:

- Annual modeling with one MW requirement for the full year

Annual PRM applied to Seasonal Peaks:

- Apply single percent value to the peaks to create a requirement for each season

Annual PRM with Seasonal Modeling:

- Use seasonal variables to create one MW requirement for the full year

Summer at 0.1 day/year LOLE and winter at minimal risk:

- Perform a secondary run to determine winter capacity to maintain set winter risk

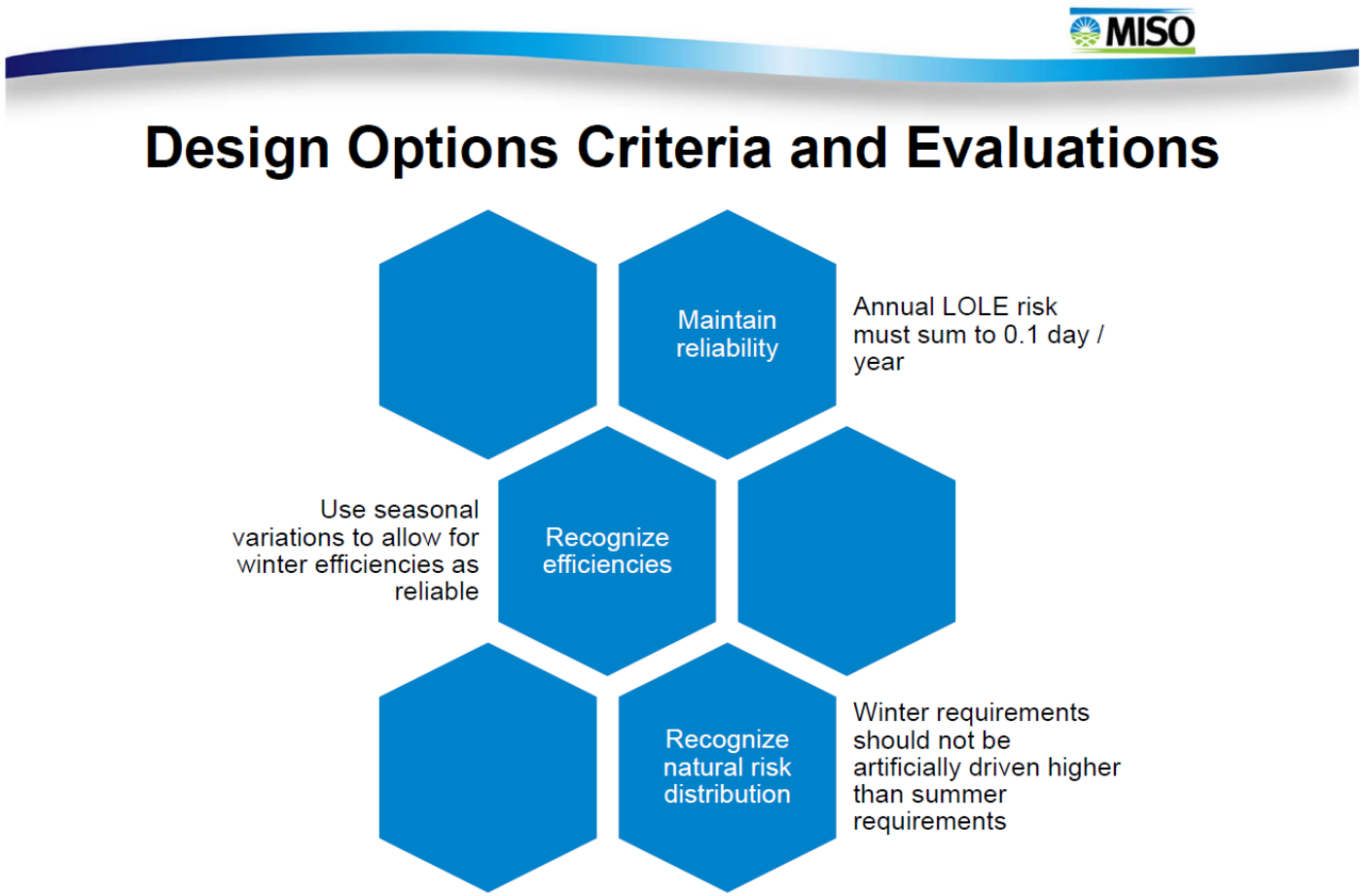
Summer and Winter LOLE adding to 0.1 day/year LOLE:

- Secondary run to determine winter capacity to maintain set winter risk
- Summer and winter risk must sum to 0.1 day / year

19

ENMAX

Seasonality in Other Jurisdictions: Additional Details



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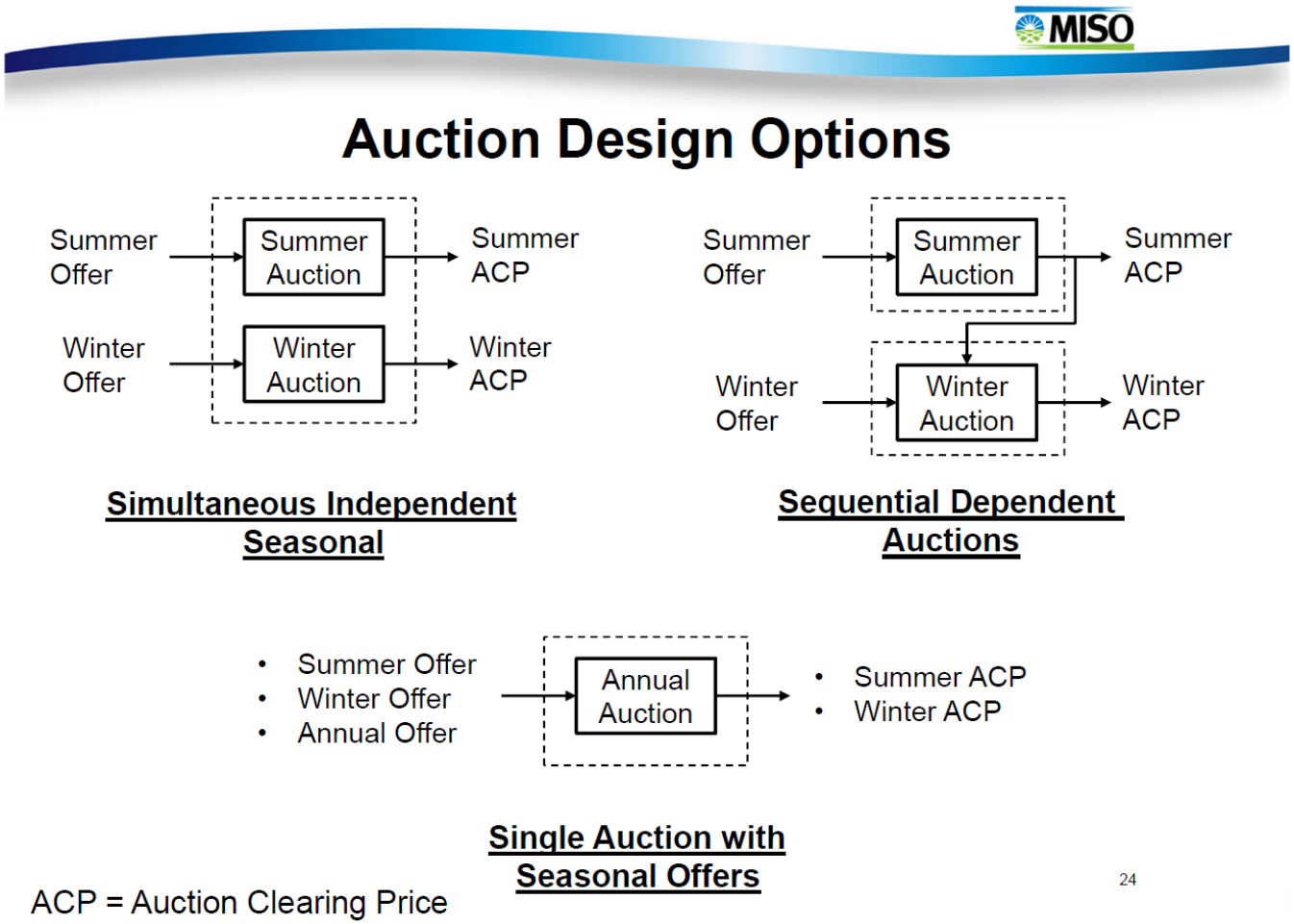

Source: Seasonal Considerations, Joint LOLEWG / SAWG, MISO, December 2nd and 3rd, 2015

Thank You!

- Please contact if you have any question or comment:
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