A Focus on Markets
Hydro Has Value, but….
Will it be Valued?

Richard R. Miller, P.E.
HDR Engineering, Inc.

NHA Hydropower Finance Summit
June 3, 2013

NHA National Hydropower Association

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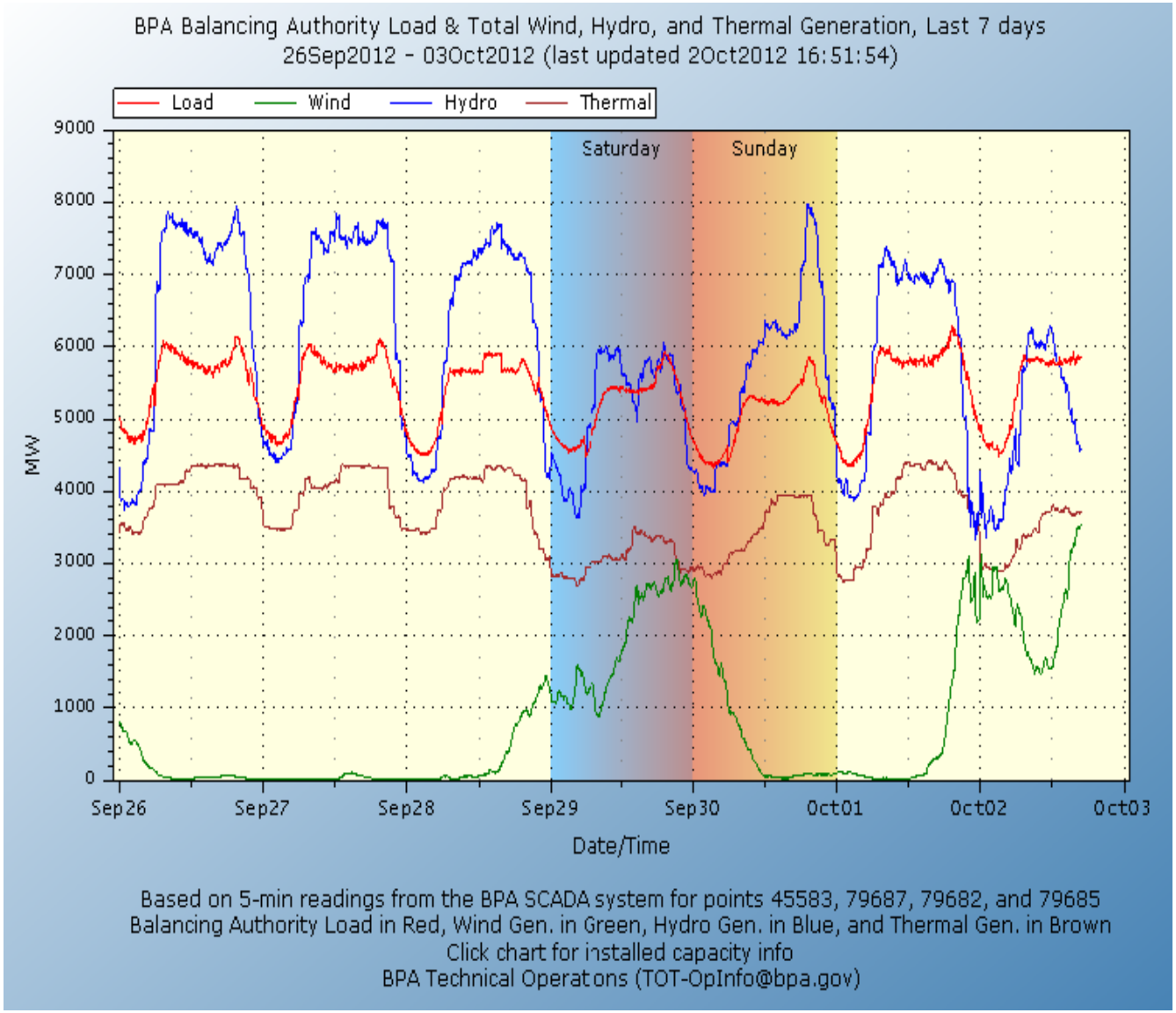

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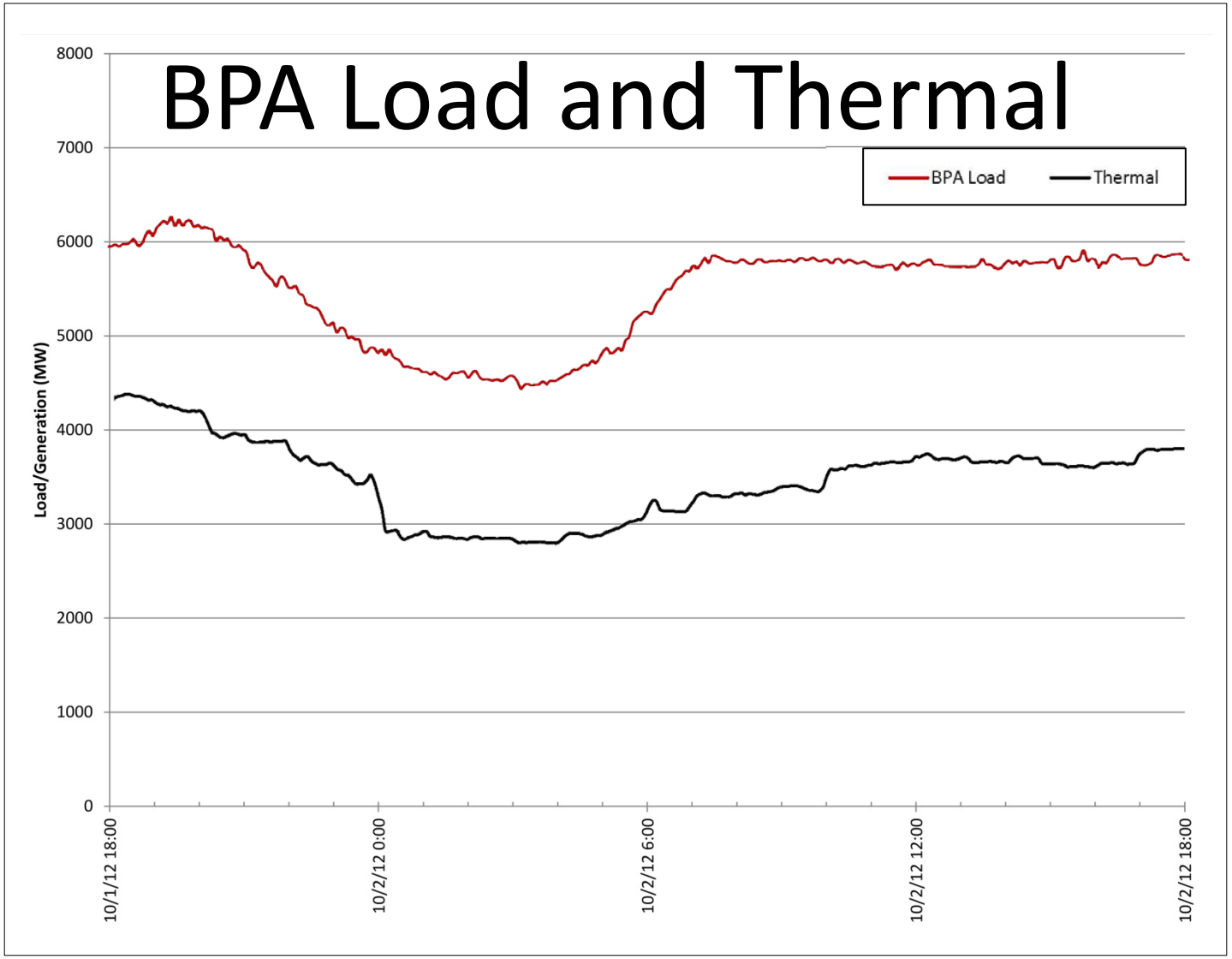
BPA Load and Thermal



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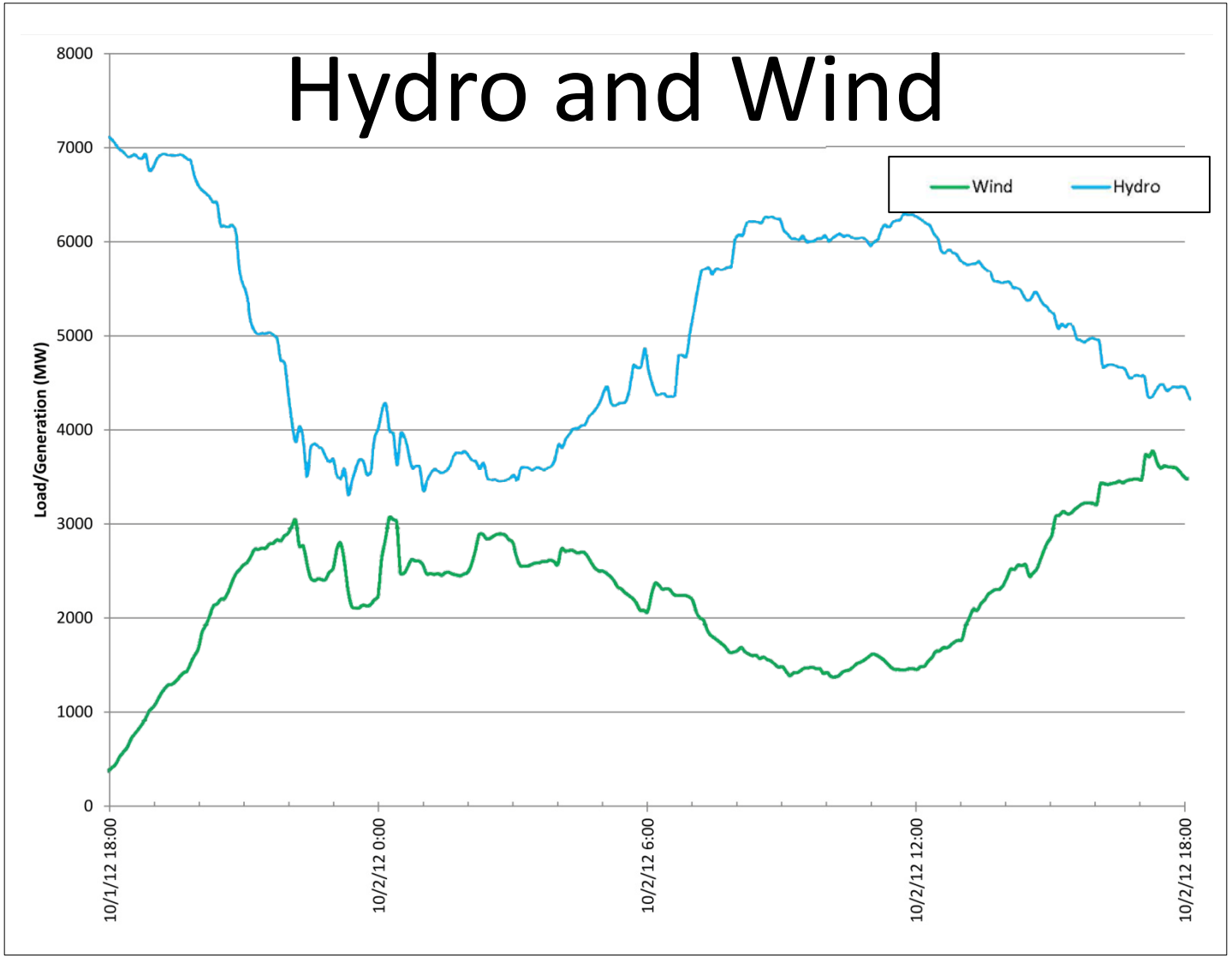
Hydro and Wind



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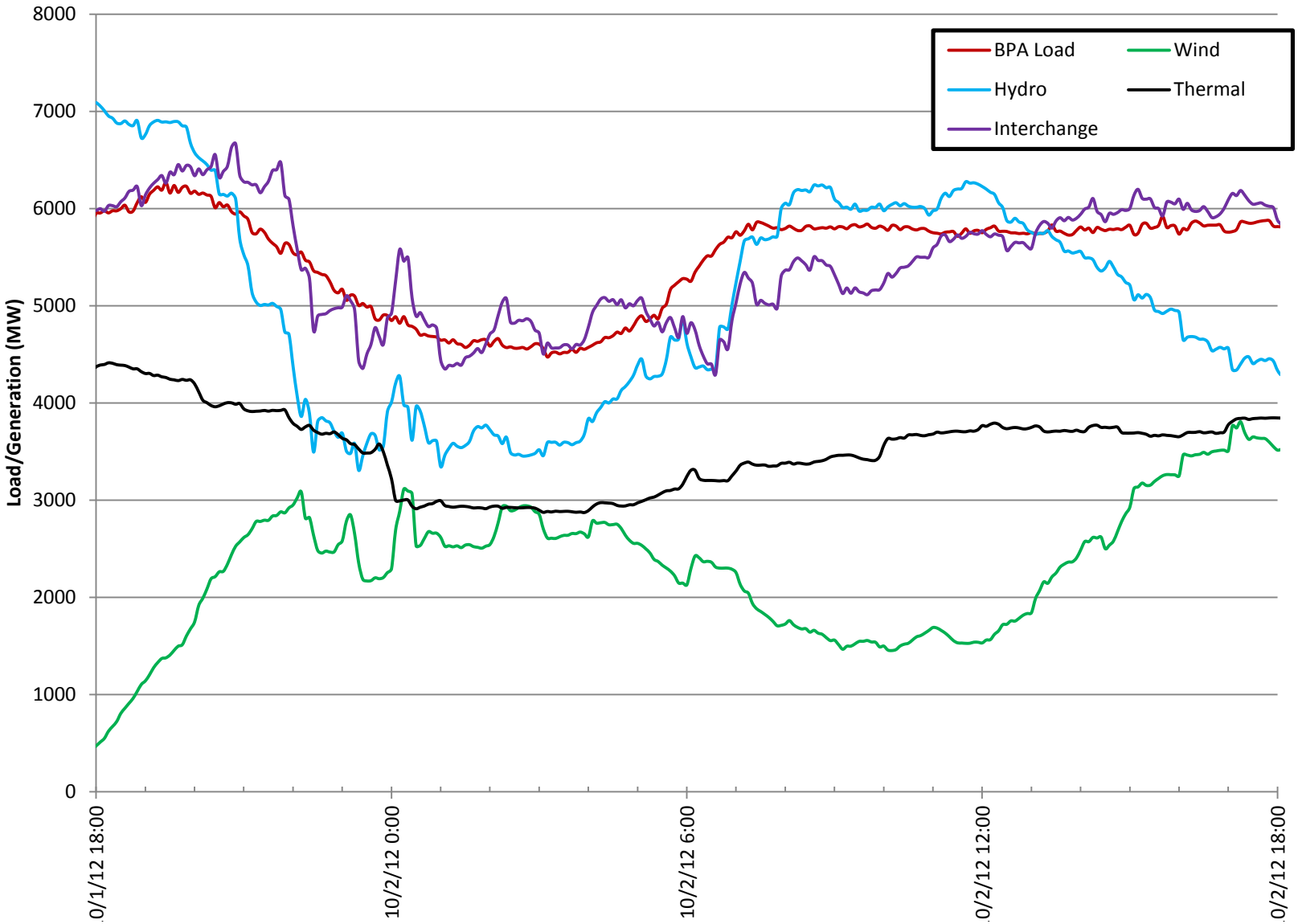

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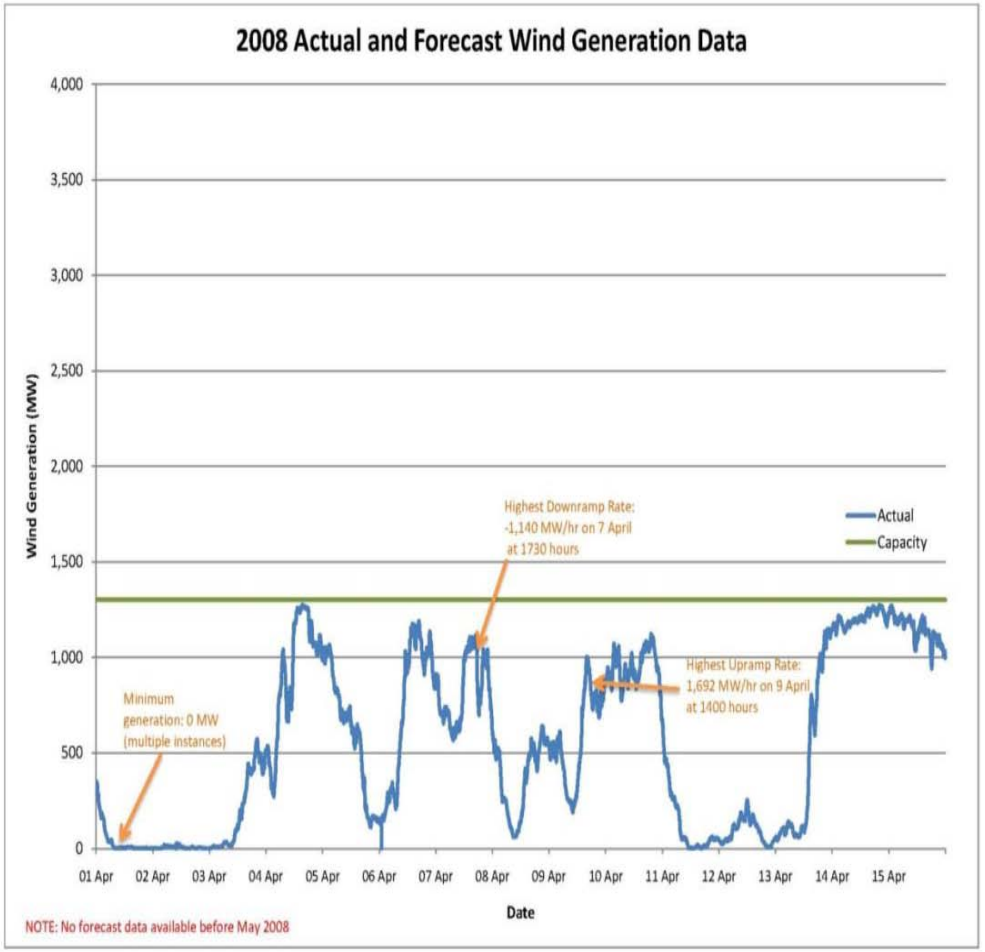
Is BPA Today California's Energy Future?



Actual and forecasted wind: large swings in power supply need to be supplemented by other sources

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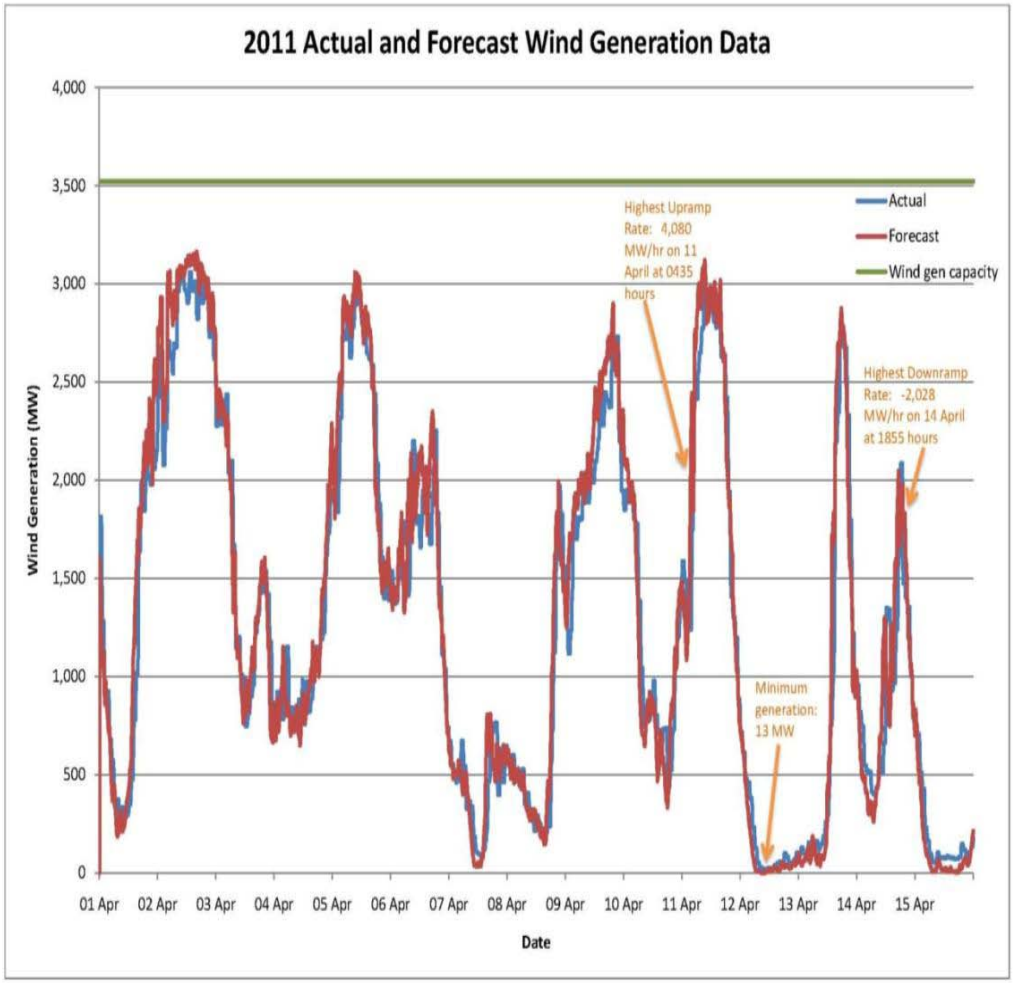
Is BPA Today California's Energy Future?

Adding Wind Plants Under Current Market Incentives ≠ Geographic Diversity : Large Ramp Rates Are Exacerbated!



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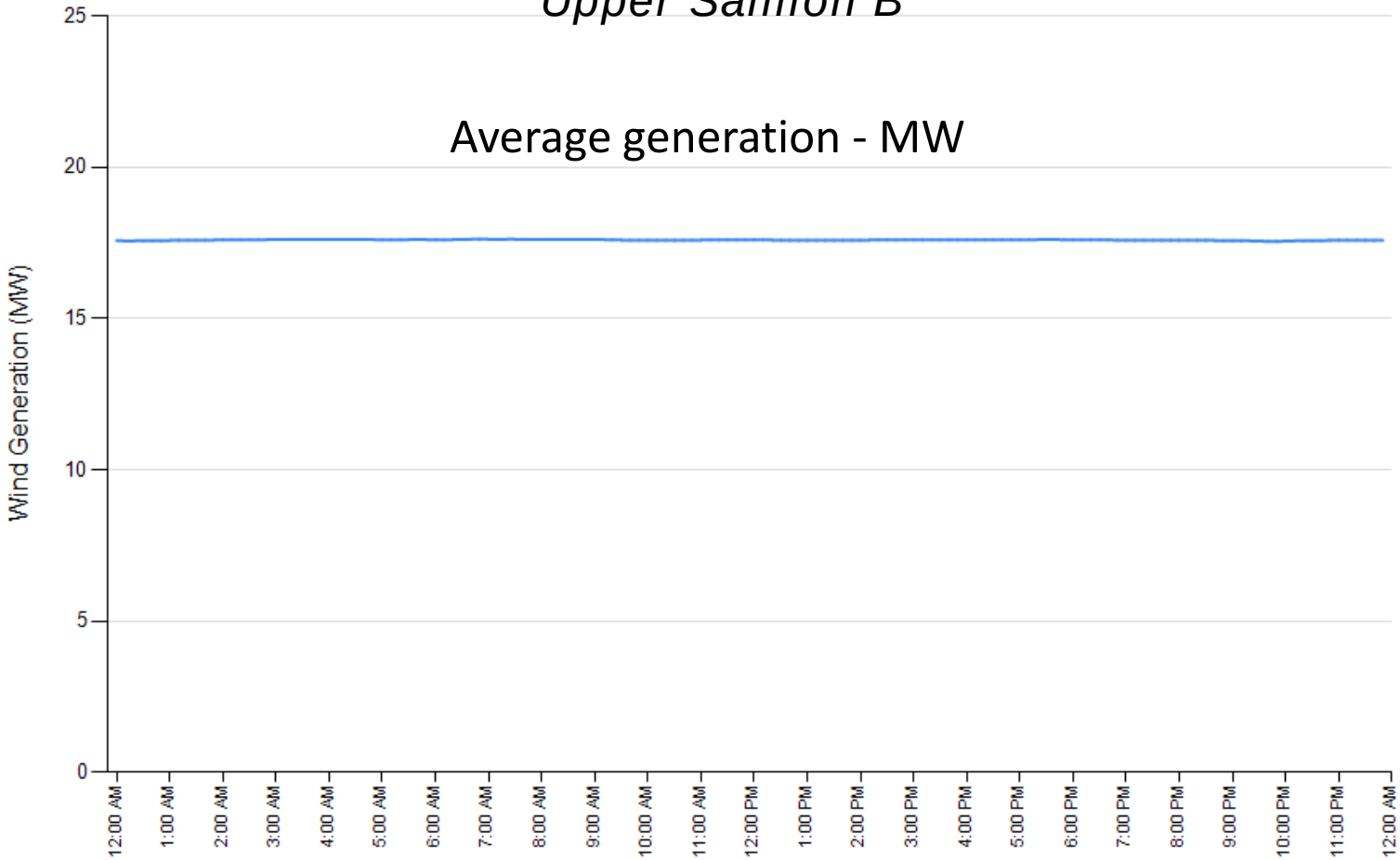
February 2012

IDAHO POWER

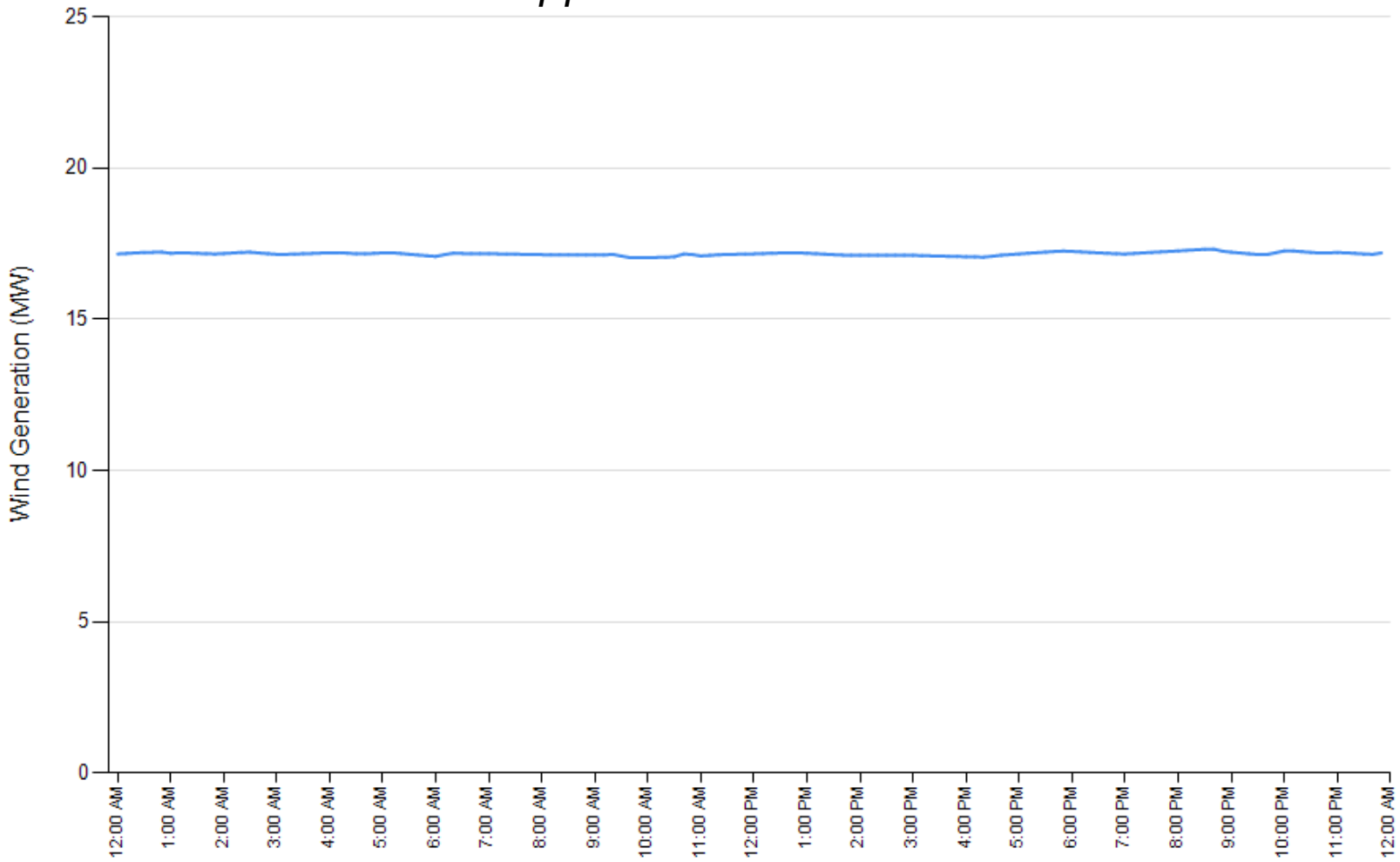
Upper Salmon B



Courtesy: Lisa Grow, Idaho Power, 2013 NHA Annual Conference, April 23, 2013

February 2012 – 1 day

Upper Salmon B



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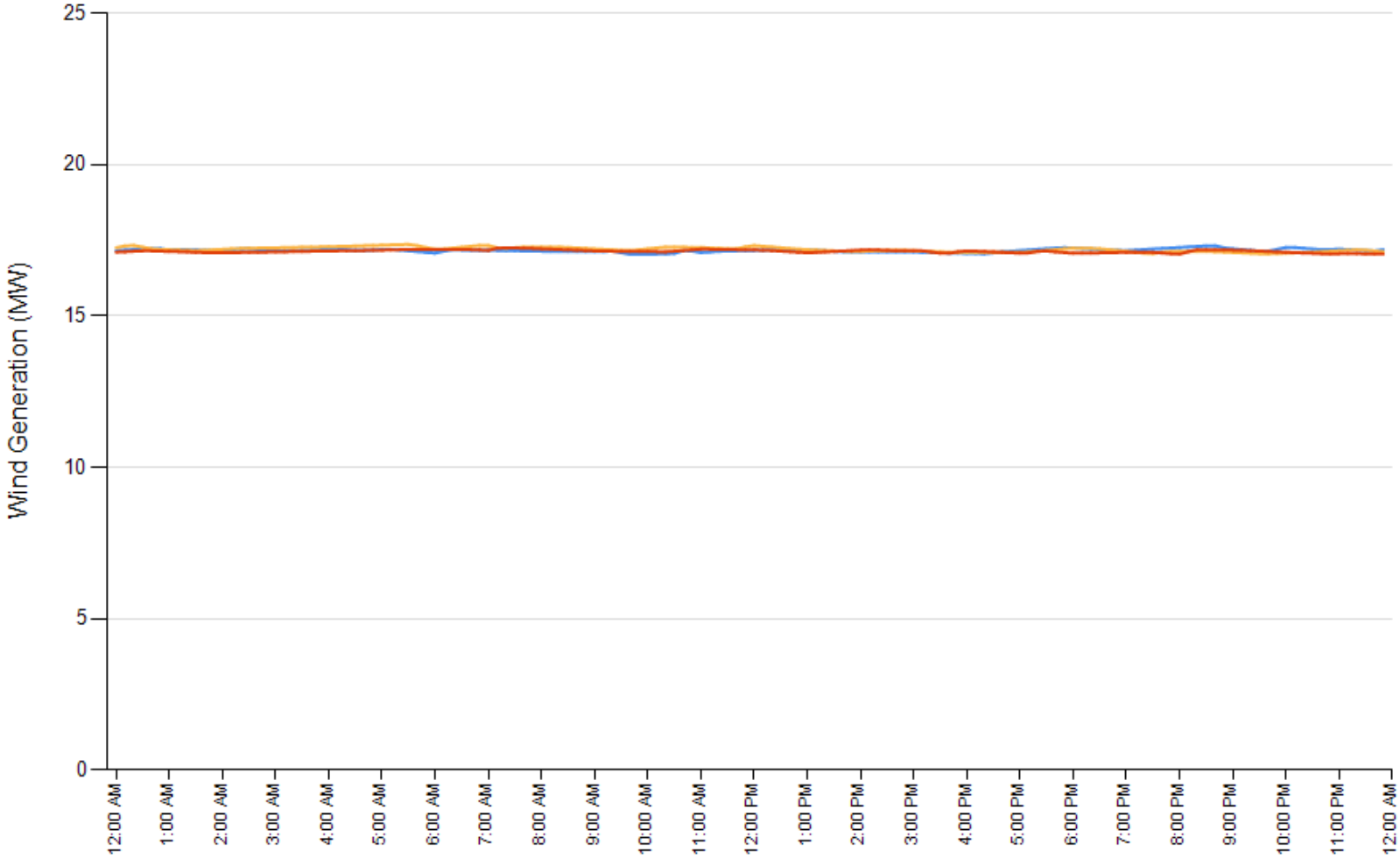
February 2012 – 3 days

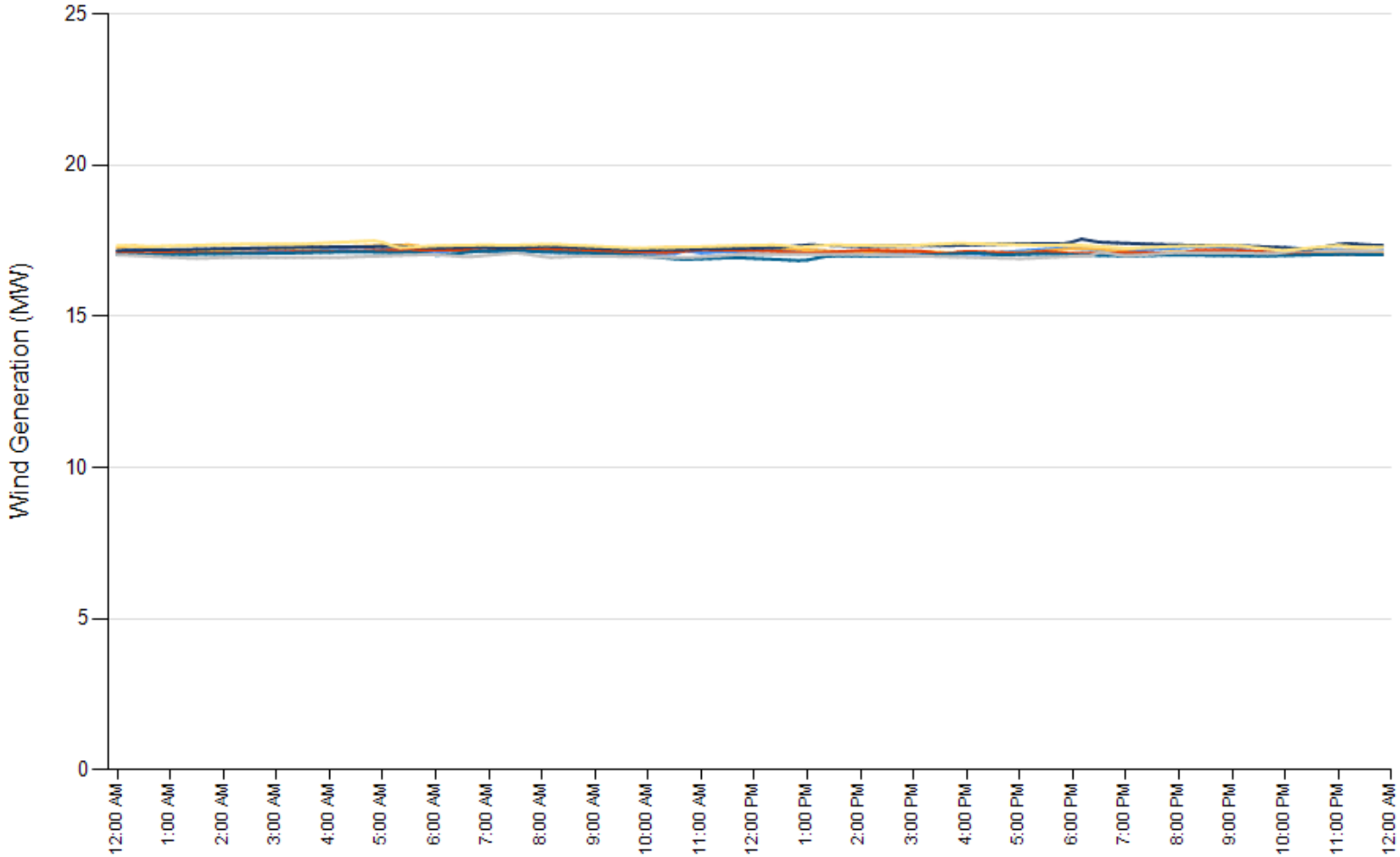
Upper Salmon B



Courtesy: Lisa Grow, Idaho Power, 2013 NHA Annual Conference, April 23, 2013

February 2012 – 7 days

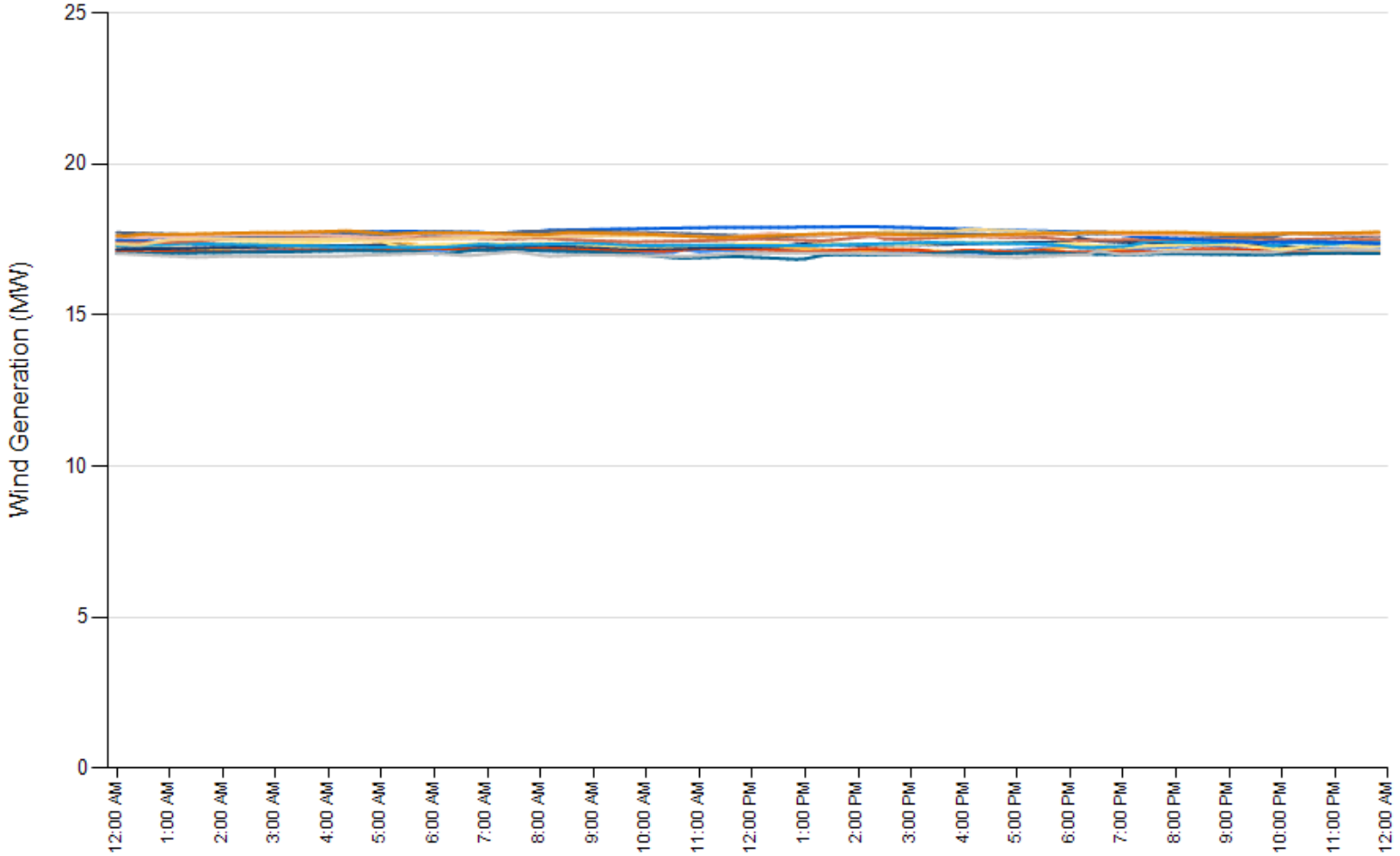
Upper Salmon B



Courtesy: Lisa Grow, Idaho Power, 2013 NHA Annual Conference, April 23, 2013

February 2012 – 14 days

Upper Salmon B



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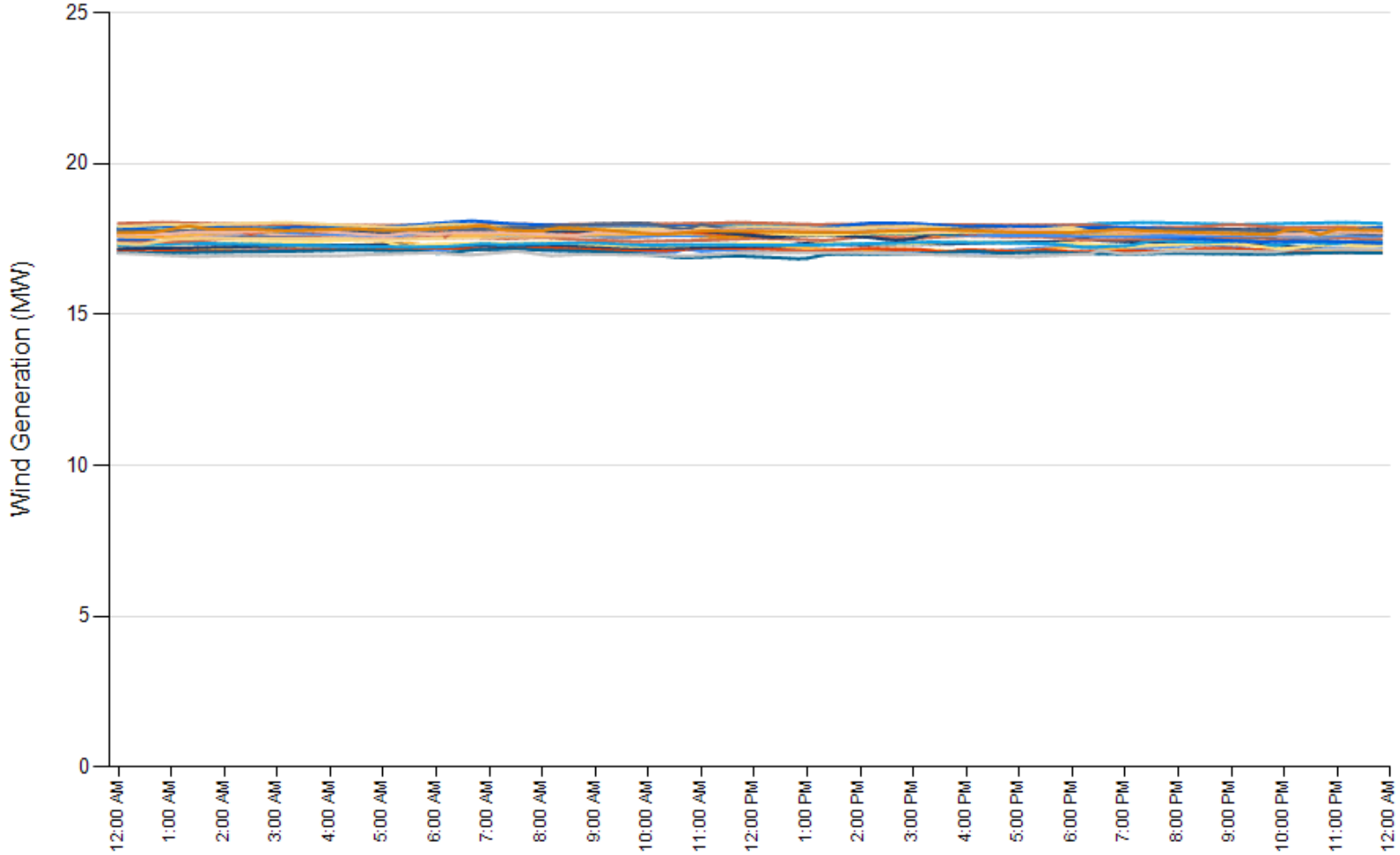
February 2012 – 29 days

Upper Salmon B



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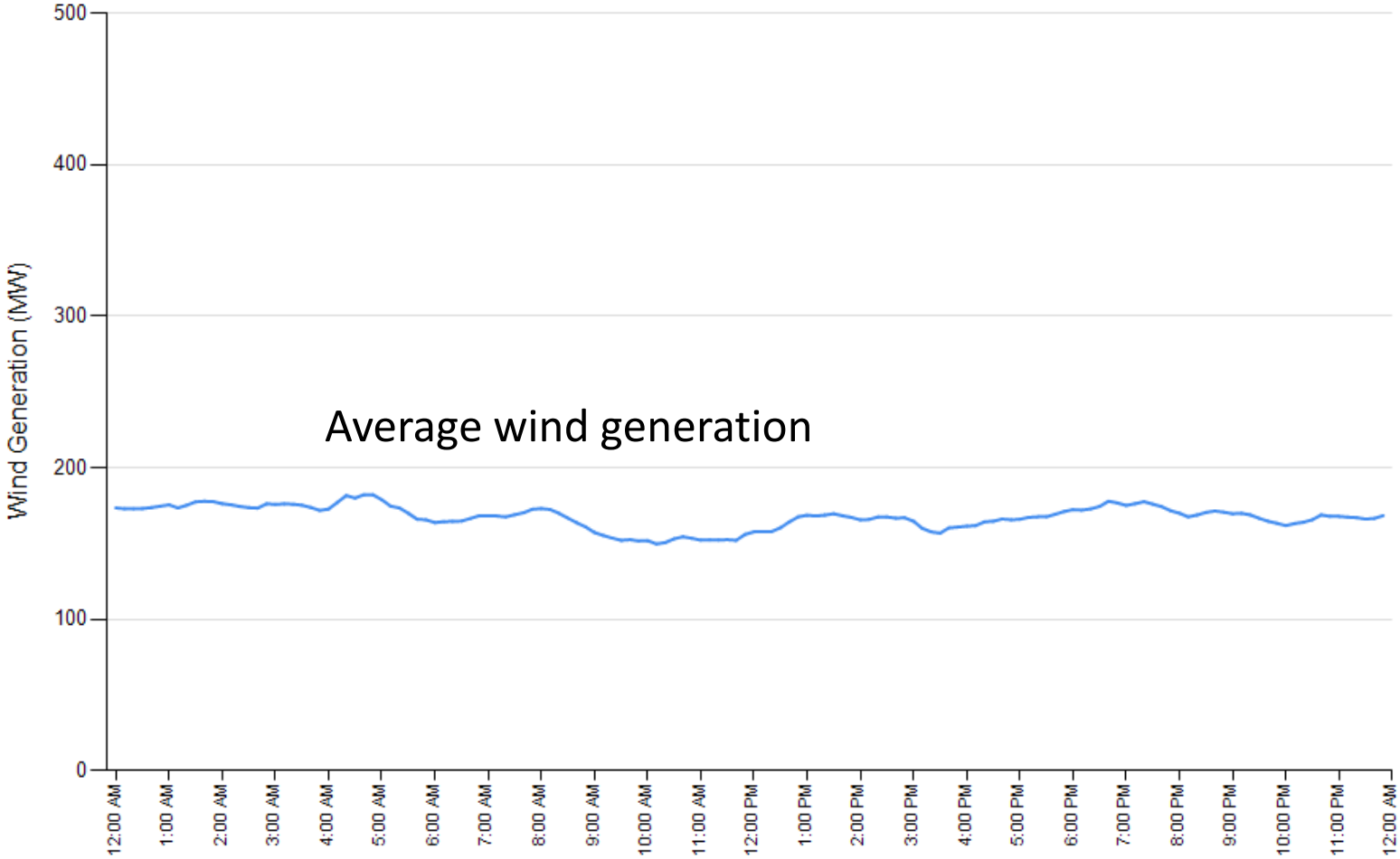
February 2012

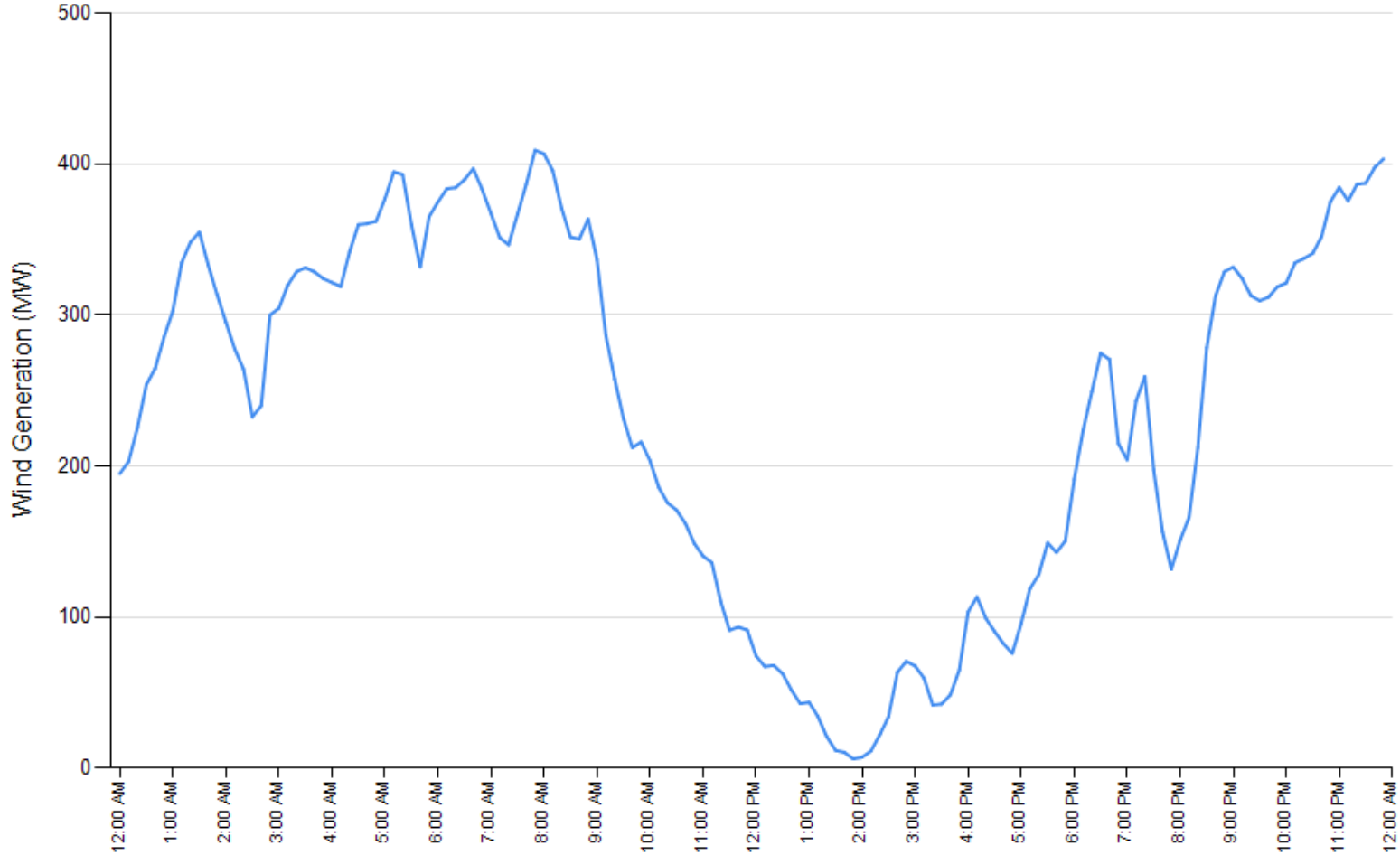
Wind Generation



Courtesy: Lisa Grow, Idaho Power, 2013 NHA Annual Conference, April 23, 2013

February 2012 – 1 day

Wind Generation



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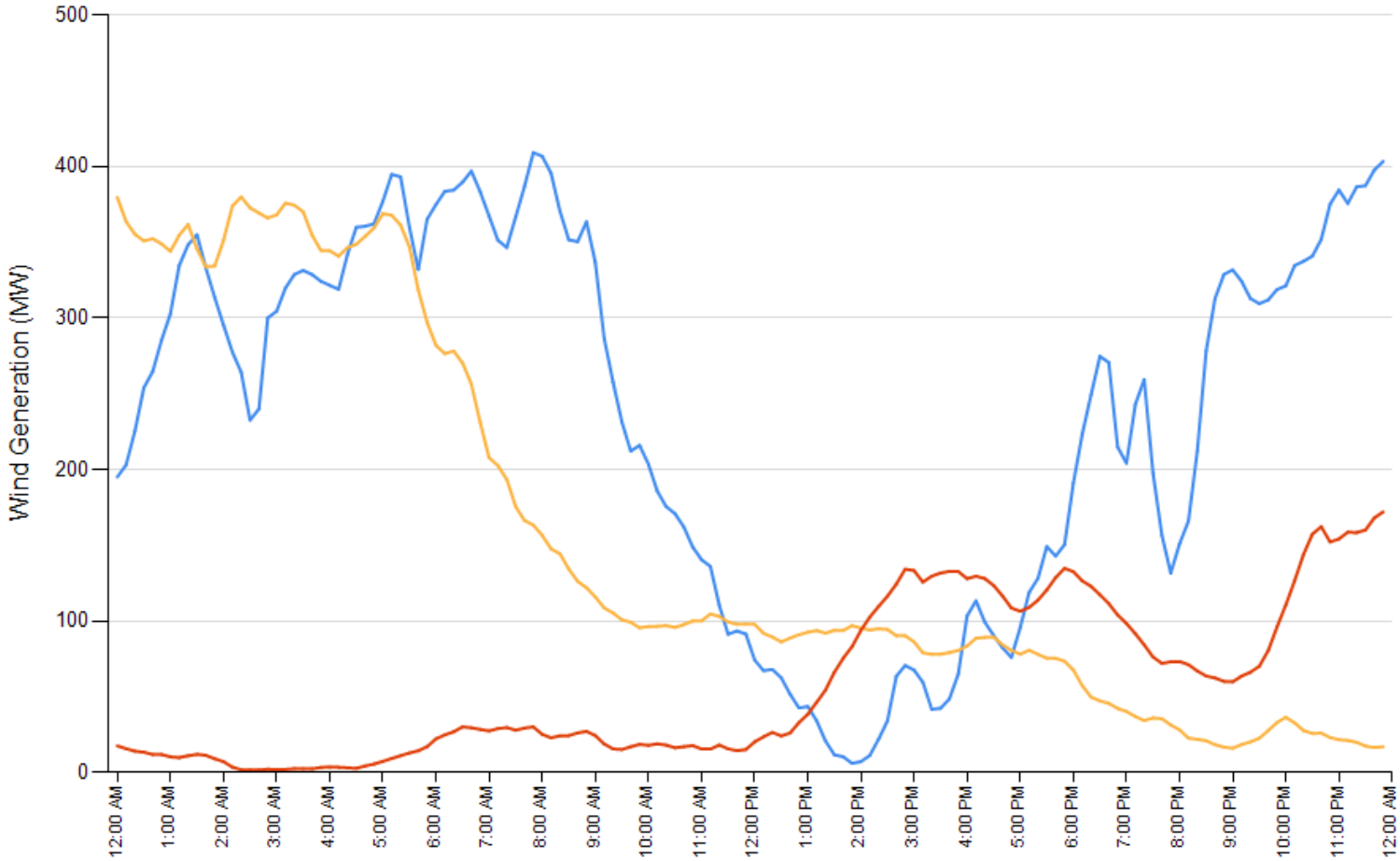
February 2012 – 3 days

Wind Generation



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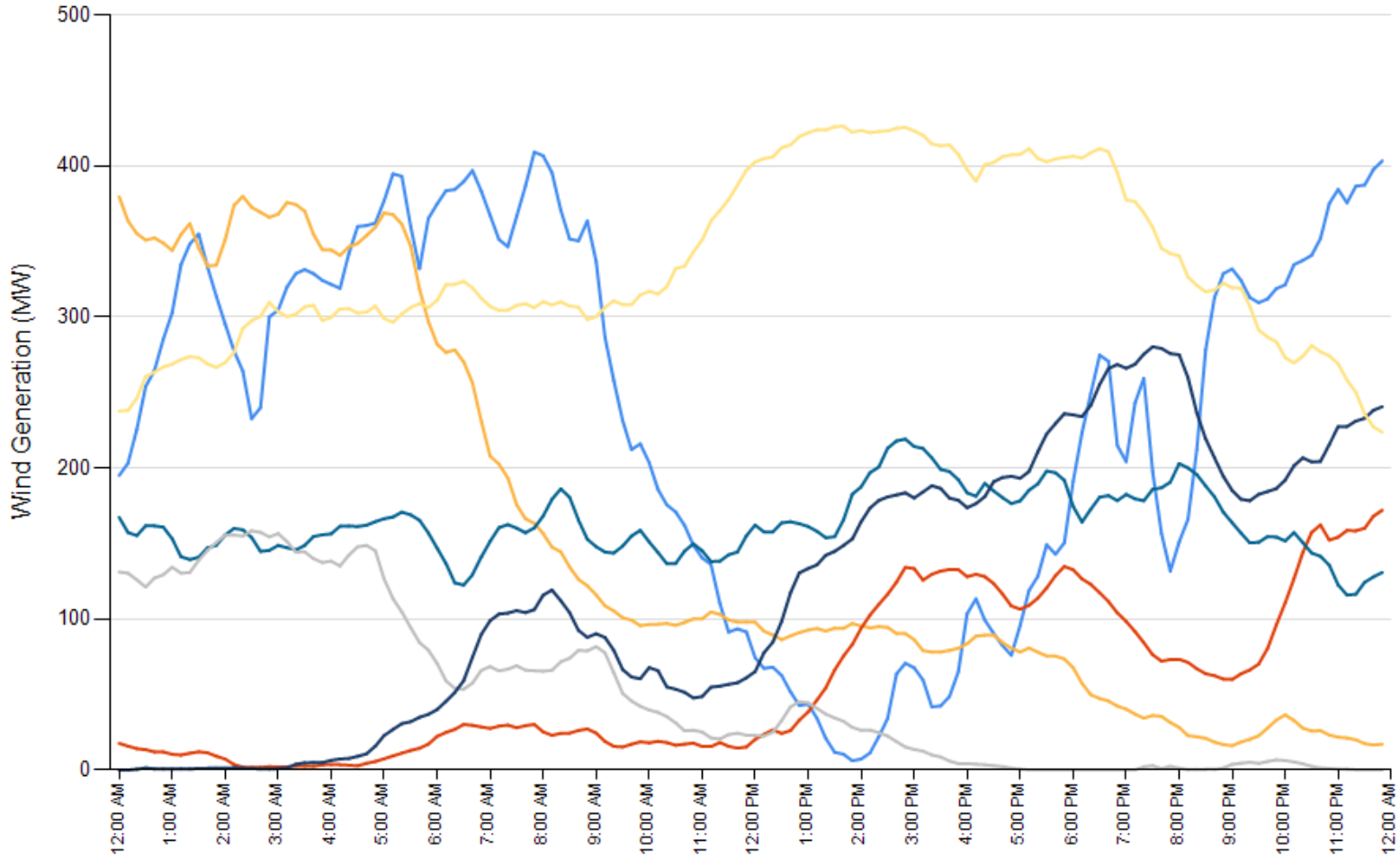
Wind Generation



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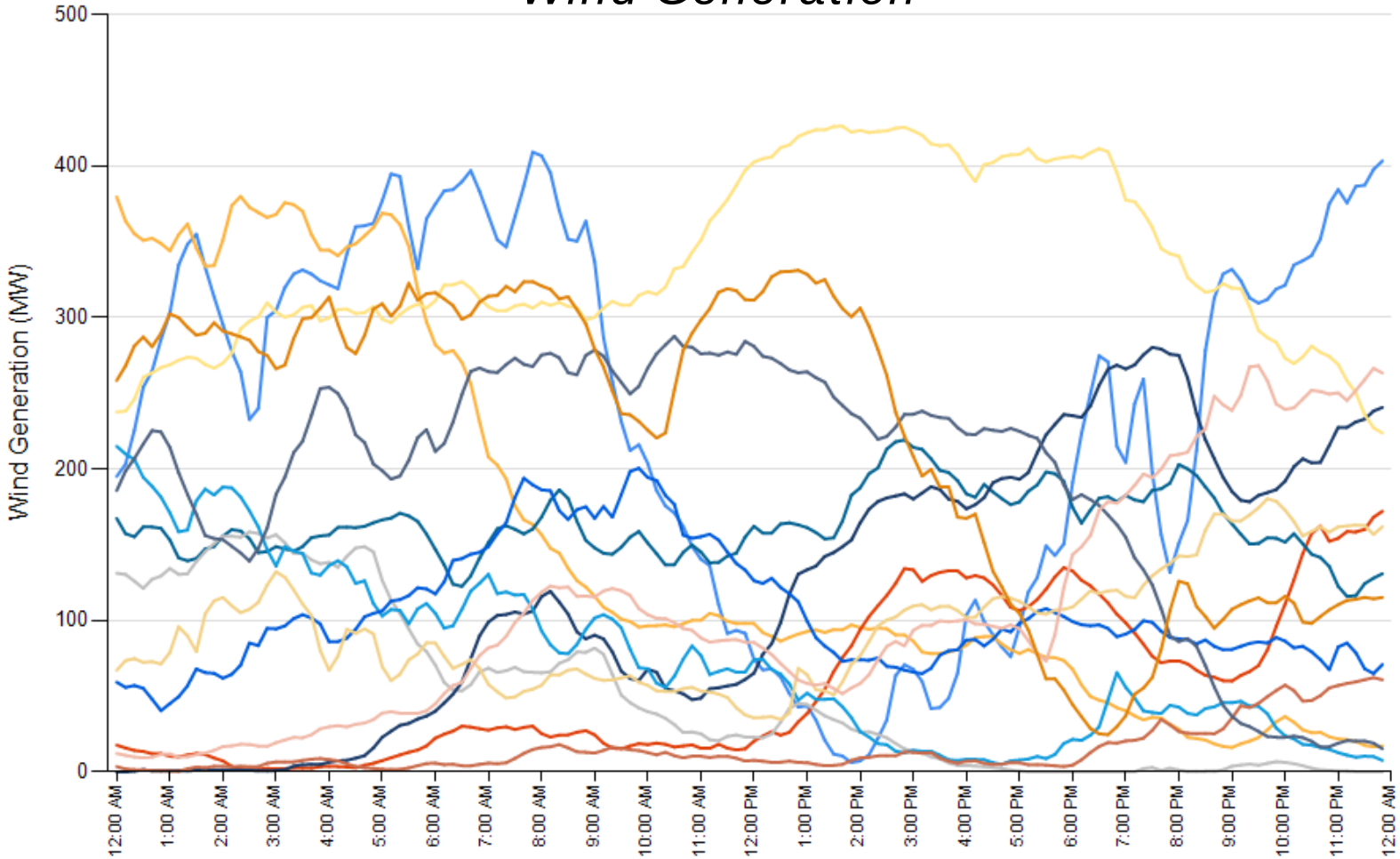
Wind Generation



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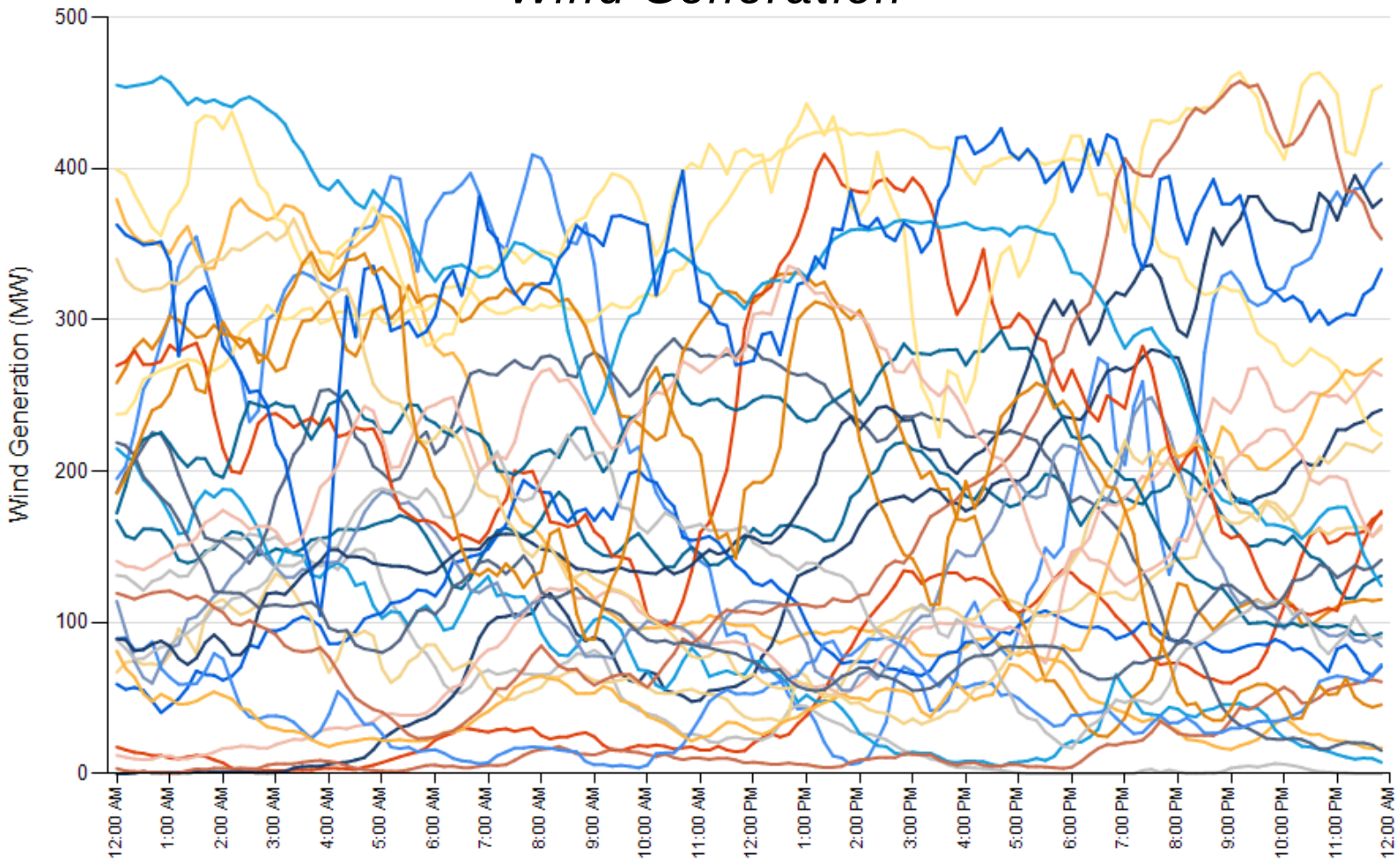
February 2012 – 29 days

Wind Generation



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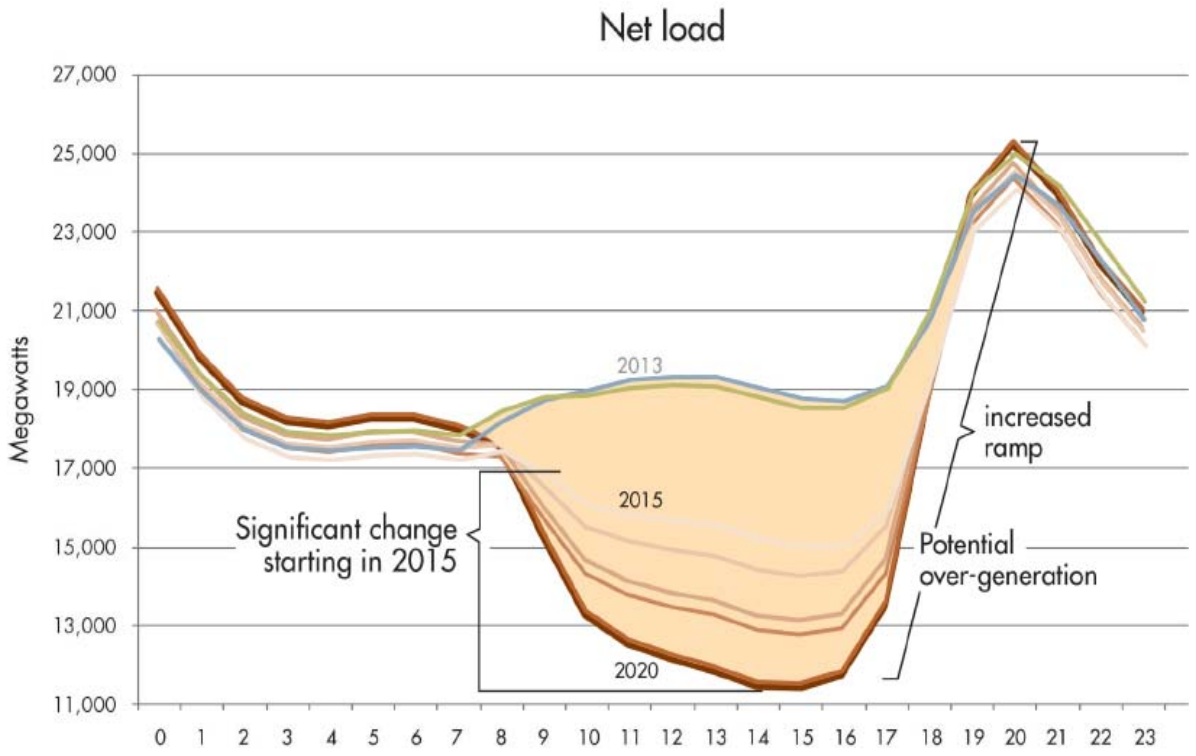
Growing need for flexibility starting 2015



California ISO
Shaping a Renewed Future

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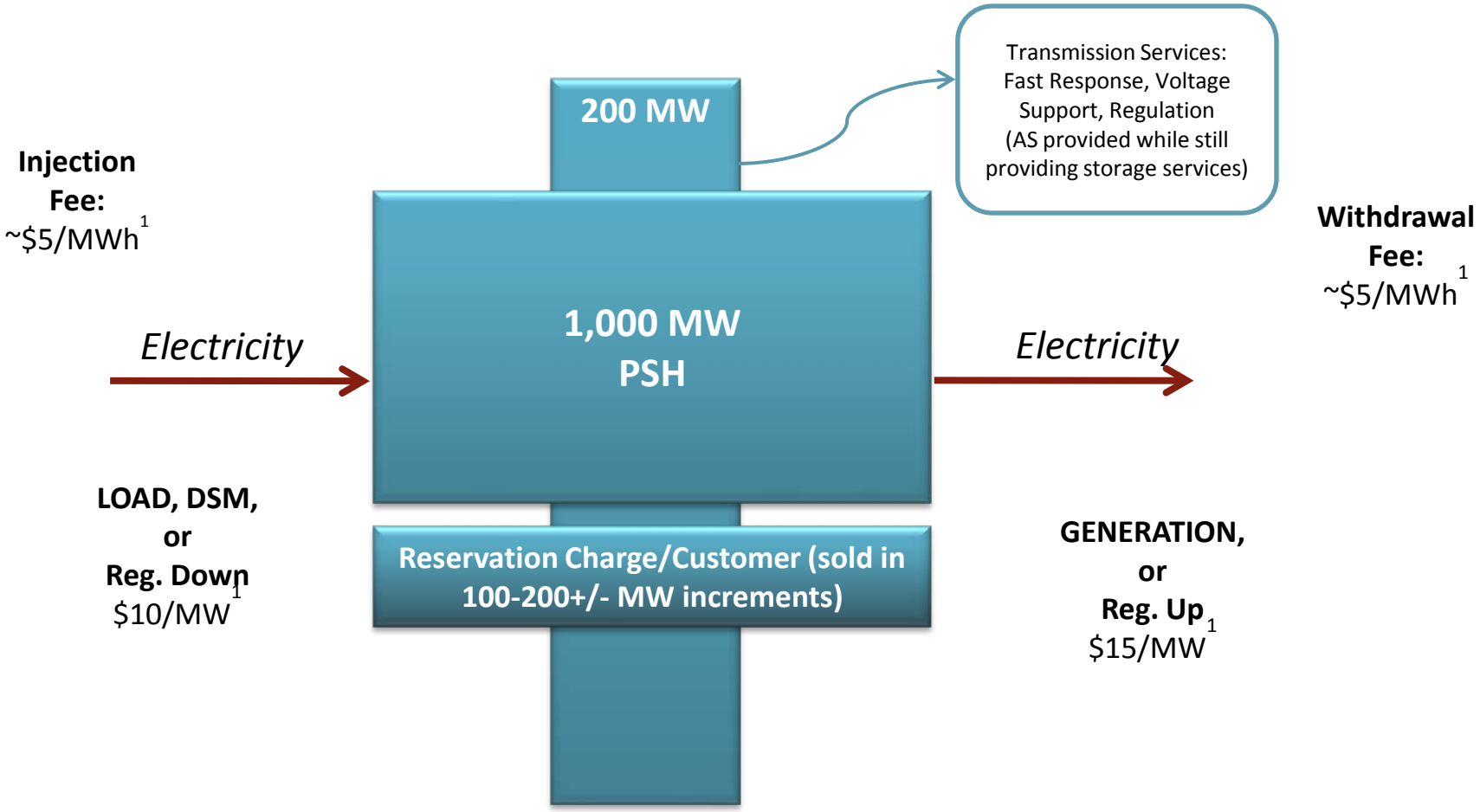
What Can Be Done to Address Challenges?
Markets: Energy Storage Model
(Similar to Gas Storage Model)



Contact Info

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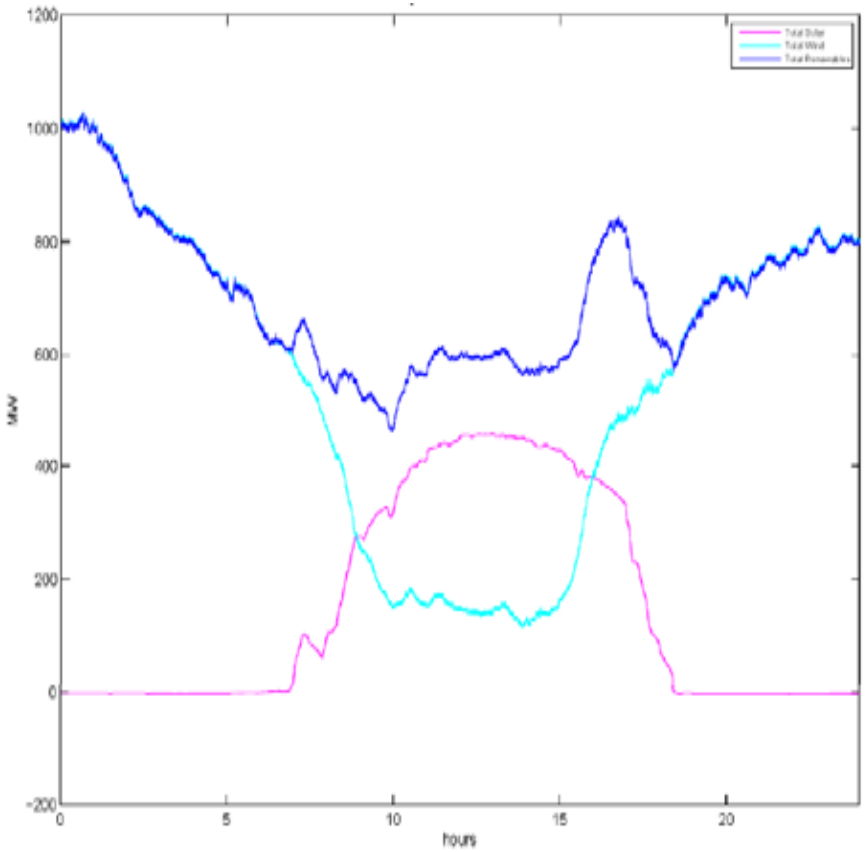
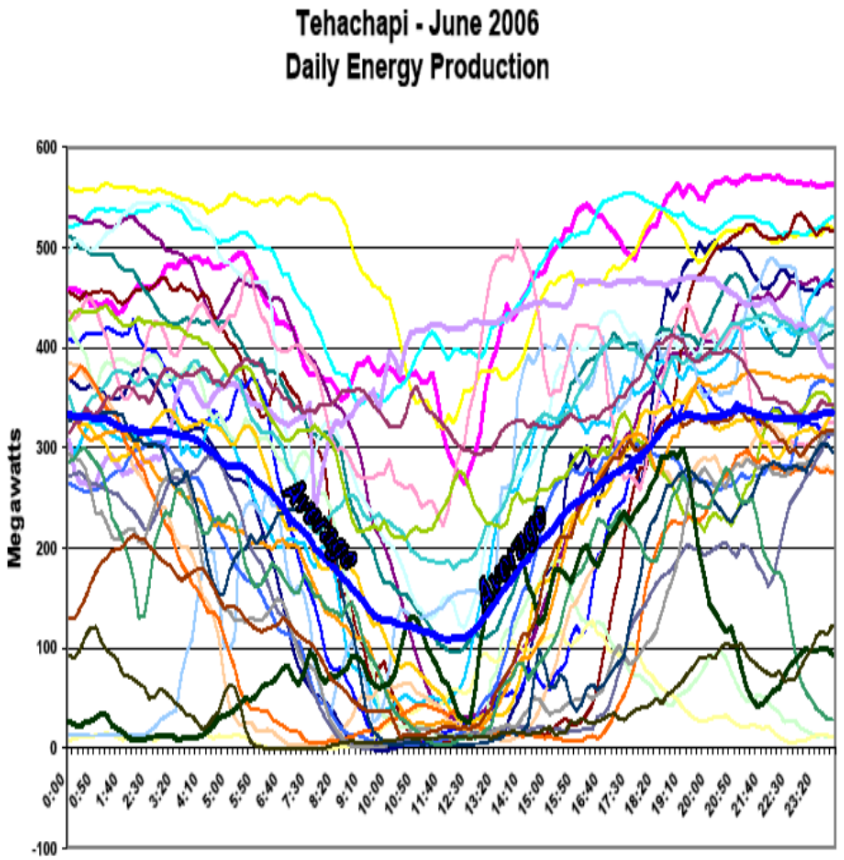
June 2010 – CEC / KEMA Study



Average wind production (July 2009)

Daily wind production (June 2006)
Tehachapi Area



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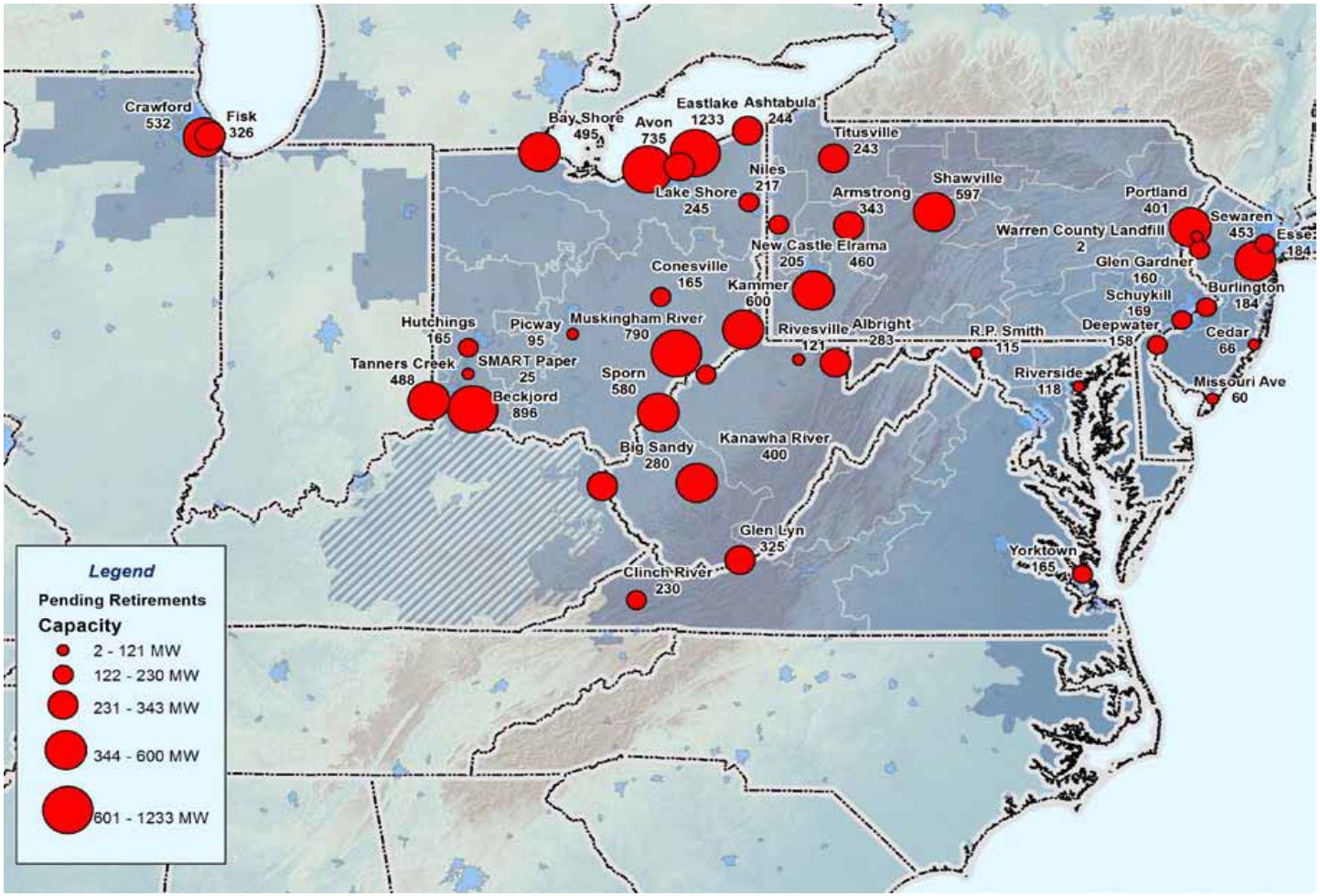
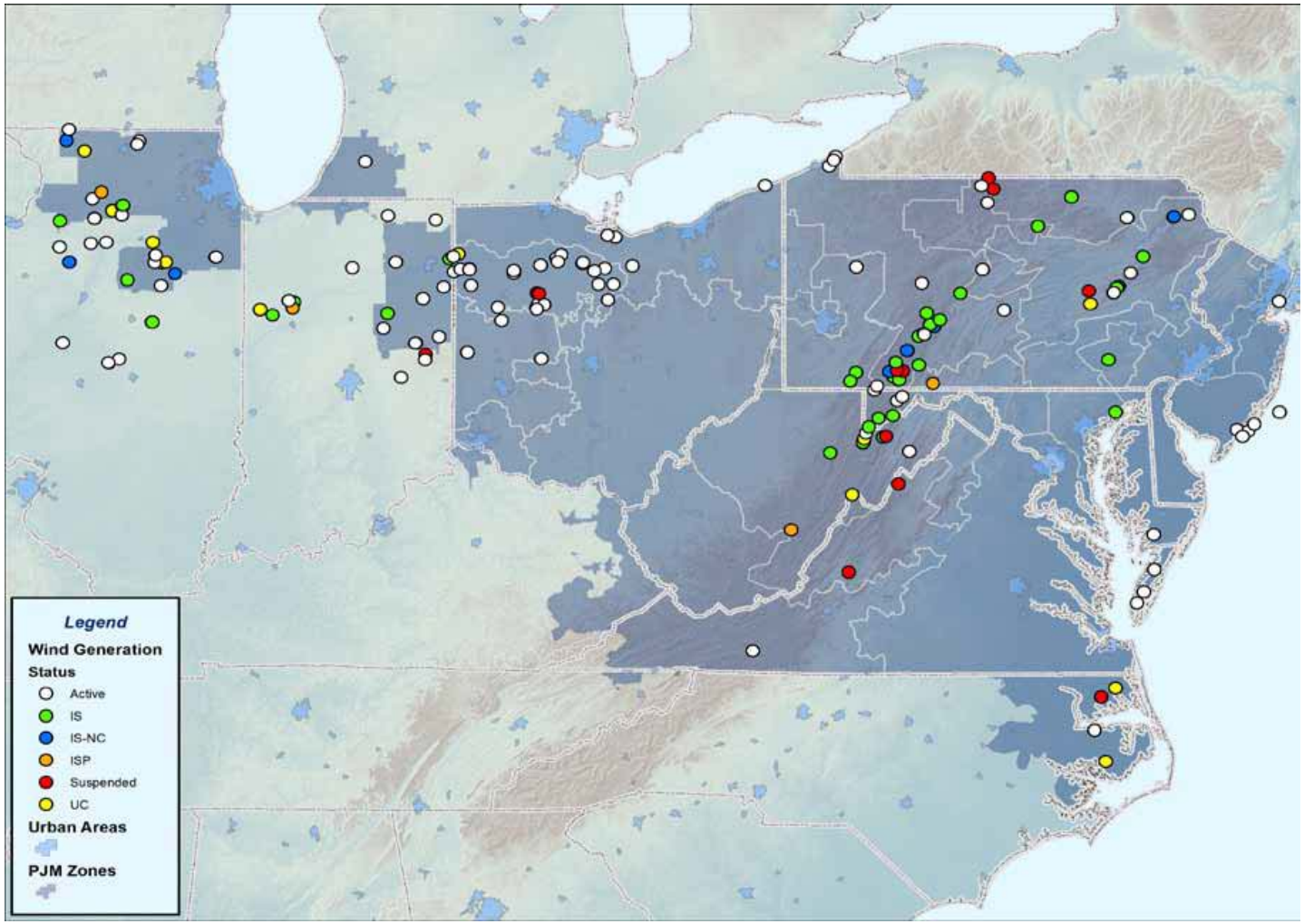
March 2013 – Proposed Power Plants Retirements



March 2013 – Proposed Gas Power Plants

March 2013 – Proposed Wind Power Plants



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Wind Challenges

Presented to the
National Hydro Association Annual Conference

Lisa Grow

April 23, 2013

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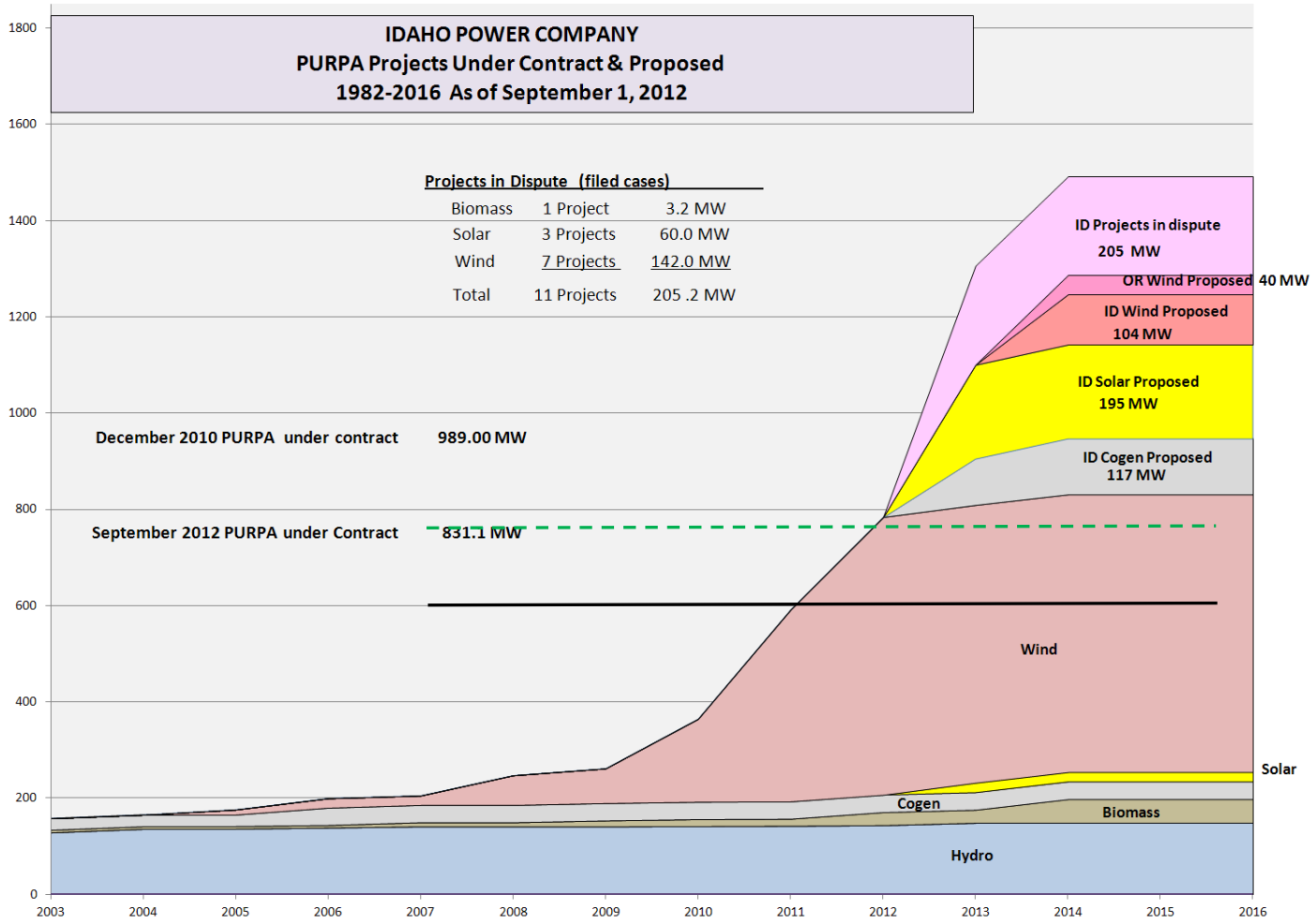
PURPA Status As of Sept 2012



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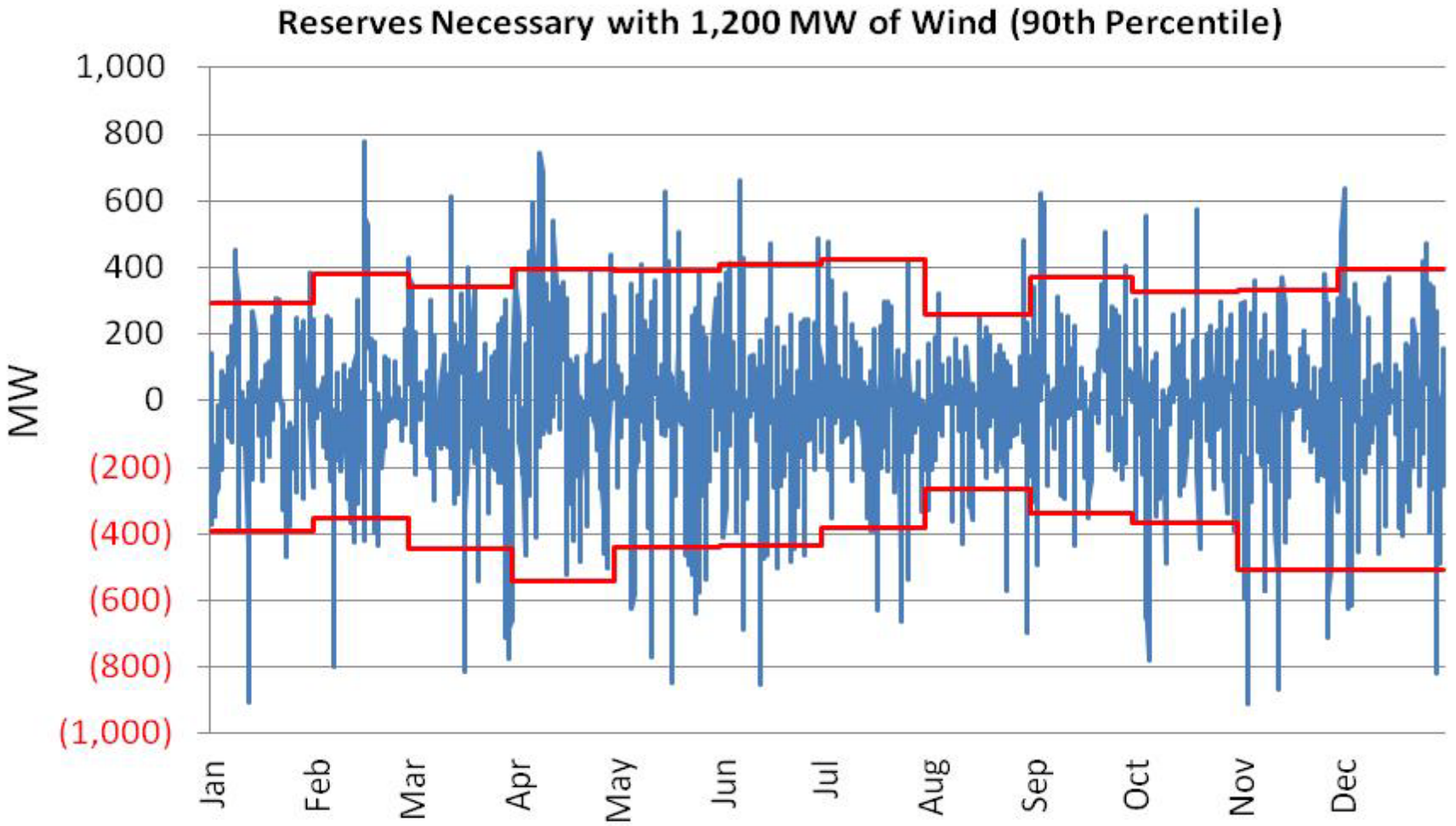
Wind Variability



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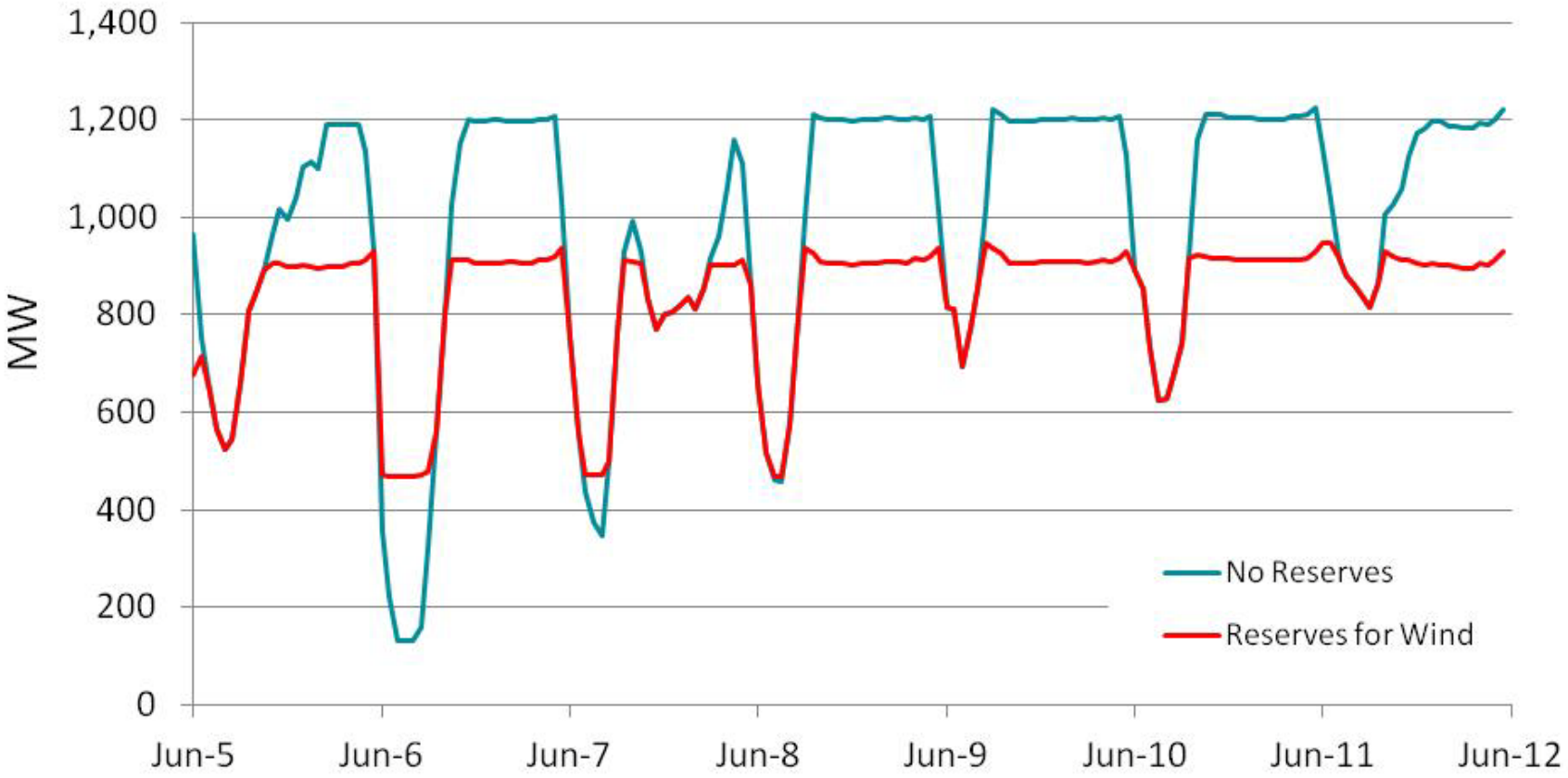
Hydro Operations

Hells Canyon Complex



Courtesy: Lisa Grow, Idaho Power, 2013 NHA Annual Conference, April 23, 2013

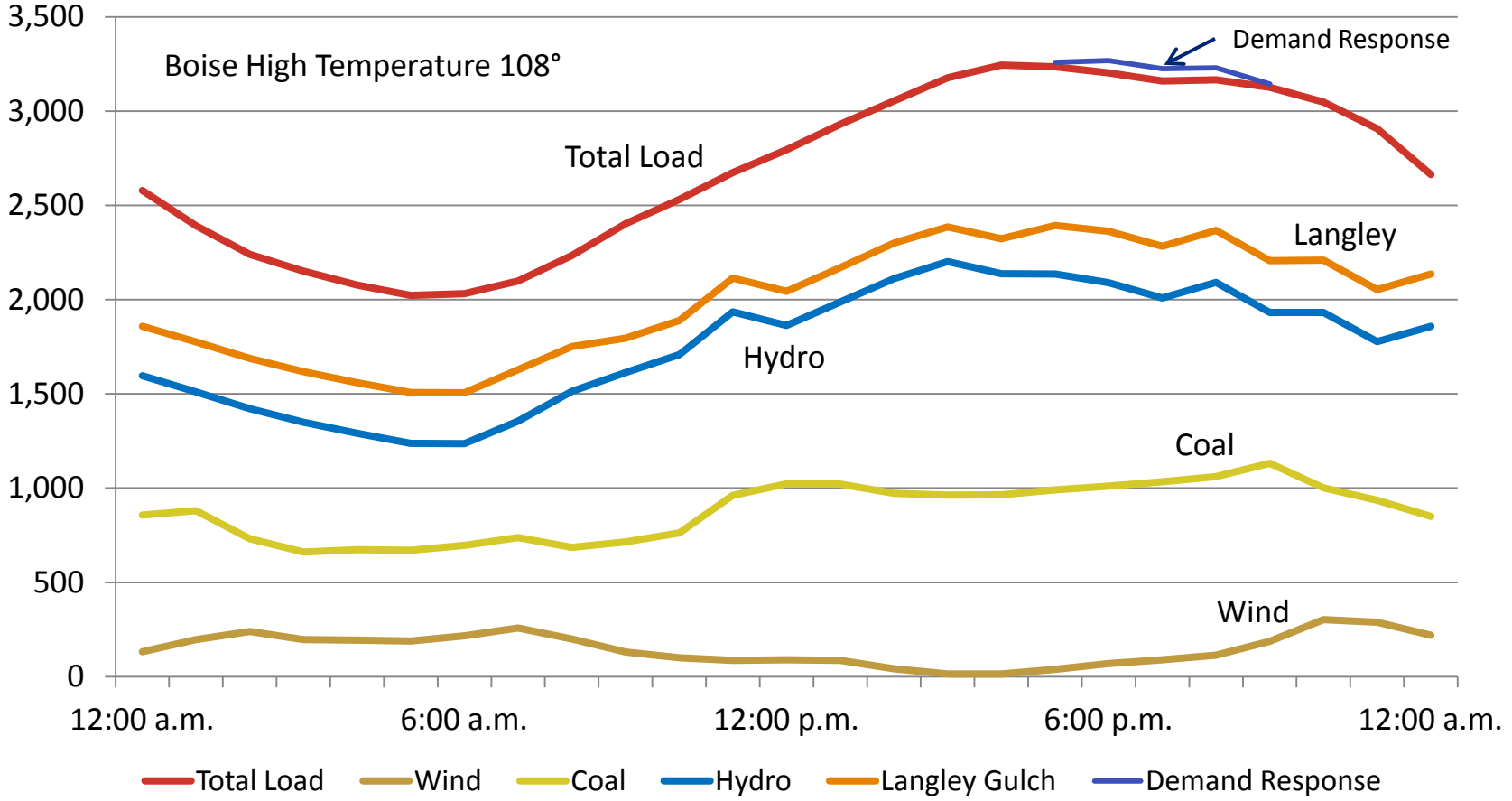
General Findings

- As wind penetration increases:
  - Hydro generation decreases
  - Spill and DG increases
  - Coal generation decreases
  - Gas generation increases (to provide reserves)
  - Net sales increase (due to surplus energy, during low/negative market)
  - Frequency and duration of curtailment increases

General Findings

- Problems during low load periods (1,000 to 1,100 MW) because all IPC resources are backed down to minimums
- More wind can be integrated when load is higher
- Integration cost and curtailment begin to increase rapidly at a penetration level of around 800 MW

Summer Peak

Load and Resources

3,245 MW - July 12, 2012