Northwest Power and Conservation Council

June 28, 2012

MEMORANDUM

TO: **Council Members**

FROM: Shirley Lindstrom

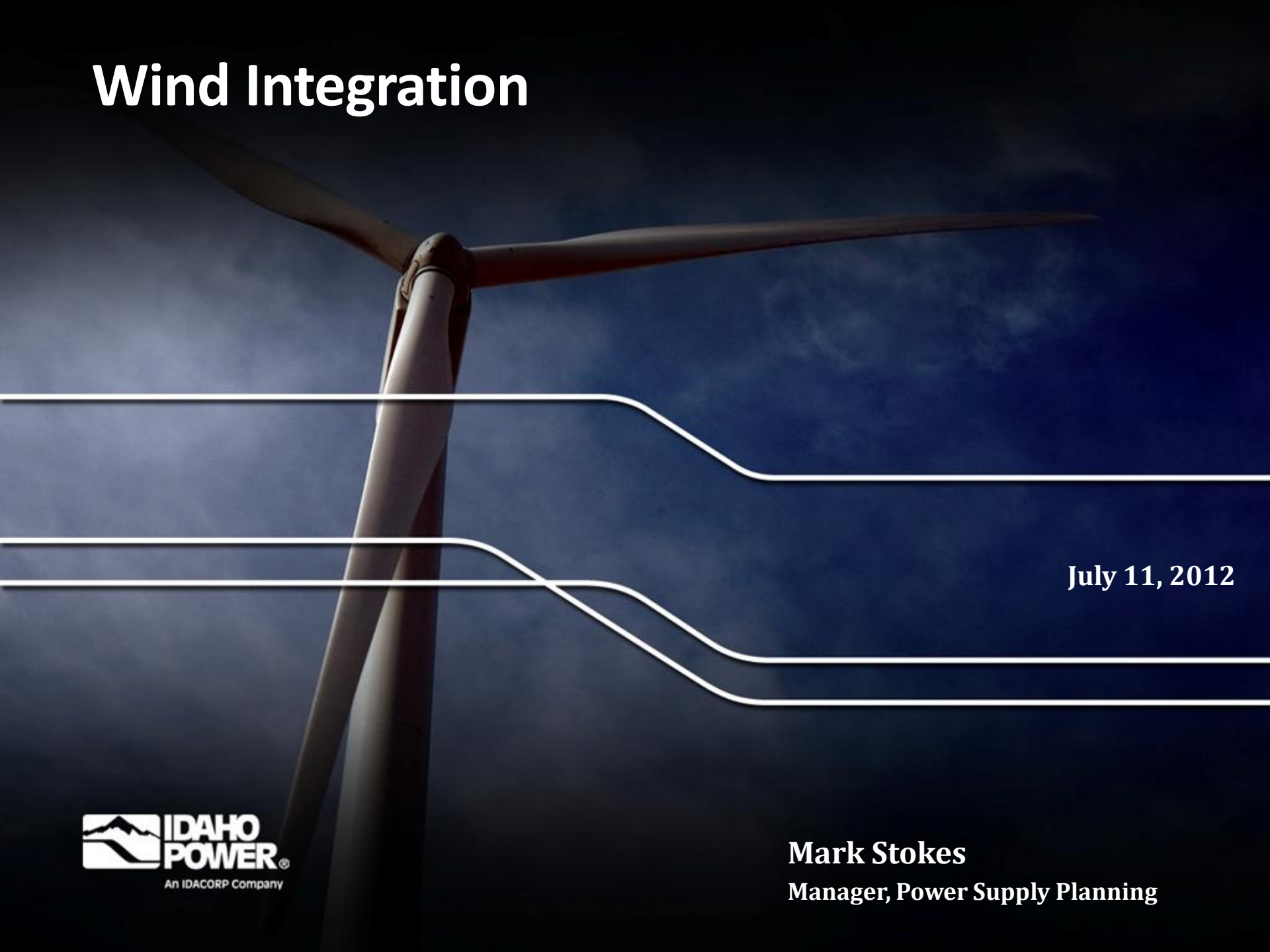
SUBJECT: Presentation by Mark Stokes on the Idaho Power Company's Wind Integration Study

Installed wind generation capacity continues to expand in the Pacific Northwest, including Idaho. This expansion is accompanied by continuing concerns over the impacts and costs of integrating production from wind generators onto a vertically integrated power system such as Idaho Power's. As a result of these concerns, Idaho Power is revisiting its study of wind integration.

The objective of this study is to assess the costs incurred in modifying operations of dispatchable generating resources in order to allow them to respond to the variable and uncertain energy supplied by wind generators such that the reliable delivery of electrical power to customers is unaffected.

Idaho Power considers the assessment of these costs an important part of efforts to ensure that the price it pays in acquiring wind energy is fair to generators and customers alike.

Wind Integration



July 11, 2012

IDAHO POWER®
An IDACORP Company

Mark Stokes
Manager, Power Supply Planning

History

- Idaho Power completed its first wind integration study in 2007
- Study results showed the cost of integrating wind was $7.92/MWh (for 500 MW of wind)
- Settlement stipulation contained three tiers with wind integration charges capped at $6.50/MWh
- The vast majority of Idaho Power's PURPA wind contracts have $6.50/MWh deducted from the contract rate

Study Goals

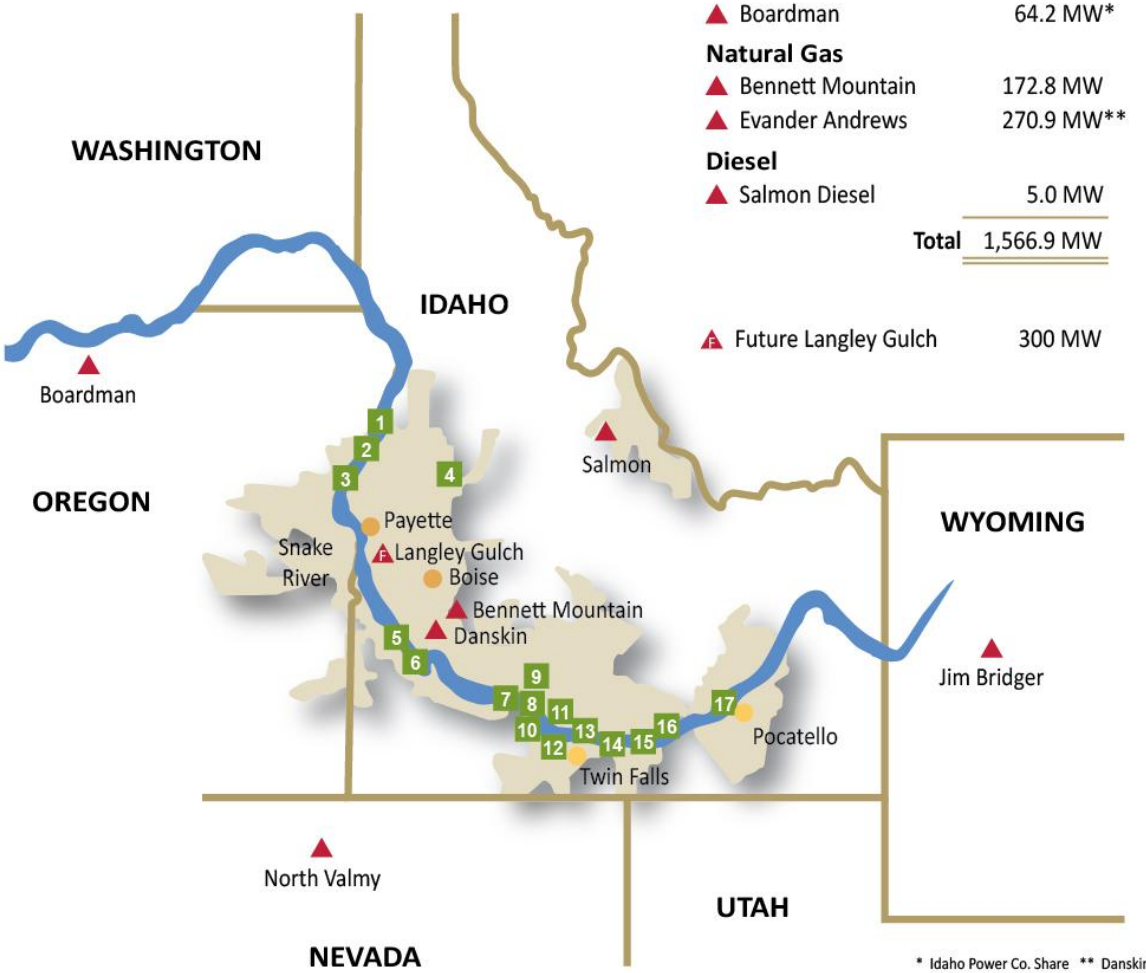
- What is the cost of integrating wind generation on Idaho Power's system?
- Is there a limit to the amount of wind generation Idaho Power's system can accommodate?

Wind currently on-line	499 MW
Wind under contract, but not yet on-line	294 MW
Total	793 MW

Service Area and Resources

Hydroelectric Facilities and Nameplate Capacities

1	Hells Canyon	391.5 MW
2	Oxbow	190.0 MW
3	Brownlee	585.4 MW
4	Cascade	12.4 MW
5	Swan Falls	27.2 MW
6	C. J. Strike	82.8 MW
7	Bliss	75.0 MW
8	Lower Malad	13.5 MW
9	Upper Malad	8.3 MW
10	Lower Salmon	60.0 MW
11	Upper Salmon	34.5 MW
12	Thousand Springs	8.8 MW
13	Clear Lake	2.5 MW
14	Shoshone Falls	12.5 MW
15	Twin Falls	52.9 MW
16	Milner	59.4 MW
17	American Falls	92.3 MW
	Total	1,709.0 MW



Thermal Facilities And Capacities

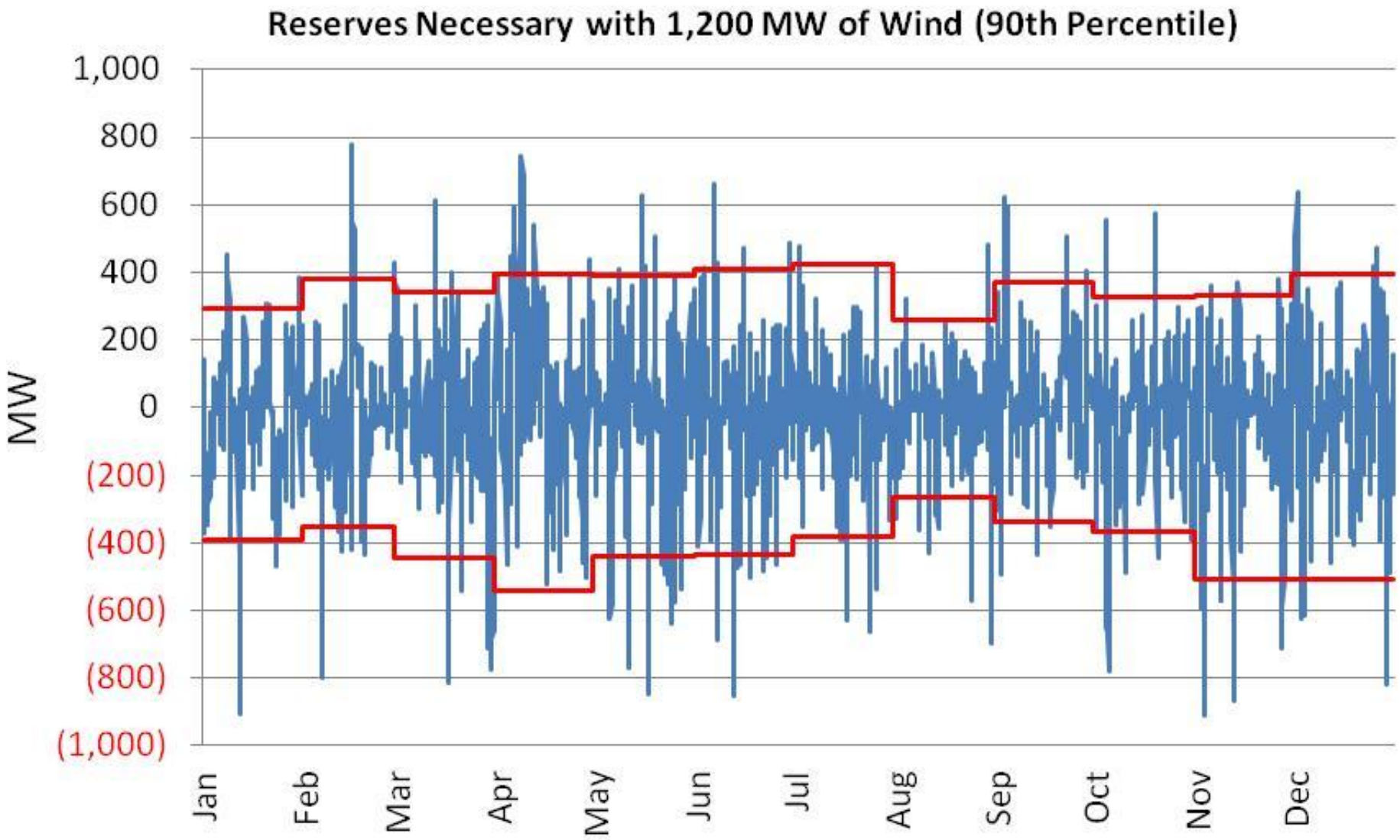
Coal		
▲	Jim Bridger	770.5 MW*
▲	North Valmy	283.5 MW*
▲	Boardman	64.2 MW*
Natural Gas		
▲	Bennett Mountain	172.8 MW
▲	Evander Andrews	270.9 MW**
Diesel		
▲	Salmon Diesel	5.0 MW
	Total	1,566.9 MW
▲ F	Future Langley Gulch	300 MW

* Idaho Power Co. Share ** Danskin

Study Parameters

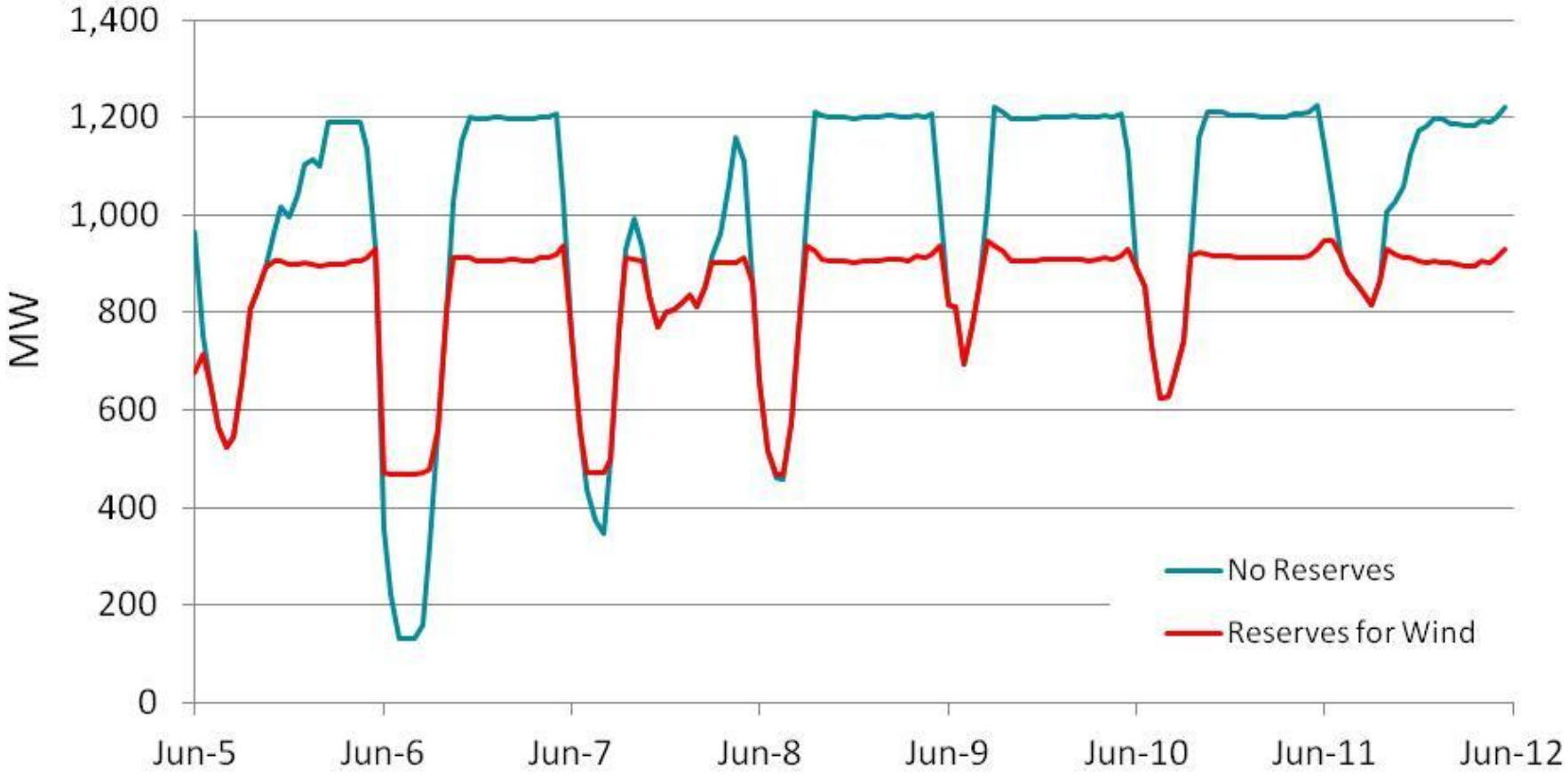
- Used 2017 as the study year in order to evaluate scenarios both with and without B2H
- Evaluated wind penetration levels of 400, 800, 1,000, and 1,200 MW under low, median, and high water years
- Data used from the 2011 IRP:
  - Load forecast for 2017
  - Expected generation from run-of-river hydro
  - PURPA and other contract purchases
  - Natural gas and market prices
- Model was allowed to dispatch Hells Canyon hydro, coal and gas plants (including Langley Gulch), and determine market purchases/sales within constraints

Wind Variability



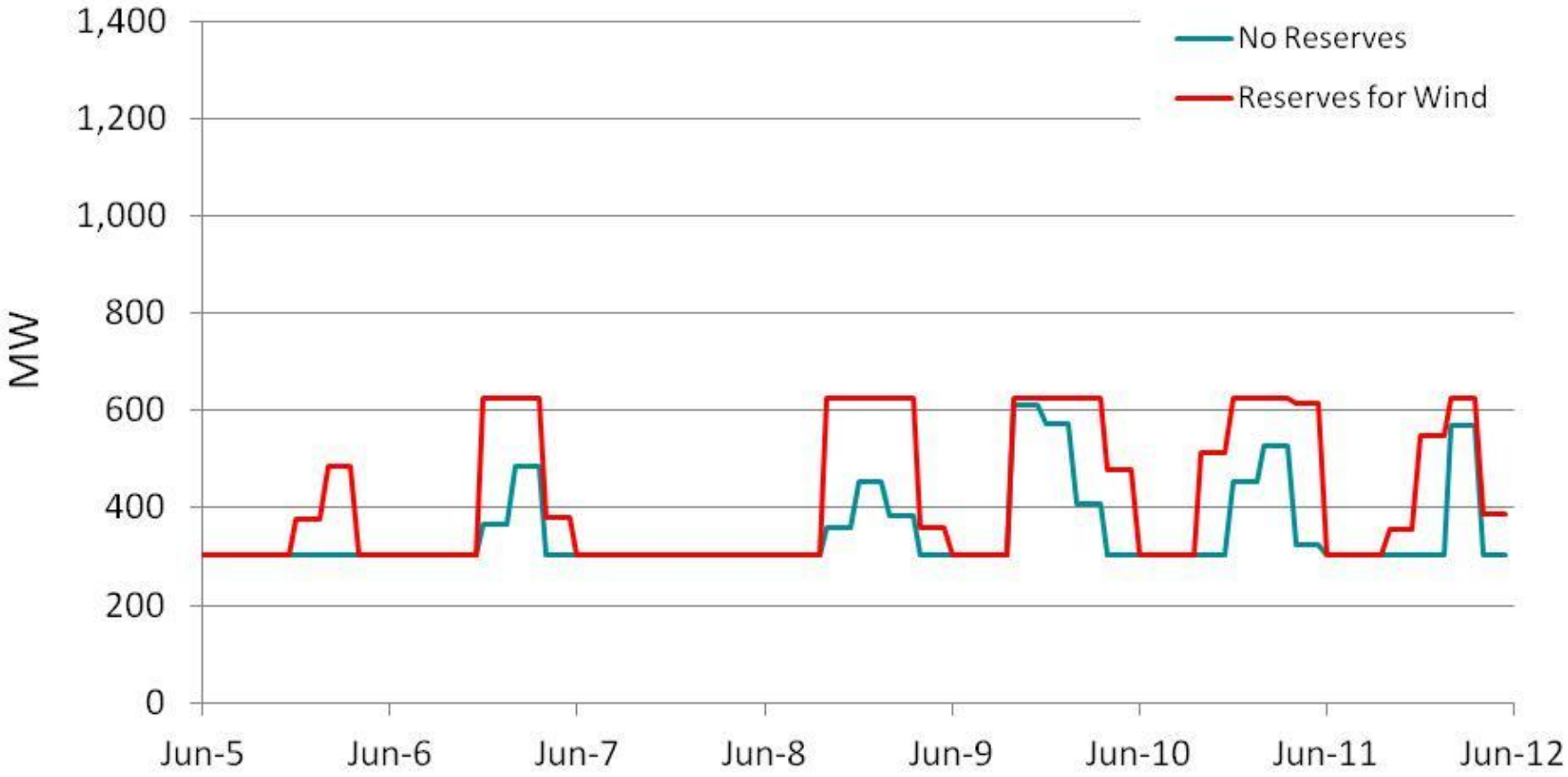
Hydro Operations

Hells Canyon Complex



Thermal Operation

Jim Bridger Plant



General Findings

- As wind penetration increases:
  - Hydro generation decreases (additional spill)
  - Coal generation decreases
  - Net sales increase (due to surplus energy)
  - Gas generation increases as the gas plants are needed to provide reserves, and are increasingly operated when not in-the-money
  - Frequency and duration of curtailment increases
- Not able to provide sufficient reg-down reserves 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 start to increase at a penetration level of around 800 MW

Wind Integration Cost

(Dollars per MWh)

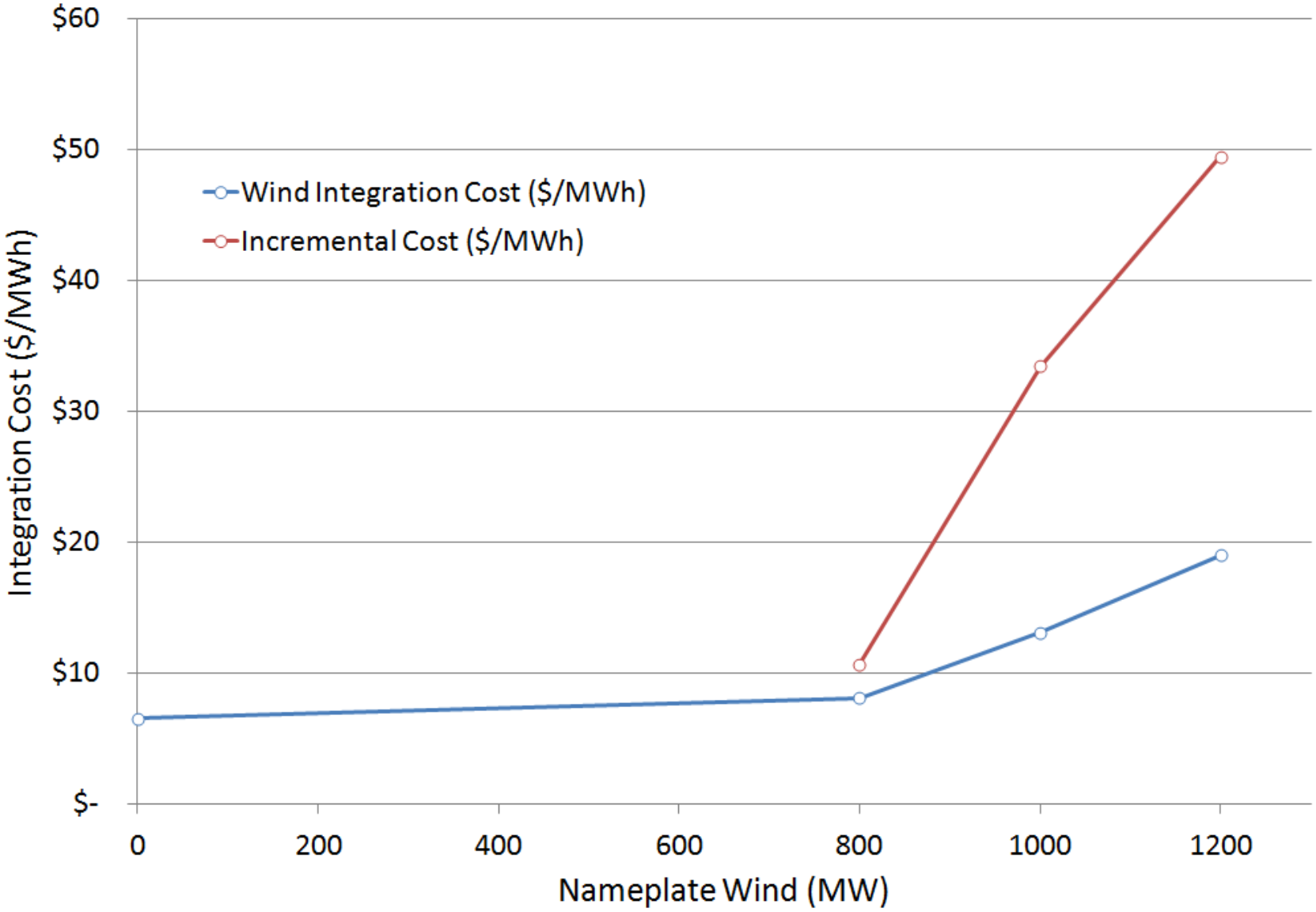
- Existing Charge $ 6.50

  Settlement stipulation following initial integration study

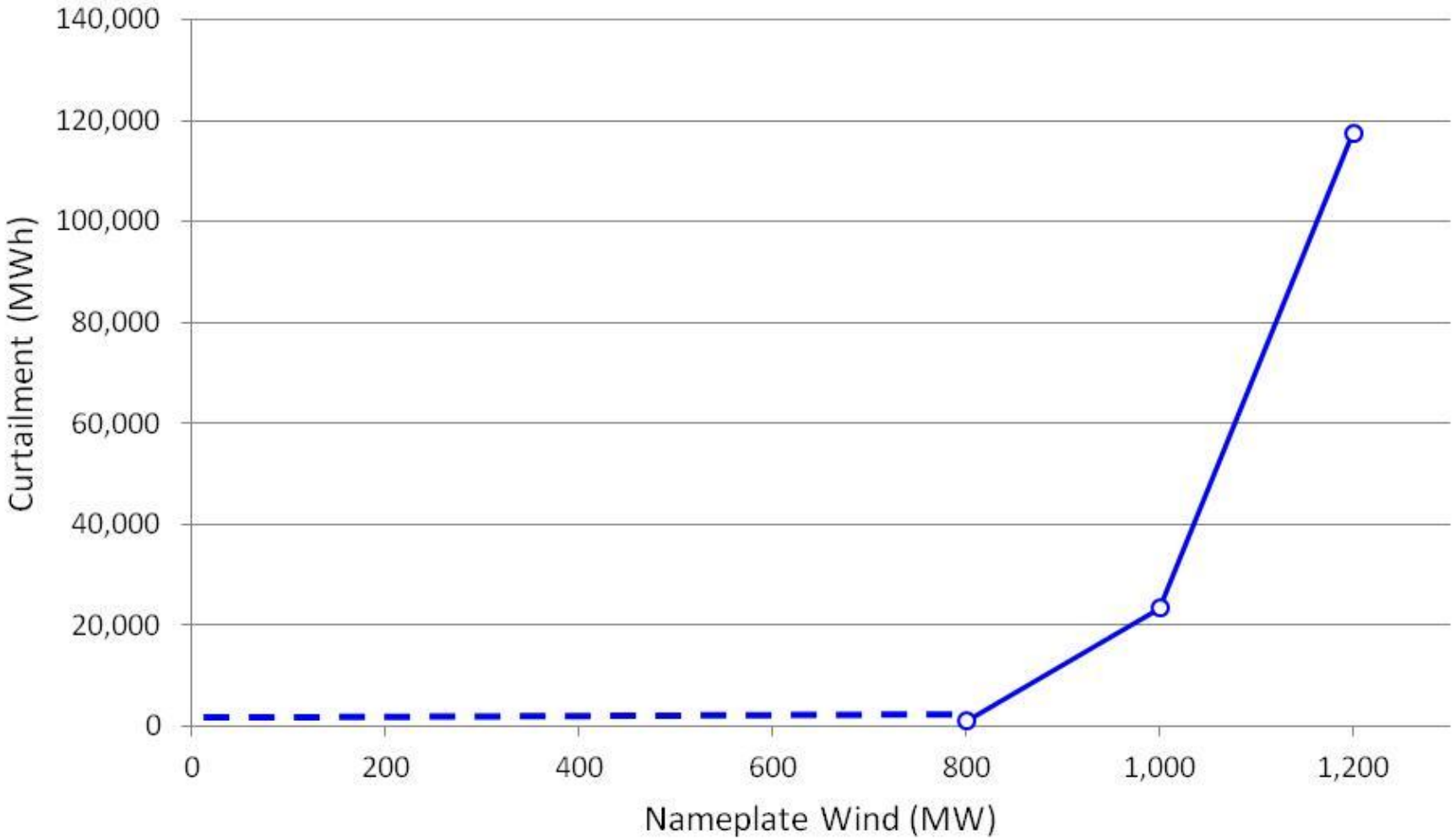
	Average	Incremental[1]
• Cost at 800 MW	$ 8.06	$10.65
• Cost at 1,000 MW	$13.06	$33.42
• Cost at 1,200 MW	$19.01	$49.46

[1] Incremental cost is the estimated charge to account for existing contracts that are only paying $6.50/MWh. These amounts would be necessary to keep customers whole if existing contracts are not amended.

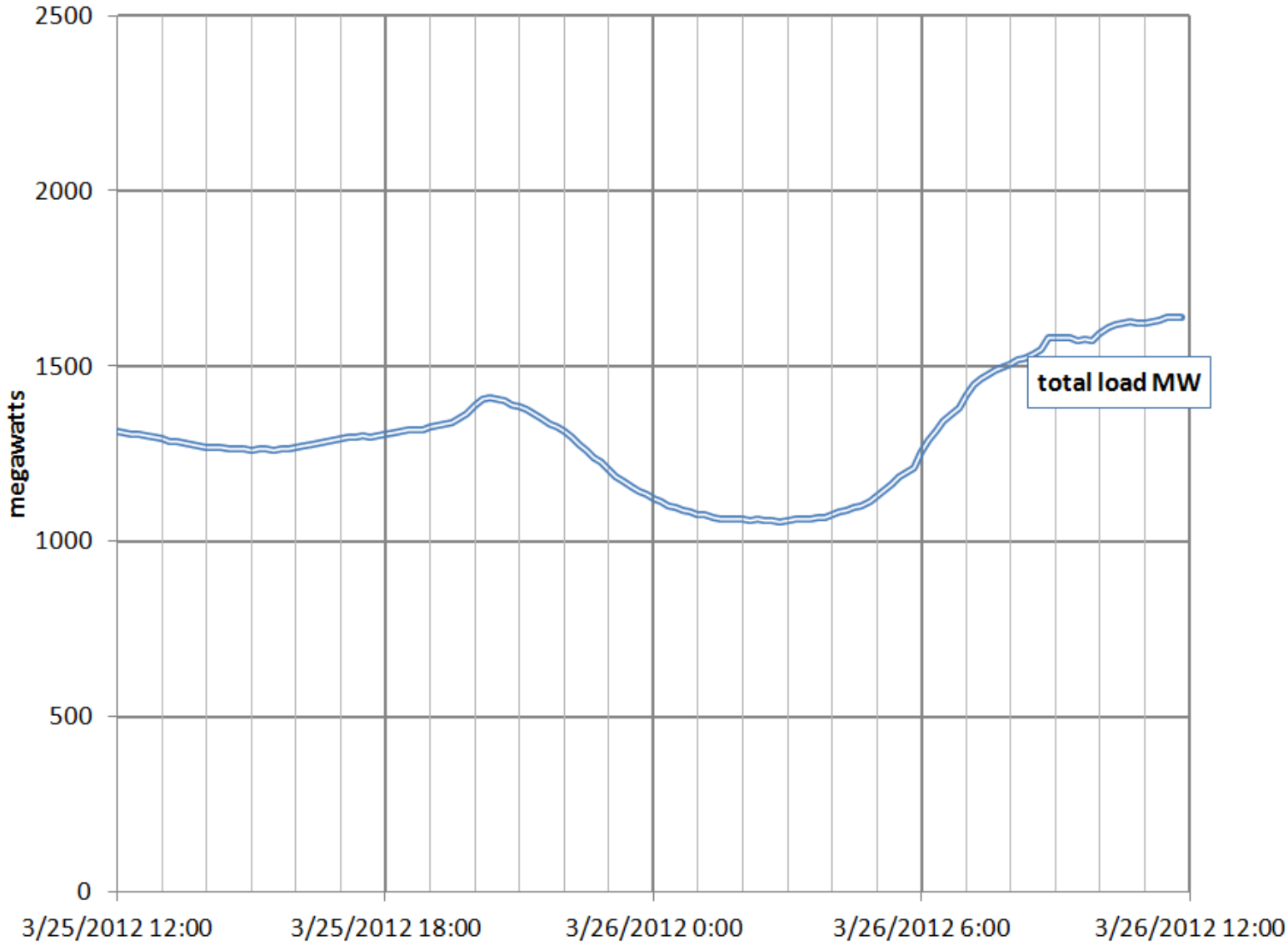
Wind Integration Cost



Wind Curtailment



March 25-26, 2012



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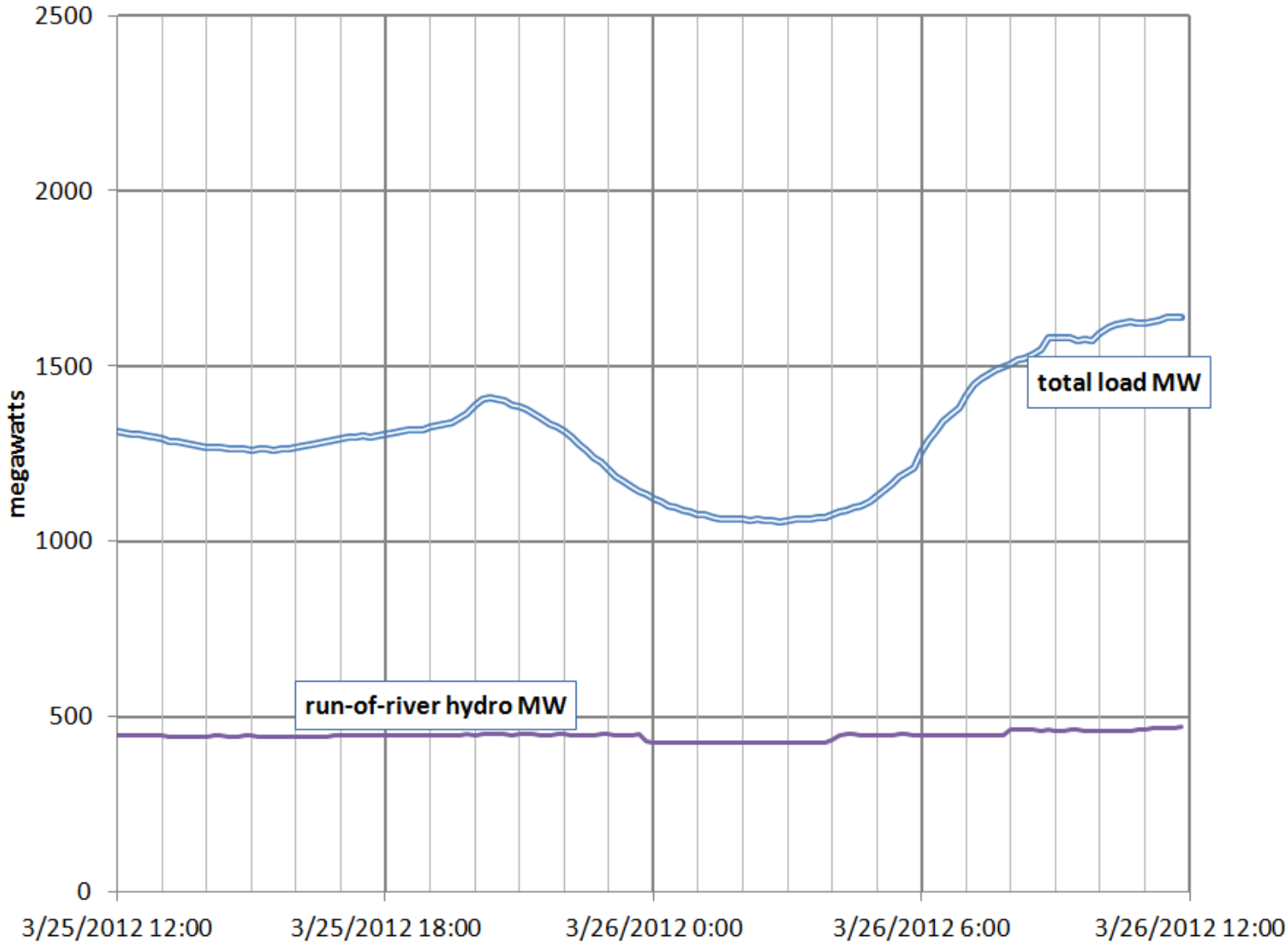

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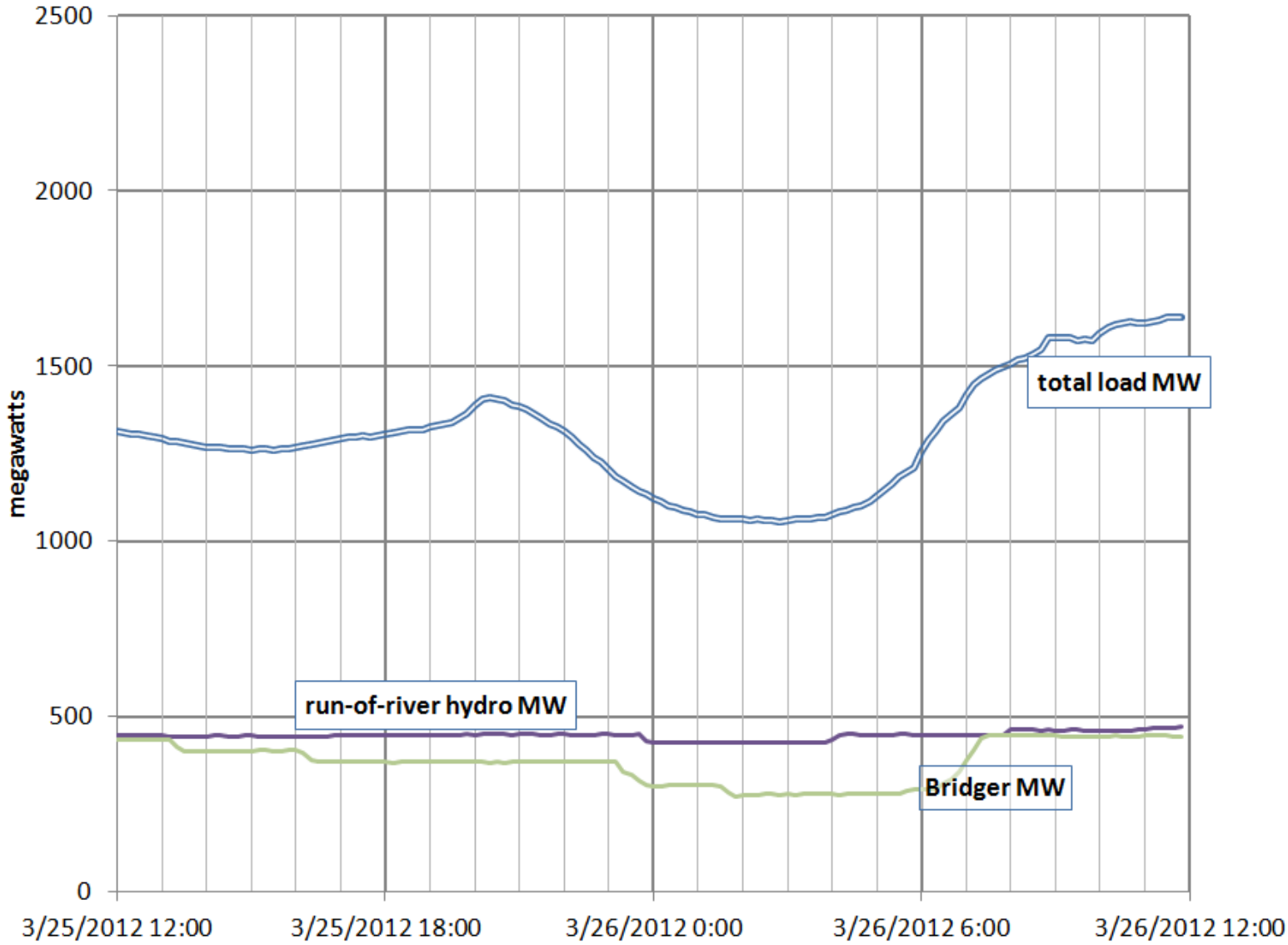

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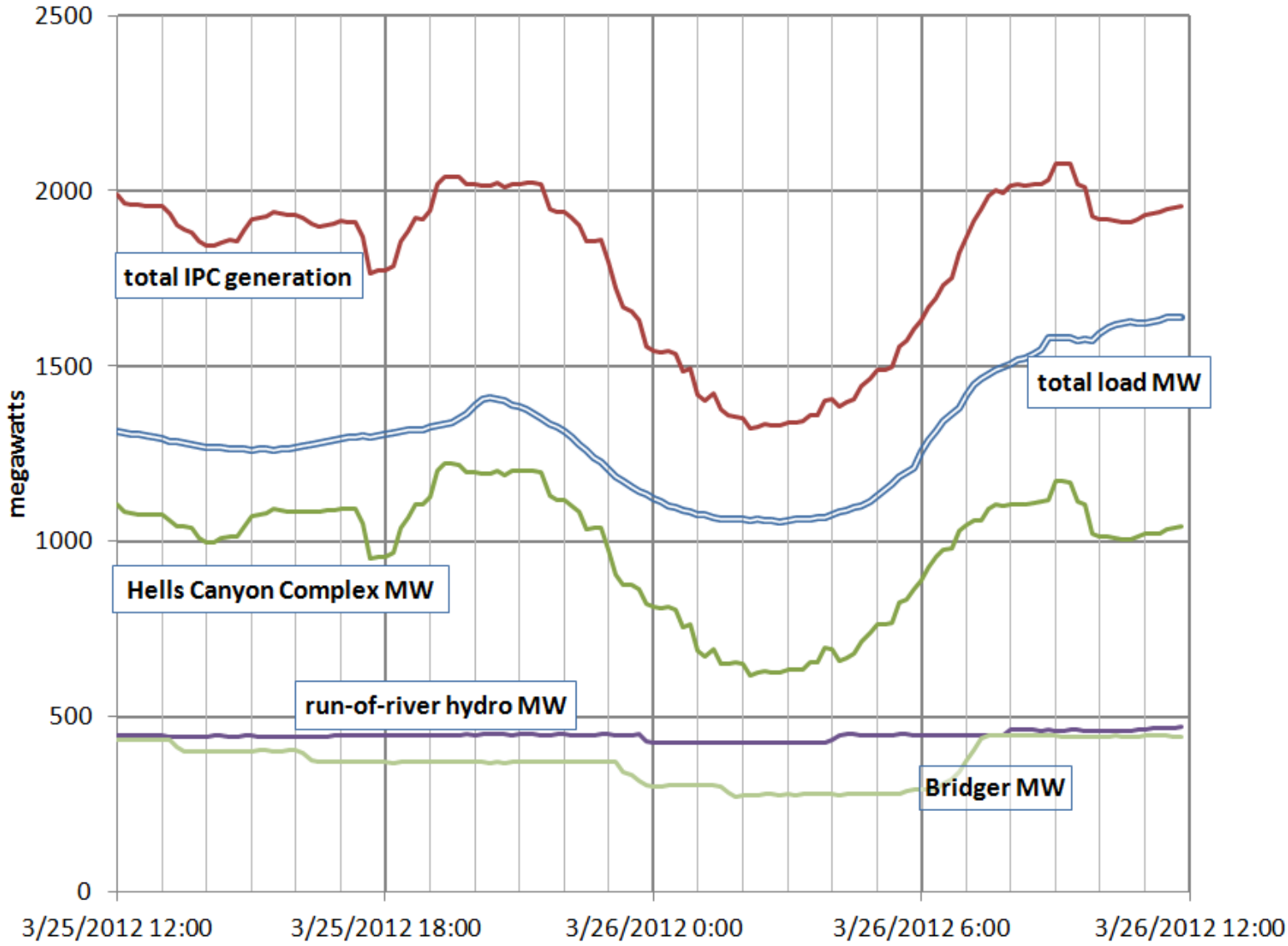

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