

Fundamental Drivers of Pacific Northwest Power Markets

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Who Is Energy GPS?

- **Energy Analytics Firm:** Offices in Portland and Calgary. Staff of 8 people. Former energy traders and IT professionals.
- **Energy Fundamentals:** Subscription service providing reports, analysis, and data to power and gas traders in the western US and Canada.
- **Consulting:** Advise developers, utilities, power marketers, investors, and others on wholesale electricity and natural gas markets. Experts in the intersection of renewable and wholesale markets.

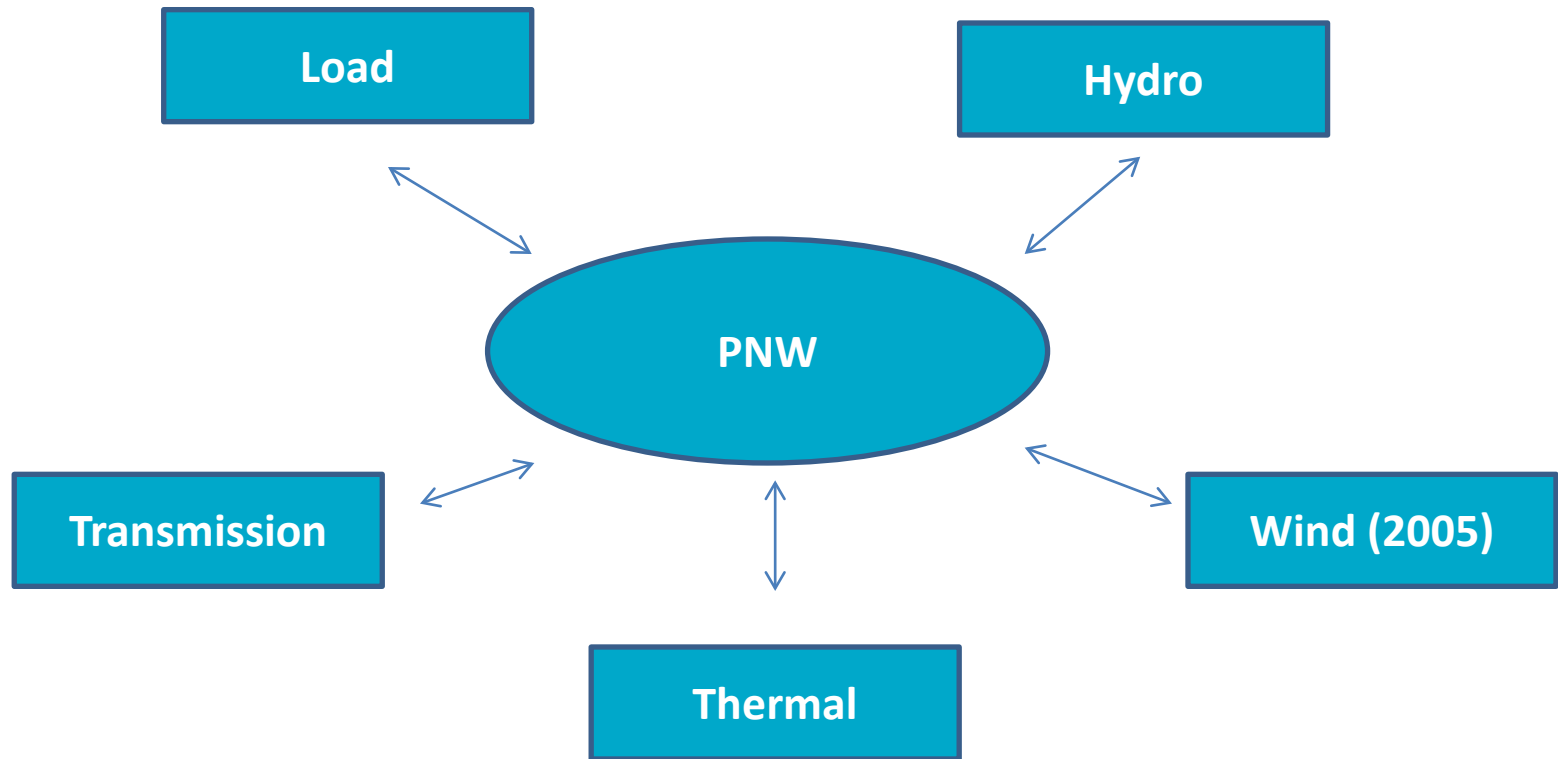
Outline

- **2002-2012 – Supply Demand Balance**
 - Healthy Supply Stack
 - Leads to Low Heat Rates
- **2013 – The System Stabilizes**
 - Average hydro and wind build out stops
 - GHG Regulations in CA stimulate PNW Exports
 - Heat Rates Steadily Increase
- **Forward Outlook**
 - Balance of the Year
 - Long Term Outlook
 - Conclusion

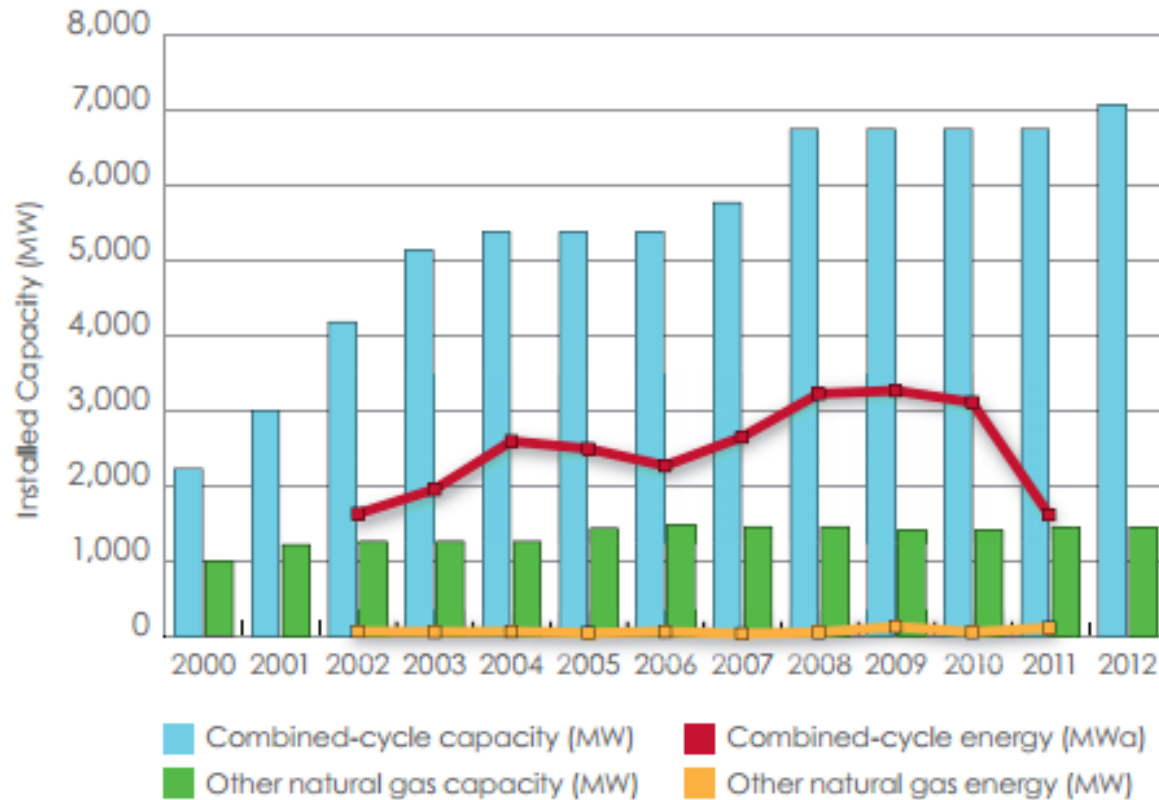
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PNW – Supply Demand Profile

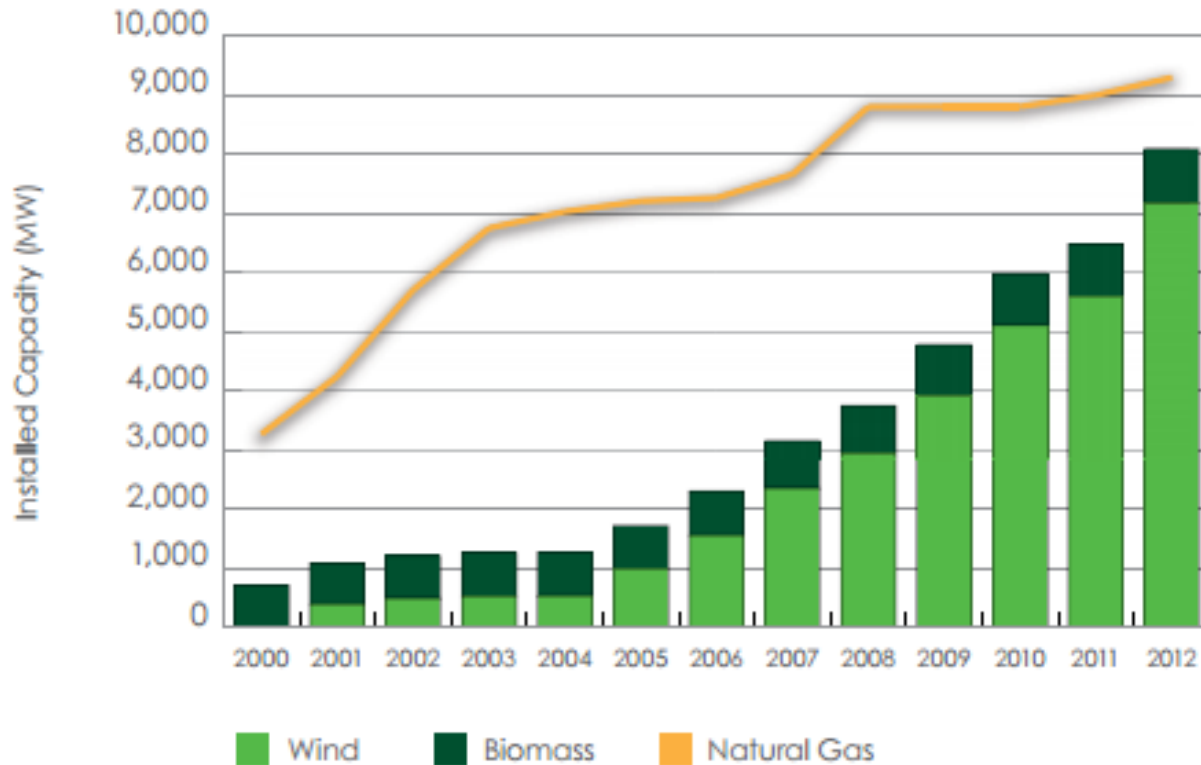


Natural Gas Capacity



5,000 MW of Natural Gas Generation Added Between 2,000 and 2008

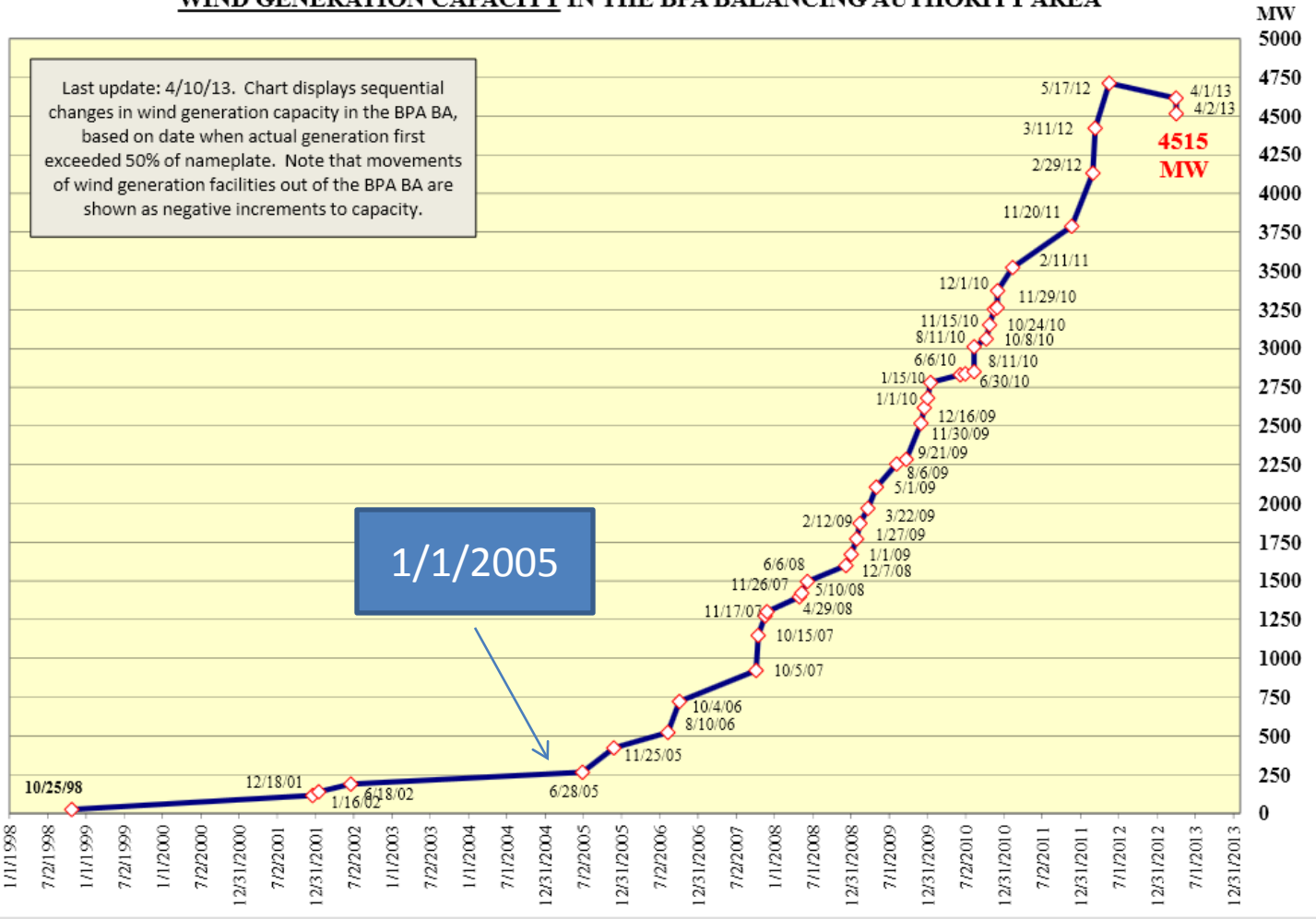
PNW Wind Capacity



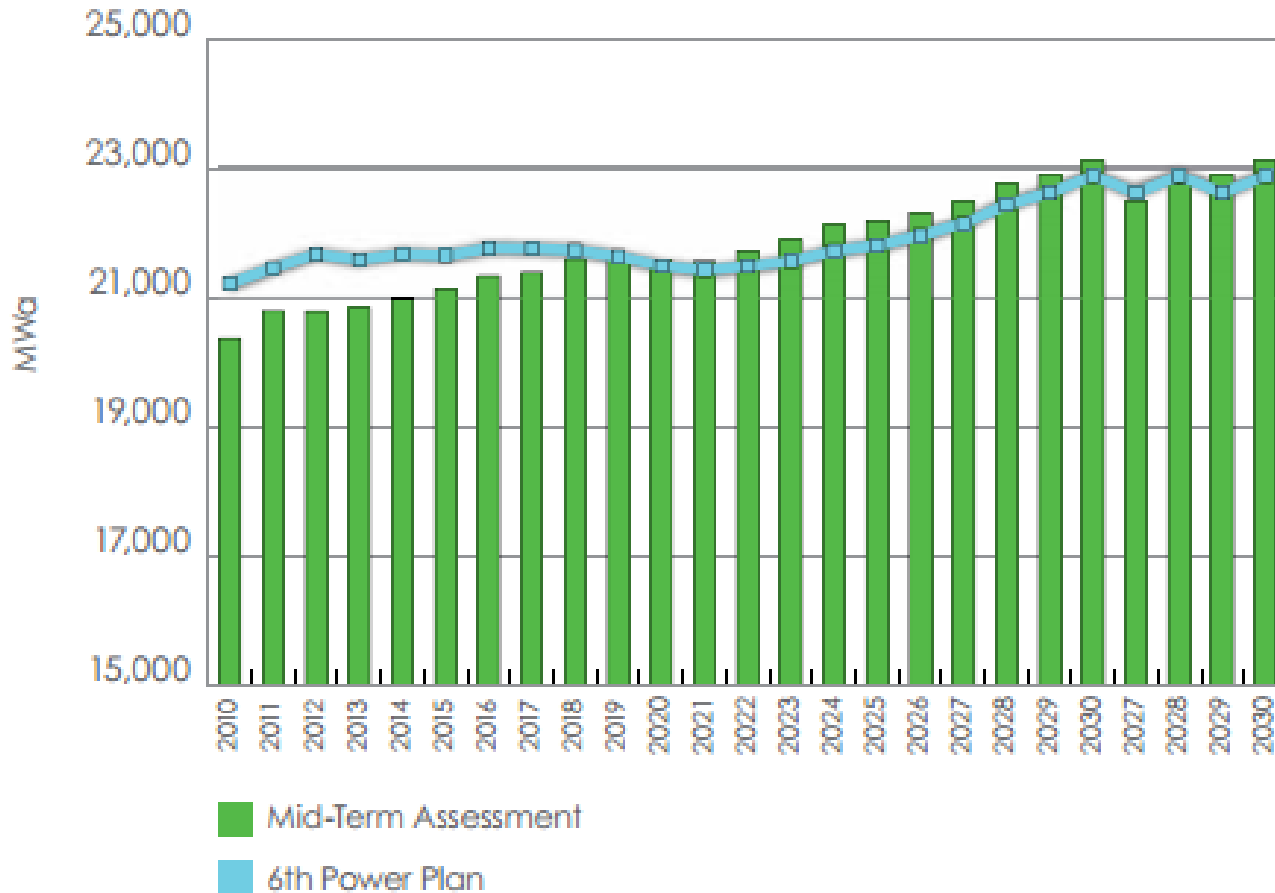
3,000 MW of wind added 2000 to 2008. 4000 MW of wind added 2009 to 2012 (OR, WA, ID, MT)

BPA Control Area Wind Capacity

WIND GENERATION CAPACITY IN THE BPA BALANCING AUTHORITY AREA

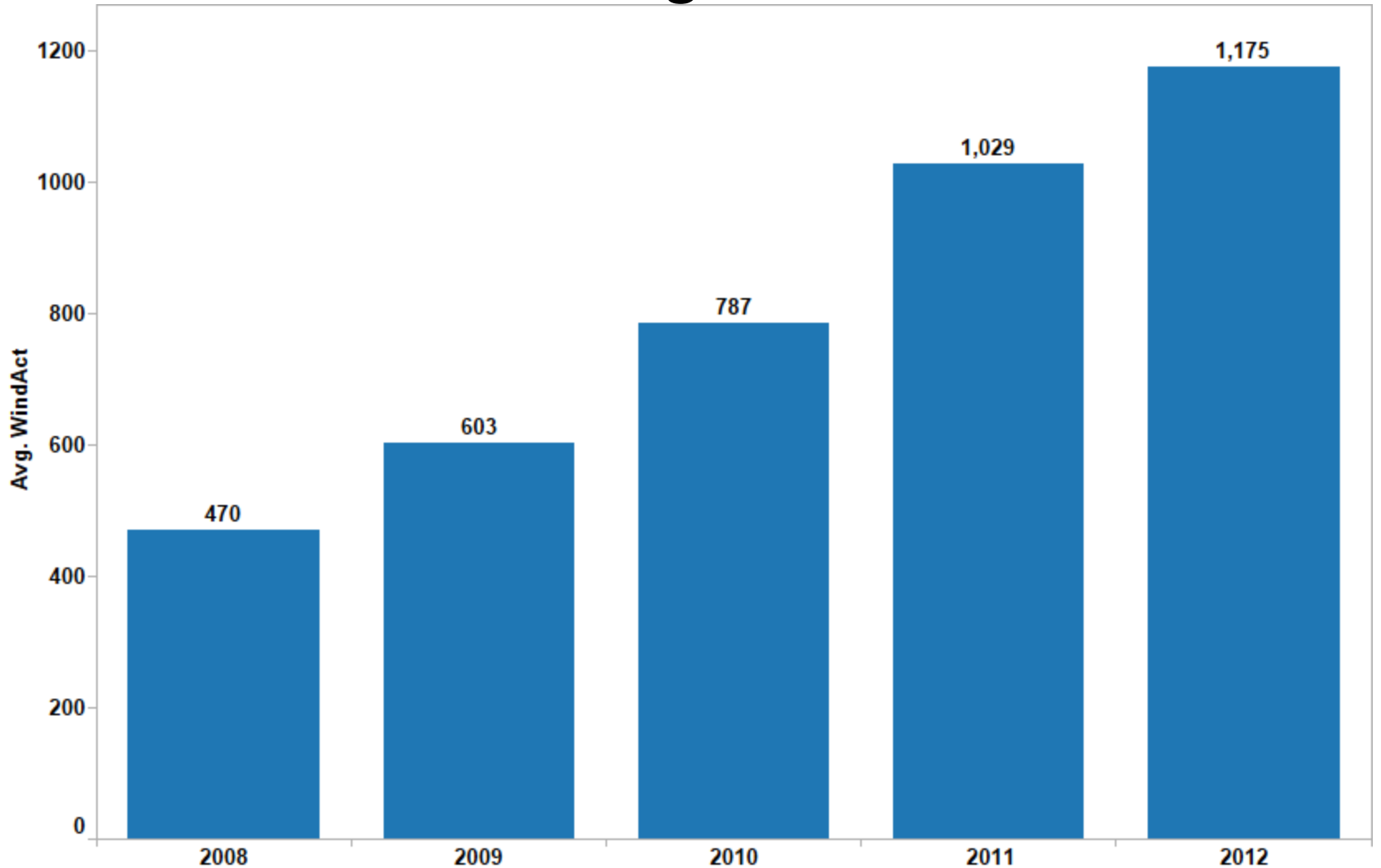


Demand Destruction



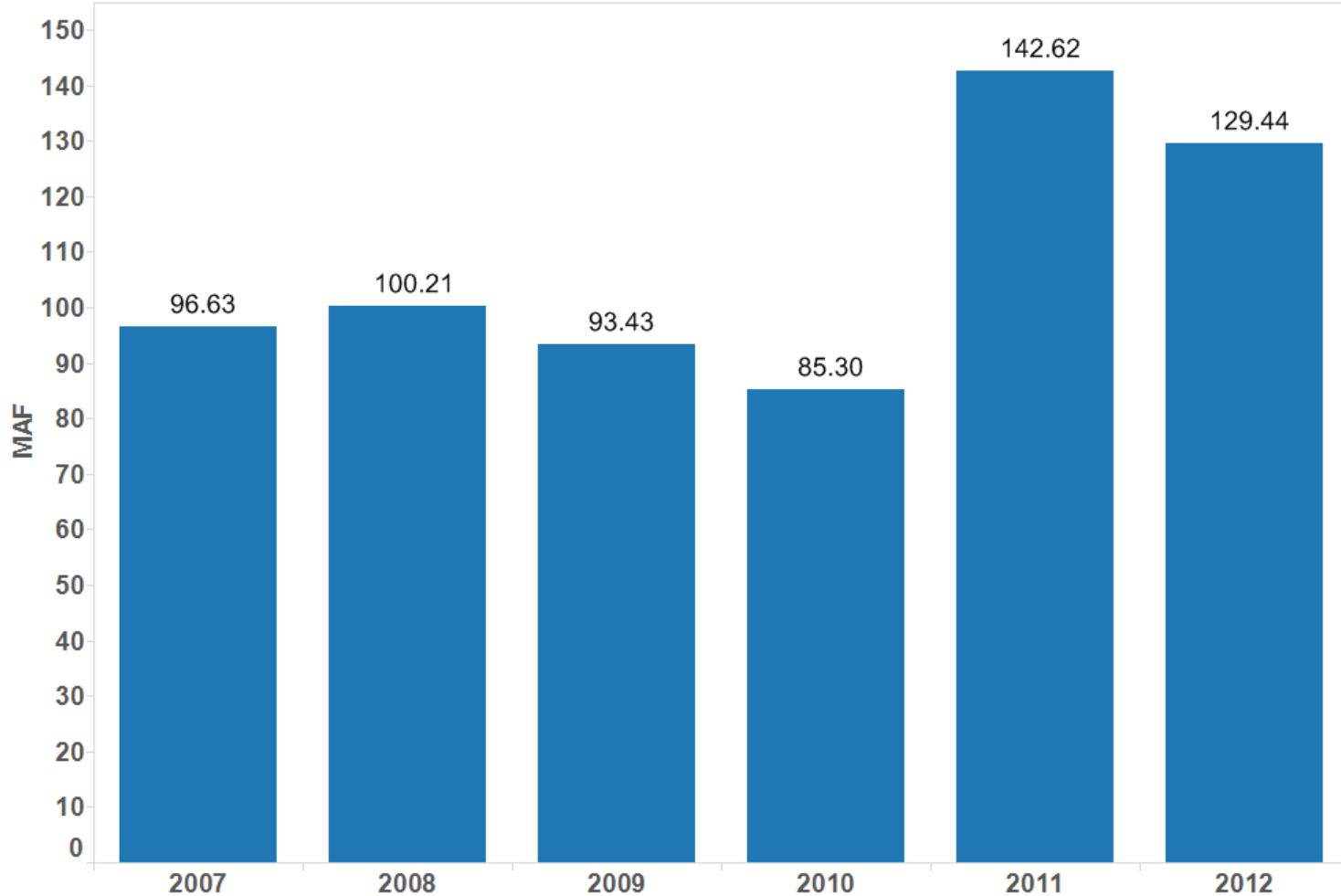
Recession Reduced Demand by Approximately 1,000 MW

BPA Average Annual Wind Production Average MW

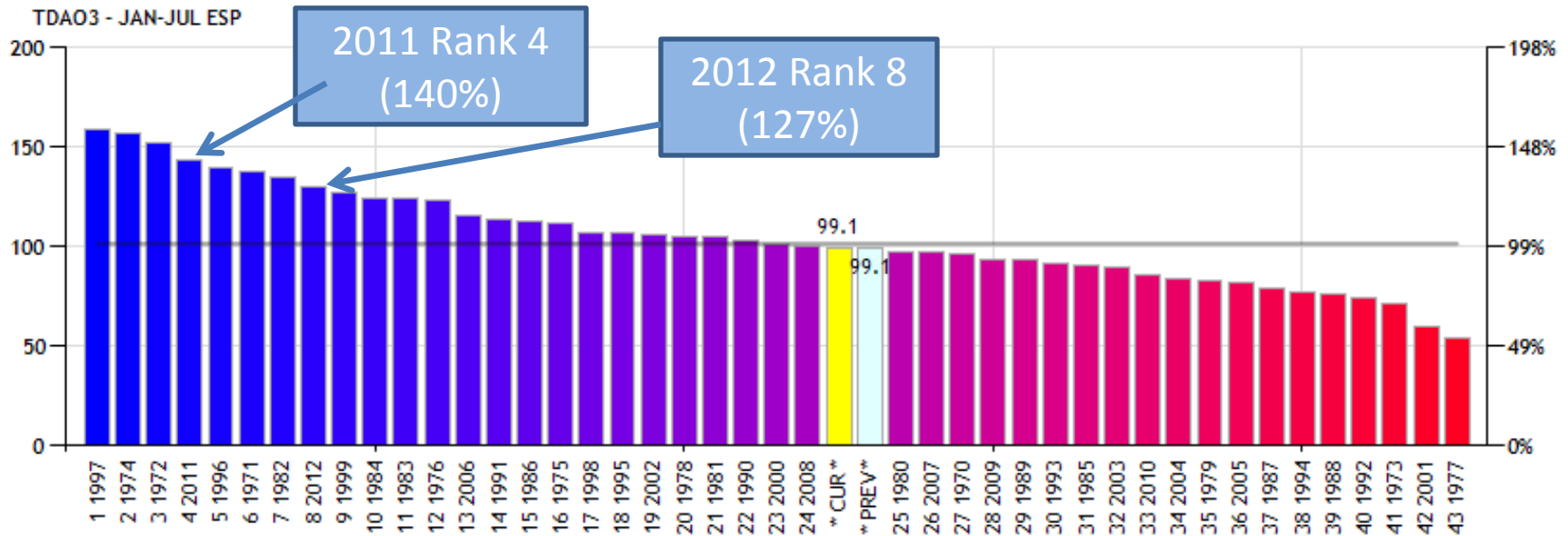


Columbia River Runoff at The Dalles

Jan-July MAF by Year



Hydro – Water Year Ranking



2013 Jan – Jul Forecast 97.7% of normal

Natural Gas Power Plant Production is Significantly Down 2010 to 2012

PNW NG Generation by Month

	2007	2008	2009	2010	2011	2012
Jan	2,657	4,271	2,559	3,048	1,985	3,223
Feb	2,437	3,791	3,688	3,220	1,027	3,226
Mar	1,035	3,795	3,427	4,005	680	2,149
Apr	1,060	3,912	1,334	3,624	784	903
May	869	1,370	547	1,065	388	406
Jun	1,804	328	665	207	286	346
Jul	3,252	2,293	4,535	3,024	702	1,359
Aug	3,742	4,602	5,486	4,777	2,082	2,790
Sep	3,859	4,394	5,248	4,383	3,079	3,461
Oct	3,965	3,661	4,571	3,774	1,899	3,551
Nov	3,551	3,108	3,618	3,232	3,196	2,302
Dec	3,835	3,760	4,435	3,023	3,972	1,651

Mid C Peak Heat Rates

	2008	2009	2010	2011	2012
January	9.8	7.9	8.2	6.9	9.3
February	8.7	9.3	8.4	7.0	9.4
March	8.2	8.6	9.2	5.2	8.6
April	9.3	7.4	9.4	7.1	7.8
May	5.7	7.6	7.7	5.8	4.5
June	3.2	7.5	4.0	5.5	3.9
July	7.2	11.3	8.9	7.2	7.8
August	9.5	12.8	10.8	8.7	11.2
September	9.4	12.2	9.8	8.7	9.2
October	8.9	9.9	9.0	7.8	9.6
November	8.4	9.2	8.7	9.6	8.1
December	10.4	10.0	8.2	9.4	7.7

Combined Cycle on Margin During Peak Hours:

2011: 4 Months

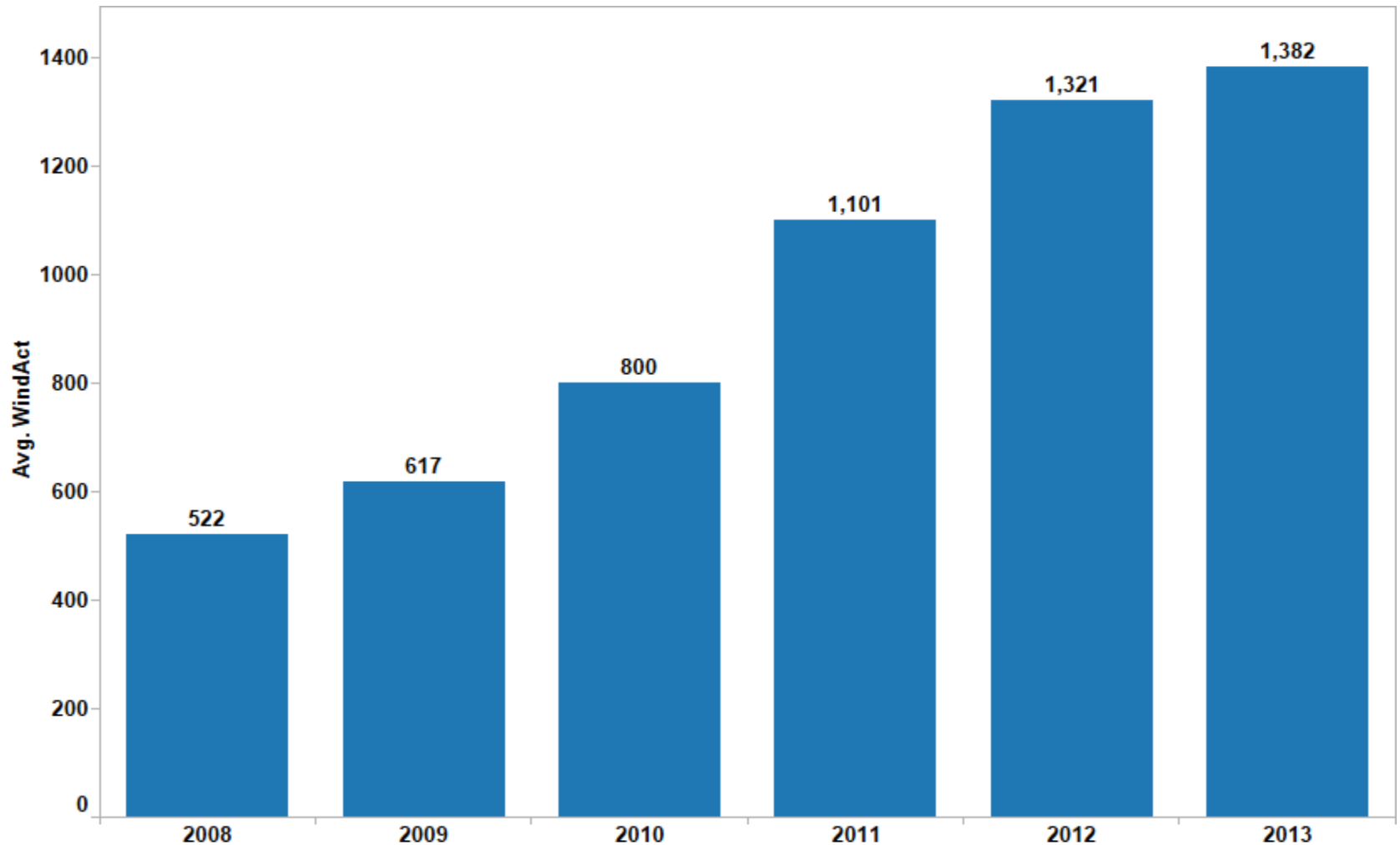
2012: 7 Months

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Q1 and Q2 Wind Output

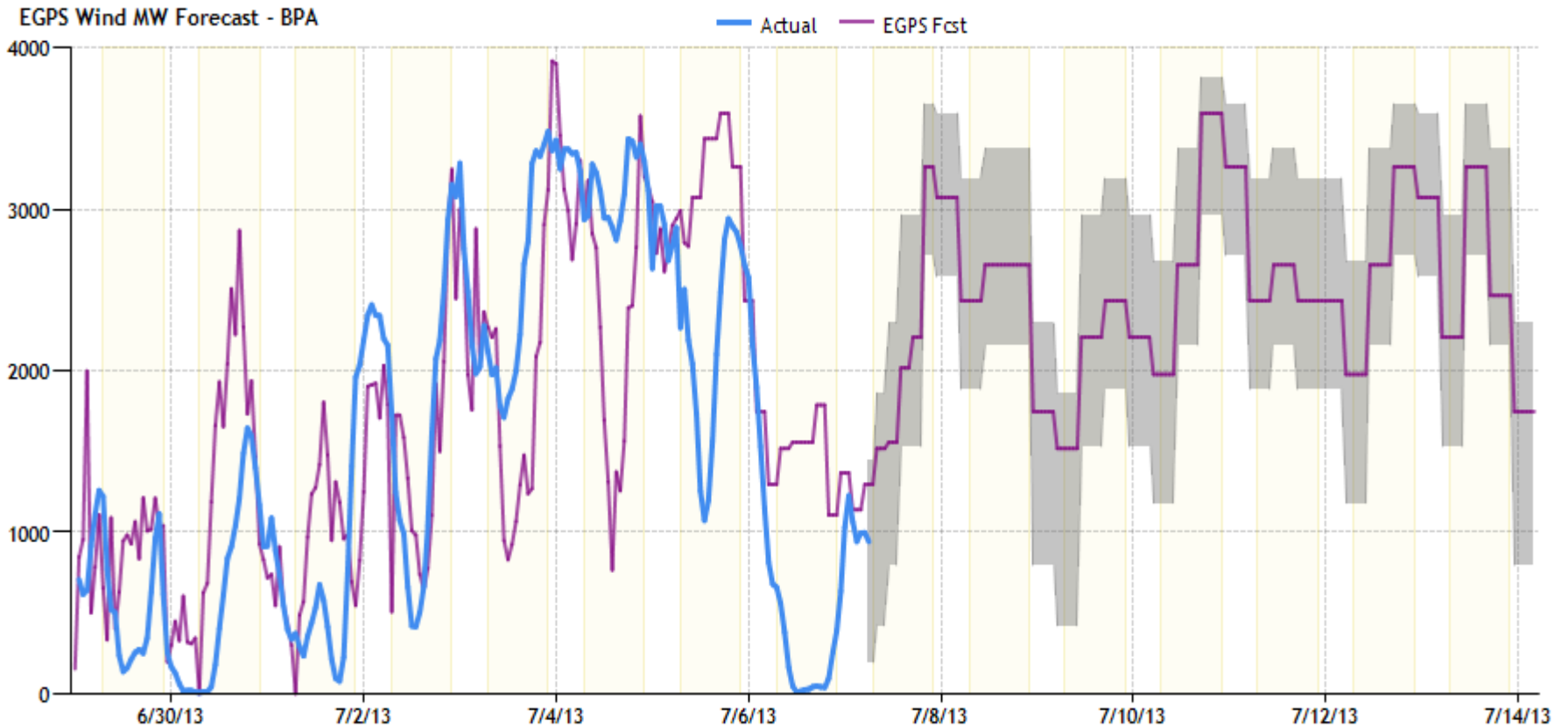
Total Wind Generation Stabilized



BPA Average Wind Production - Monthly

	BPA Wind Output			
Month	2008	2011	2012	2013
1	404	834	943	923
2	420	964	1,055	1,499
3	513	844	1,466	1,238
4	576	1,433	1,241	1,947
5	539	1,138	1,495	1,381
6	681	1,403	1,722	1,331
7	554	1,156	1,351	
8	505	1,358	1,243	
9	299	736	805	
10	358	909	932	
11	341	1,008	604	
12	449	580	1,228	
Avg	470	1,030	1,174	1,386

BPA Average Wind Production - Daily



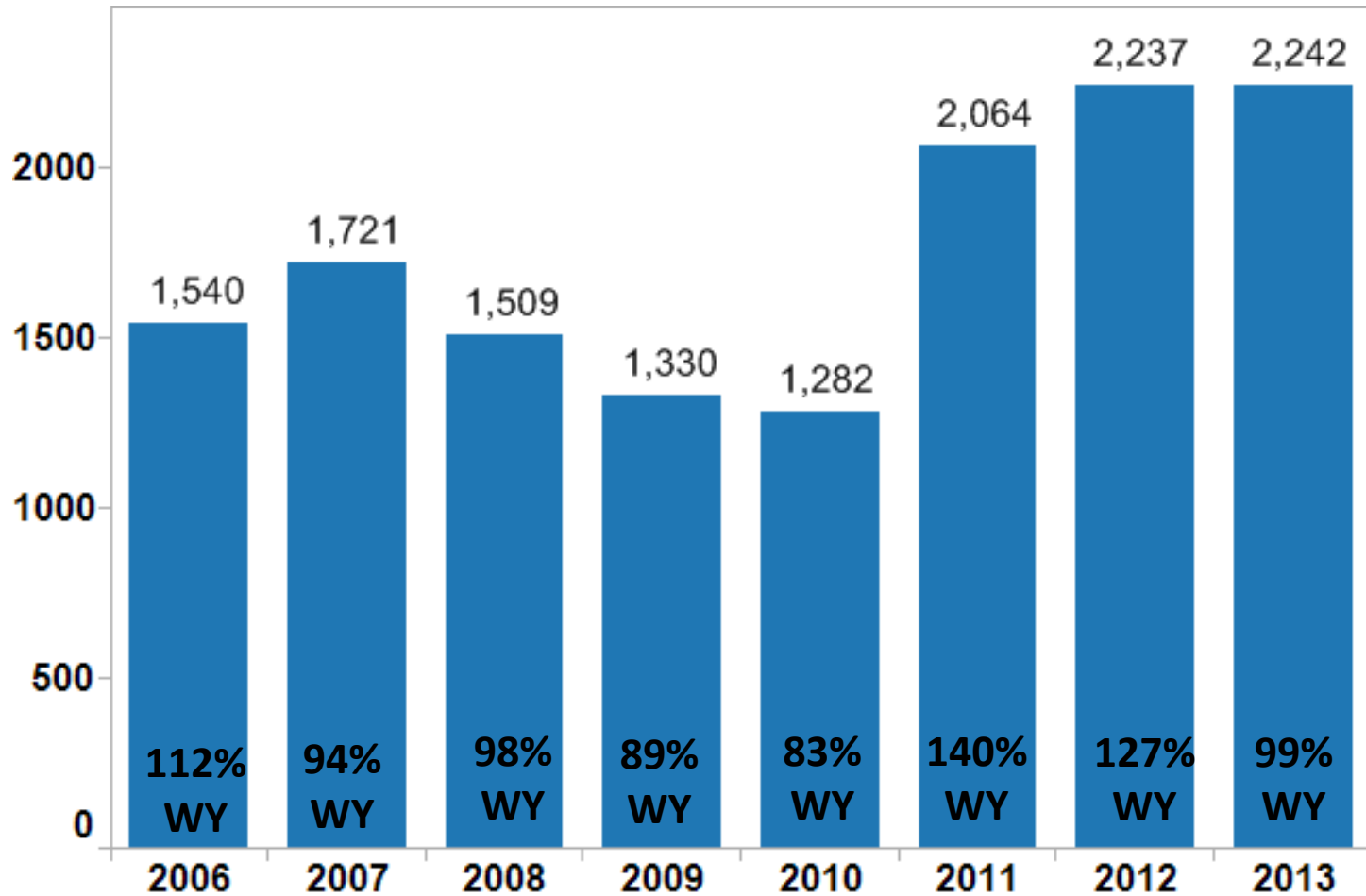
Hydro – 2013 vs. 2012

Months	WY-2012	WY-2013	Delta
Oct	11,049	9,346	(1,703)
Nov	12,263	12,942	679
Dec	13,012	16,834	3,822
Jan	13,614	16,379	2,765
Feb	12,920	12,853	(67)
Mar	17,038	11,121	(5,917)
Apr	19,883	16,781	(3,102)
May	20,914	18,818	(2,096)
Jun	20,778	18,084	(2,694)
Jan-Jun	17,525	15,673	(1,852)

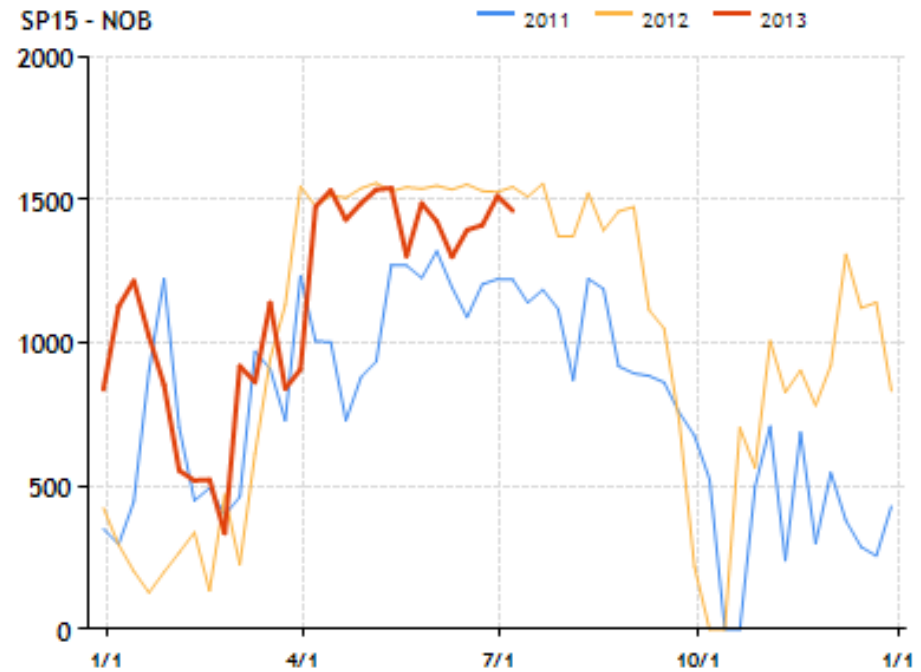
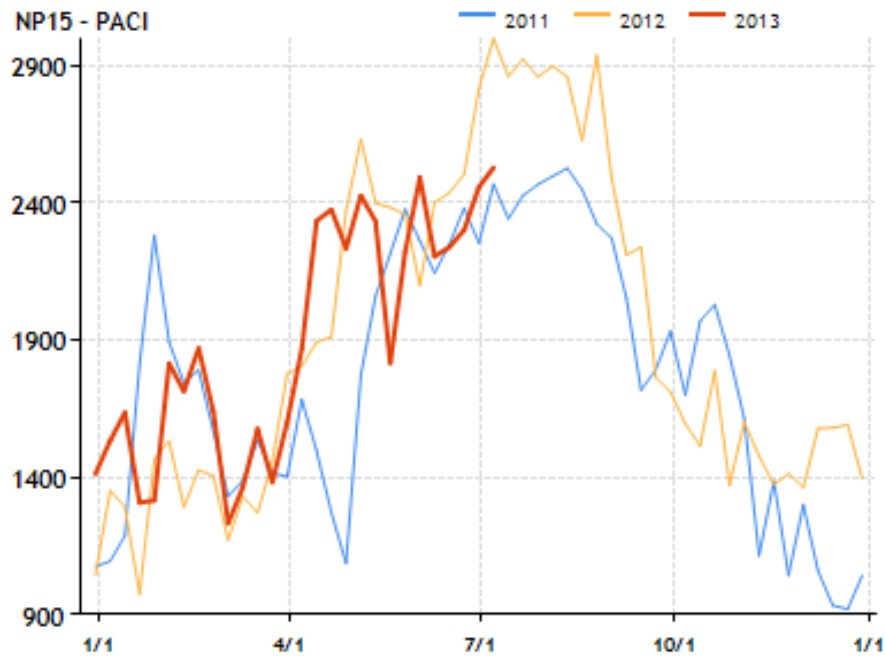
Wind & Hydro – 2013 vs. 2012 YTD

Month	WY2012			WY2013			Delta		
	Wind	Hydro	Total	Wind	Hydro	Total	Wind	Hydro	Total
Oct	909	11,049	11,958	932	9,346	10,278	23	(1,703)	(1,680)
Nov	1,008	12,263	13,271	604	12,942	13,546	(405)	679	274
Dec	580	13,012	13,592	1,228	16,834	18,062	648	3,822	4,470
Jan	943	13,614	14,557	923	16,379	17,302	(21)	2,765	2,744
Feb	1,055	12,920	13,975	1,499	12,853	14,352	444	(67)	377
Mar	1,466	17,038	18,504	1,238	11,121	12,359	(228)	(5,917)	(6,145)
Apr	1,241	19,883	21,124	1,947	16,781	18,728	706	(3,102)	(2,396)
May	1,495	20,914	22,409	1,381	18,818	20,199	(114)	(2,096)	(2,210)
Jun	1,722	20,778	22,500	1,331	18,084	19,415	(391)	(2,694)	(3,085)
Jan-Jul	1,320	17,525	18,845	1,386	15,673	17,059	66	(1,852)	(1,786)

Avg Q1 and Q2 Flows on AC and DC



California CARB Market – PNW Exports



Natural Gas – Noms YoY

NWP Power Plants				
Month	2010	2011	2012	2013
Jan	12,241	9,476	12,918	14,305
Feb	16,221	3,468	15,861	15,172
Mar	22,530	1,244	8,422	17,273
Apr	23,014	1,989	3,151	5,623
May	5,155	1,468	2,978	6,362
Jun	1,277	1,551	3,576	14,678
Jul	19,009	3,817	7,501	26,603
Aug	33,201	15,771	18,365	
Sept	29,868	19,221	18,712	
Oct	21,392	8,576	18,893	
Nov	15,825	15,909	10,108	
Dec	14,415	17,788	7,037	
Jan-Jul Avg	14,207	3,288	7,772	14,288
Annual	17,846	8,356	10,627	?????

Mid C Peak Heat Rates

	2008	2009	2010	2011	2012	2013
January	9.8	7.9	8.2	6.9	9.3	8.4
February	8.7	9.3	8.4	7.0	9.4	8.5
March	8.2	8.6	9.2	5.2	8.6	8.7
April	9.3	7.4	9.4	7.1	7.8	7.7
May	5.7	7.6	7.7	5.8	4.5	8.5
June	3.2	7.5	4.0	5.5	3.9	9.2
July	7.2	11.3	8.9	7.2	7.8	15.2
August	9.5	12.8	10.8	8.7	11.2	
September	9.4	12.2	9.8	8.7	9.2	
October	8.9	9.9	9.0	7.8	9.6	
November	8.4	9.2	8.7	9.6	8.1	
December	10.4	10.0	8.2	9.4	7.7	

Combined Cycle on the margin 6 out of 7 months YTD.

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July 2013

- **Pre July 4th Weekend**

- Temperatures were warm across the entire West, which in turn shifted the load profile higher with the super peak showing a steeper incline
- Hydro generation stayed strong to help balance the grid
- PNW exported MW to Canada and Eastern Balancing Authorities (Rockies was warm). California exports pulled back slightly
- Natural Gas plants nom'd over 1/2 BCF for the 1st/2nd
- Midc Bilateral market indexed \$120 for Tuesday, July 2nd in the heavy load, light load has been in the low teens

- **4th of July Weekend**

- Wind has been strong with the 4th averaging over 3000 MW during the heavy load hours
- Demand is down due to average temperatures and holiday businesses being closed
- Hydro generation is shifting round a bit as the volatility in the wind is substantial

- **Balance of the Month**

- PNW starts to warm up once again later next week
- Hydro has to give, assuming the 99.1 Jan-Jul MAF is correct. That only leaves 14 MAF of unregulated water (which is close to the 30 year average). Since the first 6 days have been flowing above normal, the back half of the month has no choice but to come off
- Midc heavy load will be thick into the gas stack while the light load should steadily move up to base load coal then into the gas stack

Forward Market – Balance of the Year

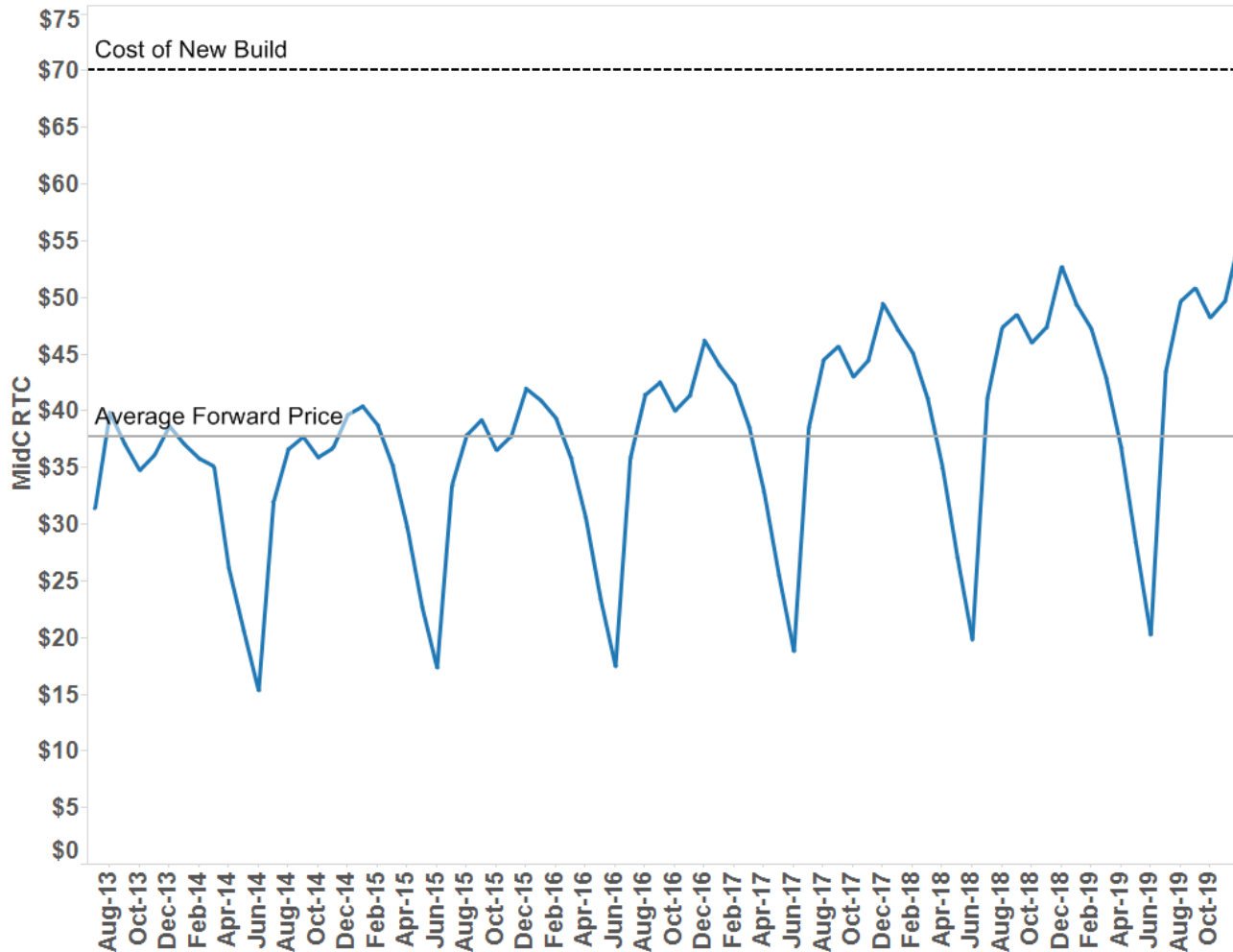
- **Hydro Production** - returns to normal balance of the month and continues that path through the rest of the summer
- **Wind** - Capacity is stable, production will be determined by the weather patterns that move through the Columbia Gorge
- **California CARB** - Market will keep incentivizing low carbon supply to move down the AC/DC interties which in turn should keep the Midc price spread to California tight
- **Load** - Continue to watch the weather forecast for widespread heat across the PNW and Rockies as this will shift the load profile up across the 24 hour strip, especially during the super peak hours
- **Natural Gas** - Units will continue to be on the margin. This is evident in the forward heavy load heat rates. With Hydro flows shifting down and wind production average, look for the light load to start making a price move towards the coal/natural gas floor this month
- **New Hydro Season** - Starts in October, it is not until late November/early December that things start to get rolling (as we saw this past December)
- **Load Growth** - Continue to watch for economic signals or new industry profile in the region

Long Term Outlook – Heat Rate Curve

	2010	2011	2012	2013	2014	2015	2016	2017	2018
Q1	8.28	5.42	8.43	8.05	8.21	8.22	8.46	8.59	8.52
Q2	6.41	4.11	3.38	6.54	6.13	6.46	5.69	5.72	5.56
Q3	9.15	7.02	8.00	10.91	9.29	9.42	9.77	9.78	9.50
Q4	8.34	8.29	7.90	8.85	8.75	8.56	8.86	8.94	8.72

Long Term Outlook - Forward Market \$30 Below New Build Economics

Cost of New Build vs MidC RTC Forward



Conclusion

- **2002 – 2012**
 - Capacity growth was stimulated over the 10 year period due to several factors
 - Market bottomed out in 2011 and 2012 as Wind Capacity saw its peak and two straight Water Years that were in the top 5 on record and a decrease in overall demand
- **2013 marks the turning point**
 - Hydro Water Year within first standard deviation (close to normal)
 - Wind Capacity Stabilized
 - Economy slowly recovering
 - California CARB Market here to stay
- **BOY 2013 – 2017**
 - Higher heat rates as NG is on the margin more hours of the year
 - New Build Cost > Forward Curve
 - Only Combined Cycle built will be utilities with rate base
 - Opportunity for small modular ramping machines due to the short term variability of both supply and demand (flex ramping)

Questions?

Contact Information

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