

2010 Resource Program

Public Workshop

September 17, 2010



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Background

- BPA prepared the Resource Program to analyze potential resource needs to meet power supply obligations under Regional Dialogue contracts, which go into effect in fiscal year 2012.
- The Resource Program examines BPA's potential power supply needs through 2019.
- The Resource Program has been prepared considering the Sixth Power Plan of the Northwest Power and Conservation Council. Any eventual long-term major resource acquisitions also will be consistent with the Council's Sixth Power Plan.
- BPA released the 2009 draft Resource Program for comment on September 30, 2009.
- BPA released the final 2010 Resource Program on September 10, 2010.



Summary

- This Resource Program:
 - is a guide for BPA
 - provides information for customers about resources available to meet their needs for the near and long term
 - will help ensure that BPA resource choices are consistent with the Council's Power Plan
- Recent events have diminished BPA's near-term resource need:
 - the current recession has lowered BPA's need for annual energy, and customers have elected to serve a substantial portion of their above-High Water Mark load from sources other than BPA.
 - new transmission operating procedures are expected to lower BPA's need for balancing reserves
- Therefore BPA expects to satisfy most of its anticipated short-term supply needs first with conservation and then with mid- and short-term power purchases from the market
- Any additional need for power in the longer term depends in large part on a number of uncertainties, including:
 - customer choices, including public customers' above-HWM load placement past 2014
 - service to the DSIs
 - timing and strength of long-term economic growth, which will impact load growth
 - fish requirements that impact hydro generation
 - success of conservation efforts



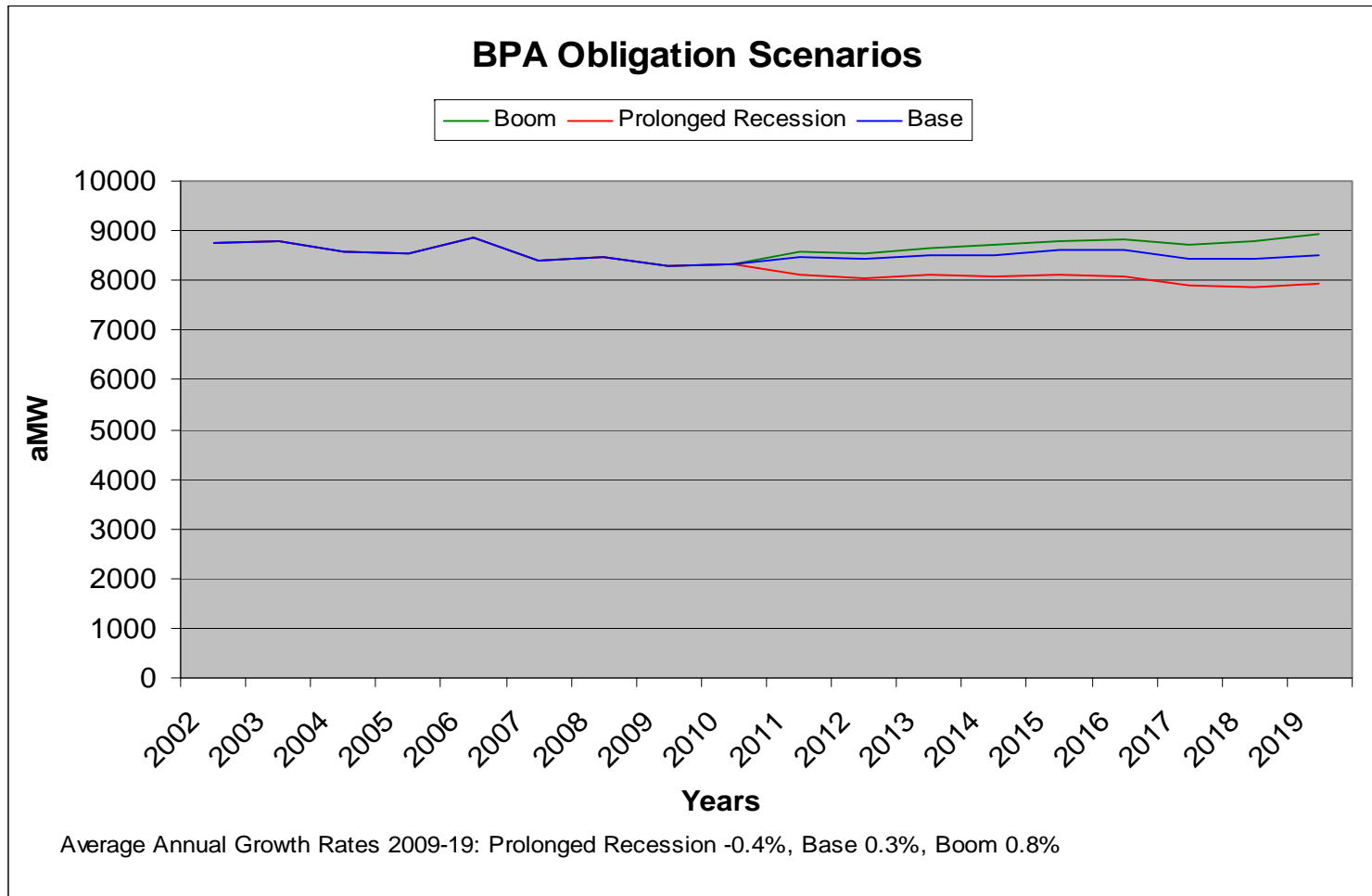
Load Forecast and Scenarios

- BPA created estimates for a base load forecast as well as high and low load scenarios
- The scenarios were comprised of:
 - Boom (High) scenario
 - Recovery and Modest Growth (Base) scenario
 - Prolonged Recession (Low) scenario

Differences from Base forecast for High and Low load scenarios:

Scenario:	2013	2019
High scenario, load increase (aMW)	200	550
Low scenario, load decrease (aMW)	-350	-80

Load Forecast



Conservation Assumptions and Range

Public Power's Share of Conservation	2013 (cumulative aMW)	2019 (cumulative aMW)
Total conservation to meet Sixth Power Plan Targets (Embedded plus Additional)	386	1,201
Range of uncertainty in total conservation	354 to 451	1,101 to 1,401
Conservation embedded in load forecast for Needs Assessment (~55 aMW annually)	212	530
Additional conservation to meet Sixth Power Plan Targets	174	671
Estimated impact of additional conservation on BPA's load obligation (Rounded to nearest 50)	50	200

Metrics

- Annual Average Energy at Critical Water
- Seasonal HLH Energy under low generation (typically low water) at 5th percentile (P5 by season roughly equates to monthly HLH at P10)
- 18-Hour Capacity
- Flexibility/Dispatchability
 - Must be able to meet reserve requirement (to integrate expected wind)

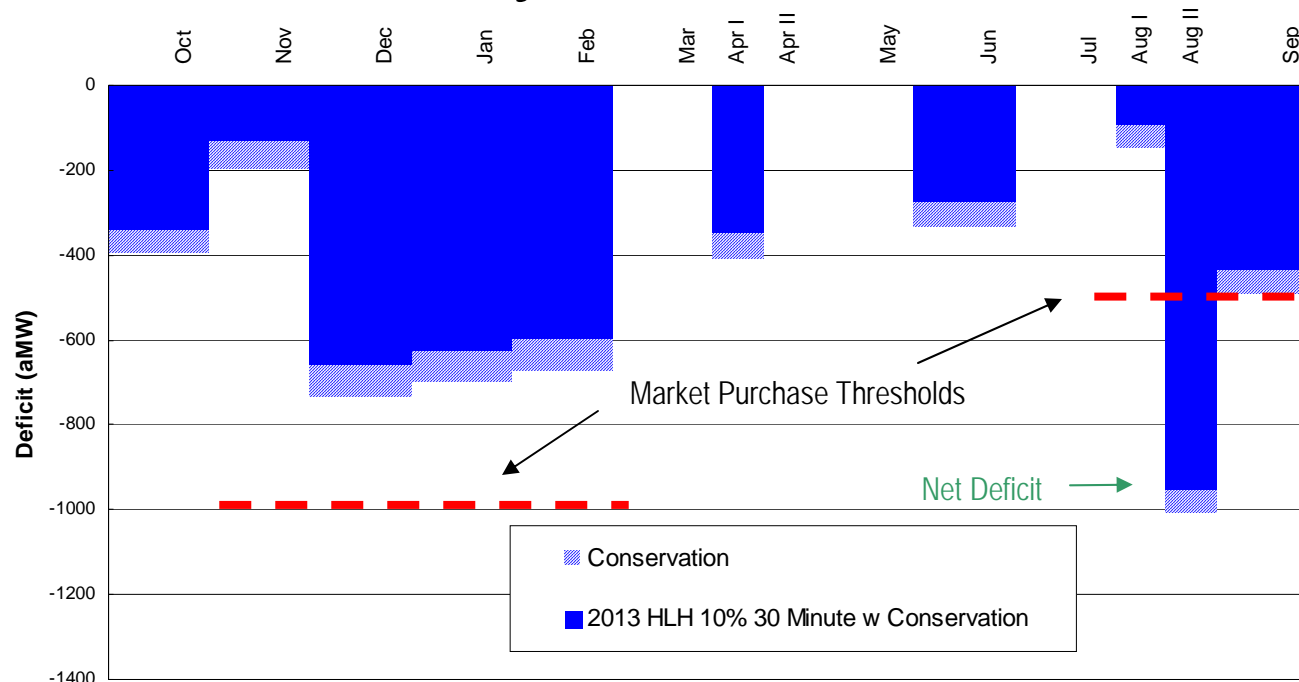


Annual Energy Results (Critical Water)

Deficit (aMW)	2013	2019
All currently contracted load (including Alcoa until 2016)	-350	-400
All currently contracted load plus additional conservation	-300	-200

- Does not include:
 - Additional DSI load (not yet contracted), service to new public agencies, additional service to DOE-Richland
 - Load growth uncertainty
 - Uncertainty in conservation (~100 MW range in 2013, ~300 MW range in 2019)

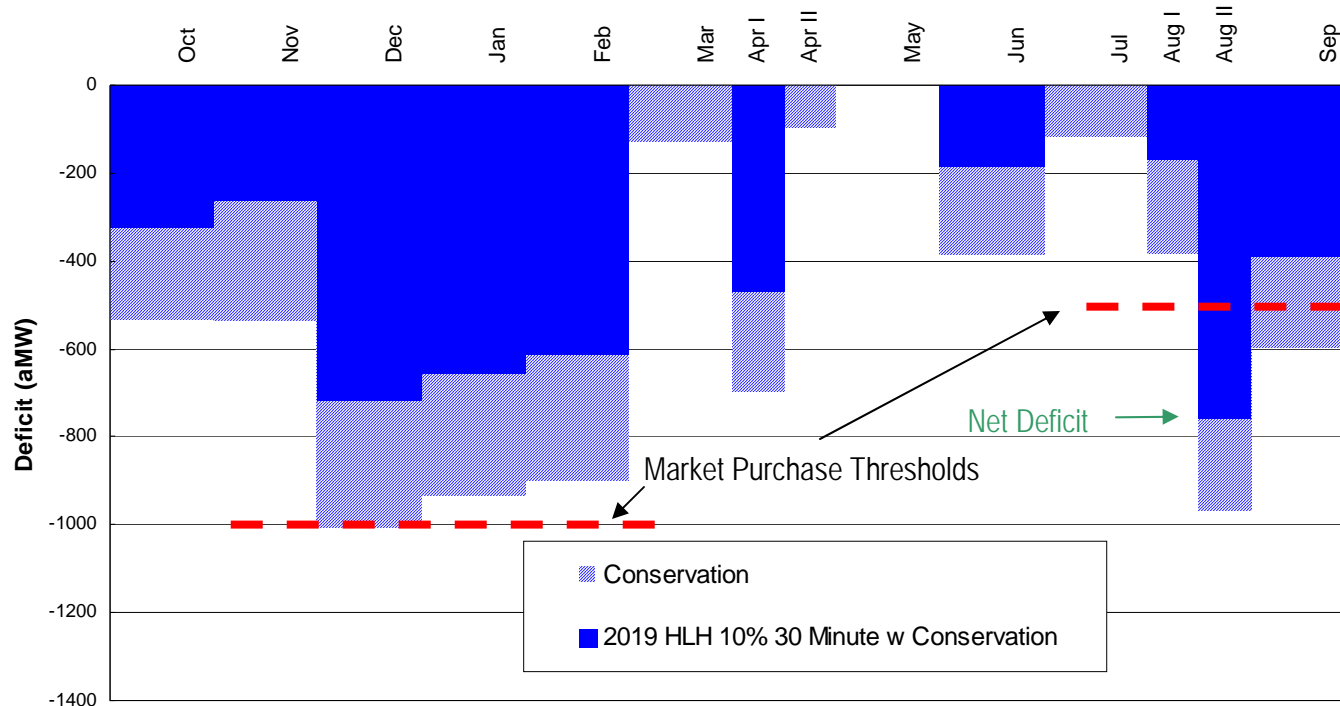
2013 BPA Heavy Load Hour Need at 10th %



- The red horizontal dashed lines at -1000 MW (winter) and -500 MW (summer) reflect the threshold for long-term (greater than 5-year) advance purchasing. Deficits less than this threshold may be met by mid- and short-term purchases.
- Assumes Council's conservation targets will be met
- Does not include:
 - Additional DSI load, service to new public agencies, additional service to DOE-Richland
 - Load growth uncertainty
 - Uncertainty in conservation
 - Potential spill for all of August



2019 BPA Heavy Load Hour Need at 10th %



- The red horizontal dashed lines at -1000 MW (winter) and -500 MW (summer) reflect the threshold for long-term (greater than 5-year) advance purchasing. Deficits less than this threshold may be met by mid- and short-term purchases.
- Assumes Council's conservation targets will be met
- Does not include:
 - Additional DSI load, service to new public agencies, additional service to DOE-Richland
 - Load growth uncertainty
 - Uncertainty in conservation
 - Potential spill for all of August



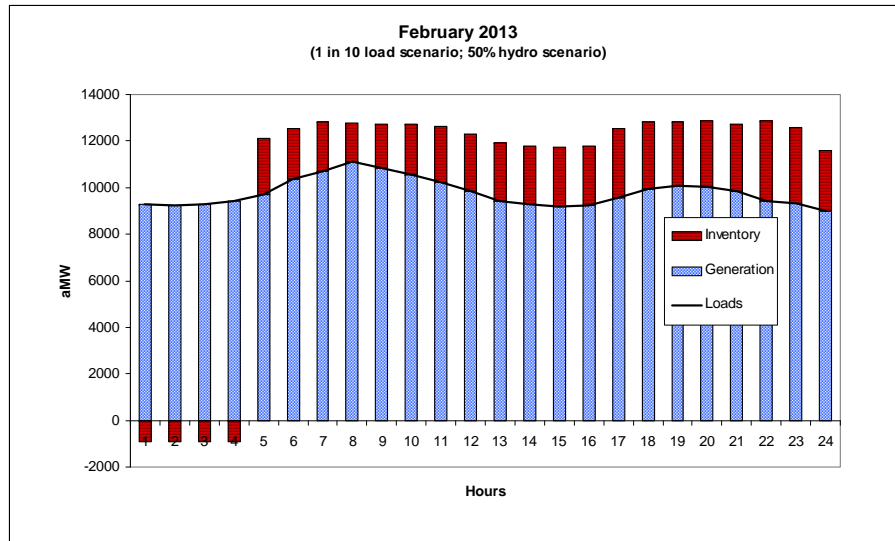
18-hour Capacity - Extreme Weather Events

- Extreme temperature event (1-in-10 year cold snap or heat wave) → High loads
- Median generation conditions (water, outages)
- 6 highest hours x 3 days (hours are not necessarily continuous: double peak in winter, single peak in summer)



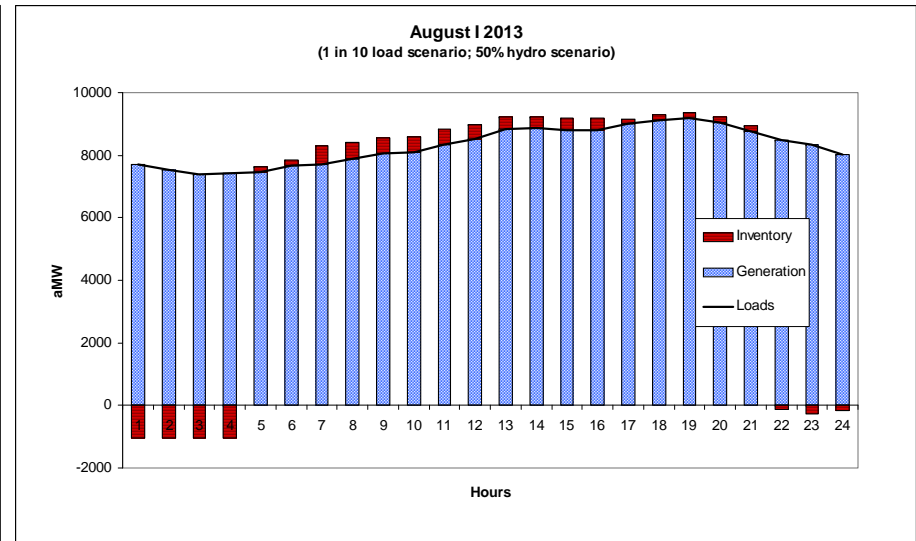
18-Hour Capacity 2013

Winter Cold Snap



18-hour Capacity: 1600 MW

Summer Heat Wave



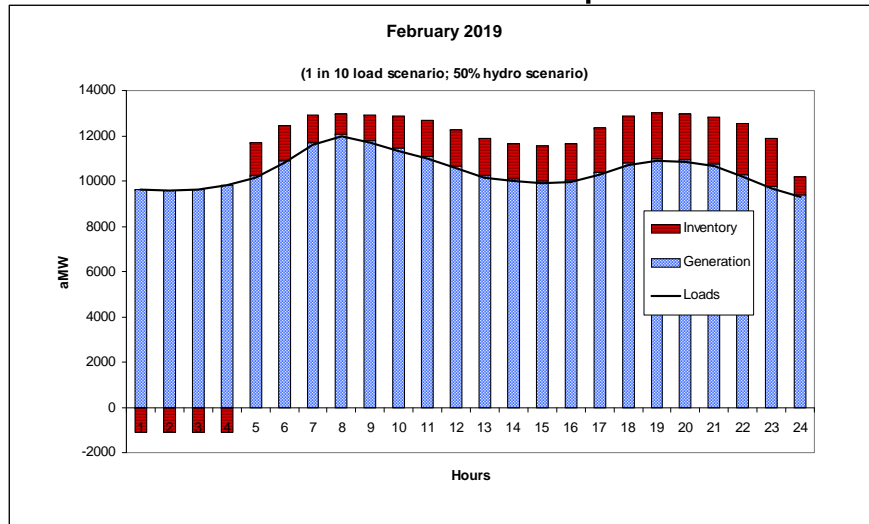
18-hour Capacity: 200 MW

- Does not include weather-responsive load uncertainty (up to 750 MW), load growth uncertainty, potential new load (additional DSI, new publics, expanded DOE-Richland), reserves above levels for 2014
- Does not include additional conservation, additional purchases needed to fill monthly Heavy Load Hour deficits



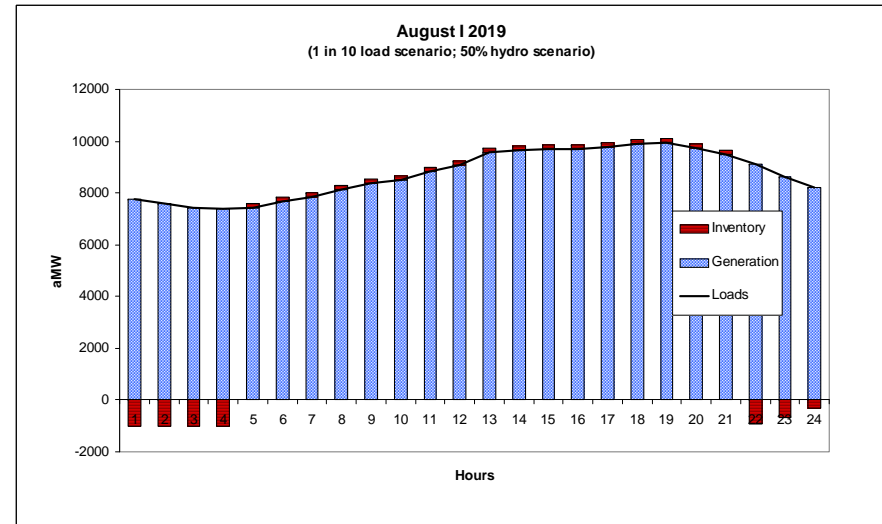
18-Hour Capacity 2019

Winter Cold Snap



18-hour Capacity: 1050 MW

Summer Heat Wave



18-hour Capacity: 150 MW

- Does not include weather-responsive load uncertainty (up to 750 MW), load growth uncertainty, potential new load (additional DSI, new publics, expanded DOE-Richland)
- Does not include additional conservation, additional purchases needed to fill monthly Heavy Load Hour deficits



Balancing Reserves for Wind and Load

Model Inputs: Reserve Requirements	2013	End of 2014 (used for 2019)
Wind Fleet Nameplate (MW)	5022 increasing to 6122	7322
INC (MW) modeled	1230 increasing to 1390	1564
DEC (MW) modeled	-1611 increasing to -1827	-2063

- Uses 30-minute persistence accuracy wind forecasts
- Based on forecast of wind fleet size and required reserves completed in January 2010
- Modeling assumes BPA and region will need to succeed in efforts to reduce level of reserves FCRPS must supply after 2014. (System not able to handle any more.)
- Hydro models used for Needs Assessment are not well suited for assessing reserve need
- **Low flows in April and high flows in June in 2010 have made it clear that events can stress the hydro system to the brink with the current wind fleet. Studies are ongoing to look closer at high and low flow scenarios with larger wind fleets with a goal of providing a definitive assessment of the FCRPS's ability to integrate wind**



Uncertain Loads May Affect BPA Obligations

Potential Load	2013 (aMW)	2019 (aMW)
Additional DSI	160	480
New Publics	38	200
DOE Richland	5	70
Total contractual load uncertainty	203	750

Does not address:

- Long-term economic growth and load growth
- Conservation uncertainty
- Uncertainty in Above-HWM elections after 2014



Additional Uncertainties

- Amount of growth of wind in BPA balancing authority area and BPA reserve obligation
- Biological Opinion ruling
- Water conditions
- CGS performance
- Natural gas and electricity markets
- Climate change (physical impacts and legislation)



Resource Needs Under Scenarios

	<i>Forecast of Potential Deficits/Surplus 2013</i>		
	Boom	Recovery and Modest Growth	Prolonged Recession
Annual Energy (aMW)	-550	-350	0
Winter HLH/All Hours	-900/-1200	-700/-1000	-350/-650
Summer HLH/All Hours	-1200/-1100	-1000/-900	-650/-550
Winter 18 hr Capacity (MW)	1400	1600	1950
Summer 18-hr Capacity (MW)	0	200	550

	<i>Forecast of Potential Deficits/Surplus 2019</i>		
	Boom	Recovery and Modest Growth	Prolonged Recession
Annual Energy (aMW)	-950	-400	-300
Winter HLH/All Hours	-1550/-1650	-1000/-1100	-900/-1000
Summer HLH/All Hours	-1550/-1300	-1000/-750	-900/-650
Winter 18 hr Capacity (MW)	500	1050	1150
Summer 18-hr Capacity (MW)	-400	150	250

- Does not include additional conservation
 - Conservation alone will not fill deficits
- Does not include short- and mid-term market purchases
 - Winter deficits in “Recovery and Modest Growth” could be filled largely by the market threshold purchases
 - Summer deficits in “Recovery and Modest Growth” would not be filled by the market threshold purchases (or purchases plus conservation)



Needs Assessment Results

- It appears that aggressive implementation of measures to meet public power's share of the conservation targets in the Council's Sixth Power Plan together with mid- and short-term market purchases could address much of BPA's need for annual and seasonal Heavy Load Hour energy through 2013, depending on additional loads placed on the agency.
- In 2019, deficits are slightly greater
 - continued conservation efforts will meet a considerable portion of BPA's projected needs
 - conservation will not be sufficient in all load scenarios
- BPA expects to continue to rely on mid- and short-term market purchases
 - up to 500 megawatts of summer power supply
 - up to 1,000 megawatts of peak winter power supply
 - mid- and short-term market purchases further diminish remaining seasonal energy needs to be served by long-term resource acquisitions
- BPA continues to assess the capability of the FCRTS and the FCRPS to provide the necessary flexibility to produce required balancing reserves to meet all expected wind integration through 2019; however BPA could need additional balancing reserves before 2014 if wind power develops as expected and efforts to have others outside the BPA balancing authority provide balancing services prove unsuccessful.
 - Low flows in April and high flows in June 2010 have made it clear that events can stress the hydro system to the brink with the current wind fleet.
 - Studies are ongoing to look closer at high and low flow scenarios with larger wind fleets with a goal of providing a definitive assessment of the FCRPS's ability to integrate wind.



Generating Resources to Address Needs

Metric	Candidate Resources
Annual Energy	<ul style="list-style-type: none"> ▪ Incremental federal and non-federal hydro system improvements and new hydro development ▪ Small renewable generation ▪ Cogeneration and waste heat
Monthly/Seasonal HLH Energy	<ul style="list-style-type: none"> ▪ Combined cycle combustion turbines ▪ Simple-cycle combustion turbines and reciprocating engines ▪ Pumped storage
Balancing Reserves	<ul style="list-style-type: none"> ▪ Combined cycle combustion turbines ▪ Simple-cycle combustion turbines and reciprocating engines ▪ Pumped storage ▪ Hydro improvements or new hydro development with storage/load following capabilities

- **Candidate generating resources are after all cost-effective conservation**
- Candidate generating resources are not listed in order of cost-effectiveness or preference



Actions

- Work with customers and regional stakeholders to achieve all cost-effective conservation measures necessary to meet public power's share of the Council's Sixth Power Plan regional conservation targets.
- Rely on wholesale power market purchases.
- Focus on efforts underway to increase the flexibility of transmission grid operation to support variable power sources.
- Continue to support research and development of relevant emerging technologies, such as Smart Grid and demand response.
- Monitor the areas of uncertainty, in order to adapt our resource acquisition strategies as necessary.
- Assess and identify cost-effective small-scale renewable and cogeneration resources in the Northwest considering customer interests and BPA resource needs.
- Evaluate and appropriately pursue pumped storage and natural gas-fired resources, such as combined and simple cycle combustion turbines and reciprocating engines, to provide seasonal heavy load hour energy or balancing reserves.

