RHWM Process Workshop

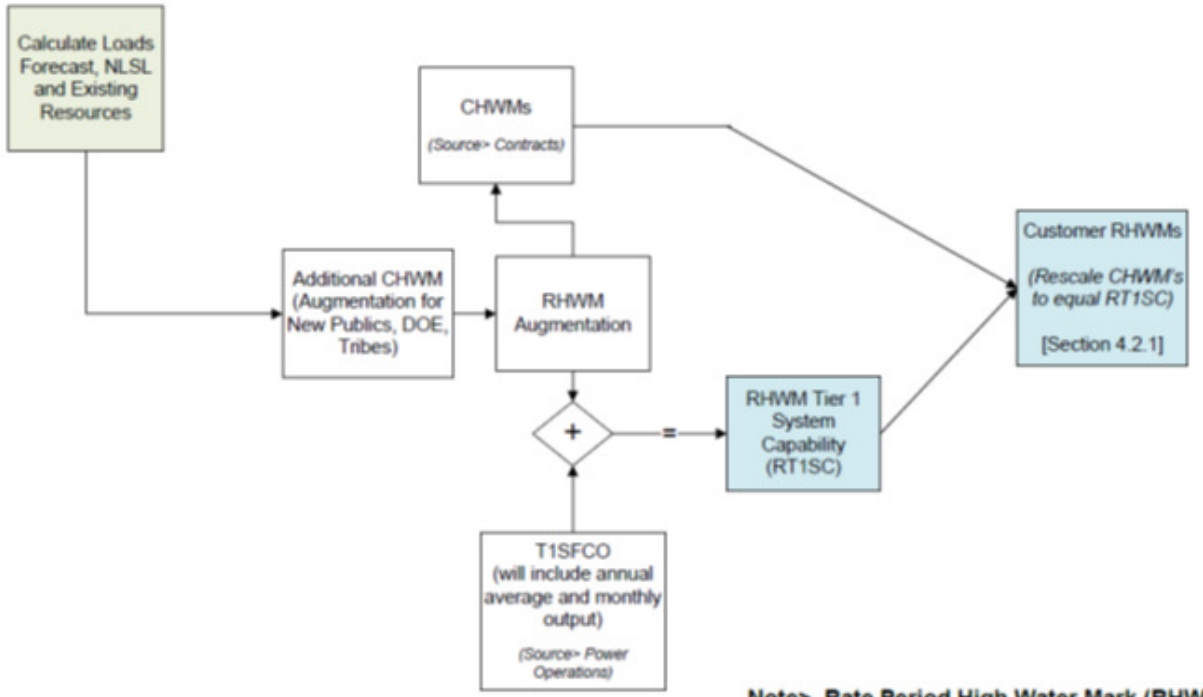
BP-16 Rate Period - Initial Outputs

Rates Hearing Room
August 5, 2014
(Revised August 8, 2014)

RHWM Process Workshop Agenda

Topic	Presenter
Intro and Purpose of Workshop, Introductions	Peter Stiffler
Part 1	
Load Forecasts – Overview and General Customer Trends	Reed Davis
Part 2	
Tier 1 System Firm Critical Output (T1SFCO)	
• Changes from BP-14 - HYDSIM	Tyler Llewellyn
• T1SFCO Study Results	Tim Misley
Part 3	
RHWM Augmentation	Peter Stiffler
Discussion: •Review Individual Customer Results •Other topics?	All
Next Steps	Peter Stiffler

RHWM Process



Note> Rate Period High Water Mark (RHWM) will include the following outputs (*as noted in the Tiered Rate Methodology (TRM) on Page xxi*):

- RHWM Tier 1 System Capability (including RHWM Augmentation)
- RHWM (by customer)
- Forecast Net Requirement (by customer)
- Above-RHWM load (by customer)

Load Forecasting

Load Forecasting Guidelines

Existing

- Consolidated forecasting in Customer Services Load Forecasting group (KSL) established in 2007
- Same basis and assumptions are used for forecasts provided to Power and to Transmission
- Consistency for all planning processes
  - in accuracy levels
  - in methods
  - in assumptions
- Seamless integration of planning from next day to the next twenty years, all with forecast accuracy

Future

- Start process to share and receive input on fundamental assumptions driving the annual forecast from across the region

Load Forecasting Process

- Bottom-up approach where each customer is individually forecasted
- Statistical based models use 10 or more years of historical data to forecast trend in predicted load changes
- Known changes identified through customer visits to adjust forecast for specific off-trend load changes, such as:
  - New large industrial or commercial loads
  - New large subdivision additions
- Economic assumptions obtained from Global Insight.
- Numerous elements are forecast from these assumptions (i.e., kWh, customer peak, TSP, CA peak, minimum load)
- Updates prepared annually followed with quarterly refinement as necessary
- Final forecast reviewed by customer and other interested parties

Load Forecasting Assumptions Summary

- Forecasts assume normal weather conditions (34 year average value)
- Continuation of recent trends with known changes identified through customer visits
  - Precious metals production (slowing and declining)
  - Food production (increases)
  - Data warehouse additions (increases)
  - Fewer new projects currently in planning stages
- Starting to show slow growth in sales, expect continuation of slow growth into mid-calendar year 2015. We expect the economy to pick up enough steam to show sustainable growth beyond that point. Future average trend growth rate expected to be in 1.75% to 2.5% range, much lower than the historical average growth rate of 3.7% from FY 2003 to FY 2009

Updated Forecast Changes

- In normal course of doing business 11 forecasts have been changed since the initial forecasts were distributed in February/March 2014
  - 7 Slice/Block contract customers
  - 6 Load following contract customers

- Forecast changes have had minimal impact on values
  - 3 of the 11 forecasts had changes greater 10 aMW
    - 2 decreased forecasts, 1 increased forecast
    - Average overall change a decrease of 6 aMW
  - 10 of the 11 forecasts had changes less than 10 aMW
    - 2 decreased forecasts, 6 increased forecasts
    - Average overall change an increase of approximately 1 aMW

Summary of Final Forecast Results

- For fiscal year 2016 total average MW decreased by about 200 aMW from the forecasts used in the RHWM Process for BP-14
  - 76.5% of the forecast decreased from the last RHWM forecast
  - Average change a bit over -1 aMW
  - Max change ~ 50 aMW

- For fiscal year 2017 total average MW decreased by about 200 aMW from the forecasts used in the RHWM Process for BP-14
  - 77.3% of the forecast decreased from the last RHWM forecast
  - Average change a bit under -1 aMW
  - Max change ~ 100 aMW

Next Steps

- Review comments on forecasts in the Public Comment Period, ending August 19, 2014
- Based upon comments received, update forecasts for significant changes that are
  - Tied to a specific unanticipated event
  - Greater than 5% change
  - Or otherwise relevant (special causes/cases)

- Release new forecasts in advance of September 9, 2014 final determinations

Tier 1 System Firm Critical Output

Updates to HYDSIM Assumptions in the BP-16 T1SFCO Studies

- **Canadian operations** were updated based on the 2016 Assured Operating Plan (Treaty AOP study). AOP17 is a roll-over year. Non-Treaty operations were also updated, similar to BP-14, with the dry year operation and the spring-summer operation. The price-dependent operations from the Non-Treaty Storage Agreement and the Libby Coordination Agreement were not included. In these studies, Canadian projects release less water during 1937.
- **Spill assumptions** were updated based on the 2014 Biological Opinion as shown on the following slide. These assumptions better reflect actual operations from the past few years, and changes are not expected within the rate period.
- **2014 PNCA project data** is used in these studies. The last Rate Case studies were based on 2012 PNCA data. This data includes minor flow requirement and elevation target changes.
- **80-year flood control data** was provided by the Corps. This data is based on the 2010 modified stream flow data and associated forecasts. In the last Rate Case, the Corps provided interim flood control data for the last 10 years of the 80-year HYDSIM studies, and the studies used older data for the first 70 years.
- **Monthly outage assumptions** were developed using a combination of planned outages plus forced outages that are based on historical data, and the project owners also made further adjustments. Using the new method, most projects have similar levels of outages compared to BP-14, but Grand Coulee availability increased several percent to ~70% on average.
- **Reserves** were provided by the Generation Inputs panel.
- **Loads** were updated based on data provided by Agency Load Forecasting. HYDSIM uses regional residual hydro loads in the Rate Case, so assumptions for other resources also affect the loads in HYDSIM. The new HYDSIM loads are about 2000 aMW lower than in BP-14. This reduction is mainly because of the new combustion turbine capacity factor assumption of 90%.

Updates to HYDSIM Assumptions – Spill Table from 2014 BiOp

Project	Proposed 2014 BiOp Spring Spill	Spring Planning Dates	Proposed 2014 BiOp Summer Spill	Summer Planning Dates
Bonneville	100 kcfs	4/10 - 6/15	95 kcfs and 85 kcfs/121 kcfs	6/16 - 8/31
The Dalles	40%	4/10 - 6/15	40%	6/16 - 8/31
John Day	April 10-27: 30% April 27-June 15: 30% and 40%	4/10 - 6/15	June 16-July 20: 30% and 40% July 20-August 31: 30%	6/16 - 8/31
McNary	40%	4/10 - 6/15	50%	6/16 - 8/31
Ice Harbor	April 3-28: 45 kcfs/Gas Cap April 28-May 30: 30% and 45 kcfs/Gas Cap	4/3 - 5/31	June 1-July 13: 30% and 45 kcfs/Gas Cap June 13-August 31: 45 kcfs/Gas Cap	6/1 - 8/31* (8/21)
Lower Monumental	Gas Cap (~27 kcfs, bulk pattern)	4/3 - 5/31	17 kcfs	6/1 - 8/31* (8/19)
Little Goose	30%	4/3 - 5/31	30%	6/1 - 8/31* (8/17)
Lower Granite	20 kcfs	4/3 - 5/31	18 kcfs	6/1 - 8/31* (8/9)

* The Snake River projects end spill in August based on fish passage data. The end dates used in HYDSIM are based on the averages from 2005 through 2013 data.

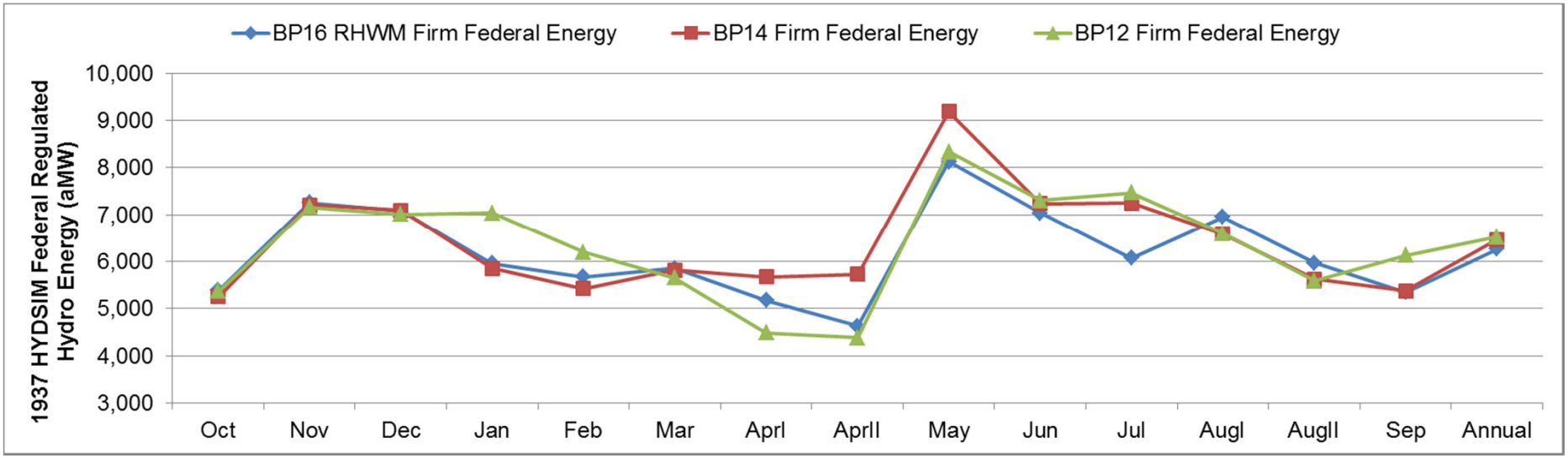
Spring maximum transport operations for two weeks in all years and in dry years are not in the 2014 Biological Opinion.

HYDSIM Results from BP-16 T1SFCO Studies

- The new estimate of firm average annual regulated hydro energy is 200 aMW lower than the last Rate Case.
- This loss is primarily caused by the increased spill for fish and the decreased stream flow releases from Canadian projects in 1937.

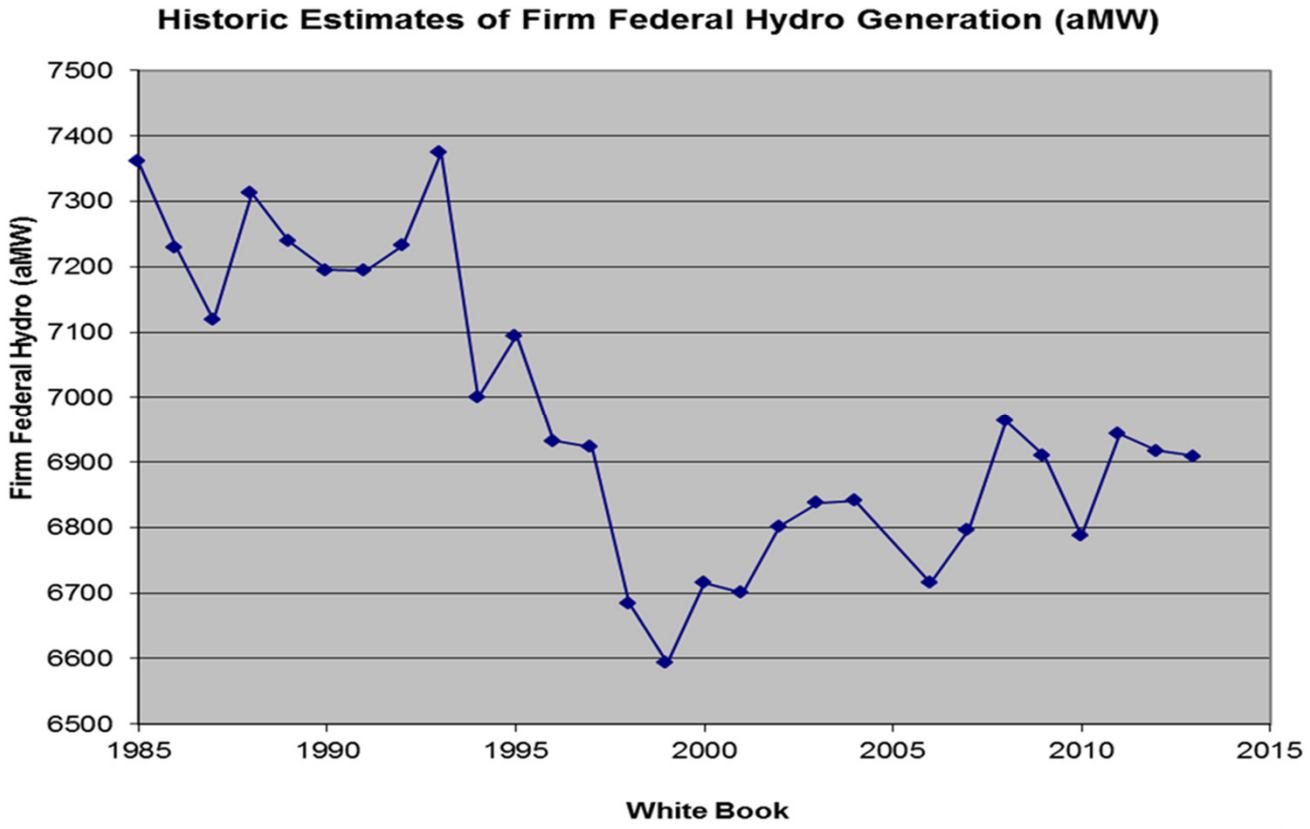
Firm Federal Regulated Hydro Energy (Average MW)

1937	Oct	Nov	Dec	Jan	Feb	Mar	AprI	AprII	May	Jun	Jul	AugI	AugII	Sep	Annual
BP16 RHWM Studies	5,379	7,258	7,072	5,953	5,669	5,849	5,173	4,632	8,122	7,036	6,073	6,948	5,961	5,348	6,265
BP14 Final Studies	5,246	7,211	7,095	5,846	5,425	5,813	5,673	5,726	9,188	7,239	7,244	6,585	5,624	5,371	6,465
BP12 Final Studies	5,364	7,161	7,005	7,037	6,194	5,648	4,488	4,382	8,333	7,301	7,463	6,596	5,586	6,124	6,517
BP16 - BP14 difference	133	47	-23	107	244	35	-499	-1,094	-1,066	-203	-1,171	363	337	-23	-200



Historical Estimates of Firm Federal Hydro Generation

- Historically BPA's estimates of firm hydro generation have changed +/-200 aMW for many reasons that are generally beyond BPA's control, such as: changes in load, changes in operations for fish, revisions to Canadian operations, updates to flood control rule curves, and updates in PNCA planning data. These changes will continue to occur in future studies.



BP-16 RHWM - Federal Tier 1 System Firm Critical Output

- **BPA staff incorporated HYDSIM studies and updated Federal system resources, obligation forecasts; and contract purchases and sales for the BP-16 Rate High Watermark (RHWM) process for FY16 & FY17.**

  - These studies will be used to determine the RHWM Tier1 System Firm Critical Output (T1SFCO) for the Rate Period High Water Mark (RHWM) Process. The T1SFCO used in the RHWM process is the 2-year average for FY16 & FY17 of a set Federal system resources, contract purchases and contract sales specified in the TRM.
  - The RHWM process determines the overall amount of Tier 1 energy that BPA will offer in the FY16 – FY17 Rate Period.

BP-16 RHWM - Federal Tier 1 System Firm Critical Output

Resource and Contract Comparison

BP-16 RHWM Process for FY2016-17 versus the BP-14 RHWM Process for FY2015-16

- Updated HYDSIM hydro regulation studies that decreased the 2-year averaged regulated hydro generation by about 198 aMW under 1937 critical water conditions.
- Updated CGS generation and maintenance schedule to reflect recent work at the project. This increased CGS 2-year averaged generation estimates for FY16 & FY17 by about 42 aMW.
- The expiration of the Georgia-Pacific (Wauna) acquisition contract on 3/31/2016. This decreased the 2-year averaged generation estimates for FY16 & FY17 by about 14 aMW.
- Contract purchases:
  - Update to BPA/BCHA LCA receipts increased over the 2-year average for FY16 & FY17 by 1 aMW
  - Expiration of BPA/PASA contract receipts that expire 4/30/2015 decreased over the 2-year average for FY16 & FY17 by 5 aMW
  - Expiration of BPA/RVSD contract receipts that expire 4/30/2016 decreased over the 2-year average for FY16 & FY17 by 8 aMW
  - Expiration of BPA/PAC SNX receipts 11/30/2013 decreased over the 2-year average for FY16 & FY17 by 7 aMW
- Contract obligations:
  - Update to BPA/BCHA LCA decreased the 2-year averaged Federal contract obligations for FY16 & FY17 by about 7 aMW
  - Update to BPA/BCHA NTSA decreased the 2-year averaged Federal contract obligations for FY16 & FY17 by about 5 aMW
  - Yearly changes to the BPA/BCHA CER to Canada that decreased the 2-year averaged Federal contract obligations for FY16 & FY17 by about 5 aMW
  - Expiration of BPA/PASA contract deliveries that expire 4/30/2015 decreased over the 2-year average for FY16 & FY17 by 3 aMW
  - Expiration of BPA/RVSD contract deliveries that expire 4/30/2016 decreased over the 2-year average for FY16 & FY17 by 8 aMW
  - Updated Federal Transmission distribution losses increased 9 aMW
  - Updated Slice Transmission loss returns increased by 1 aMW
  - Updated Columbia Basin obligation forecast increased by 2 aMW
- Updated critical Wind forecasts which had minimal impacts in wind generation forecasts.

BP-16 RHWM - Federal Tier 1 System Firm Critical Output

RHWM Comparison from BP-14

2-Year Average Comparison BP-16 Final BP-14 RHWM Process *(Energy in aMW)*	BP-16 Prelim Proposal	BP-14 RHWM Proecss	Difference 2-Year Average	Comment
T1SFCO Projections				
1. Federal System Hydro Generation	6,664	6,862	-198	Changes in spill criteria on Lower Snake projects in the 2014 BiOp Implementation Plan that highlights splill even in low water conditions
2. Designated Non-Fed Owned Res.	1,050	1,022	28	Resource changes: CGS (+42 aMW), GP-Paper (Wauna) (-14 aMW)
3. Designated BPA Cont. Purchases	177	195	-18	Purchase changes: BPA/BCHA LCA (-1 aMW), Expiration of BPA/PASA contract 4/30/2015 (-5 aMW), BPA/RVSD contract 4/30/2016 (-8 aMW), BPA/PAC SNX (-7 aMW), Canadian Return NFD (+1 aMW), Slice Tx Loss Return (+1 aMW)
4. Designated System Obligations	-1,005	-1,021	16	Obligation changes: CER to Canada (-5 aMW), LCA (-7 aMW), NTSA (-5 aMW); Expiration of BPA/PASA contract 4/30/2015 (-3 aMW), BPA/RVSD contract 4/30/2016 (-8 aMW), updated Tx loss factors (+9 aMW), updated Slice Tx loss returns (+1 aMW), and Columbia Basin obligation forecast (+2 aMW)
5. Federal T1SFCO Output	**6,886**	**7,058**	**-172**	

RHWM Augmentation

RHWM Augmentation

- The TRM provides for two types of RHWM Augmentation
  - Augmentation for DOE Richland and tribal load growth
  - Augmentation for new publics
- For the BP-16 period, these augmentation amounts will be 59.107 aMW
  - 6.395 aMW for DOE Richland; 6.865 aMW for Yakima and Umpqua
  - 45.847 aMW for Jefferson County PUD
- This results in an RHWM Tier 1 System Capability of:
  - T1SFCO + RHWM Aug = 6886.210 + 59.107 = 6945.317 aMW

Next Steps

- Public Comment Period August 6-19, 2015
- August 8, 2014 is the deadline to provide notice of intent to preserve right to dispute
- BPA reviews public comments, and August 26th workshop tentatively scheduled to address customer concerns raised in the public comment period.
- September 9th, BPA posts the Administrator's final determinations
- Forecast Net Requirement posting in early November (following October 31st Deadline for certain adjustments to customer Above RHWM load service elections).

Appendix

Appendix: Updates to HYDSIM Spill Assumptions

- **John Day & Ice Harbor Spill**: These operations will eventually be determined based on BiOp juvenile dam passage survival performance standards, but this will not likely occur before the rate period. Current HYDSIM study includes the test operations shown in the 2014 BiOp spill table.
- **Early August Spill Curtailment**: This operation is in the 2014 BiOp. Current HYDSIM study includes this spill assumption similar to the last Rate Case studies but updated to reflect August spill end dates provided by the Corps last fall.
- **Spring Maximum Transport for 2 Weeks in All Years**: This operation is not in the 2014 BiOp. Current HYDSIM study removes this no-spill assumption.
- **Spring Maximum Transport in Dry Years**: This operation is not in the 2014 BiOp. Current HYDSIM study removes this no-spill assumption.
- **April Spill Start Dates at Snake River Projects**: The operation in the 2014 BiOp shows April 3rd, but the last Rate Case study used April 5th at Little Goose and April 7th at Lower Monumental and Ice Harbor. Current HYDSIM study starts spill April 3rd.

Appendix: HYDSIM Results from BP-16 T1SFCO Studies

- **Grand Coulee**: Generation reduced ~20 aMW, mostly due to reductions in Canadian releases. The Grand Coulee generation reduces in April-July, and this is mostly offset by gains in August-November and January-March.
- **Chief Joseph**: Generation reduced ~20 aMW, mostly due to reductions in Canadian releases. The Chief Joseph generation reduces in April-July, and this is mostly offset by gains in August-November and January-March.
- **Lower Snake**: Generation reduced ~120 aMW due to spill changes.
- **Lower Columbia**: Generation reduced ~30 aMW due to reductions in Canadian releases and due to spill changes.
- **Libby**: Annual average generation is unchanged, but Libby produces less energy in May and more in June due to the delayed sturgeon pulse start from mid-May to June 1st.
- **Hungry Horse**: No changes to generation.
- **Albeni Falls**: Annual average generation is unchanged.
- **Dworshak**: No changes to generation.

Canadian Operations in Rate Case & T1SFCO Studies

AOP = Assured Operating Plan

- The 1964 Columbia River Treaty requires the US & Canada to develop an assured operating plan for operation of Canadian Storage six years in advance every year.
  - AOP16 for 2016 was published Sep 2011. AOP17 for 2017 was published Nov 2011.
  - BPA staff are currently working on AOP20 for 2020.
- AOP studies follow the protocol defined in the Treaty for an AOP to achieve an optimal power and flood control operation for the US & Canada.
  - The HYDSIM study follows standard utility practice to balance loads and resources.
    - AOP loads are based on Pacific Northwest Area loads as defined in the Treaty.
    - BC Hydro insists that these be our published White Book loads, not just an informal BPA forecast.
    - AOP16 & AOP17 loads came from 2010 White Book
    - Additional mutually-agreeable adjustments are made to balance loads & resources in the AOP, such as including California & Canadian imports to balance when the study has deficits.
  - The study does not include modern non-power requirements, so the AOP does not reflect actual operations.
  - Because the AOP balances loads & resources and does not include non-power constraints, the load assumption significantly affects the AOP.
- The AOP study results determine the monthly power & flood control planning operations for Canadian storage, unless otherwise agreed (i.e. in the DOP or in annual operating agreements).
- The Canadian Entitlement is also determined in the AOP.
  - Under the Treaty, the Canadians are entitled to half of the downstream power benefits resulting from Treaty storage operations.
  - The Canadian Entitlement is set by the AOP study and is not updated or modified for differences in the DOP or annual operating agreements.

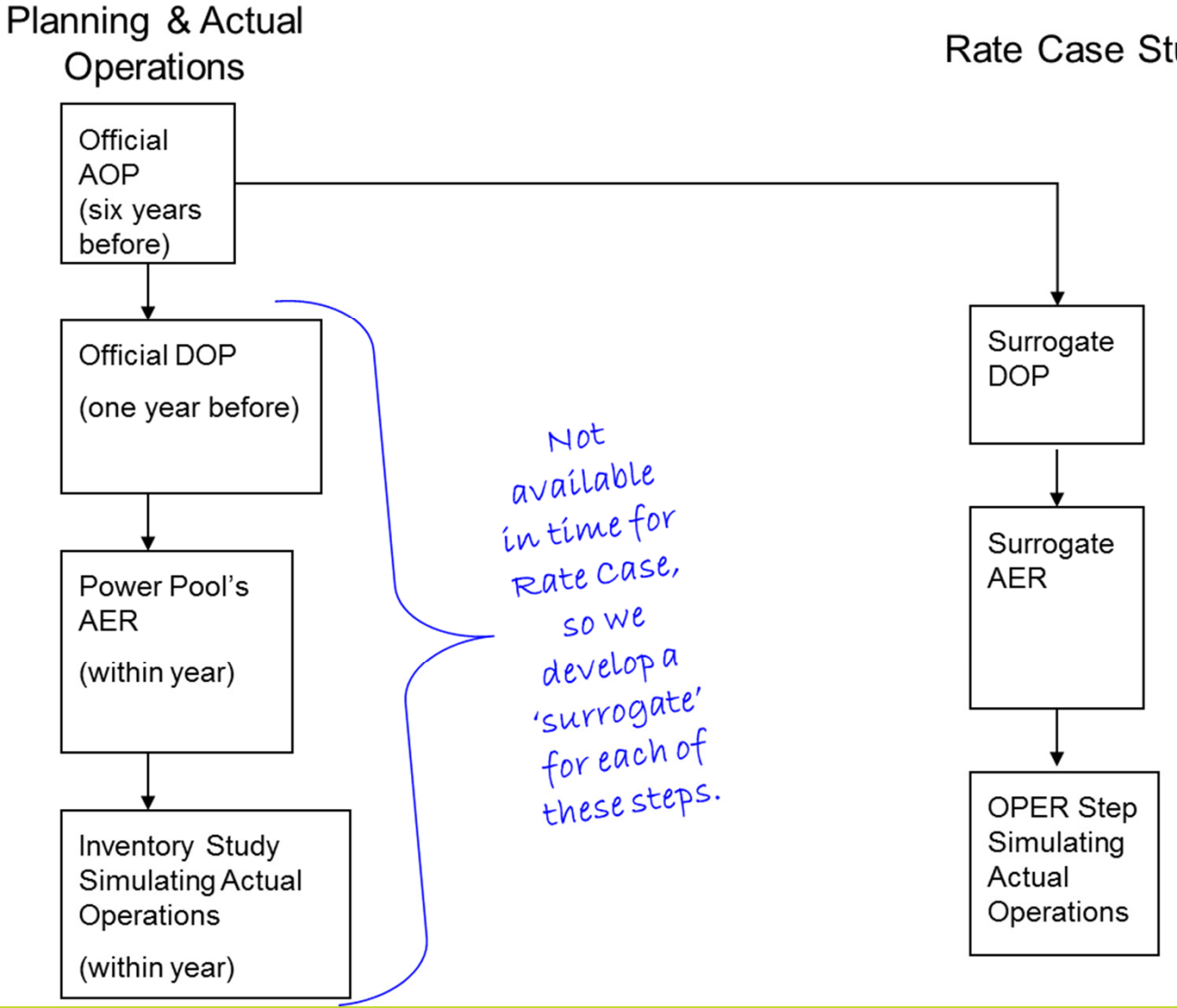
Unlike our Rate Case study, which reflects actual operations and is so constrained by non-power operating requirements that the load does not have a significant affect.

Canadian Operations in Rate Case & T1SFCO Studies

DOP = Detailed Operating Plan

- DOP is completed the year prior to the operating year.
  - Unfortunately, this means these studies are not available early enough for our T1SFCO studies or Rate Case studies.
  - For instance, the 2015 DOP was published in June 2014, but the Rate Case study for 2015 was initiated in July 2012 and completed in April 2013.
- DOP is an optional refinement of the AOP
  - Only reflecting mutually agreeable updates
  - Typically only includes minor changes
    - Updated flood control procedures
    - Updated stream flow procedures
    - Updated plant data
    - Updated hydro independent data
- DOP is the study that gets used in the PNCA planning process, i.e. the studies run by the Northwest Power Pool
- Since the official DOP is not available early enough for the Rate Case studies, we use a surrogate study.

Canadian Operations in Rate Case & T1SFCO Studies



Canadian Operations in Rate Case & T1SFCO Studies

What really gets input to the Rate Case study?

- Surrogate DOP
  - We need an approximation of the DOP before the official DOP is available, sort of surrogate DOP study that is only for the Rate Case
  - We start with the AOP – the official AOP is available for the rate period years.
  - We change this to a forecast-based study for fiscal year instead of a perfect knowledge study running August-July.
  - We update Canadian operations following the same process that will be used in the official DOP.
    - Update plant data with most recent PNCA data
    - Use the most recent streamflow data available (80-yr 2010 modified streamflow)
    - Update flood control using most recent assumptions & procedures from the Corps of Engineers

The DOP Surrogate determines Canadian operations for the AER step.

- AER Step
  - We use the resulting Canadian operations from the surrogate DOP study in our AER step.
  - We use the PNCA planning data for all projects.
  - We run this step of the study similar to the Power Pool's AER study used for PNCA planning.
  - This step is used to estimate the operations of all the non-federal projects.

The AER step determines non-Federal operations for the OPER step.

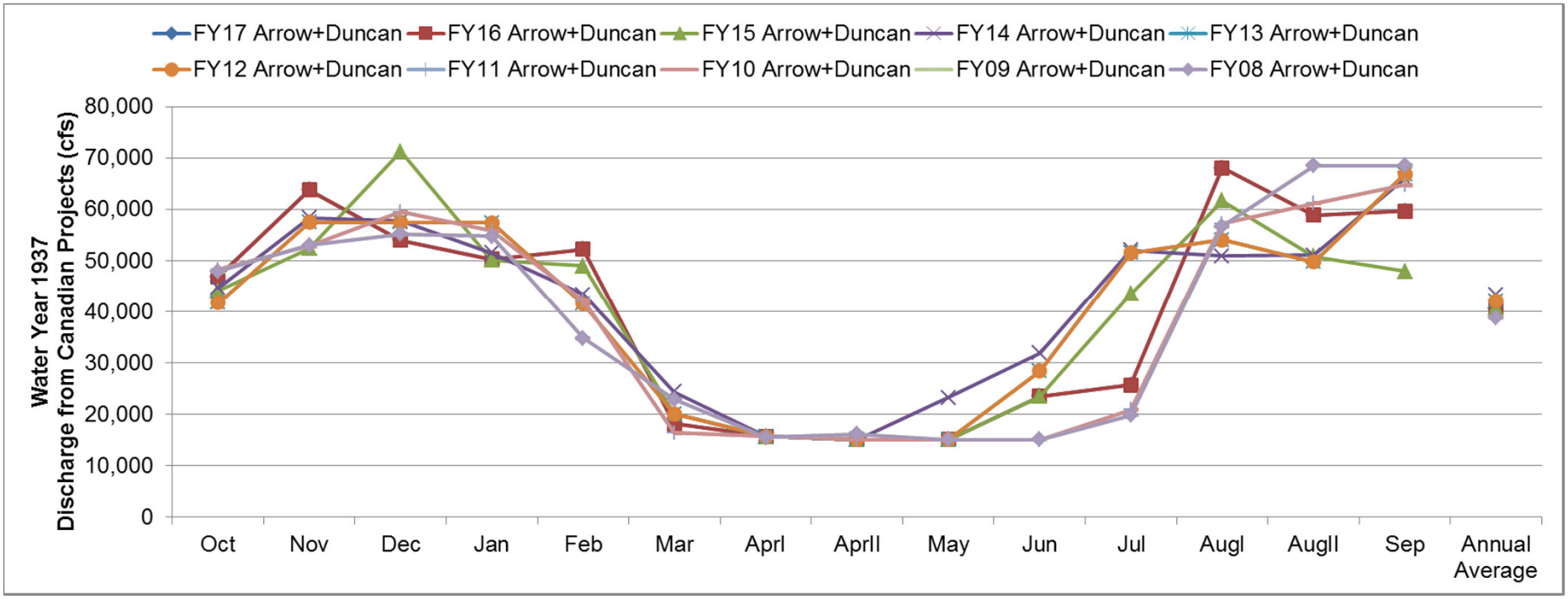
- OPER Step
  - This step is similar to the AER step but includes more refinements to better reflect expected actual operations.
  - We use the resulting US non-federal project operations from the AER step.
  - We add refinements at the federal projects where the PNCA data is either too generic or outdated.
  - We add expected Canadian operations that are not reflected in the DOP
    - Biological Opinion flow augmentation of 1 maf
    - Arrow trout spawning logic
    - Whitefish operation at Duncan
    - Non-Treaty Storage Agreement

The OPER step determines Federal operations for the generation estimates used in our Rates & T1SFCO studies.

Canadian Operations in Rate Case & T1SFCO Studies

How much do the Canadian Operations change in our Rate Case studies?

- The chart below shows the 1937 critical year Canadian project outflow from our past few Rate Case studies and the recent T1SFCO studies for FY16 & FY17.
- The operations do change from year to year in these studies.
  - The overall shape appears to be relatively consistent with the most variation in the summer months.
  - The average annual discharge ranges from about 39,000 to 43,000 cfs.



BP-16 RHWM - Federal Tier 1 System Firm Critical Output

Table 2.12.1
Federal Tier 1 System Firm Critical Output Projection - 2-Year Average
2016 RHWM Process for BP-16 Rate Period
PNW Loads and Resources Study
Study: S113-RC-20140724-130549

1.	T1SFCO Projections Energy in aMW	2016	2017	Average [1/]
2.	Total Federal System Hydro Generation (Table 2.12.2)	6,663.32	6,665.51	6,664.41
3.	Total Designated Non-Federally Owned Resources (Table 2.12.3)	1,134.40	964.55	1,049.59
4.	Total Designated BPA Contract Purchases (Table 2.12.4)	183.55	170.76	177.16
5.	Total Designated System Obligations (Table 2.12.5)	-1,006.32	-1,003.60	-1,004.96
6.	***Federal Tier 1 System Firm Critical Output***	***6,974.95***	***6,797.22***	***6,886.21***

[1/] 2-year average calculated hourly to take into account leap year FY 2016.

BP-16 RHWM - Federal Tier 1 System Firm Critical Output

Table 2.12.2
Federal System Hydro Generation for use in the T1SFCO Calculation
2016 RHWM Process for BP-16 Rate Period
PNW Loads and Resources Study
Study: S113-RC-20140724-130549

1.	Regulated Hydro	2016	2017	Average [1/]
2.	Albeni Falls	24.3	24.4	24.3
3.	Bonneville Hydro	392.6	392.4	392.5
4.	Chief Joseph Hydro	1,110.1	1,110.5	1,110.3
5.	Dworshak Hydro	141.3	141.6	141.4
6.	Grand Coulee Hydro	1,939.3	1,940.0	1,939.7
7.	Hungry Horse	83.8	83.8	83.8
8.	Ice Harbor Hydro	107.9	107.8	107.8
9.	John Day Hydro	790.1	790.2	790.1
10.	Libby	186.5	186.8	186.6
11.	Little Goose Hydro	156.5	156.6	156.6
12.	Lower Granite Hydro	146.5	146.6	146.5
13.	Lower Monumental Hydro	147.1	147.1	147.1
14.	Mc Nary Hydro	481.0	481.0	481.0
15.	The Dalles Hydro	603.5	603.5	603.5

BP-16 RHWM - Federal Tier 1 System Firm Critical Output

Table 2.12.2 (continued)
Federal System Hydro Generation for use in the T1SFCO Calculation
2016 RHWM Process for BP-16 Rate Period
PNW Loads and Resources Study
Study: S113-RC-20140724-130549

16.	Independent Hydro	2016	2017	Average [1/]
17.	Anderson Ranch	12.2	12.2	12.2
18.	Big Cliff	9.7	9.7	9.7
19.	Black Canyon	6.2	6.2	6.2
20.	Boise River Diversion	1.2	1.2	1.2
21.	Chandler	6.1	6.1	6.1
22.	Cougar	19.0	19.0	19.0
23.	Cowlitz Falls	26.5	26.5	26.5
24.	Detroit	33.8	33.8	33.8
25.	Dexter	9.4	9.4	9.4
26.	Foster	12.2	12.2	12.2
27.	Green Peter	26.8	26.9	26.8
28.	Green Springs - USBR	7.3	7.3	7.3
29.	Hills Creek	17.9	18.0	17.9
30.	Idaho Falls - City Plant	4.2	4.2	4.2
31.	Idaho Falls - Lower Plants #1 & #2	5.8	5.8	5.8
32.	Idaho Falls - Upper Plant	4.2	4.2	4.2
33.	Lookout Point	35.7	35.8	35.8
34.	Lost Creek	30.0	30.1	30.0
35.	Minidoka	10.7	10.7	10.7
36.	Palisades	67.3	67.4	67.4
37.	Roza	6.9	6.9	6.9
38.	***Total Federal System Hydro Generation***	***352.9***	***353.4***	***6,664.4***

BP-16 RHWM - Federal Tier 1 System Firm Critical Output

Table 2.12.3
Designated Non-Federally Owned Resources for use in the T1SFCO Calculation
2016 RHWM Process for BP-16 Rate Period
PNW Loads and Resources Study
Study: S113-RC-20140724-130549

1.	Project	2016	2017	Average [1/]
2.	Ashland Solar Project	0.0	0.0	0.0
3.	Columbia Generating Station	1,075.0	916.0	995.6
4.	Condon Wind Project	9.6	9.7	9.6
5.	Dworshak/Clearwater Small Hydropower	2.6	2.6	2.6
6.	Foote Creek 1	4.0	4.0	4.0
7.	Foote Creek 2	0.5	0.5	0.5
8.	Foote Creek 4	4.4	4.4	4.4
9.	Fourmile Hill Geothermal (Not included)	0.0	0.0	0.0
10.	Georgia-Pacific Paper (Wauna) *(Acquisition Expires 3/31/2016)*	10.9	0.0	5.4
11.	Klondike I	6.8	6.8	6.8
12.	Stateline Wind Project	20.7	20.7	20.7
13.	White Bluffs Solar	0.0	0.0	0.0
14.	***Total Designated Non-Federally Owned Resources***	***1,134.4***	***964.6***	***1,049.6***

[1/] 2-year average calculated hourly to take into account leap year FY 2016.

BP-16 RHWM - Federal Tier 1 System Firm Critical Output

Table 2.12.4
Designated BPA Contract Purchases for use in the T1SFCO Calculation
2016 RHWM Process for BP-16 Rate Period
PNW Loads and Resources Study
Study: S113-RC-20140724-130549

1.	Contract Purchases	Contract #	2016	2017	Average [1/]
2.	Priest Rapids CER for Canada	97PB-10099	29.4	29.3	29.3
3.	Rock Island #1 CER for Canada	97PB-10102	18.1	18.1	18.1
4.	Rock Reach CER for Canada	97PB-10103	37.6	37.5	37.5
5.	Wanapum CER for Canada	97PB-10100	28.4	28.0	28.2
6.	Wells CER for Canada	97PB-10101	24.0	24.0	24.0
7.	BCHP to BPA PwrS	99PB-22685	1.0	1.0	1.0
8.	BCHP to BPA LCA	99PB-22685	28.9	32.9	30.9
9.	PASA to BPA Pk Repl	94BP-93658	0.0	0.0	0.0
10.	PASA to BPA S/N/X	94BP-93658	0.0	0.0	0.0
11.	PASA to BPA Xchg Nrg	94BP-93658	0.0	0.0	0.0
12.	RVSD to BPA Pk Repl	94BP-93958	2.3	0.0	1.1
13.	RVSD to BPA Seas Xchg	94BP-93958	6.7	0.0	3.3
14.	RVSD to BPA Xchg Nrg	94BP-93958	7.3	0.0	3.7
15.	PPL to BPA SNX (Spring Return)	94BP-94332	0.0	0.0	0.0
16.	PPL to BPA SPX (Summer Return)	94BP-94332	0.0	0.0	0.0
17.	***Total Designated BPA Contract Purchases***		***183.6***	***170.8***	***177.2***

[1/] 2-year average calculated hourly to take into account leap year FY 2016.

BP-16 RHWM - Federal Tier 1 System Firm Critical Output

Table 2.12.5
Designated BPA System Obligations for use in the T1SFCO Calculation
2016 RHWM Process for BP-16 Rate Period
PNW Loads and Resources Study
Study: S113-RC-20140724-130549

1.	System Obligation	Contract #	2016	2017	Average [1/]
2.	BPA to BRCJ Chief Joseph	14-03-17506; 14-03-49151	7.4	7.4	7.4
3.	BPA to BRCB Columbia Basin Project	Ibp-4512; 14-03-001-12160	139.1	139.5	139.3
4.	BPA to BRCR Crooked River Project	14-03-73152	0.8	0.8	0.8
5.	BPA to BROP Owyhee Project	EW-78-Y-83-00019	3.4	3.4	3.4
6.	BPA to BRRP Rathdrum Prairie Project	14-03-49151	0.6	0.6	0.6
7.	BPA to BRSID Southern Idaho Projects	EW-78-Y-83-00019	19.8	19.8	19.8
8.	BPA to BRSIN Spokane Indian Develop.	14-03-49151	0.3	0.3	0.3
9.	BPA to BRSV Spokane Valley	14-03-63656	0.7	0.7	0.7
10.	BPA to BRTD The Dallas Reclamation Proj	14-03-32210	2.0	2.0	2.0
11.	BPA to BRTV Tualatin Project	14-03-49151	0.7	0.7	0.7
12.	BPA to BRUB Umatilla Basin Project	10GS-75345	2.2	2.2	2.2
13.	BPA to BRYK Yakima Project	DE-MS79-88BP92591	1.8	1.8	1.8
14.	BPA to BCHP LCA	99PB-22685	32.1	32.2	32.2
15.	BPA to BCHA Can Ent	99EO-40003	471.3	467.9	469.6
16.	BPA to BCHA NTSA *(from Kim)*	12PG-10002	9.4	9.4	9.4
17.	BPA to BHEC 2012PSC	97PB-10051	7.5	7.5	7.5
18.	BPA to PASA C/N/X	94BP-93658	0.0	0.0	0.0
19.	BPA to PASA S/N/X	94BP-93658	0.0	0.0	0.0
20.	BPA to RVSD C/N/X	94BP-93958	2.2	0.0	1.1
21.	BPA to RVSD Seas Xchg	94BP-93958	0.0	0.0	0.0
22.	Federal Intertie Losses (Calculated: 3.0% of Intertie Sales Table 2.12.5 lines 18-21)	n/a	0.1	0.0	0.0

BP-16 RHWM - Federal Tier 1 System Firm Critical Output

Table 2.12.5
Designated BPA System Obligations for use in the T1SFCO Calculation
2016 RHWM Process for BP-16 Rate Period
PNW Loads and Resources Study
Study: S113-RC-20140724-130549

1.	System Obligation	Contract #	2016	2017	Average [1/]
23.	BPA to AVWP WP3 S	85BP-92186	41.8	41.7	41.7
24.	BPA to PPL SNX (Spring Delivery)	94BP-94332	0.0	0.0	0.0
25.	BPA to PPL SPX (Summer Delivery)	94BP-94332	0.0	0.0	0.0
26.	BPA to PSE WP3 S	85BP-92185	41.8	41.7	41.7
27.	BPA to PSE Upper Baker 2	09PB-12126	1.3	1.3	1.3
28.	BPAP to BPAT (Dittmer/Substation Service)	09PB-12128	9.4	9.4	9.4
29.	Federal Power Trans. Losses	n/a	245.8	247.7	246.8
30.	Slice Transmission Loss Returns	n/a	-35.2	-34.3	-34.7
31.	***Total Designated System Obligations***		***1,006.3***	***1,003.6***	***1,005.0***

[1/] 2-year average calculated hourly to take into account leap year FY 2016.

BP-16 RHWM – BPA/PASA/RVSD Contracts Exports

BPA/PASA Expires 4/30/2015
BPA/RVSD Expires 4/30/2016

	Energy-aMW	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Aug1	Aug16	Sep	Avg
	FY 2014 BPA/PASA/RVSD Exports															
1	BPA-P to PASA CNX Del	0	0	0	0	0	0	0	0	0	0	4.6	4.4	4.1	4.6	1.1
2	BPA-P to PASA SNX Del	0	0	0	0	0	0	0	0	15.0	15.0	0	0	0	0	2.5
3	BPA-P to RVSD CNX Del	11.1	2.6	2.7	2.8	2.7	2.5	2.8	2.8	0.0	0.0	11.1	10.5	9.8	11.0	5.0
4	BPA-P to RVSD SNX Del	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	40.0	0.0	0.0	0.0	0.0	6.7
5	Total BPA/PASA/RVSD Exports	11.1	2.6	2.7	2.8	2.7	2.5	2.8	2.8	55.0	55.0	15.8	14.9	13.9	15.6	15.3
	FY 2015 BPA/PASA/RVSD Exports															
6	BPA-P to PASA CNX Del	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	BPA-P to PASA SNX Del	0	0	0	0	0	0	0	0	15.0	15.0	0	0	0	0	2.5
8	BPA-P to RVSD CNX Del	11.1	2.5	2.8	2.7	2.7	2.7	2.8	2.8	0.0	0.0	11.1	10.5	9.8	11.0	5.0
9	BPA-P to RVSD SNX Del	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	40.0	0.0	0.0	0.0	0.0	6.7
10	Total BPA/PASA/RVSD Exports	11.1	2.5	2.8	2.7	2.7	2.7	2.8	2.8	55.0	55.0	11.1	10.5	9.8	11.0	14.2
	FY 2016 BPA/PASA/RVSD Exports															
11	BPA-P to PASA CNX Del	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	BPA-P to PASA SNX Del	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	BPA-P to RVSD CNX Del	10.6	2.6	2.8	2.5	2.7	2.8	2.6	2.6	0	0	0	0	0	0	2.2
14	BPA-P to RVSD SNX Del	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	Total BPA/PASA/RVSD Exports	10.6	2.6	2.8	2.5	2.7	2.8	2.6	2.6	0	0	0	0	0	0	2.2
	FY 2017 BPA/PASA/RVSD Exports															
16	BPA-P to PASA CNX Del	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	BPA-P to PASA SNX Del	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	BPA-P to RVSD CNX Del	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	BPA-P to RVSD SNX Del	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Total BPA/PASA/RVSD Exports	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

BP-16 RHWM – BPA/PASA/RVSD Contracts Imports

BPA/PASA Expires 4/30/2015
BPA/RVSD Expires 4/30/2016

	Energy-aMW	Oct	Nov	Dec	Jan	Feb	Mar	Apr1	Apr16	May	Jun	Jul	Aug1	Aug16	Sep	Avg
	FY 2014 BPA/PASA/RVSD Imports															
1	PASA to BPA-P CNX EER	3.4	3.5	3.6	3.4	3.5	1.7	0	0	0	0	0	0	0	3.5	1.9
2	PASA to BPA-P CNX Repl	0.2	0	0	0	0	0	0	0	0	0	4.4	4.3	4.5	4.4	1.1
3	PASA to BPA-P SNX Ret	4.6	4.6	4.8	4.6	4.7	2.2	0	0	0	0	0	0	0	4.6	2.5
4	RVSD to BPA-P CNX EER	0	16.3	16.2	15.6	16.1	16.8	7.9	7.9	0	0	0	0	0	0	7.3
5	RVSD to BPA-P CNX Repl	11.1	3.1	2.5	2.8	2.7	2.5	2.8	2.8	0.1	0	10.6	10.5	10.8	10.5	5.0
6	RVSD to BPA-P SNX Ret	0	9.4	9.3	9.0	9.3	9.7	4.5	4.5	0	0	0	0	0	0	4.2
7	Total BPA/PASA/RVSD Imports	19.4	36.9	36.4	35.4	36.2	32.9	15.2	15.2	0.1	0	15.1	14.8	15.4	23.0	22.1
	FY 2015 BPA/PASA/RVSD Imports															
8	PASA to BPA-P CNX EER	3.4	3.6	3.4	3.4	3.5	1.8	0	0	0	0	0	0	0	0	1.6
9	PASA to BPA-P CNX Repl	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
10	PASA to BPA-P SNX Ret	4.6	4.8	4.6	4.6	4.7	2.4	0	0	0	0	0	0	0	0	2.1
11	RVSD to BPA-P CNX EER	0	16.9	15.6	16.2	16.1	16.2	7.9	7.9	0	0	0	0	0	0	7.3
12	RVSD to BPA-P CNX Repl	11.1	3.0	2.7	2.8	2.7	2.5	2.8	2.8	0.1	0	10.6	10.0	10.3	11.0	5.0
13	RVSD to BPA-P SNX Ret	0	9.8	9.0	9.3	9.3	9.4	4.5	4.5	0	0	0	0	0	0	4.2
14	Total BPA/PASA/RVSD Imports	19.4	38.1	35.3	36.3	36.2	32.3	15.2	15.2	0.1	0	10.6	10.0	10.3	11.0	20.3
	FY 2016 BPA/PASA/RVSD Imports															
15	PASA to BPA-P CNX EER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	PASA to BPA-P CNX Repl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	PASA to BPA-P SNX Ret	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	RVSD to BPA-P CNX EER	0	16.4	15.6	16.8	16.0	15.6	7.9	7.9	0	0	0	0	0	0	7.3
19	RVSD to BPA-P CNX Repl	11.1	2.5	2.8	2.7	2.6	2.8	2.8	2.8	0	0	0	0	0	0	2.3
20	RVSD to BPA-P SNX Ret	0	15.4	14.2	15.7	14.5	13.7	6.9	6.9	0	0	0	0	0	0	6.7
21	Total BPA/PASA/RVSD Imports	11.1	34.2	32.6	35.2	33.0	32.1	17.5	17.5	0	0	0	0	0	0	16.3
	FY 2017 BPA/PASA/RVSD Imports															
22	PASA to BPA-P CNX EER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	PASA to BPA-P CNX Repl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	PASA to BPA-P SNX Ret	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	RVSD to BPA-P CNX EER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	RVSD to BPA-P CNX Repl	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	RVSD to BPA-P SNX Ret	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	Total BPA/PASA/RVSD Exports	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0