



# **BPA Climate Change Resiliency**

## **Proposed Update to Long-Term Hydro Generation Forecast**

2<sup>nd</sup> Stakeholder Workshop

April 18, 2022



# Overview

- At the March 21<sup>st</sup> workshop, BPA proposed to update streamflow assumptions for its long-term hydro generation forecast used in routine planning to better reflect emerging climate change trends and provide a more accurate range of future generation. Specifically, BPA is proposing to:
  - To use the most-recent 30-years of streamflows (1989 – 2018 Modified Flows), instead of streamflows dating back to 1929.
  - To establish firm generation using the monthly 10<sup>th</sup> percentiles from the most recent 30-years of streamflows, instead of using 1937 water.
- BPA is proposing to make these changes for the upcoming RHWM process and BP-24 rate case.
- Subsequently, BPA received requests from several customers to provide additional analysis on the down-stream impacts. Accordingly, BPA is providing additional rate-related analysis so it can be used to better inform stakeholder comments.

# Additional Analysis

- Today, BPA is sharing results of additional analysis and/or discussion on the impacts of the proposed change per the following customer requests:
  - Customer-specific impacts to Tier 1 allocations and effective rates
  - Impacts to generation inputs
  - Impacts to risk
  - Impacts to the Slice RSO test
  - Additional hydrological data (a synthetic climate change adjustment to historical dataset)
- In addition to this PowerPoint, a full rates impact model is available at <https://www.bpa.gov/energy-and-services/power/climate-change-fcrps> under “Climate Change Resiliency” (TRMbd\_Climate Change)

# Understanding the Math

- In the next two slides, we will walk through two examples to illustrate how overestimating firm inventory would impact BPA's Slice and Non-Slice products.
- **Proof 1** compares the financial impact assuming all customers have loads greater than their RHWM.
- **Proof 2** compares the financial impact assuming customers have Unused RHWM equal to the amount of firm inventory overestimation.
- **Conclusion:** The financial impact is the same across products and the ultimate amount paid is the same (less a small impact associated with the risk of Unused RHWM being borne by the Non-Slice product).

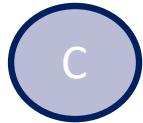
# Simple Math Proof 1 – Tier 1 Reduced

Forecast System Bigger than Actual System					Forecast System Equal to Actual System							
1		Market \$/MWh	\$	40	1		Market \$/MWh	\$	40			
2		BPA Revenue Requirement	\$	2,000,000,000	2		BPA Revenue Requirement	\$	2,000,000,000			
3	A	Forecast Firm		7,100	3	B	Forecast Firm		6,900			
4		Actual System		6,900	4		Actual System		6,900			
5					5							
6					6							
7		<u>Slice</u>		<u>Non-Slice</u>	7		<u>Slice</u>		<u>Non-Slice</u>			
		25%		75%			25%		75%			
8	Forecast Effective Tier 1 Rate	\$	32.16	\$	32.16	Total	\$	33.09	\$	33.09	Total	
9					aMW					aMW		
10	Load MWh		15,549,000		46,647,000	7100	Load MWh		15,549,000		46,647,000	7100
11	Forecast Tier 1 MWh		15,549,000		46,647,000	7100	Forecast MWh		15,111,000		45,333,000	6900
12	Actual Tier 1 MWh		15,111,000		46,647,000	7050	Actual MWh		15,111,000		45,333,000	6900
13	Actual Tier 1 Effective Rate	\$	33.09	\$	32.16		Actual Tier 1 Effective Rate	\$	33.09	\$	33.09	
14	Power Purchase aMW		50		150	200	Power Purchase aMW		50		150	200
15	Power Purchase MWh		438,000		1,314,000	200	Power Purchase MWh		438,000		1,314,000	200
16	Power Purchase Costs	\$	17,520,000	\$	52,560,000		Power Purchase Costs	\$	17,520,000	\$	52,560,000	
	Actual Tier 1 + Power						Actual Tier 1 + Power					
17	Purchase Costs Effective Rate	\$	33.28	\$	33.28		Purchase Costs Effective Rate	\$	33.28	\$	33.28	

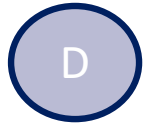
**Proof 1 - Load above RHWM.** The only difference between A and B is the source of funding unexpected power purchase costs for Non-Slice products. In A, it is forecast error paid for by BPA financial reserves. In B, it is above RHWM load paid for through Tier 2 rates or non-Federal resources. In BPA staffs' opinion, this is working as intended and is demonstrably equitable.

# Simple Math Proof 2 – Tier 1 Unchanged

Forecast System Bigger than Actual System			
1	Market \$/MWh	\$	40
2	BPA Revenue Requirement	\$	2,000,000,000
3	Forecast Firm		7,100
4	Actual System		6,900
5	Unused		200
6	Tier 1 Load	60,444,000	6,900
7	Slice %	25%	
8	Tier 1 Slice	15,549,000	26%
9	Tier 1 Non-Slice	44,895,000	74%
10	Unused Revenue	\$	70,080,000
11			
12			
13	Percent of Costs	26%	74%
14	Forecast Effective Tier 1 Rate	\$ 31.93	\$ 31.93
15			Total aMW
16	Load MWh	15,549,000	44,895,000
17	Forecast Tier 1 MWh	15,549,000	44,895,000
18	Actual Tier 1 MWh	15,111,000	44,895,000
19	Actual Tier 1 Effective Rate	\$ 32.85	\$ 31.93
20	Power Purchase aMW	50	150
21	Power Purchase MWh	438,000	1,314,000
22	Power Purchase Costs	\$ 17,520,000	\$ 52,560,000
23	Actual Tier 1 + Power Purchase Costs Effective Rate	\$ 33.06	\$ 33.10



Forecast System Equal to Actual System			
1	Market \$/MWh	\$	40
2	BPA Revenue Requirement	\$	2,000,000,000
3	Forecast Firm		6,900
4	Actual System		6,900
5	Unused		-
6	Tier 1 Load	60,444,000	6,900
7	Slice %	25%	
8	Tier 1 Slice	15,111,000	25%
9	Tier 1 Non-Slice	45,333,000	75%
10	Unused Revenue	\$	-
11			
12			
13	Percent of Costs	25%	75%
14	Forecast Effective Tier 1 Rate	\$ 33.09	\$ 33.09
15			Total aMW
16	Load MWh	15,111,000	45,333,000
17	Forecast Tier 1 MWh	15,111,000	45,333,000
18	Actual Tier 1 MWh	15,111,000	45,333,000
19	Actual Tier 1 Effective Rate	\$ 33.09	\$ 33.09
20	Power Purchase aMW	-	0
21	Power Purchase MWh	-	0
22	Power Purchase Costs	\$ -	\$ -
23	Actual Tier 1 + Power Purchase Costs Effective Rate	\$ 33.09	\$ 33.09



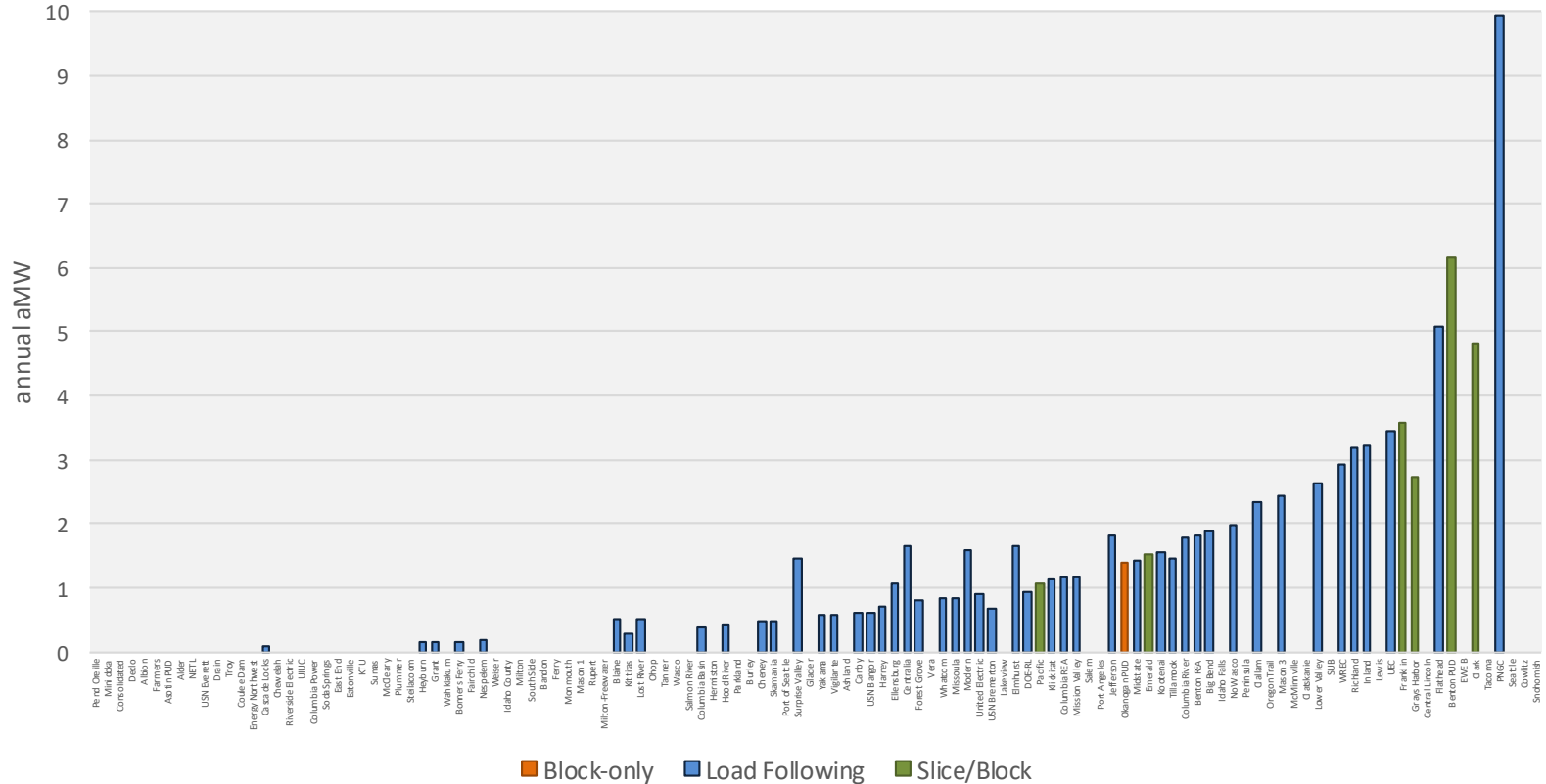
**Proof 2 – Unused RHHM equal to lost system.** Products pay the same effective rate less a small difference due to Non-Slice products bearing the risk of Unused RHHM.

# Impacts to Customer Rates

	Critical Water Data	T1SFCO aMW	Rates
Previous	80WY/1937	6,739	BP-22 adjusted for TOCAs 1/
Current	30WY/P10	6,955	BP-22 adjusted for TOCAs and Climate Change rate analysis 2/

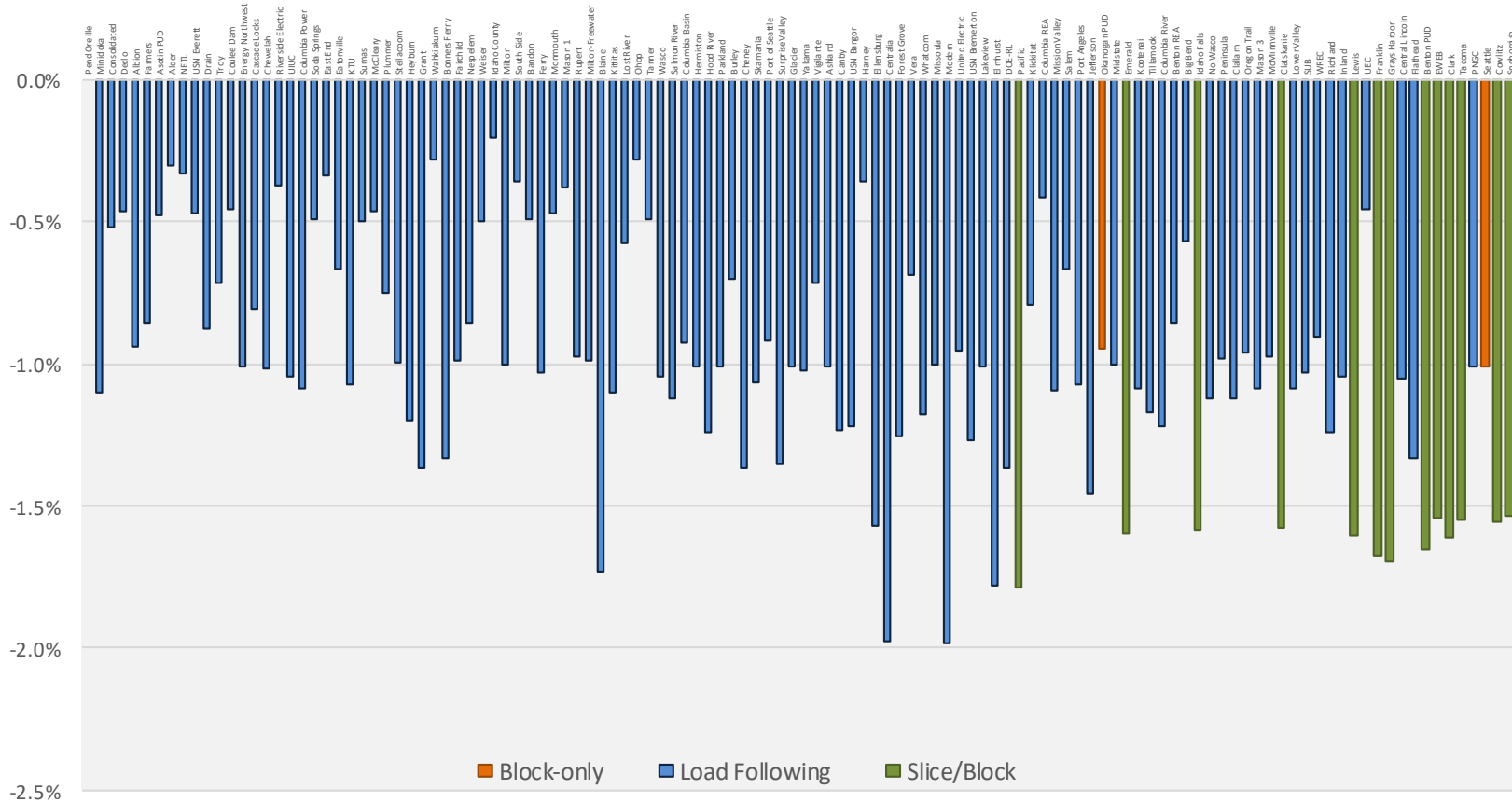
- Rate impact analysis compares: (i) forecast Tier 1 effective rates calculated using 80WY/1937 hydro generation data to determine the T1SFCO and RHWMs; to (ii) forecast Tier 1 effective rates calculated using 30WY/P10 hydro generation data to determine the T1SFCO and RHWMs.
- Analysis is based on customer load data in the BP-22 TRMbd Model
- Analysis uses BP-22 Tier 1 rates with the following adjustments:
  - 80WY/1937: Composite and Non-Slice customer rates are rescaled based on updated TOCAs and Non-Slice TOCAs.
  - 30WY/P10: Composite and Non-Slice customer rates are rescaled based on updated TOCAs and Non-Slice TOCAs. Additionally, the Composite rate includes an increased Firm Surplus Credit of \$21 million (from previous rate analysis) and a reduction in Generation Inputs revenue of \$407 thousand (see Gen Inputs slide below); and the Non-Slice rate includes a reduction in secondary revenue of \$32 million (non-slice share of \$42 million from previous rate analysis.)

## Change to amount of power sold at Tier 1 rates due to using 30WY/P10 hydro generation to set RHWMs





### Tier 1 effective rate impacts of using 30WY/P10 hydro generation to set rates



# Impacts to Generation Inputs

- All else equal, BPA's BP-24 embedded cost of capacity used in the calculation of BPA's Operating Reserve and Balancing Services is expected to go down slightly under the 30WY/P10 metric.
- As a reminder, the firm 1-hour capacity metric is used as the denominator in the embedded cost of capacity. Because BPA's available capacity can be water (fuel) constrained, the additional water inventory in the 30WY/P10 metric increases the 1-hour capacity measurement by 68 MW.

	BP24 draft 1937	BP24 draft P10
<b>1-Hour Capacity Measurement</b>	13,686 MW	13,754 MW
<b>Embedded Unit Cost</b>	\$ 5.64	\$ 5.61
<b>Total Balancing Reserve Revenue</b>	\$ 51,082,393	\$ 50,845,858
<b>Total Operating Reserve Revenue</b>	\$ 36,587,749	\$ 36,417,309
<b>Total Revenue Delta from 1937 to P10</b>	NA	\$ (406,974)

# Impact on Risk

- The risk evaluation should be based on the best data available, which we believe is the recent 30 year data set.
  - The recent 30WY data set best represents the range of potential outcomes. Using the full historical (80WY) data set would be a less accurate representation of current hydrological risk and result in a biased financial analysis.
- In order to understand how the risk profile changes between the different assumptions, we compared the risk results under the 30WY with P10 firm generation, and the 80WY with 1937 firm generation.
  - A change in the water years used for the Power and Transmission Risk Analysis will result in a change to the estimated probabilities of various positive and negative financial outcomes.
  - Relative to the status quo, the 30WY analysis will result in different probabilities and expected values of the CRAC<sup>1</sup>, FRP Surcharge<sup>2</sup>, and RDC<sup>3</sup> (collectively, the “Risk Mechanisms”) reported in the rate case.
  - The 30WY/P10 approach is not expected to result in any change to the thresholds and other parameters set for the Risk Mechanisms, nor result in a need to add PNRR or other adjustments to meet the Treasury Payment Probability (TPP) Standard.
  - The Risk Mechanisms trigger (take effect) based on end of year actual financial results, not any probabilistic analysis or forecast. This means that the financial reserves uncertainty modeled under the 30 or 80WY analysis does not result in rate adjustments. Instead, rate adjustments are a product of actual financial outcomes.

<sup>1</sup> Cost Recovery Adjustment Clause: an upward rate adjustment that is set at \$0 in Financial Reserves for Risk attributed to a business line

<sup>2</sup> Financial Reserves Policy Surcharge: an upward rate adjustment that is set at the equivalent of 60 days cash attributed to a business line

<sup>3</sup> Reserves Distribution Clause: A mechanism to repurpose Reserves for Risk, set at the equivalent of 120 days cash attributed to a business line

# Impact on Slice RSO Test

- RSO is an acronym for “Requirements Slice Output” (§5.6 of the Slice/Block Contract).
- RSO represents a minimum amount of Slice energy (“Slice Output”) each Slice customer must use to meet their net “requirements” load (total retail load, less resources dedicated to load).
- RSO is a monthly volume, based on the minimum of three criteria
  - Critical Slice Amount (Adjusted Annual RHWMTier 1 System Capability (AART1SC) \* Slice %)
  - Planned Net Requirement (Estimated Load, less resources, less Block)
  - Actual Net Requirement (Actual Load, less resources, less Block)
- The RSO test is a critical provision of the Slice agreement as it justifies the product as a “Requirements” product
  - Otherwise, BPA could not have offered Slice to it’s requirements (preference) customers

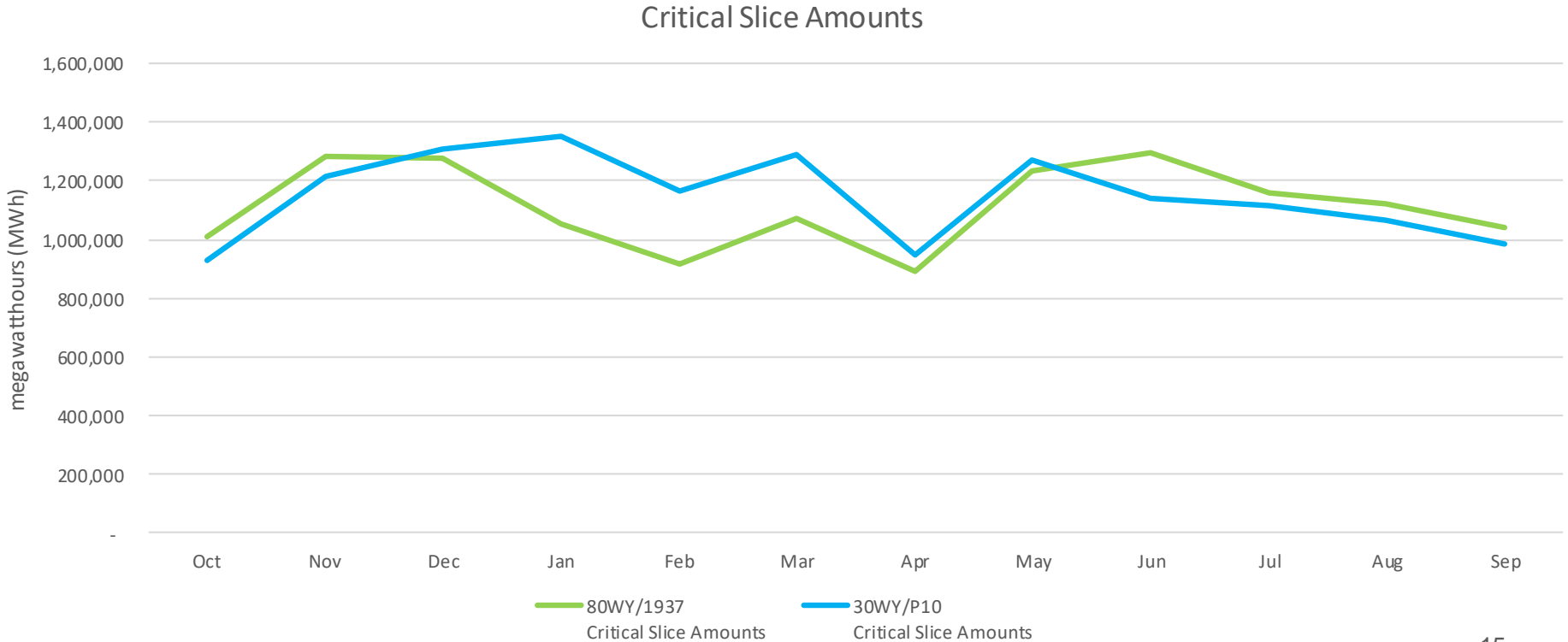
# Impact on Slice RSO Test

- The proposed change indicates the Critical Slice Amount (CSA) will increase by 220 aMW in FY24 and 212 aMW in FY25. This will result in slightly more critical slice and overall slightly less block on an annual basis.
- The proposed change also indicates the T1SFCO and AART1SC will be reshaped across the year, with higher amounts in the Winter through early Spring months and lower amounts in the late Spring through Fall months.
- The RSO Test remains the same. The CSA is one of three criteria used to determine the RSO.
  - BPA has the right to deem a customer to have passed the RSO test, if they fail the strict mathematical test.
  - The deeming language represents acknowledgement that the strict monthly RSO test criteria is too broad and that within-month changes in conditions can make it difficult to pass the test.

# Impact on Slice RSO Test

- The RSO Deeming Guidance document was developed collaboratively with Slice Customers. While there have been a number of failures of the RSO test, each customer has been deemed to have passed in all cases reviewed, and penalty charges have not been applied.
- Since the beginning of the RD Slice Contract in 2012, there have been 56 RSO Test Failures. Out of the 56 failures, 41 of these failures were by customers with no, or few, dedicated resources.
- The CSA has been one of the RSO Determinants (minimum criteria) in 10 of the RSO test failures, but was not necessarily the cause of these failures.
- The month of November has the highest number of RSO test failures, followed by October, and September. With the reshaping of the T1SFCO and AART1SC due to the proposed methodology, the CSA will decrease in these months. This is expected to reduce the likelihood of CSA as the RSO Determinant for those months, thus reducing the chance of the CSA causing an RSO Test Failure.

# Impact on Slice RSO Test



# Follow-up Hydrologic Data Request

- One customer proposed developing a new, synthetic dataset which would adjust the 90-year streamflow record to current climate signals.
- Although the suggestion is scientifically interesting, the costs would exceed any value in doing this additional analysis.
  - The research would need to be contracted-out and would be expensive (the costs of which would be borne by rate payers).
  - It would take several years to complete: 2-3 years to develop the study, similar to RMJOC-I & II, plus a peer-review process.
  - The synthetic flows would only be estimates of past flows projected onto changing climate.
  - Synthetic flows may still not be enough to keep pace with climate change like a shorter period-of record would.
  - Shorter, 30-year period of record (1989-2018) includes similar inter- and intra-annual hydrologic volatility as the 90-year (1928-2018) record, yet captures the emerging climate signals predicted by RMJOC-II and other studies.



# Next Steps

- This presentation and other related materials can be found on BPA's climate change webpage (<https://www.bpa.gov/energy-and-services/power/climate-change-fcrps>) under climate change resiliency.
- The comment period has been extended through April 29. Comments can be submitted at <https://publiccomments.bpa.gov/>.
- BPA intends to make a decision soon on whether it will update planning assumptions at this time, which would inform the upcoming RHWM process and BP-24 rate case.
- To provide the requested additional time for analysis and discussion in this process, BPA is delaying the kick-off of the RHWM process until June.