Western Area Power Administration

GCDAMP August Meeting

CRSP Hydropower Update – LTEMP SEIS

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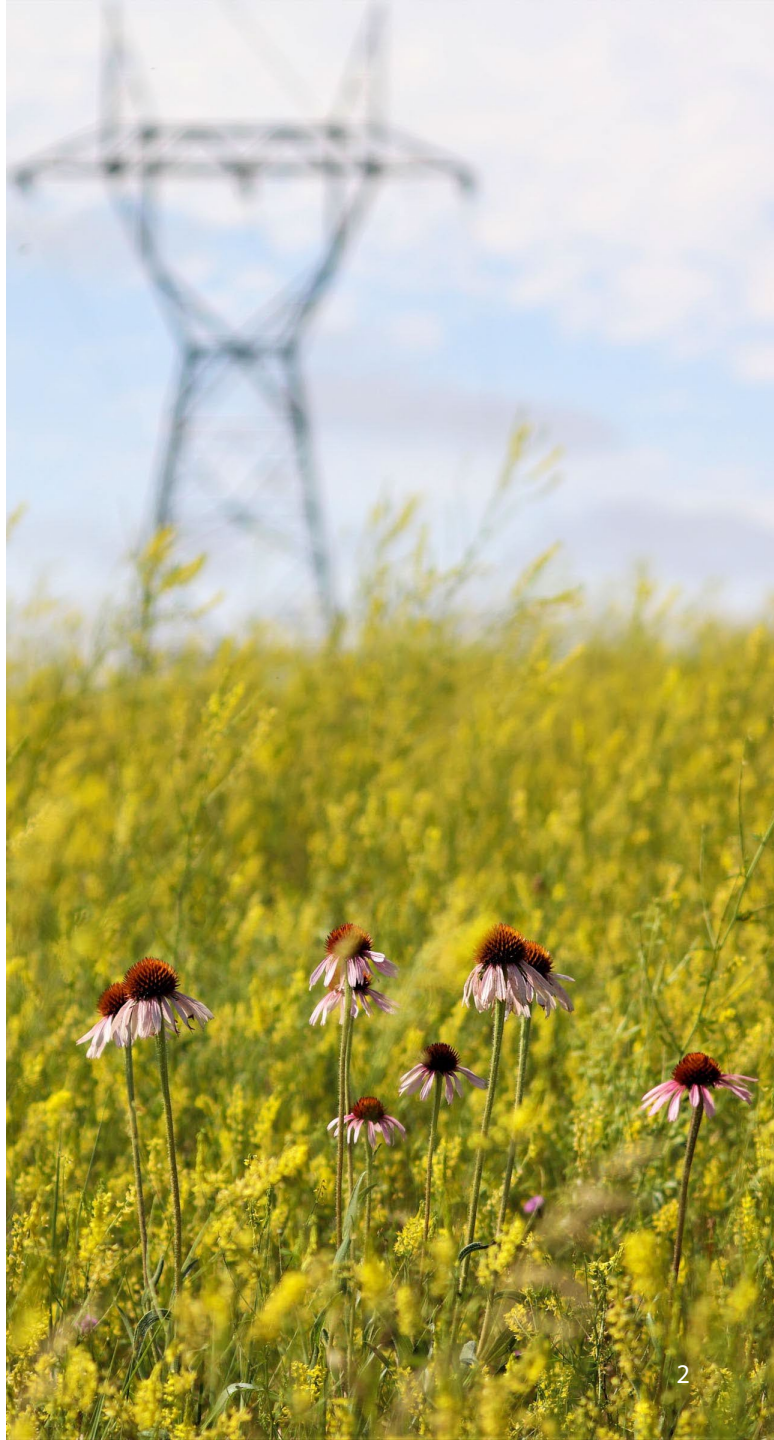
Environmental Team Lead and Administrative and Technical Services Manager

August 2024

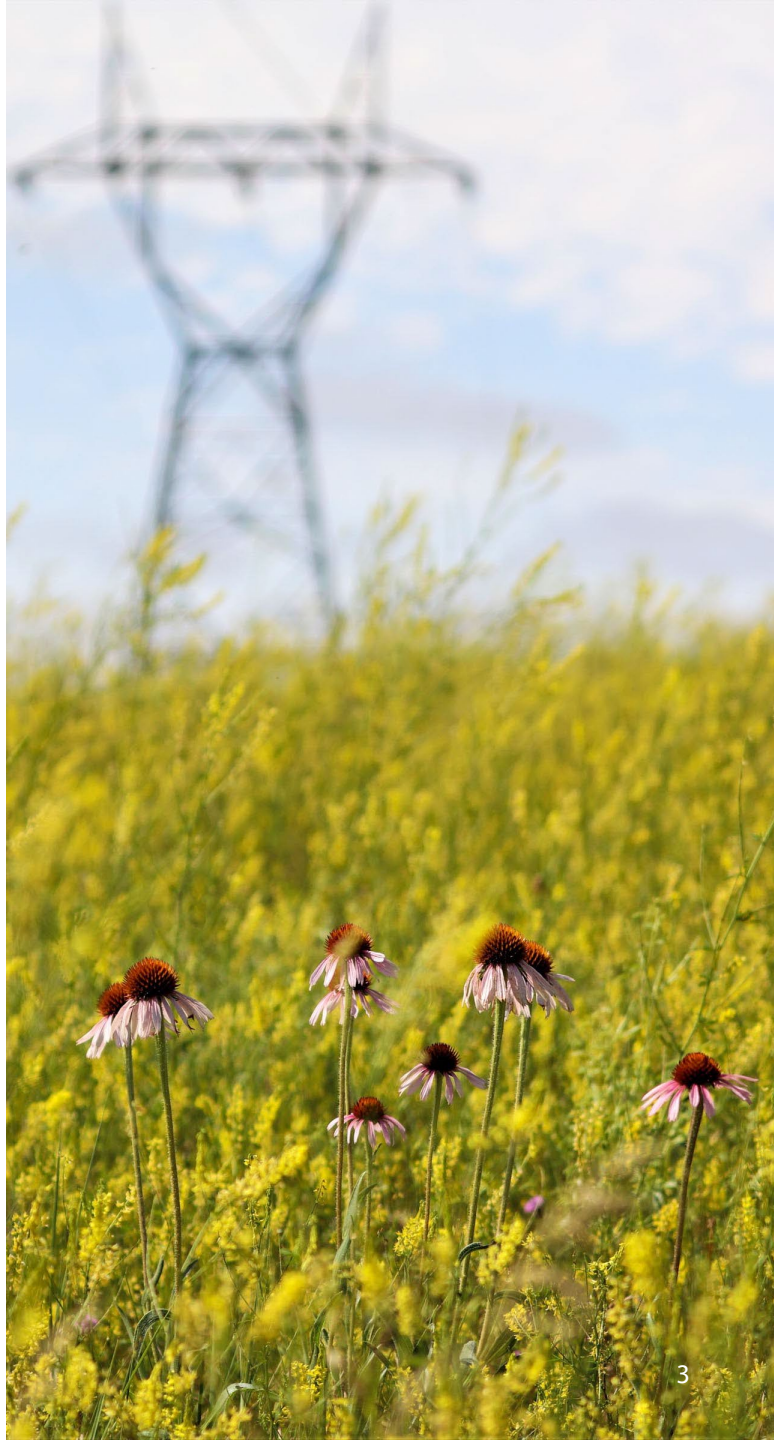
Thanks…

- Jerry Wilhite
- Tony Henriquez
- Courtney Harris
- Craig Ellsworth
- Argonne National Lab



Outline

- LTEMP SEIS Analyses
- HFE and Bug Flows vs. SMB Flows
- Optimization Tool
- Hydropower metrics of interest
- Initial estimates and initial results of SMB flows
- Projections through August
- Basin Fund status



LTEMP SEIS Analyses

How does this year compare to what was estimated?

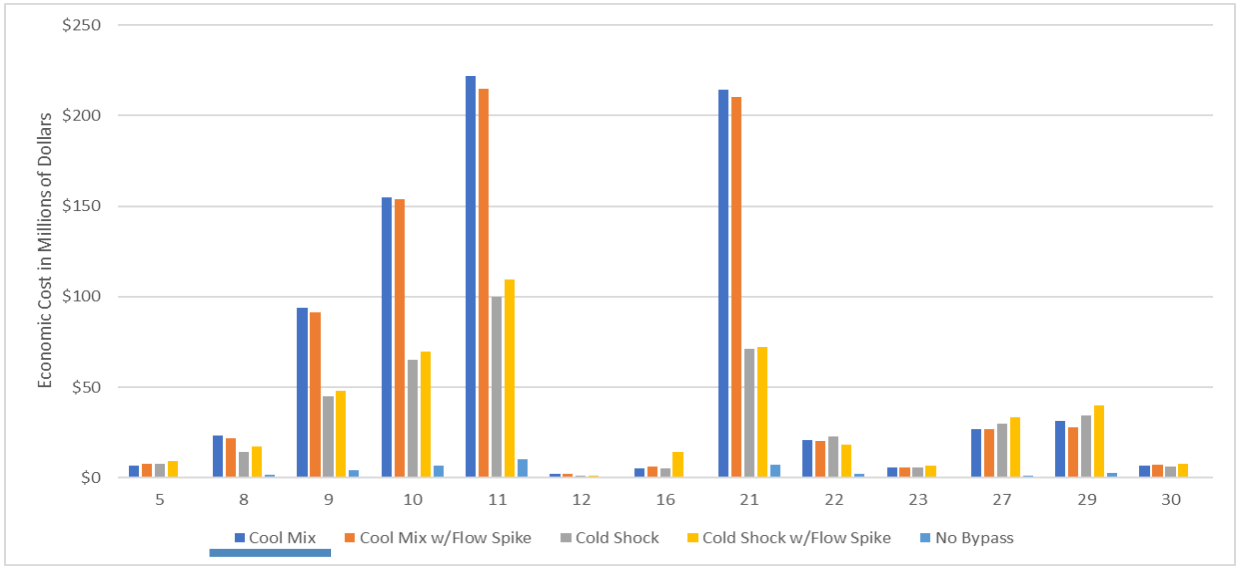
- Cool mix chosen
- 13 traces had bypass events
- Wide range of potential outcomes

About $15 million per year

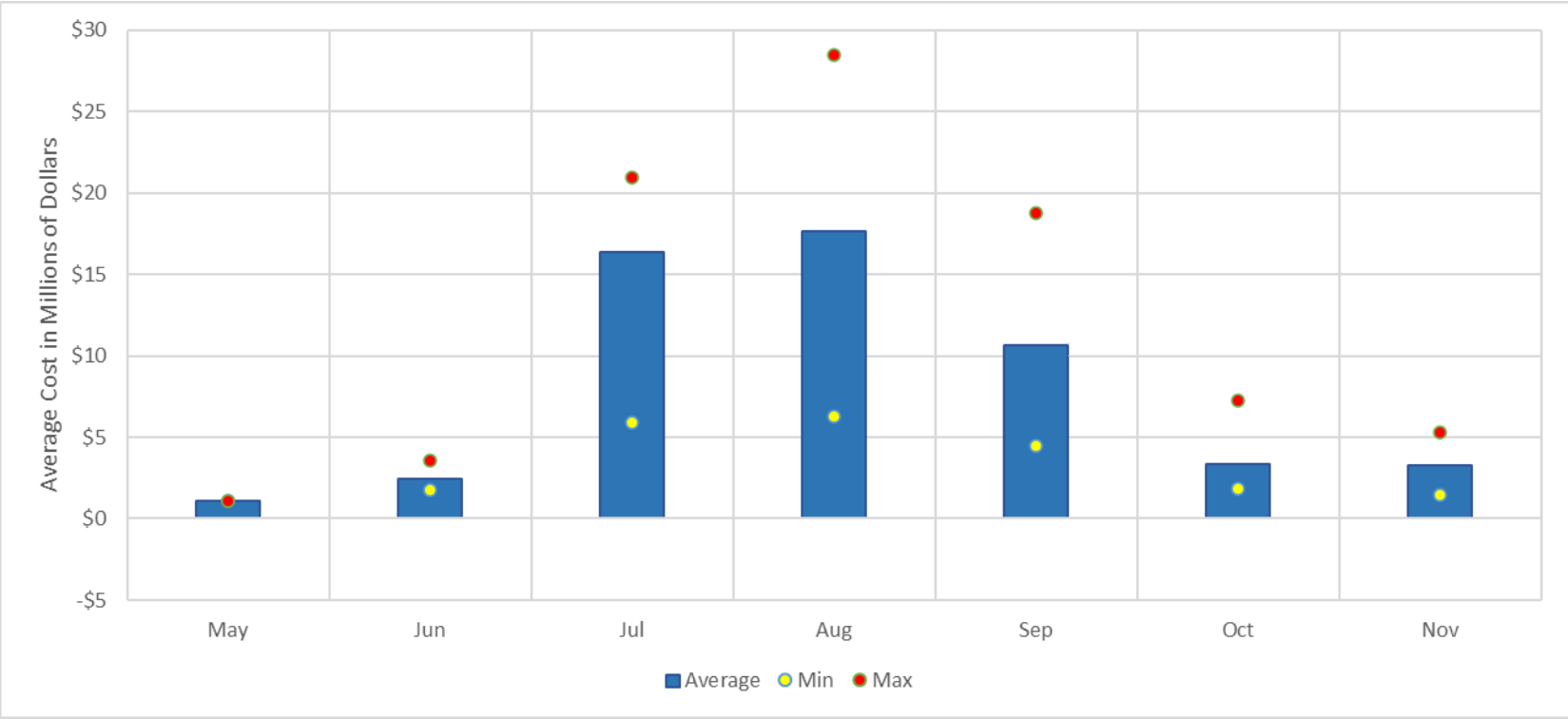
Potential 45-Month (4 summers) Flow Impacts on Economic Value of Electrical Energy, River Mile 61 ($ million)

Alternative	Average	Median	Min	10th %	90th %	Max
Cool Mix Alternative	62.53	23.06	1.93	5.38	202.39	222.03
Cool Mix with Flow Spike Alternative	61.14	21.97	1.93	5.70	198.86	214.55
Cold Shock Alternative	31.36	22.87	1.31	5.26	69.85	100.01
Cold Shock with Flow Spike Alternative	34.40	18.15	1.31	6.85	71.72	109.55
Non Bypass Alternative	2.81	1.65	0.00	0.03	7.18	10.39

Cost to Economic Value (in millions) by Alternative, for the 13 Traces where they were Triggered at River Mile 61



The Average Difference in Energy Value by Month for those Months when Bypass is Triggered, for the Cool Mix Alternative using the River Mile 61 Trigger



HFE and Bug Flows compared to SMB Flows

Weather and Stochastic Events

Week to week estimates based on input variables and bypass needed on an average daily basis to meet temperatures at rm 61

Comparison of WAPA's Pre-experiment Cost Estimate with the Post-experiment Cost Determination for HFEs and Macroinvertebrate Flows from 2012-2023

Experiment	Estimated cost per occurrence ($M)	Actual cost per occurrence ($M)	Difference between Estimated and Actual ($M)
High Flow Experiments (HFEs)			
LTEMP EIS			
2012		1.92*	
2013	1.74	2.59	-0.85
2014	1.75	2.1	-0.35
2016		1.15	0.25
2018			
2023			
Macroinvertebrate Flows (Bug Flows)			
2018	0.34	0.17	0.17
2019	0.33	0.33	0
2020		0.94	-0.53
2021		1.02***	-0.29
2022			

*Included cost of the fall steady flow

**Financial assessment has not been completed

*** Macroinvertebrate Flows were not implemented in 2021 but a cost was calculated by Argonne for discussion purposes at the time to see what the cost would have been if one had been implemented.

Potential 45-Month Flow Impacts on Economic Value of Electrical Energy, River Mile 61 ($ million)

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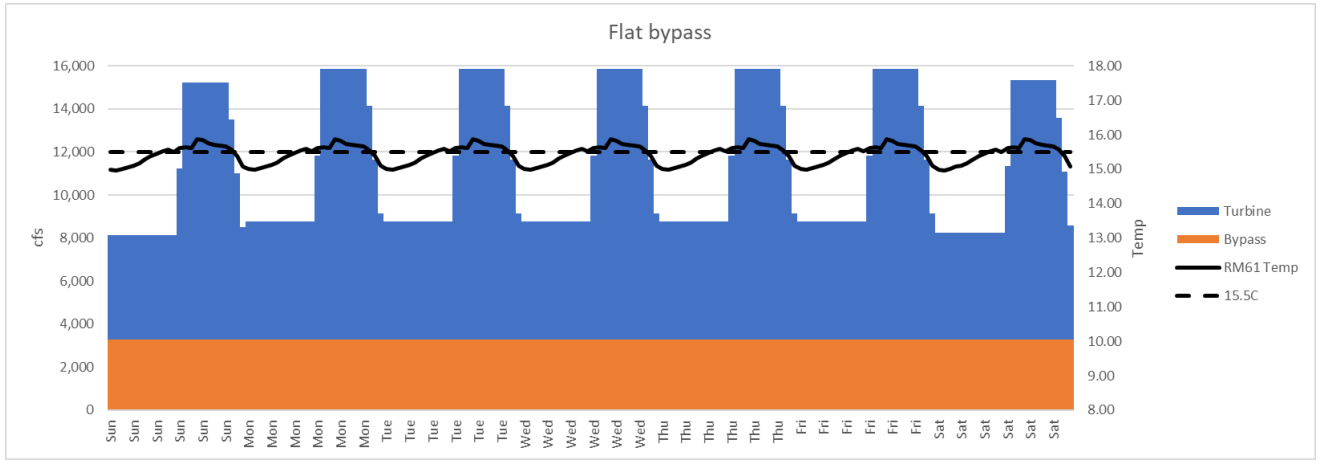
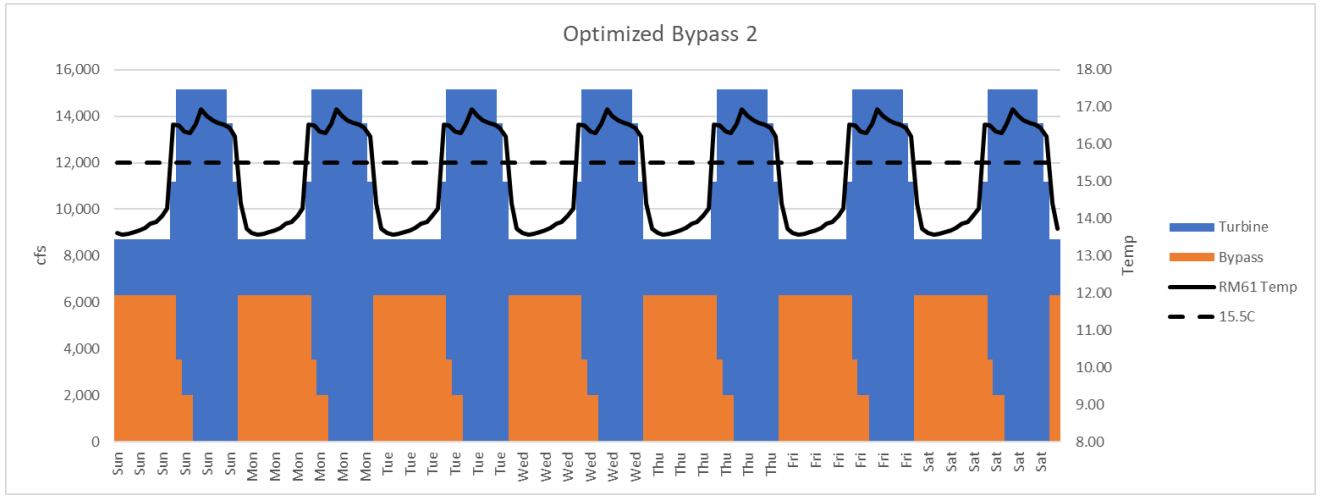
Bypass Optimization Tool

- Can we mitigate some of the cost to purchase replacement power by modifying penstock and bypass releases while maintaining downstream temperature targets?
- Many variables to consider: model inputs/constraints
  - Penstock release temperatures
  - Bypass release temperatures
  - Downstream warming of water by hour of release
  - Energy prices
  - Daily release volume
  - Daily min/max release
  - Min penstock release
  - Min bypass release
  - Number of bypass changes per day (4 max)
  - RM temp target (in this case rm 61), 15.5c daily average
  - Daily temperature fluctuation max (4c hourly/daily)
  - Temperature fluctuations, **weather**
- An optimization tool was developed with Argonne National Lab to account for the complex interactions among numerous variables

Week 2





Hydropower metrics of interest

- Energy produced (MWh)
- Total volume released (AF)
- Bypass Volume (AF)
- Daily average bypass flows (CFS)
- Difference in value from flat flow bypass option ($)
- Purchase replacement power ($, MWH)

Forecast modeled cost estimates of SMB flows

Week	Dates	Number of Days	Estimated Cost Flat Bypass Option	Estimated Cost Optimized Bypass	Difference in Value (Flat - Opt)	% Difference in Value (Flat - Opt)
1	Tue Jul 9 - Sat Jul 13	5	$ 1,163,304	$ 1,031,806	$ 131,498	11.3%
2	Sun Jul 14 - Fri Jul 19	6	$ 1,501,651	$ 1,224,129	$ 277,522	18.5%
3	Sat Jul 20 - Fri Jul 26	7	$ 1,653,501	$ 1,325,943	$ 327,558	19.8%
4	Sat Jul 27 - Fri Aug 2	7	$ 1,966,066	$ 1,675,267	$ 290,799	14.8%
5	Sat Aug 3 - Fri Aug 9	7	$ 1,857,335	$ 1,584,859	$ 272,476	14.7%
6	Sat Aug 10 - Wed Aug 14	5	$ 1,339,112	$ 1,076,115	$ 262,997	19.6%
7	Thu Aug 15 - Fri Aug 23	9	$ 3,142,857	$ 2,522,482	$ 620,375	19.7%
8	Sat Aug 24 - Fri Aug 30	7	$ 2,286,030	$ 1,953,219	$ 332,811	14.6%

Initial estimates do not cite, draft only

Forecast modeled cost estimates of SMB flows

				Optimized Bypass Estimated Costs		Post-hoc Analysis
Week	Dates	Number of Days	Purchased (MW)	Argus Forward Curve* ($)	Median of Price Vectors ($)	MCG Weighted Avg hourly# ($)
1	Tue Jul 9 - Sat Jul 13	5	13,701	1,031,806	624,550	794,926
2	Sun Jul 14 - Fri Jul 19	6	18,855	1,224,129	822,112	912,171
3	Sat Jul 20 - Fri Jul 26	7	20,698	1,325,943	899,064	1,033,776
4	Sat Jul 27 - Fri Aug 2	7	24,171	1,675,267	1,076,833	1,285,250
5	Sat Aug 3 - Fri Aug 9	7	21,038	1,584,859	971,140	1,099,109
6	Sat Aug 10 - Wed Aug 14	5	15,300	1,076,115	696,585	765,375
7	Thu Aug 15 - Fri Aug 23	9	35,329	2,522,482	1,613,214	
8	Sat Aug 24 - Fri Aug 30	7	25,894	1,953,219	1,195,615	
	Est. Total through week 4:		77,425	$ 5,257,144	$ 3,422,560	$ 4,026,123
	Est. Total through Week 8:		174,985	$ 12,393,819	$ 7,899,115	

*Argus Forward Curve (FWD Curve) based on the Palo Verde Index

Preliminary MCG Values are weighted average of prescheduled and real-time energy transaction prices

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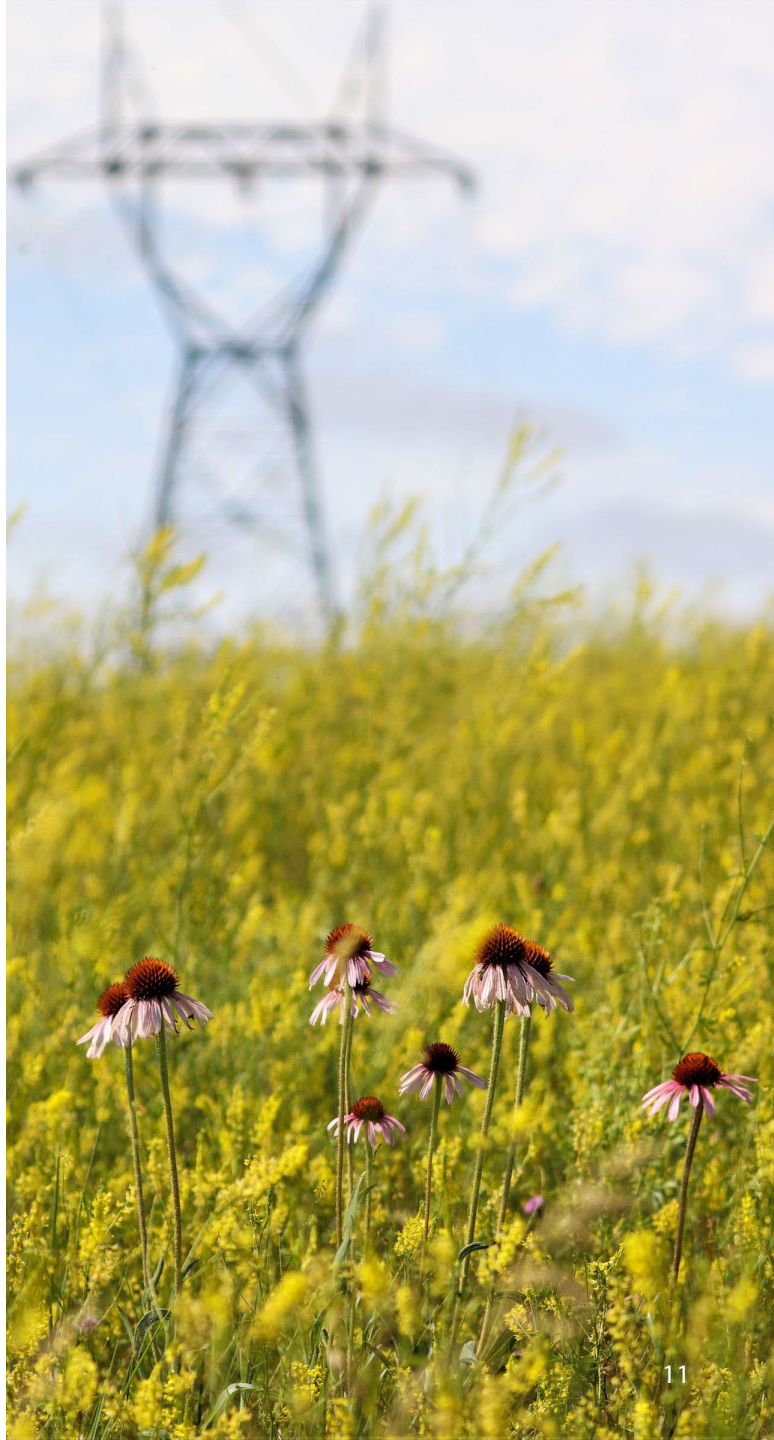
Basin Fund Status and Projection

- Oct 1, 2023 Basin Fund Balance: $203M
  - Includes $85 of BIL funds from FY22/23 that needs to be returned (likely prior to 2032).
- Projected September 30, 2024 balance: $170M
  - Includes projected SMB experiment through Sep 30.
- FY25 Basin Fund Requirements:
  - GCD Experiments (SMB/HFE/other)
  - Capital Expenditures in FY25 (WAPA and BOR): $48M
  - Unexpected requirements
    - Phase Shifting Transformers: $20-$30M - must replace pair.
    - Not included in FY25 capital expenditure number above



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