NID PFW Reservoir Operations Modeling

Strategic Alternatives
March 21, 2024

Agenda

- Review Modeling Assumptions
- Review Strategic Alternatives
- Modeling Results
- Next Steps

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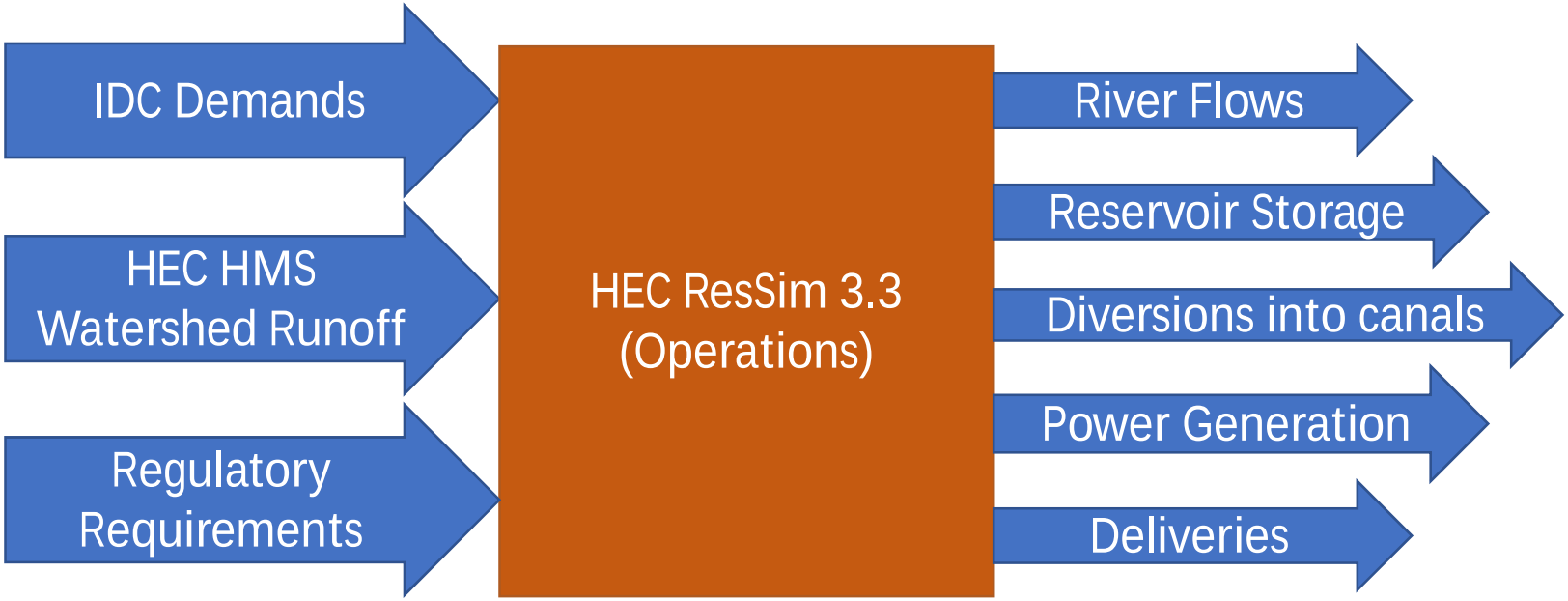
Reservoir Operations Model

US Army Corps
of Engineers
Hydrologic Engineering Center

HEC-ResSim

Reservoir System Simulation



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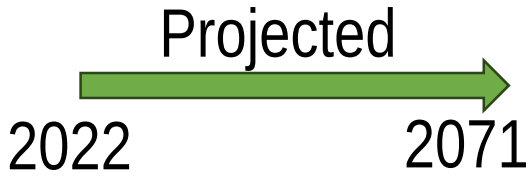
Projected Hydrology

Projected Scenarios

Climate Models Selected for Use

Scenarios	Models and Emissions
High Bookend (Wet)	EC-Earth3-Veg_ssp370
Median	CNRM-ESM2 1_ssp245
Low Bookend (Dry)	CESM2-LENS_ssp370



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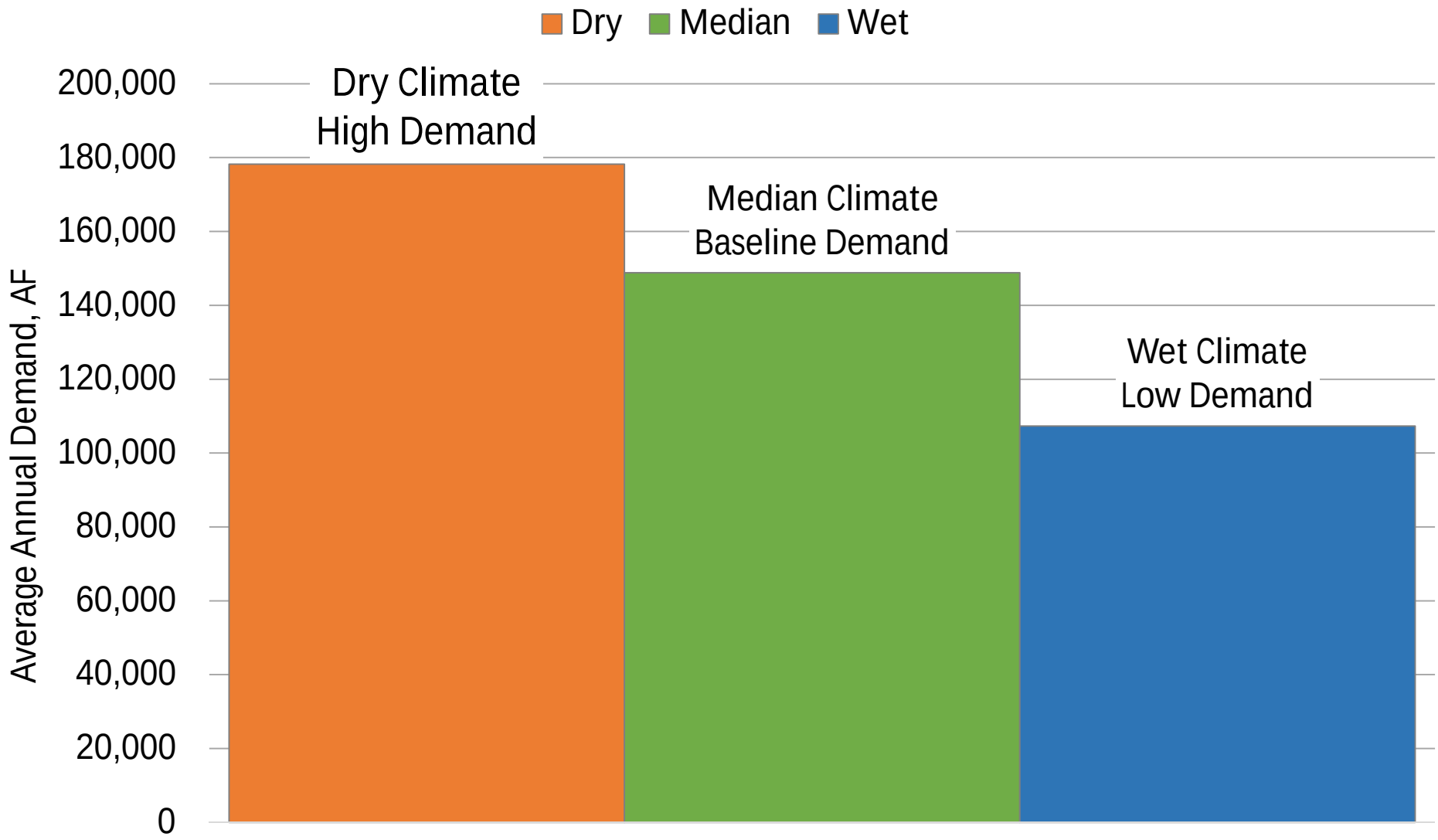
Consumptive Demands (Acre-Feet)



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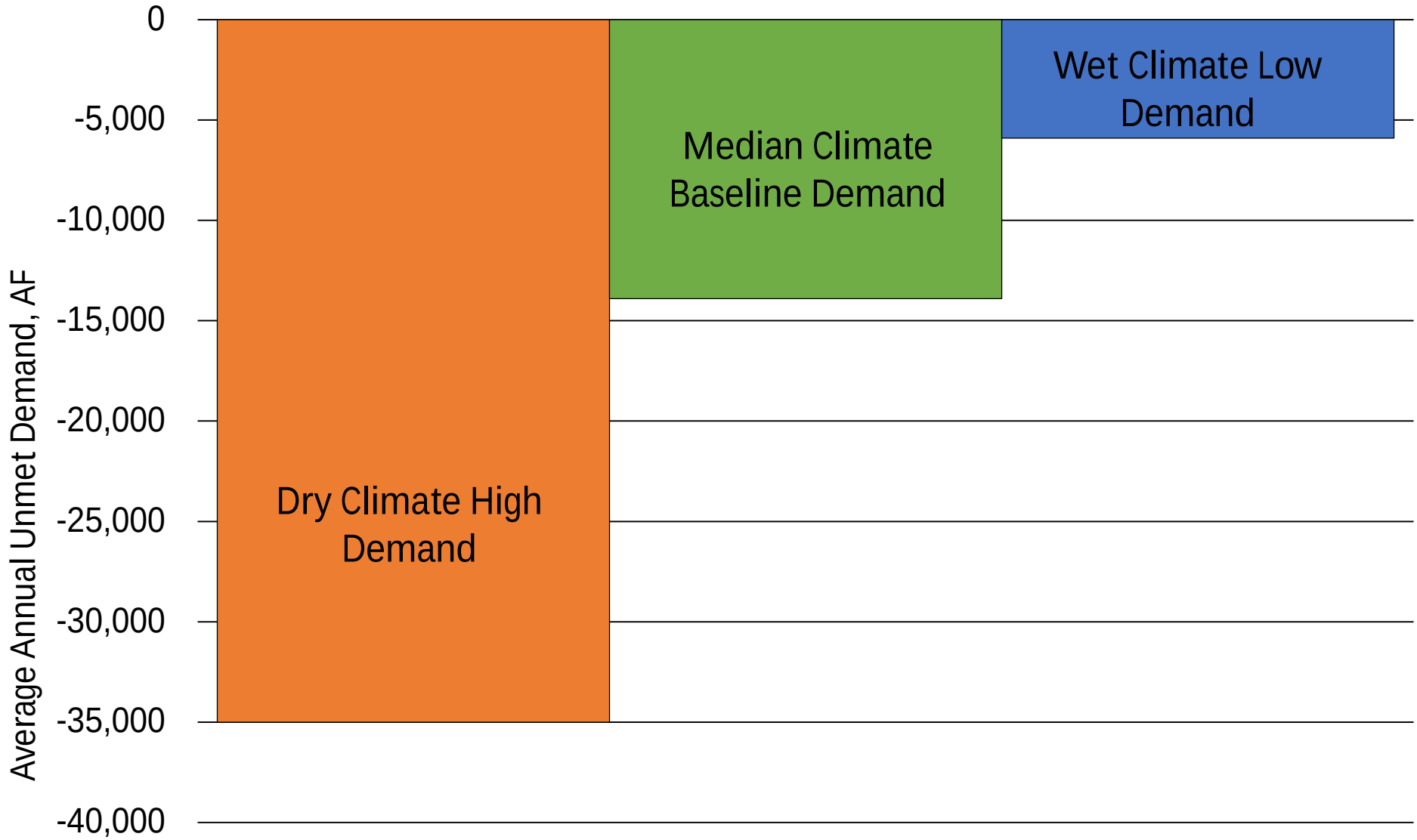
Unmet Demands (Acre-Feet)



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Strategic Alternatives That Required Modeling

- Increase Rollins Reservoir 10,000 Acre-Feet
- Increase Rollins Reservoir 50,000 Acre-Feet
- Build Centennial Reservoir 110,000 Acre-Feet

- Extended Irrigation Season through October 31

- Revised Carryover Targets
- Water Purchases from PG&E

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Revised Carryover Targets

Carryover Targets, AF		
	Existing	Revised Carryover Targets
Jackson Meadows	35,000	21,000
Bowman	30,000	14,500
Sawmill	1,500	1,000
French	7,000	5,000
Faucherie	2,100	1,500
Jackson	600	1,000
Rollins	40,000	25,000
Scotts Flat	23,000	17,000
Combie	2,500	2,500
Total	141,700	88,500

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Revised Carryover Targets

- Draw Reservoirs down further to move more water in the summer and fall
- Increase “Net Storage” in the annual allocation logic

Delivery Allocation		100%	>= 90%	>= 80%
Dry Climate High Demand	Existing Carryover	43%	67%	86%
	Revised Carryover	69%	84%	94%
Median Climate Base Demand	Existing Carryover	69%	86%	94%
	Revised Carryover	88%	94%	100%
Wet Climate Low Demand	Existing Carryover	76%	86%	94%
	Revised Carryover	88%	96%	100%

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Revised Carryover Targets

- Average November 1 Storage Levels

	Existing Carryover	Revised Carryover
Dry Climate High Demand	110,800	91,700
Median Climate Base Demand	131,400	114,700
Wet Climate Low Demand	147,800	134,300

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Revised Carryover Targets

- Unmet Demand – Annual Average

	Existing Carryover	Revised Carryover
Dry Climate High Demand	35,000	28,900
Median Climate Base Demand	13,900	10,300
Wet Climate Low Demand	5,900	3,100

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Revised Carryover Targets

- Unmet Demand – Worst 3-year Deficiency

	Existing Carryover	Revised Carryover
Dry Climate High Demand	211,300	182,900
Median Climate Base Demand	92,600	67,000
Wet Climate Low Demand	58,900	38,600

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Water Purchases from PG&E

- 2018 COA between NID and PG&E allows for NID to purchase water from PG&E
- Maximum purchase volumes are based on Sac Valley Water Supply Index:

	Dry Years	Normal Years
Deer Creek Powerhouse	31,962 AF	41,341 AF
Bear River Canal	12,490 AF	13,020 AF
Combined	44,182 AF	54,361 AF

- Volumes can be reduced further in Dry years, as low as 25,000 AF

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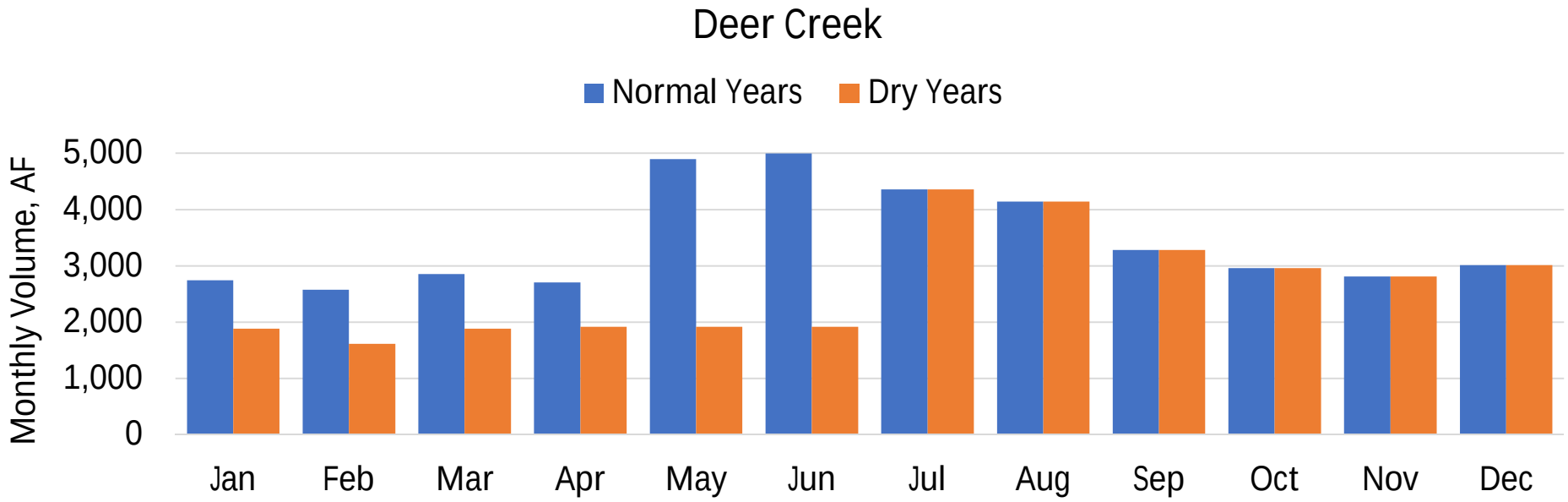
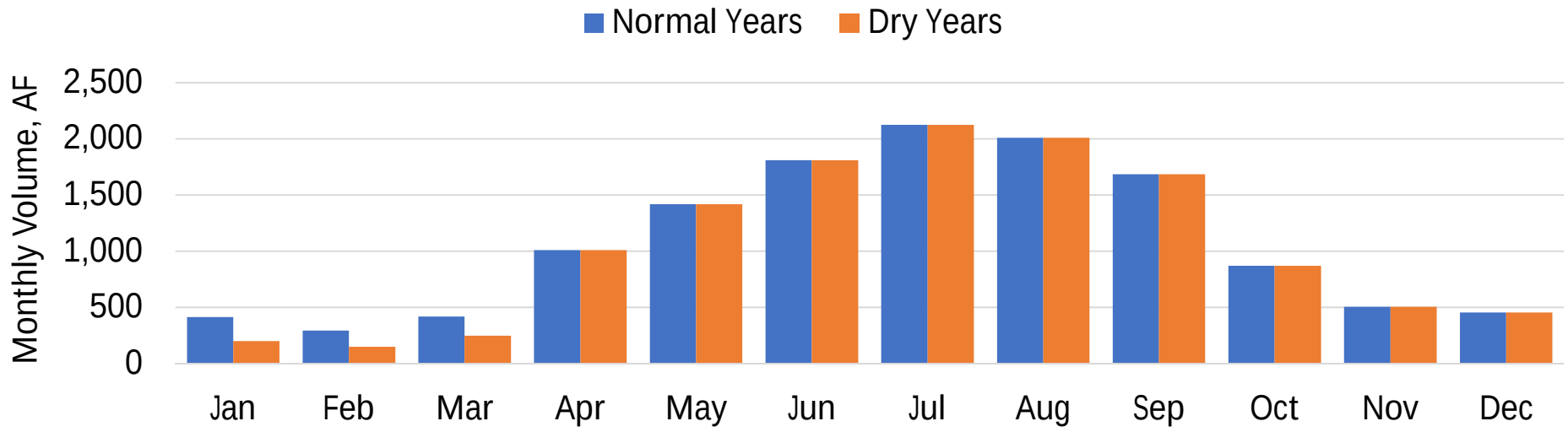
Water Purchases from PG&E





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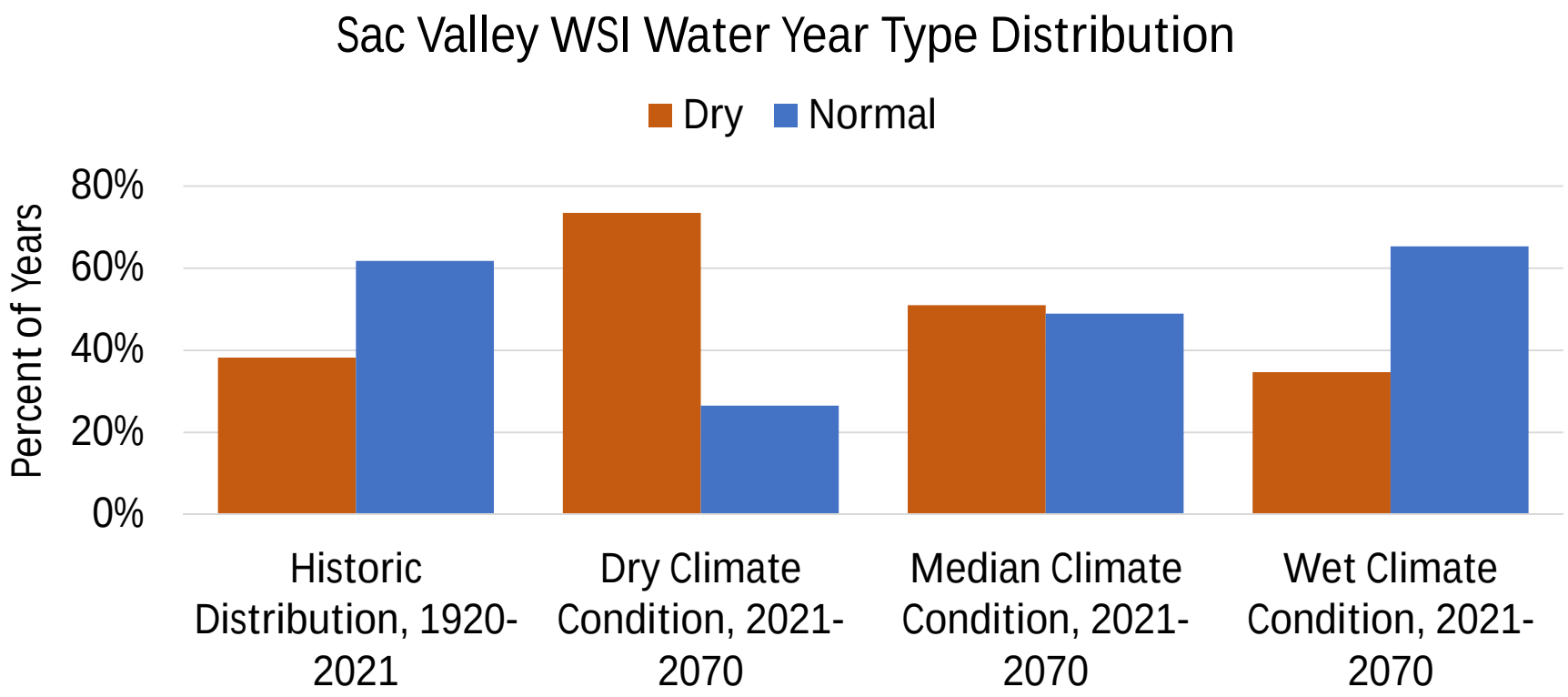
Monthly Available Purchase Volumes

Water Purchases from PG&E

- Regression-based estimate of Sac Valley WSI with climate change hydrology



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Water Purchases from PG&E

- Estimated Sac Valley WSI WY Types are used to determine water available for purchase each month
- Look at Baseline model results to determine when purchase could be used to reduce unmet demand

	Dry Scenario	Median Scenario	Wet Scenario
Maximum Available for Purchase	54,400	54,400	54,400
Average Available for Purchase	40,200	44,600	47,400
Average Purchased	16,600	9,800	4,100

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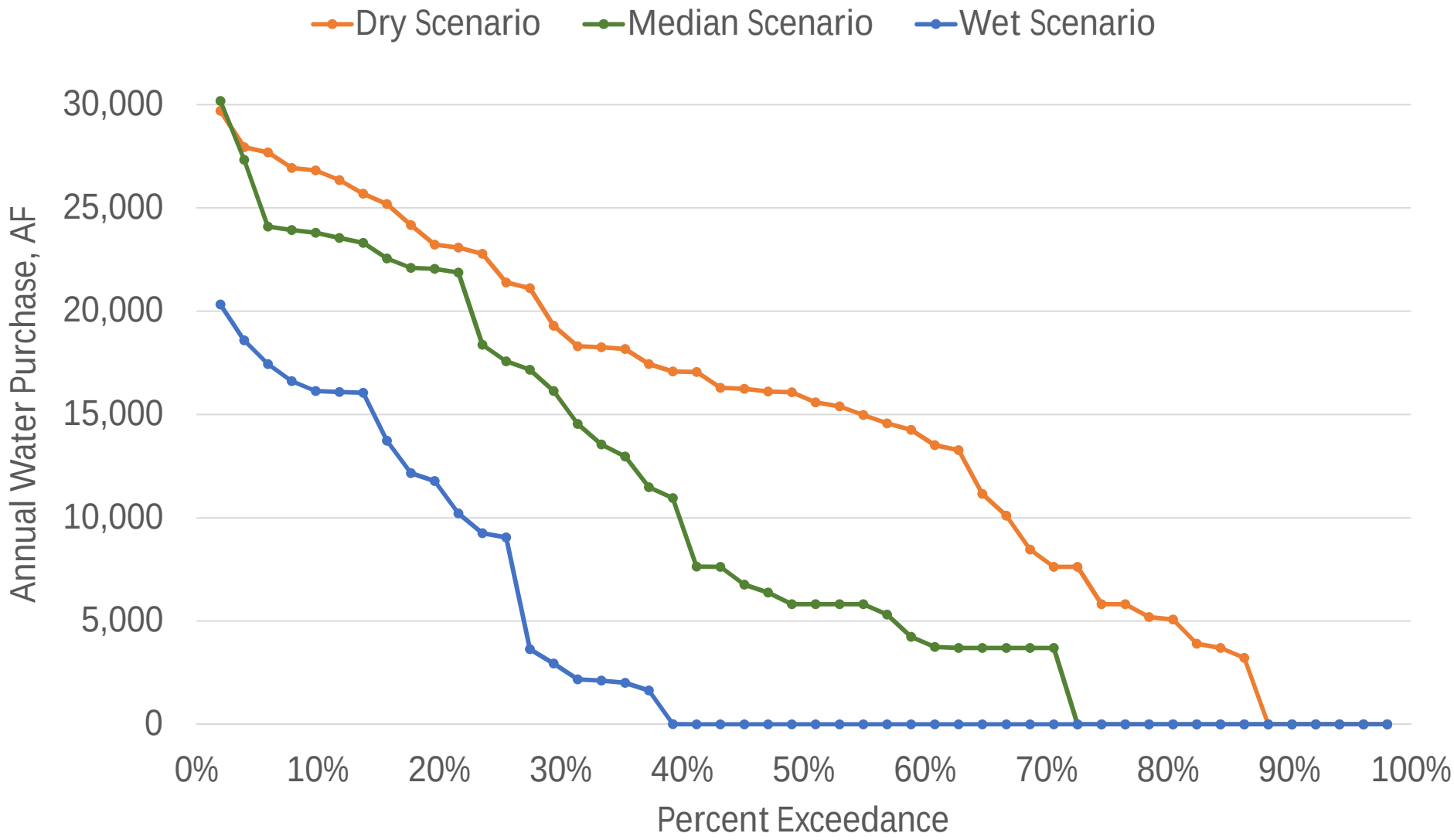
Water Purchase Volumes



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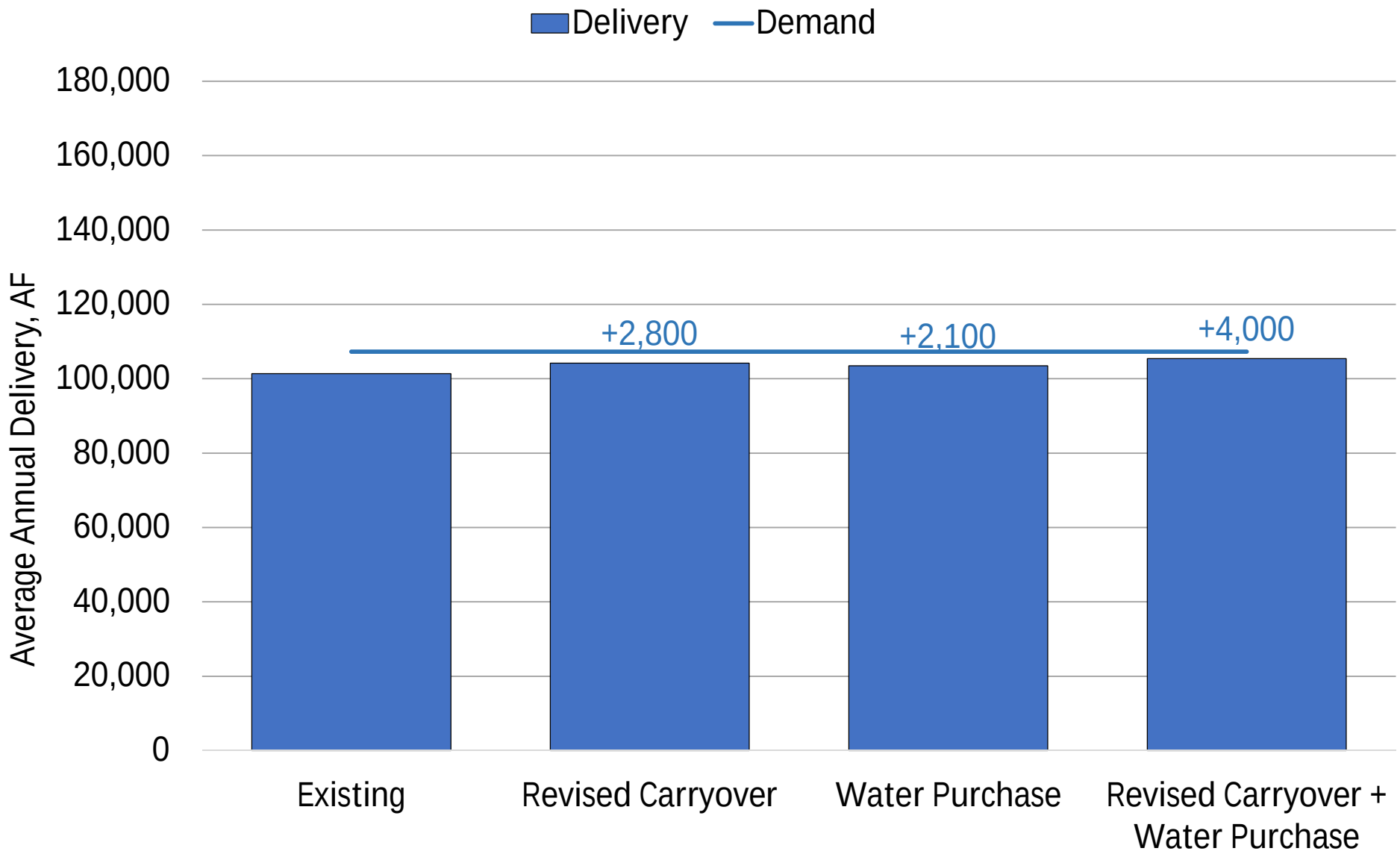
Water Purchases + Revised CO Targets

- Revised Carryover Targets provide more supply on average, so unmet demands are reduced further or less purchase is needed
- Unmet Demand – Worst 3-year Deficiency

	Existing Carryover	Revised Carryover
Dry Climate High Demand	211,300	167,400
Median Climate Base Demand	92,600	50, 700
Wet Climate Low Demand	58,900	29,100

Results Summary – Deliveries

Wet Hydrology Low Demand



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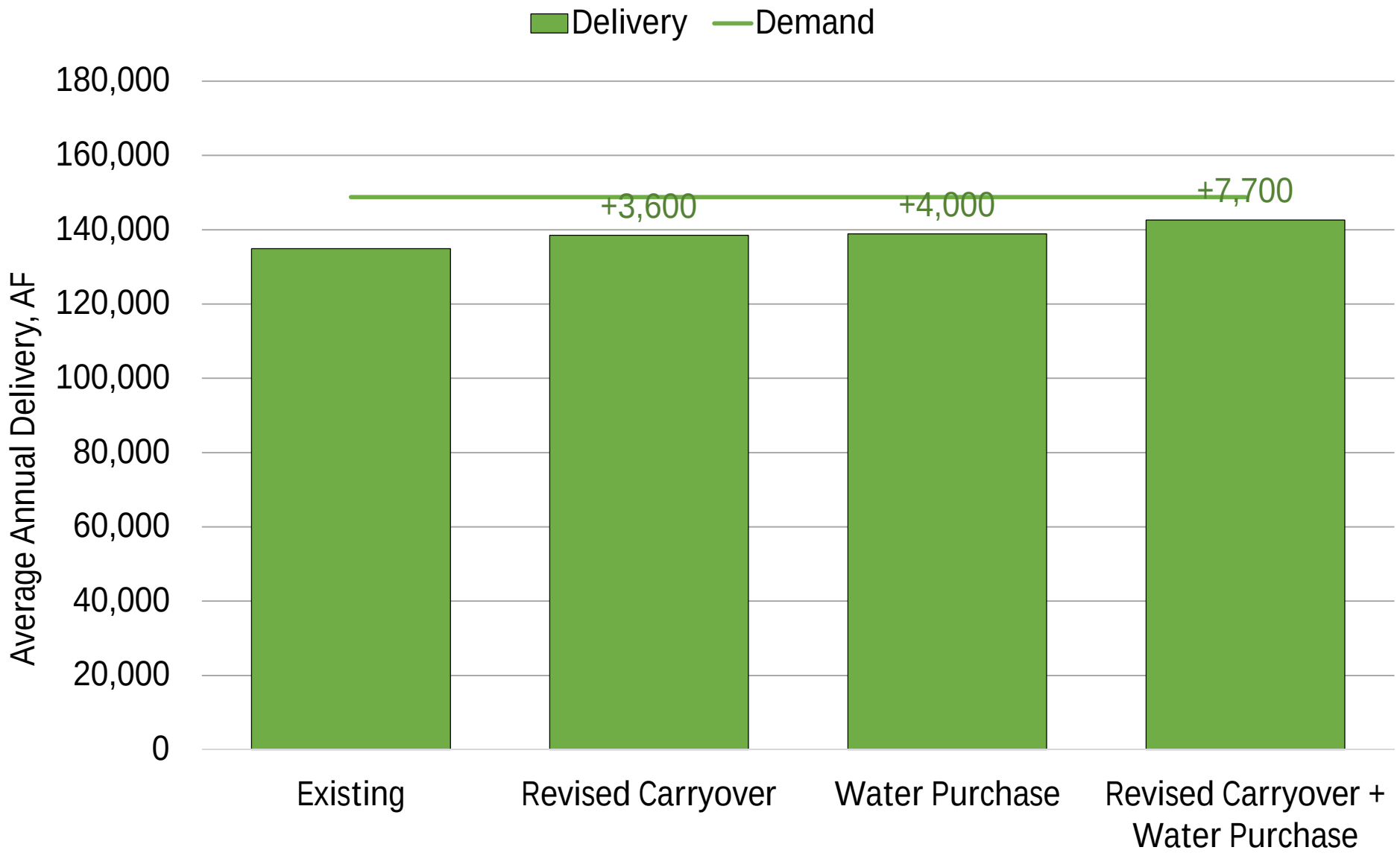
Results Summary – Deliveries

Median Hydrology Baseline Demand



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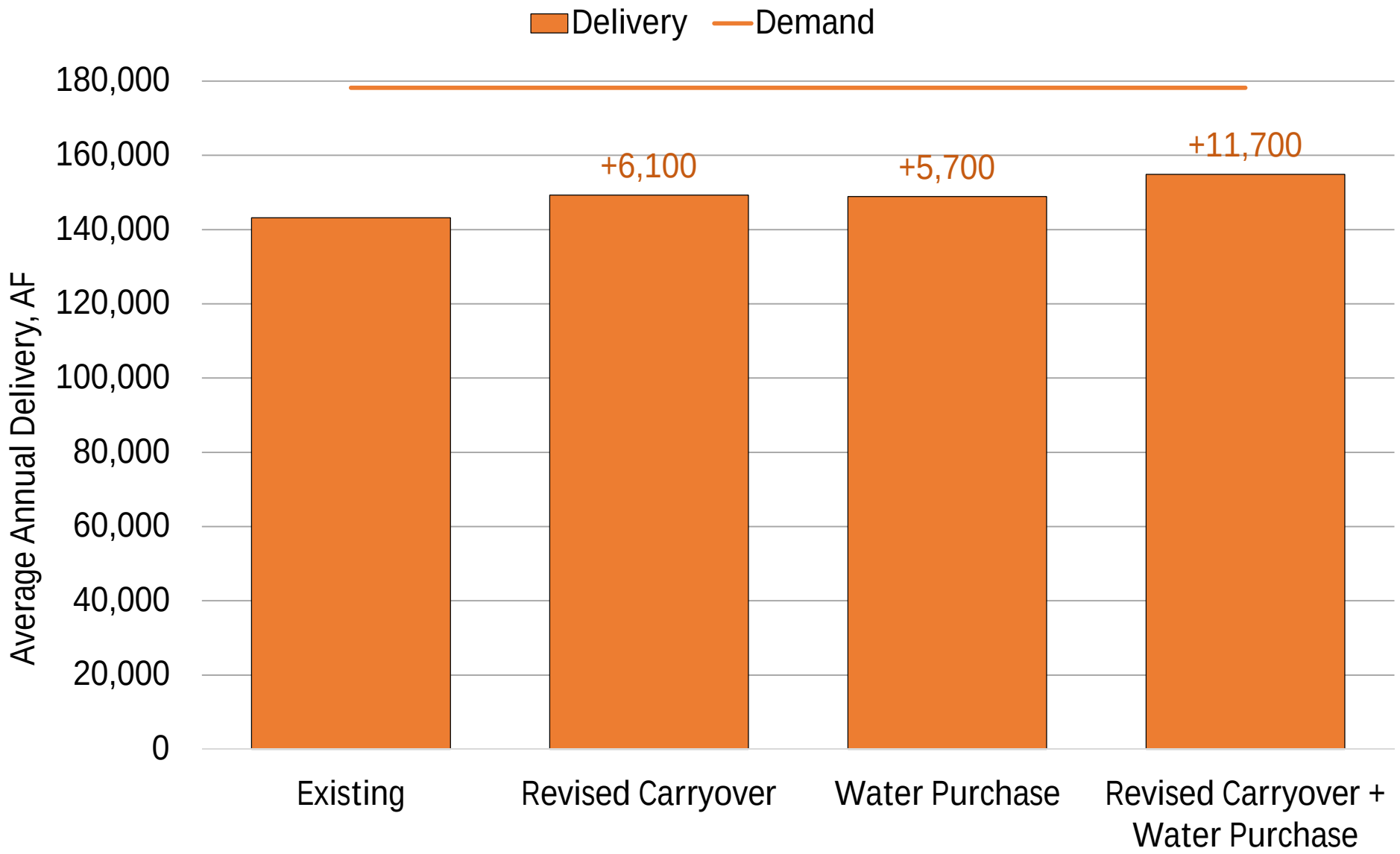
Results Summary – Deliveries

Dry Hydrology High Demand



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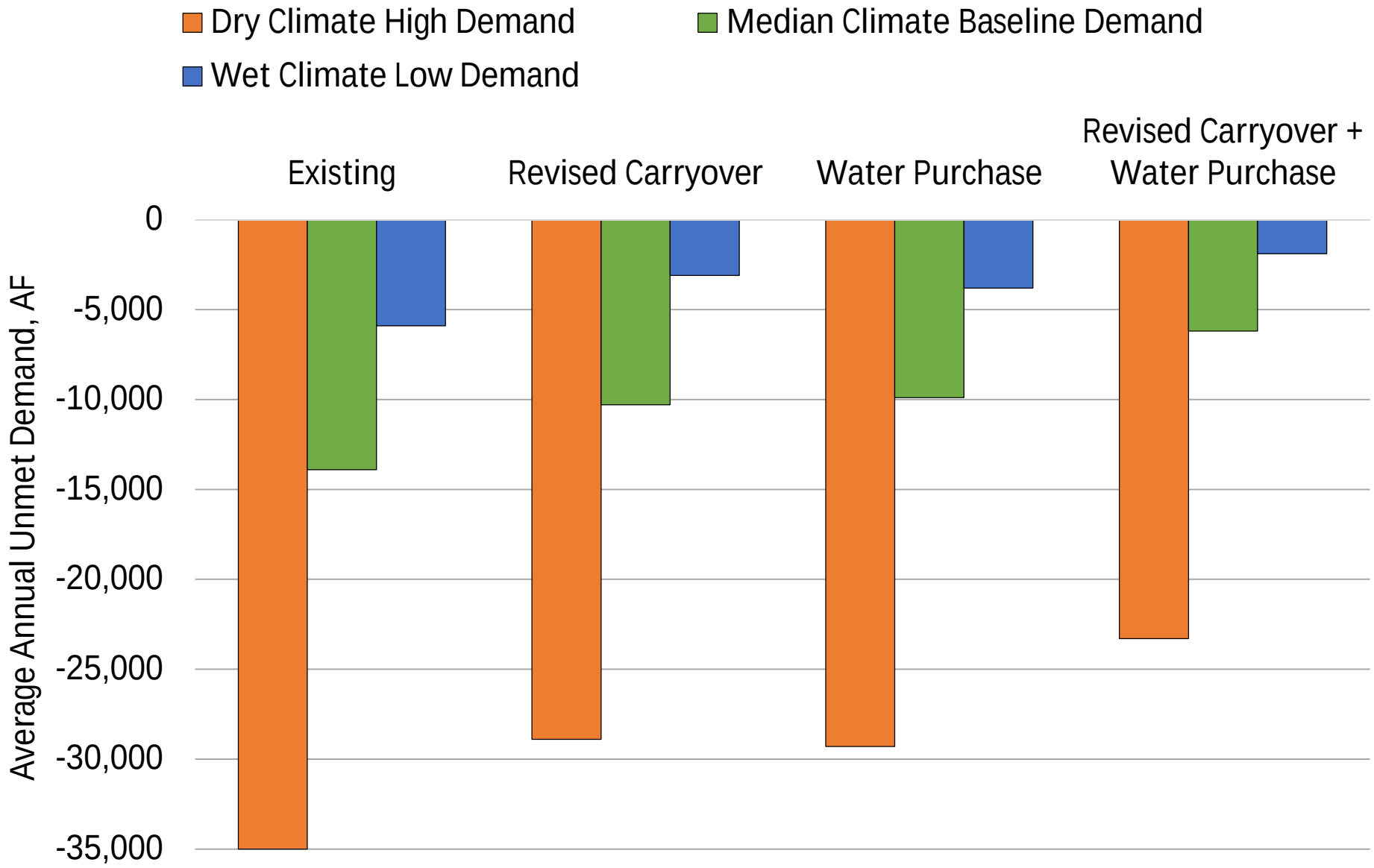
Results Summary - Unmet Demand



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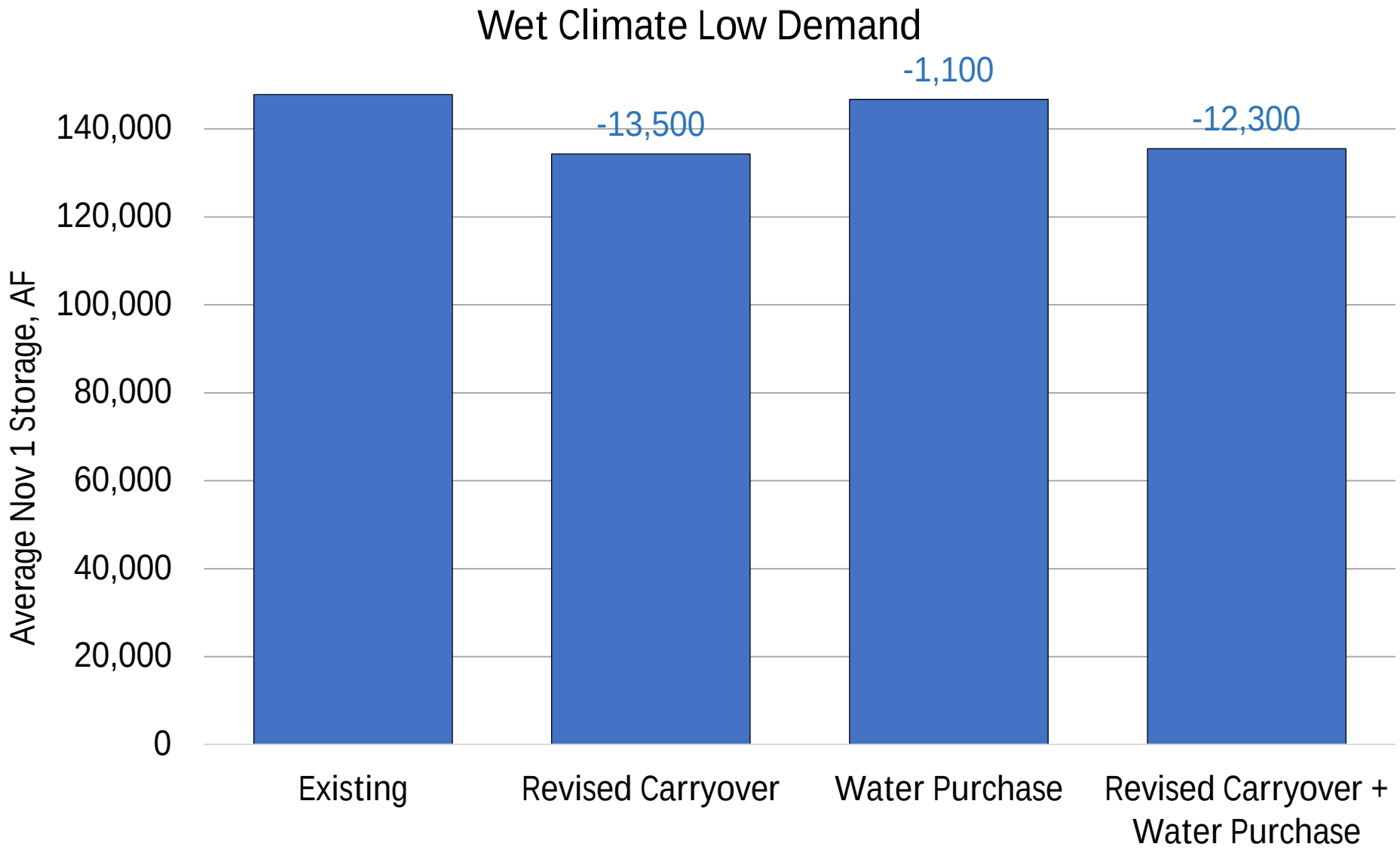
Results Summary – Carryover Storage

Wet Hydrology Low Demand



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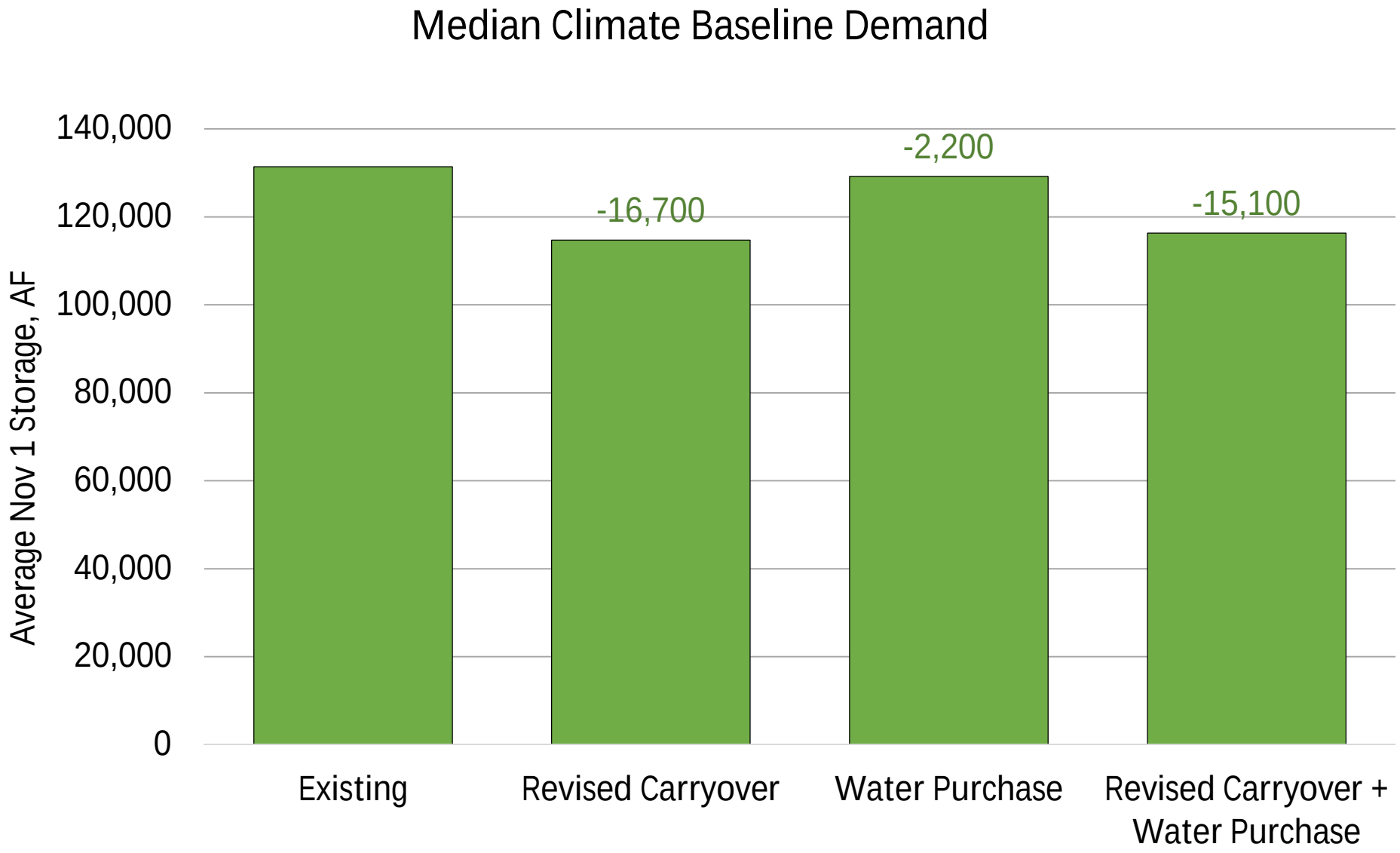
Results Summary – Carryover Storage

Median Hydrology Baseline Demand



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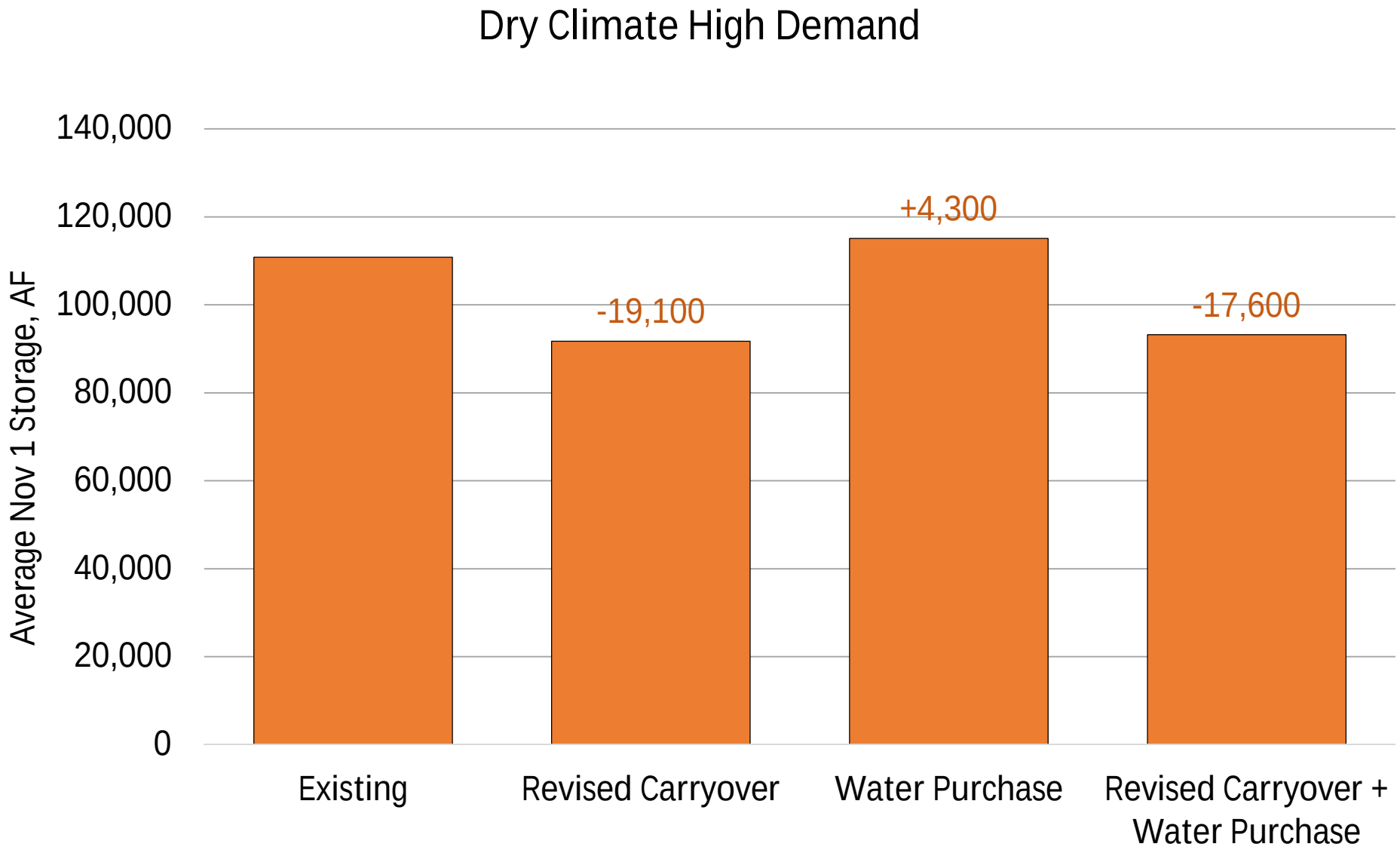
Results Summary – Carryover Storage

Dry Hydrology High Demand



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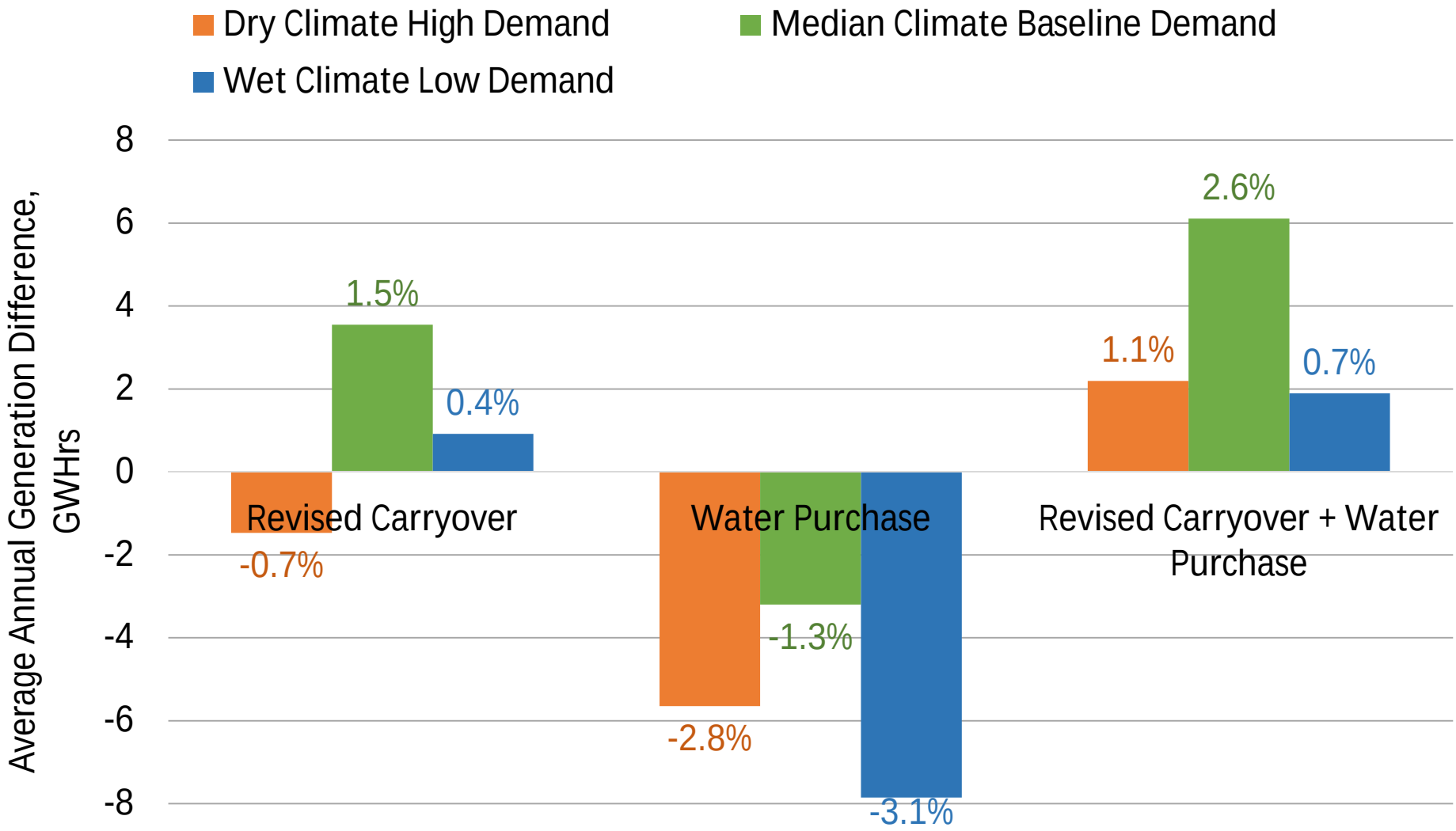
Results Summary - Generation

Difference from Existing Baseline



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Results Summary

Wet Hydrology Low Demand

Change Relative to Existing Baseline

	Revised Carryover Targets	Water Purchases	Revised Carryover + Water Purchases
Delivery	+2,800 AF 3%	+2,100 AF 2%	+4,000 AF 4%
Unmet Demand	-2,800 AF -47%	-2,100 AF -36%	-4,000 AF -68%
Carryover Storage	-13,500 AF -9%	-1,100 AF -1%	-12,300 AF -8%
Generation	+0.9 GWH 0.4%	-7.9 GWH -3.1%	+1.9 GWH 0.7%
Yuba Exports to Deer Creek	+800 AF 4%	+100 AF 0%	0 AF 0%
Yuba Exports to Bear River	+5,700 AF 19%	+1,300 AF 4%	+6,500 AF 22%

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Results Summary

Median Hydrology Baseline Demand

Change Relative to Existing Baseline

	Revised Carryover Targets	Water Purchases	Revised Carryover + Water Purchases
Delivery	+3,600 AF 3%	+4,000 AF 3%	+7,700 AF 6%
Unmet Demand	-3,600 AF -26%	-4,000 AF -29%	-7,700 AF -55%
Carryover Storage	-16,700 AF -13%	-2,200 AF -2%	-15,100 AF -11%
Generation	+3.6 GWH 1.5%	-3.2 GWH -1.3%	+6.1 GWH 2.6%
Yuba Exports to Deer Creek	+1400 AF 6%	-400 AF -2%	-600 AF -3%
Yuba Exports to Bear River	+4,900 AF 17%	+1,400 AF 5%	+6,100 AF 22%

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Results Summary

Dry Hydrology High Demand

Change Relative to Existing Baseline

	Revised Carryover Targets	Water Purchases	Revised Carryover + Water Purchases
Delivery	+6,100 AF 4%	+5,700 AF 4%	+11,700 AF 8%
Unmet Demand	-6,100 AF -17%	-5,700 AF -16%	-11,700 AF -33%
Carryover Storage	-19,100 AF -17%	+4,300 AF 4%	-17,600 AF -16%
Generation	-1.5 GWH -0.7%	-5.6 GWH -2.8%	+2.2 GWH 1.1%
Yuba Exports to Deer Creek	+2,100 AF 10%	-1,600 AF -8%	-2,100 AF -10%
Yuba Exports to Bear River	+3,300 AF 13%	+1,500 AF 6%	5,700 AF 22%

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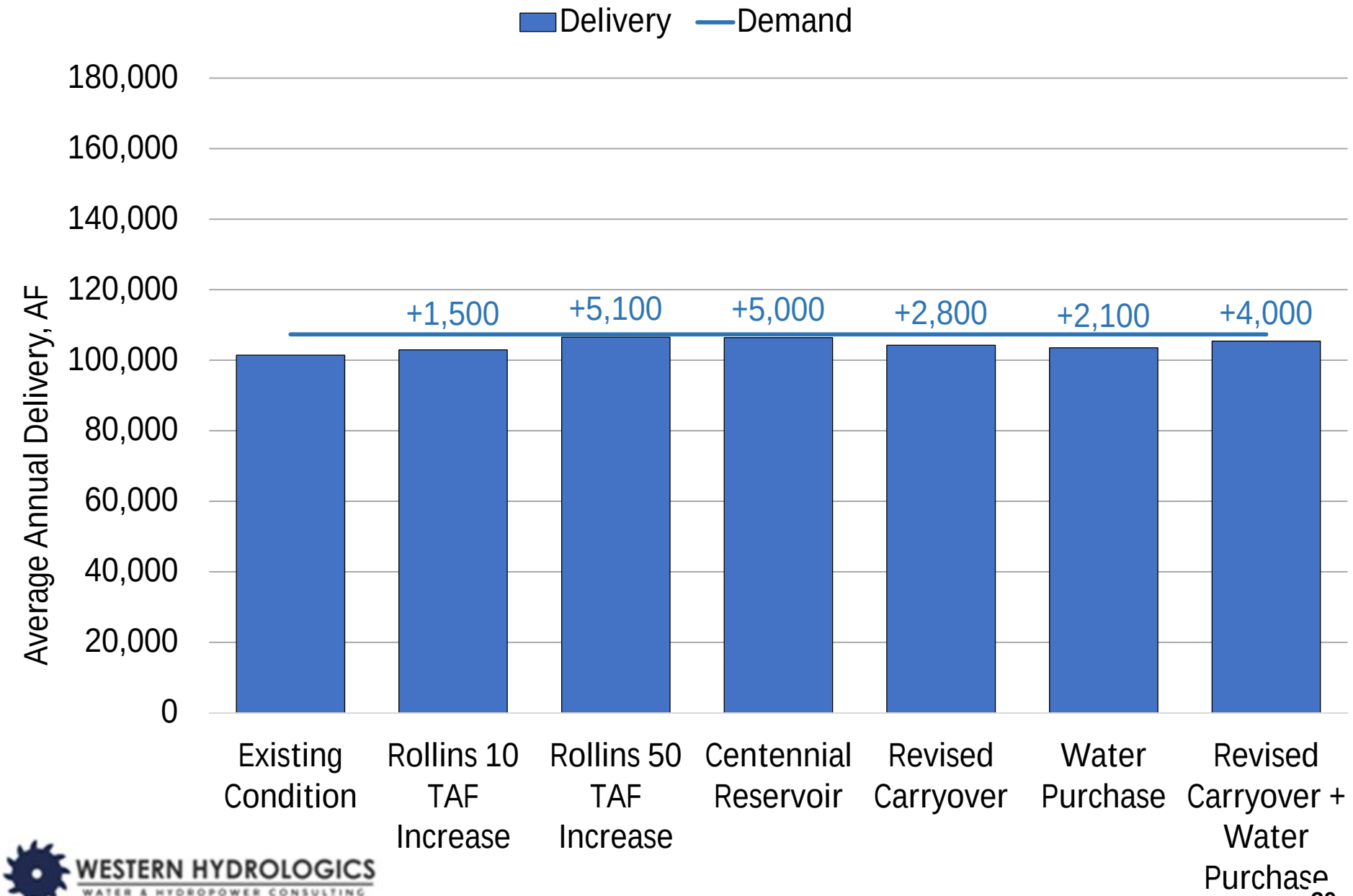
Results Summary – Deliveries

Wet Hydrology Low Demand



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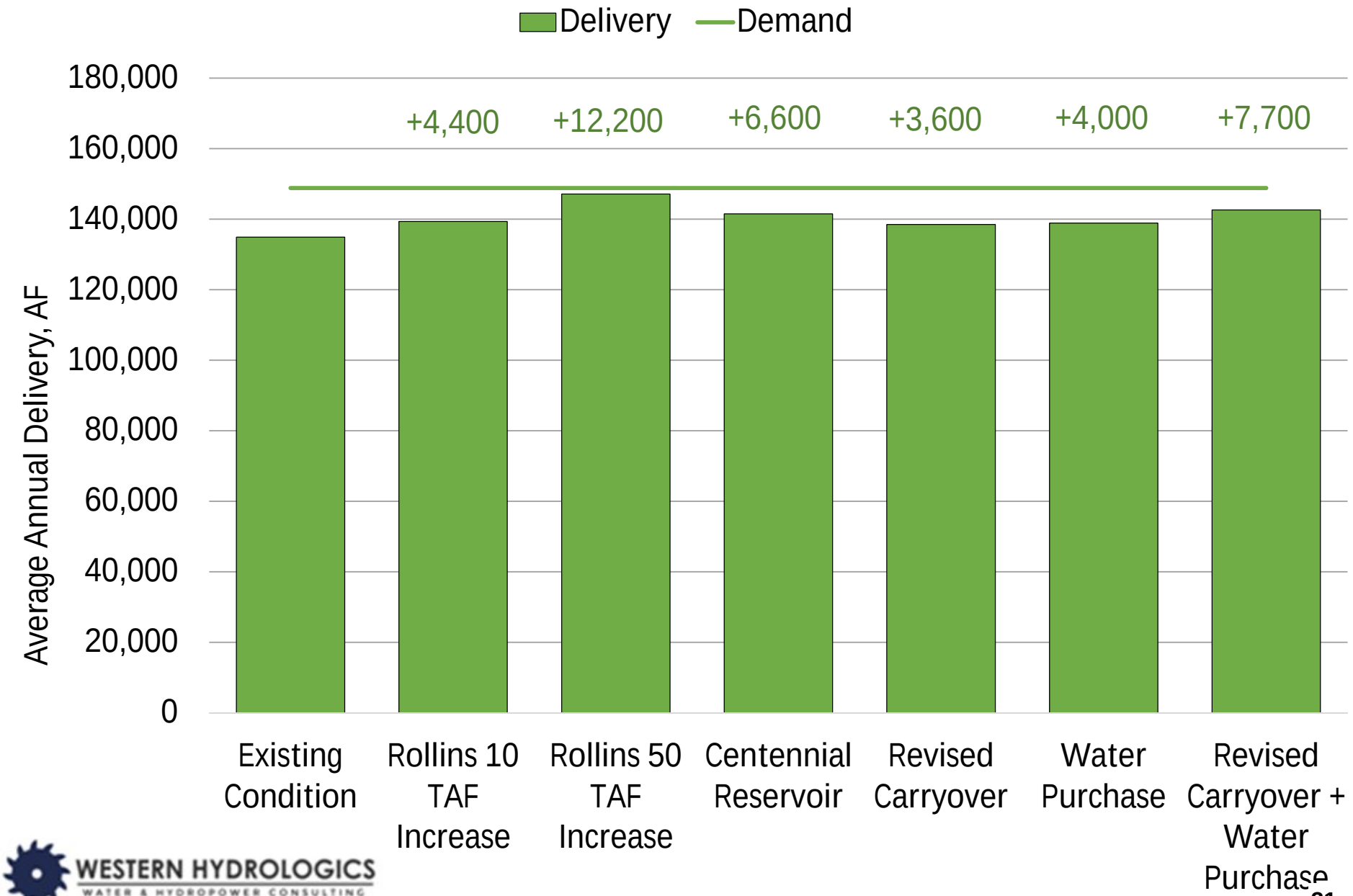
Results Summary – Deliveries

Median Hydrology Baseline Demand



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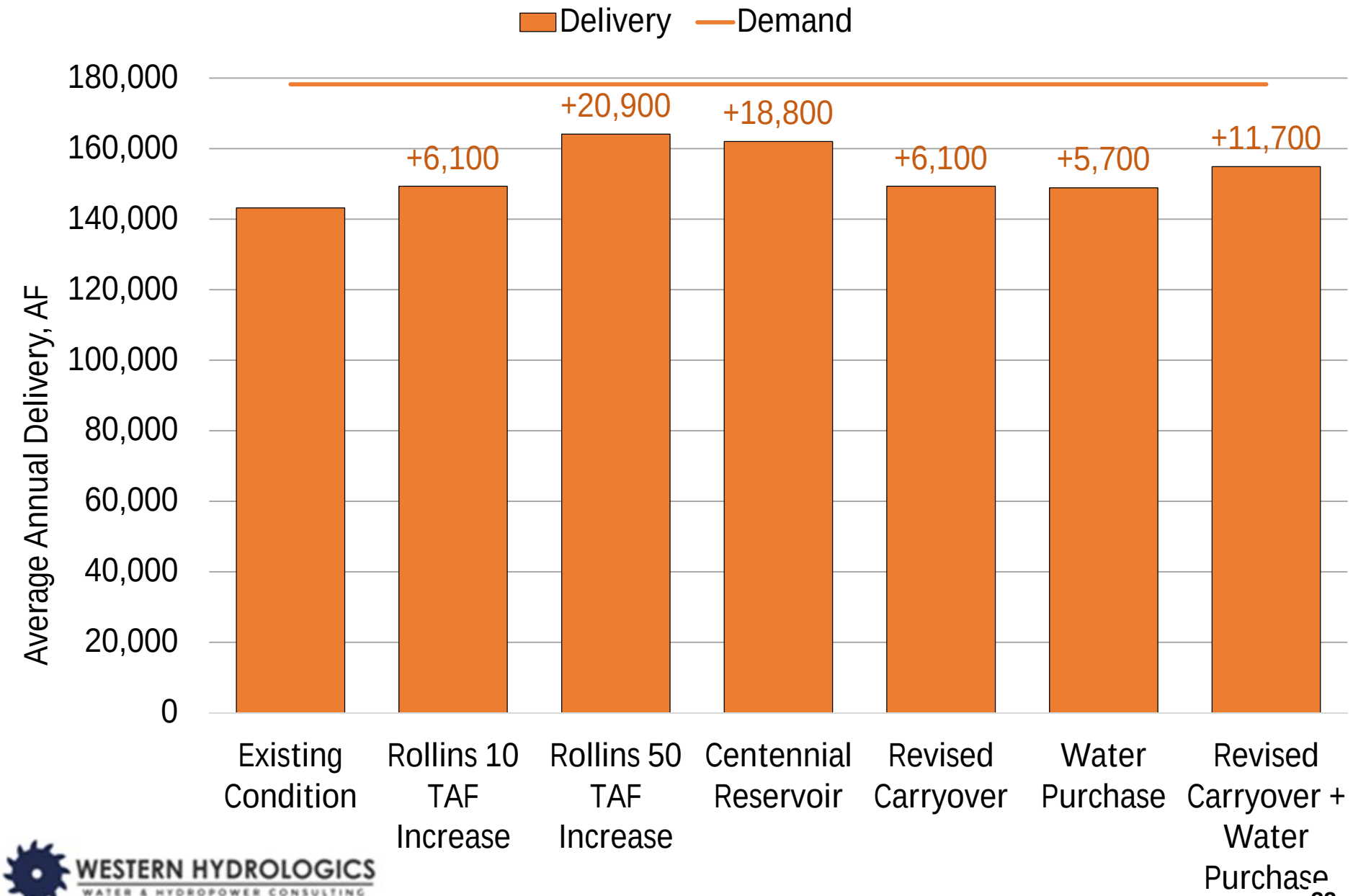
Results Summary – Deliveries

Dry Hydrology High Demand



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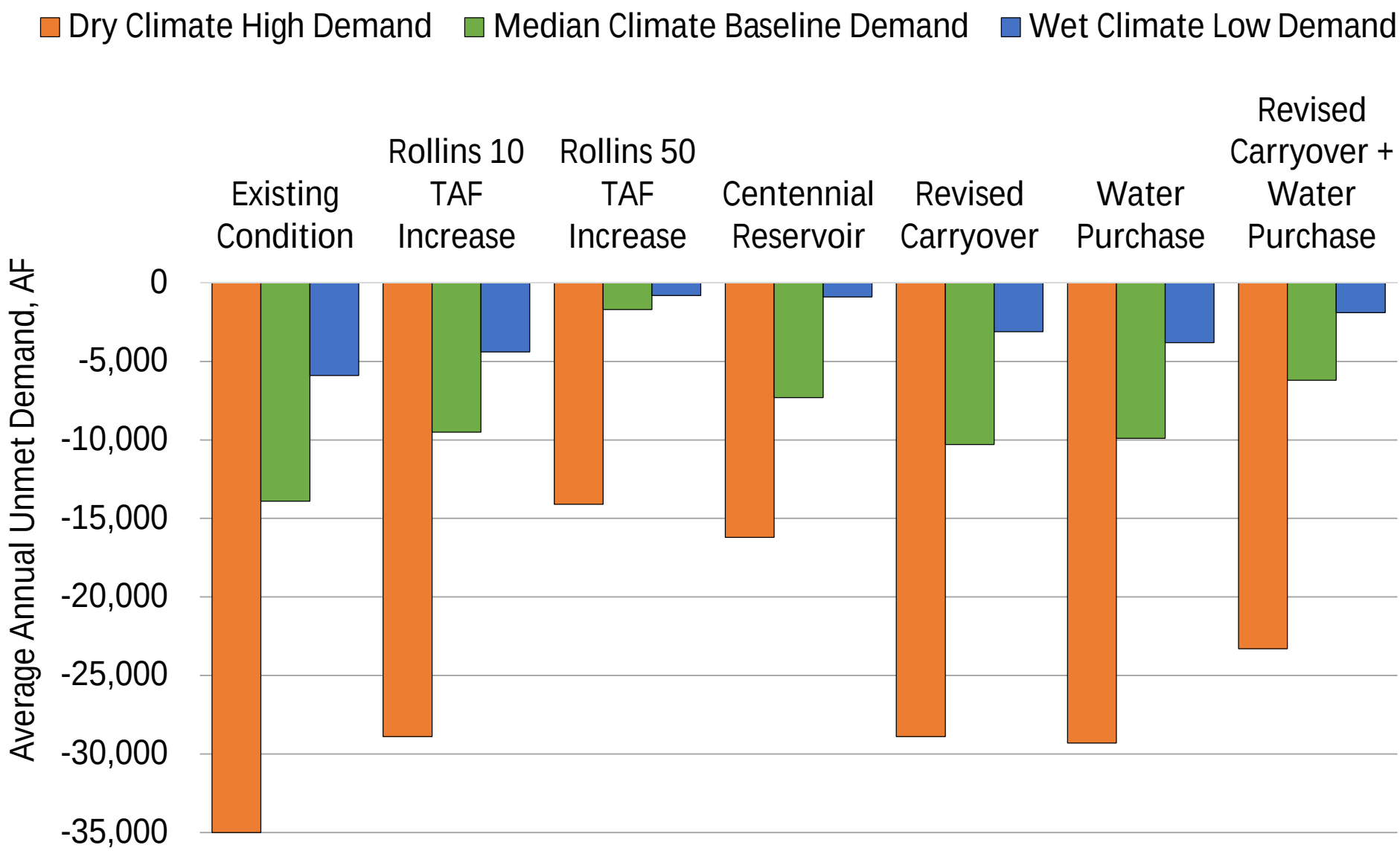
Results Summary - Unmet Demand



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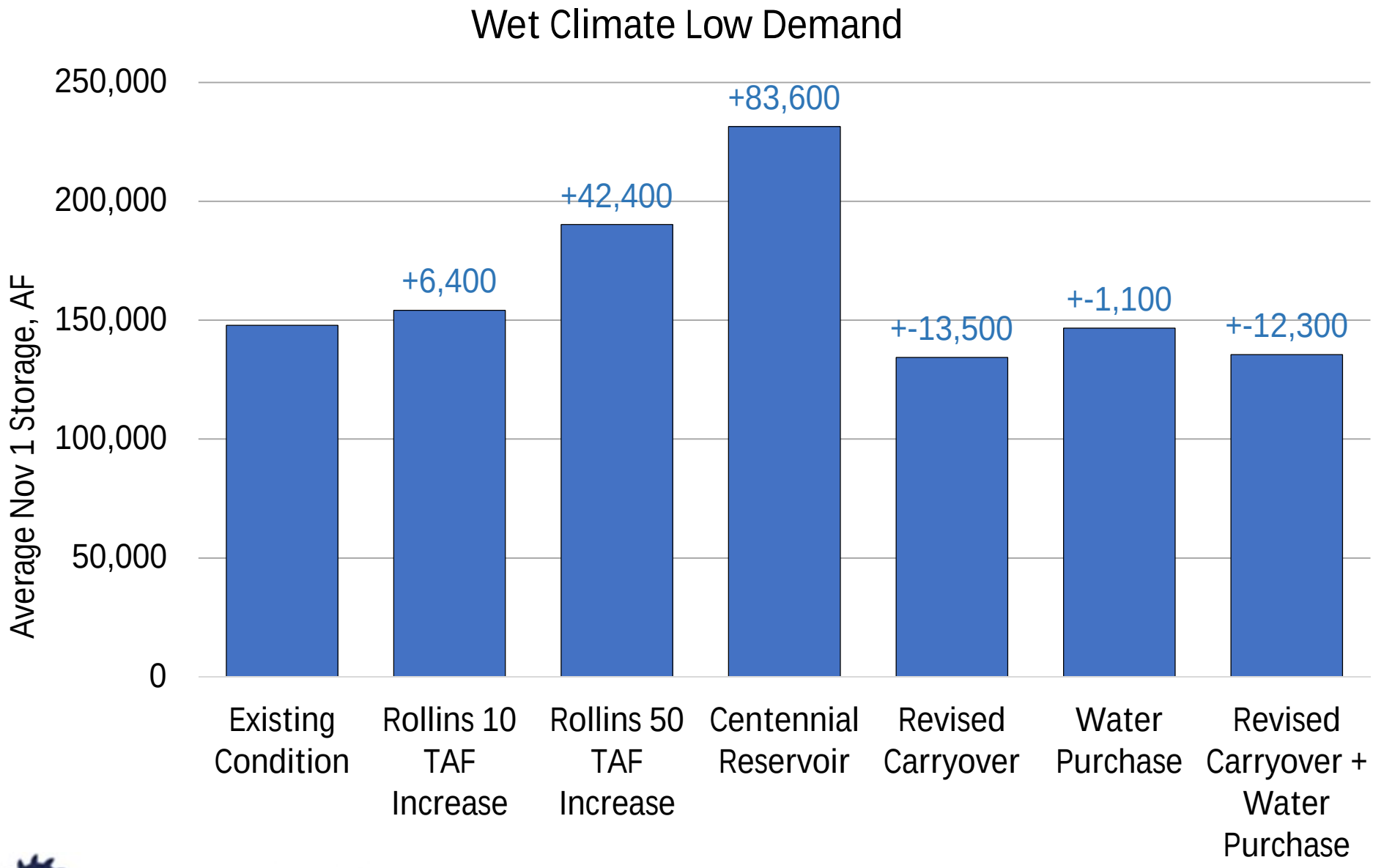
Results Summary – Carryover Storage

Wet Hydrology Low Demand



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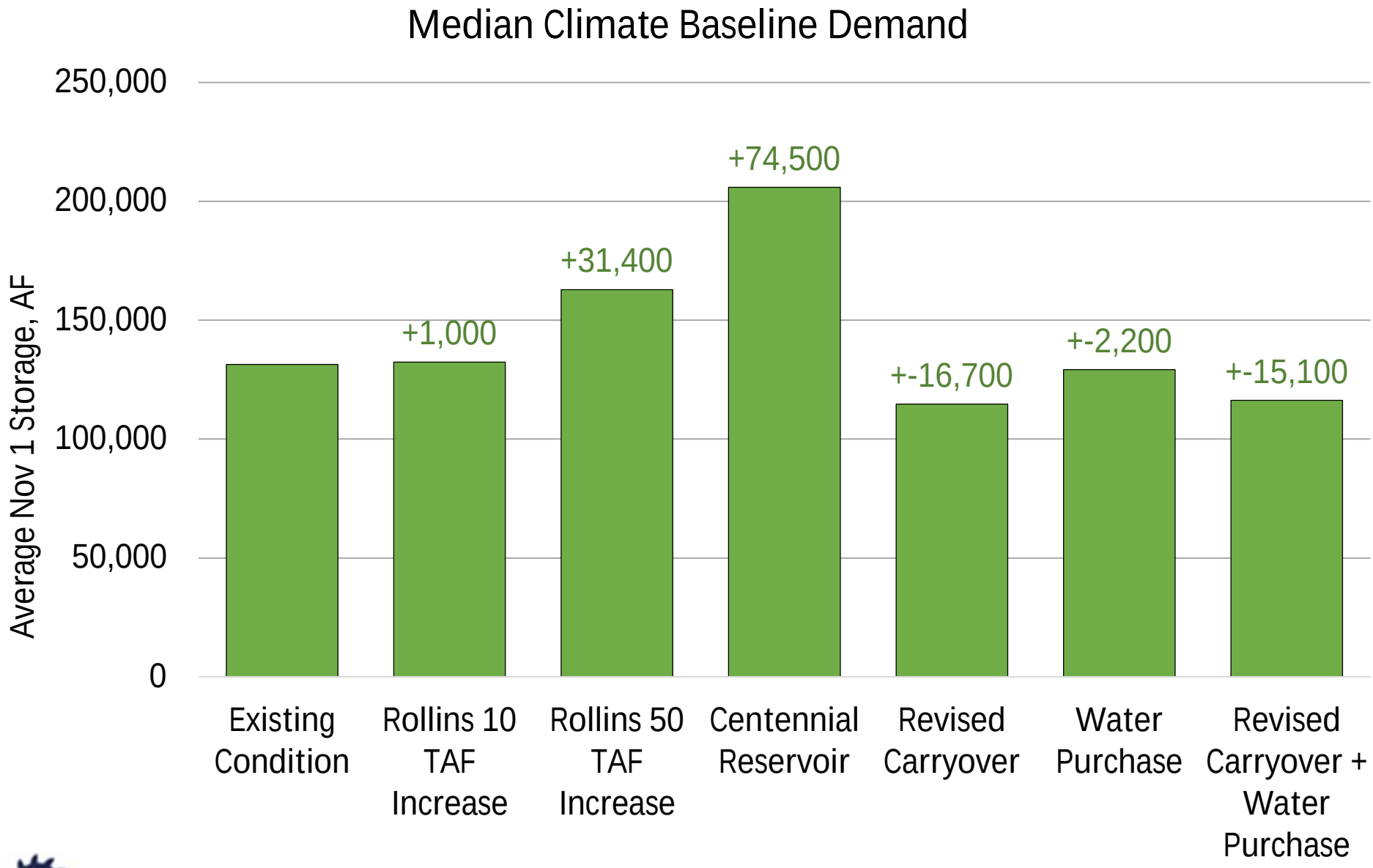
Results Summary – Carryover Storage

Median Hydrology Baseline Demand



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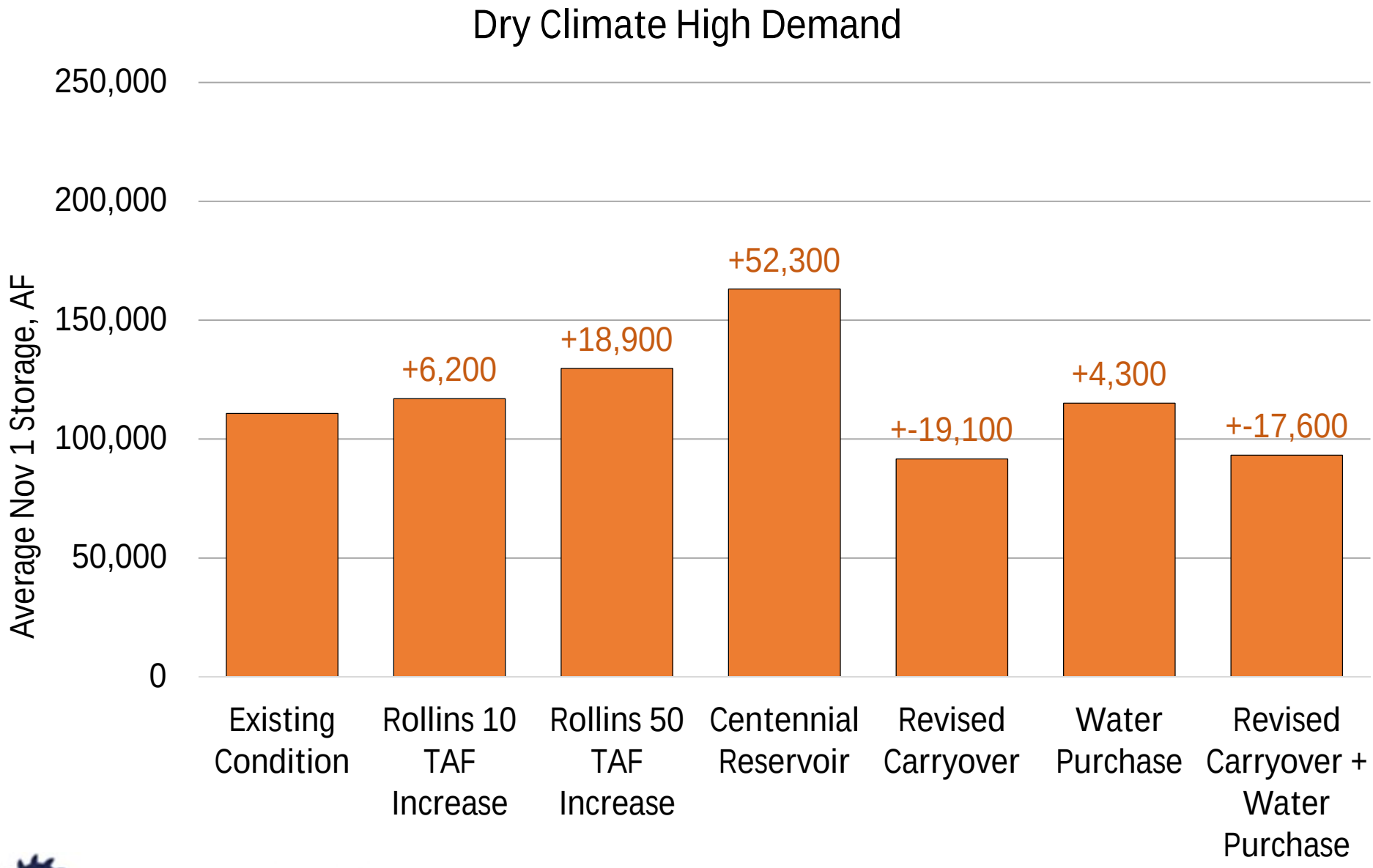
Results Summary – Carryover Storage

Dry Hydrology High Demand



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Next Steps to Complete PFW

- Final Analysis of Storage Options
- Finalize Recommendations for Options Matrix Analysis

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Questions / Comments?