THE USE OF TRWD RIVERWARE OPERATIONAL MODEL AS A PLANNING TOOL FOR ENERGY PRICE SPIKE RESPONSE POLICY




riverware
2023 User Group Meeting

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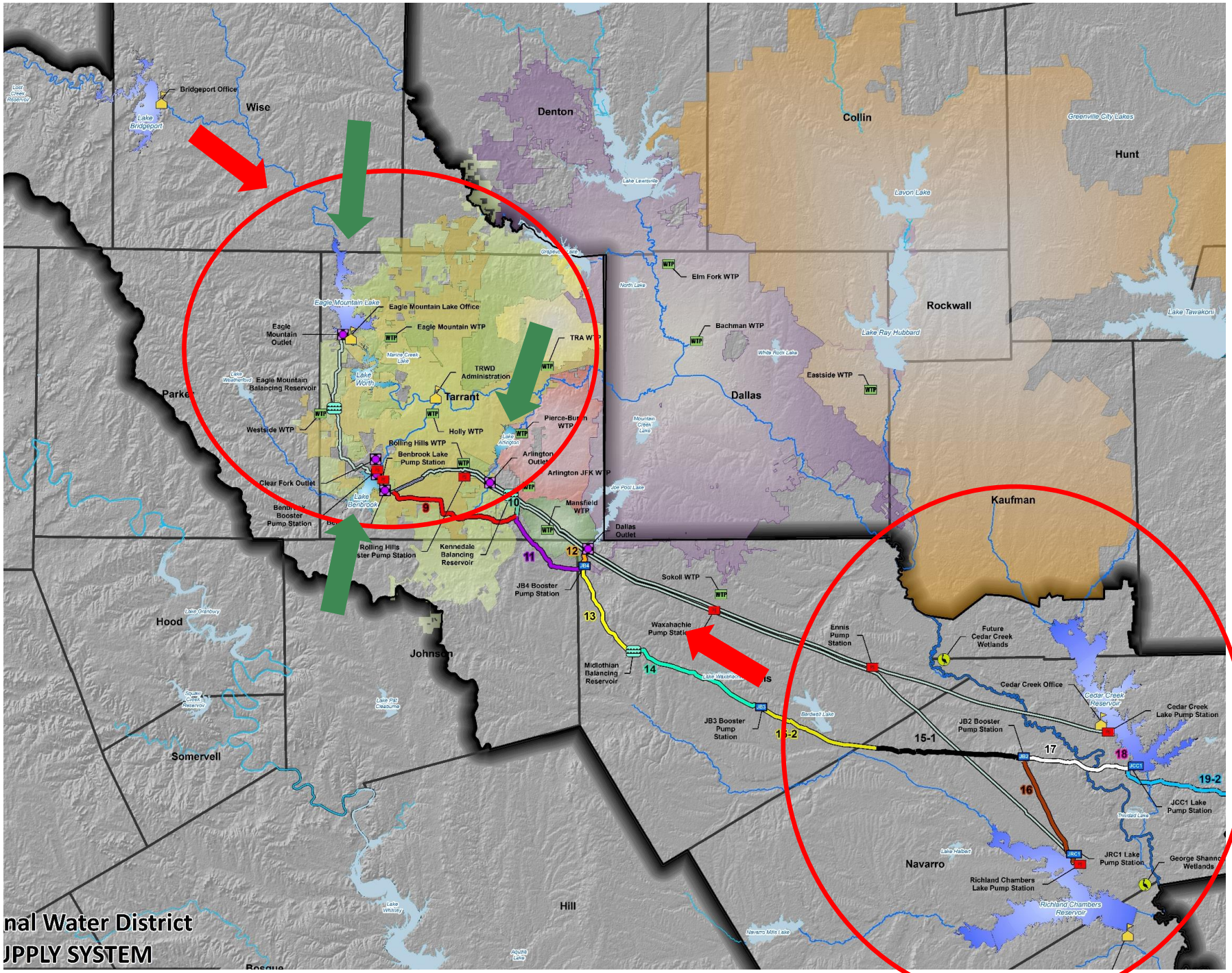
OVERVIEW OF THE TRWD TRANSMISSION SYSTEM

- TRWD provides Flood Protection, Recreation, and Water Supply
- TRWD serves 11 counties and ~2.3 million people
- TRWD has built 250 miles of larger diameter pipelines



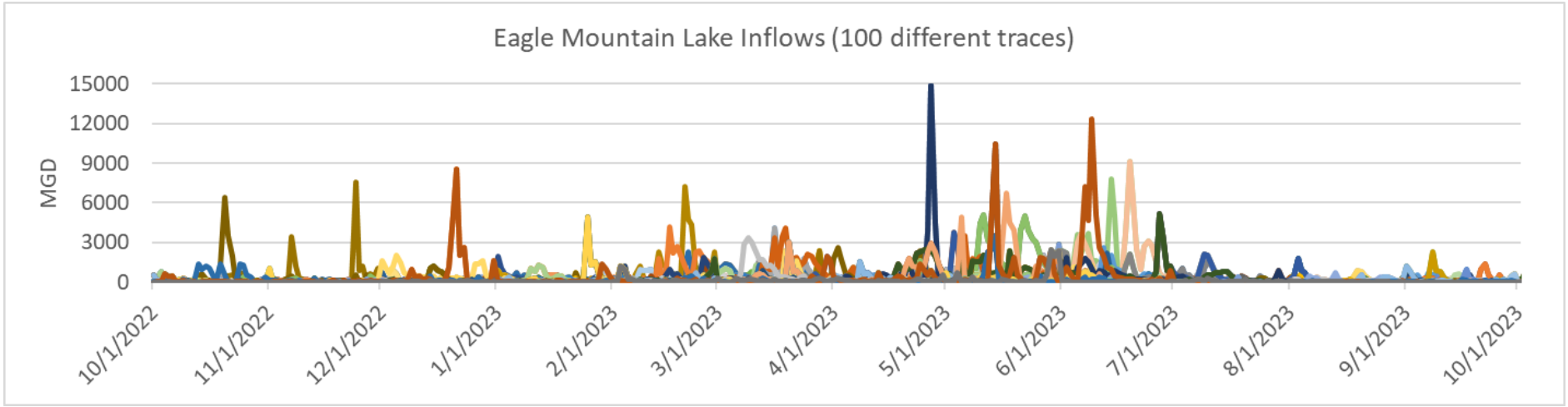
TRWD RIVERWARE MODEL

- TRWD has been using RiverWare for over 15 years
- Their multipurpose model is used for long-term planning & scenarios studies, and for short-term (1-year) operational forecasting
- Global climate variables (NASA MERRA-2) are used to generate probabilistic forecast of their system's hydrologic conditions

TRWD RIVERWARE HYDROLOGIC TRACES

- TRWD plugs the probabilistic forecast into Hydrologic Trace Generation Tool:

- Based on first month's probabilistic forecast, and transitional probabilities, Hydrologic Trace Generation Tool samples from historical database using Markov Chain process, creating 100 different hydrologic traces:



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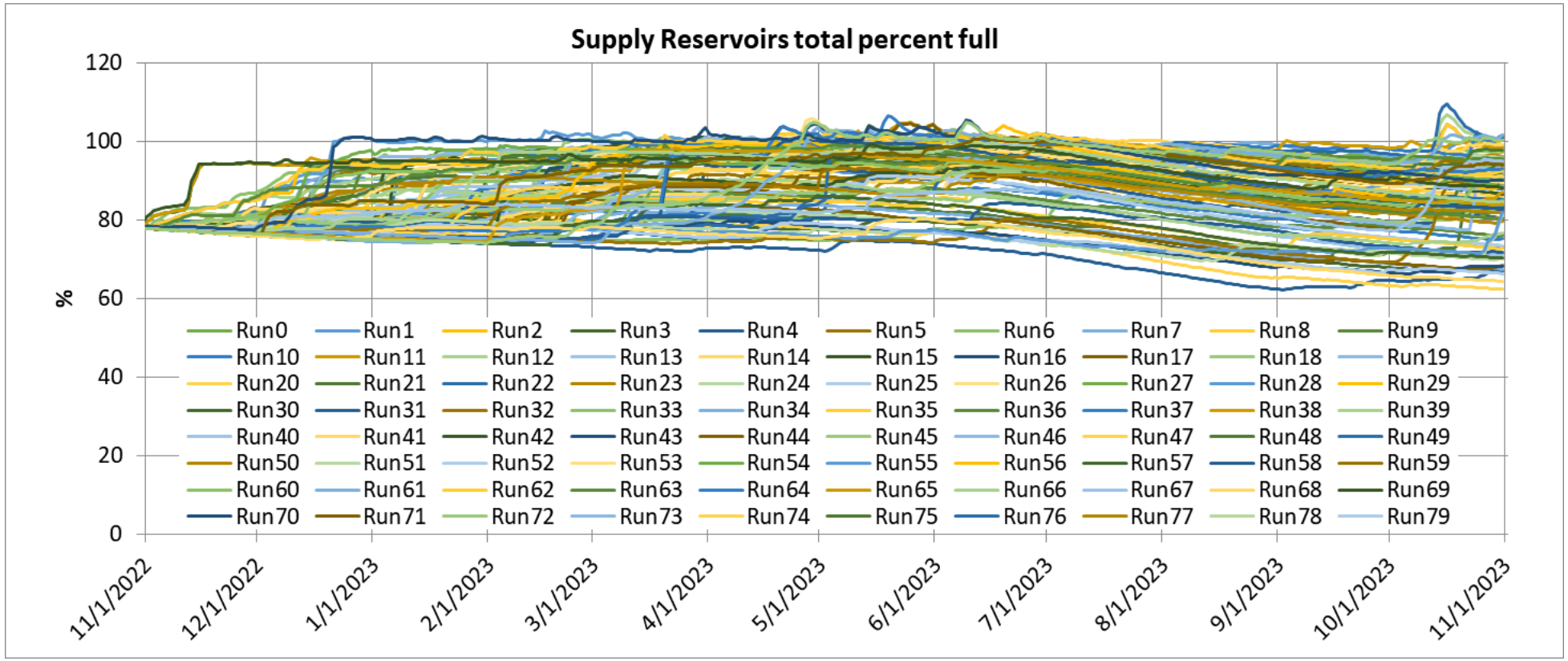
TRWD RIVERWARE OPERATIONAL MODEL

- TRWD RiverWare model (with year-to-date measured data and accounting) is run 100 times (with each of the hydrologic traces) using a distributed MRM, and the outputs are sent to RiverWare data files (RDFs)



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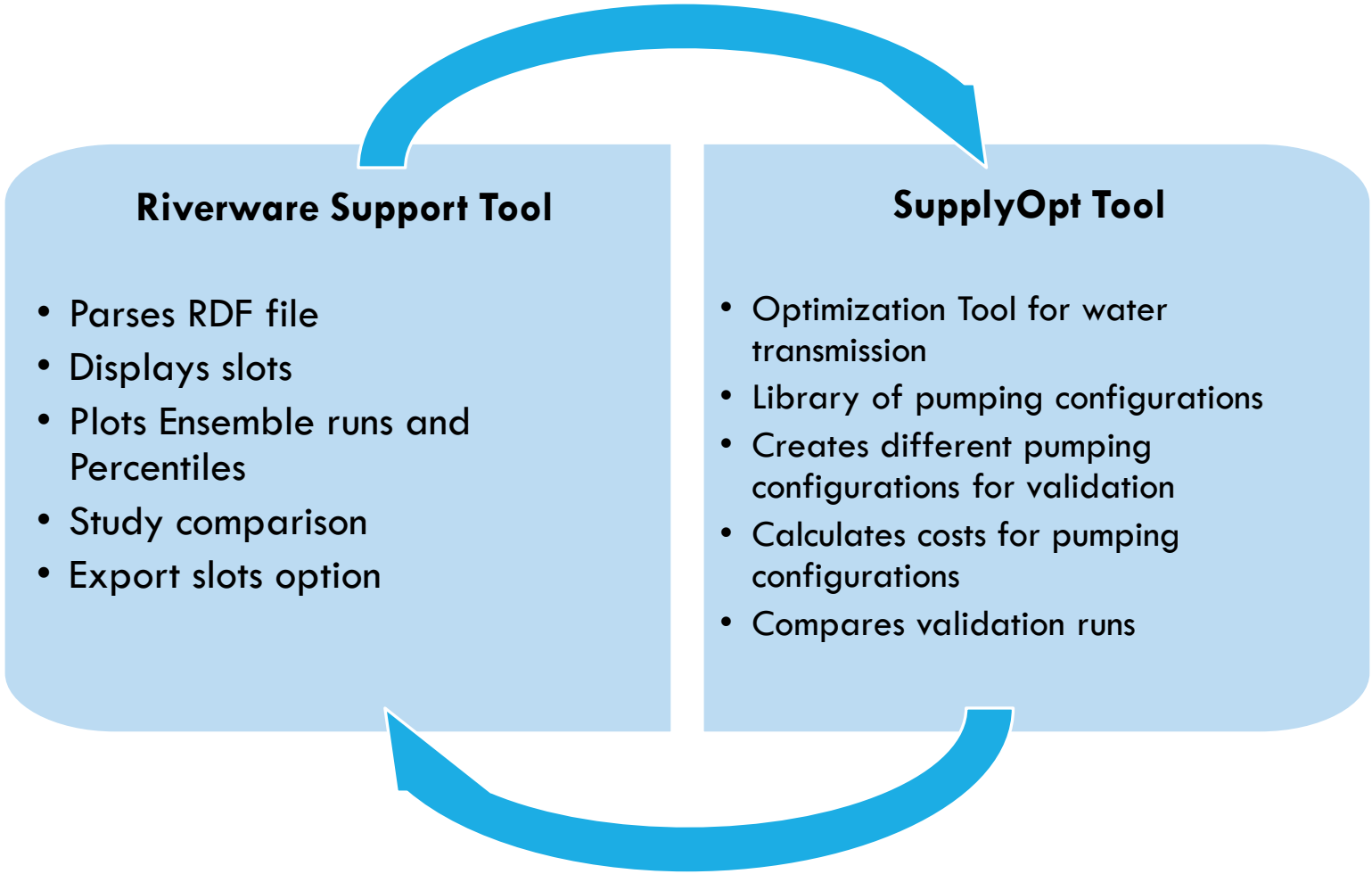
IN-HOUSE TOOLS FOR RIVERWARE DATA PROCESSING AND ANALYSIS



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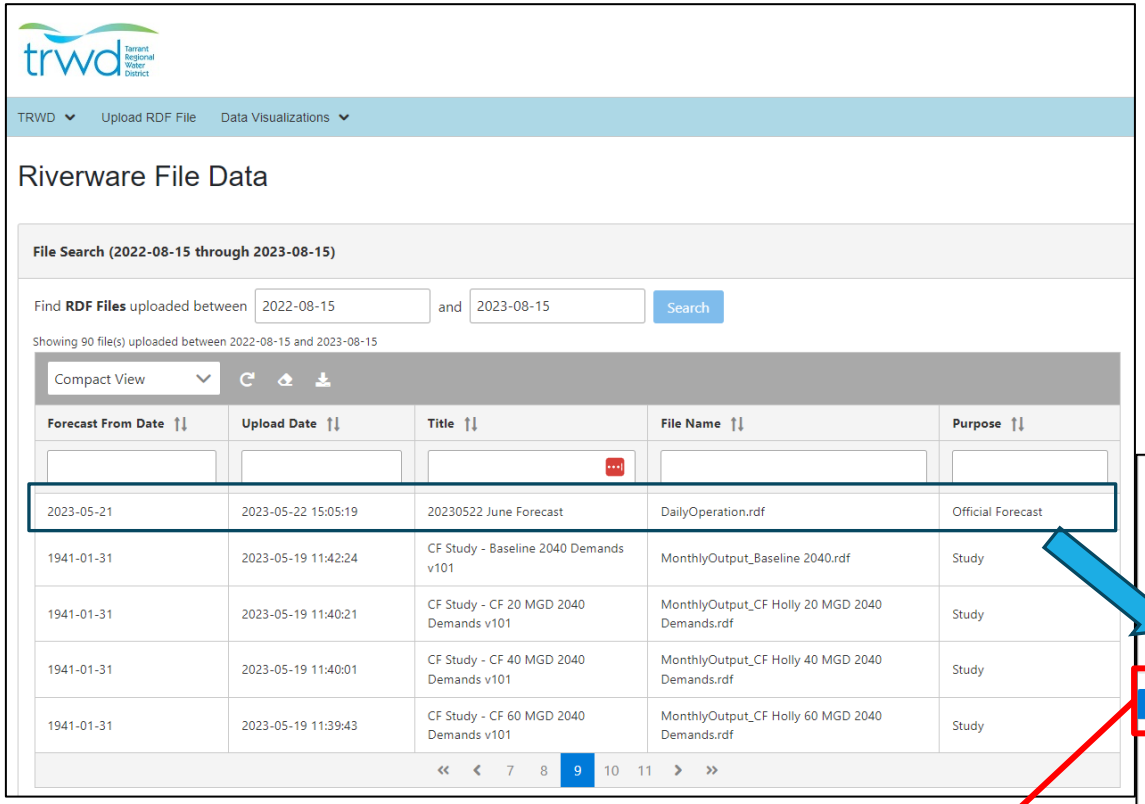
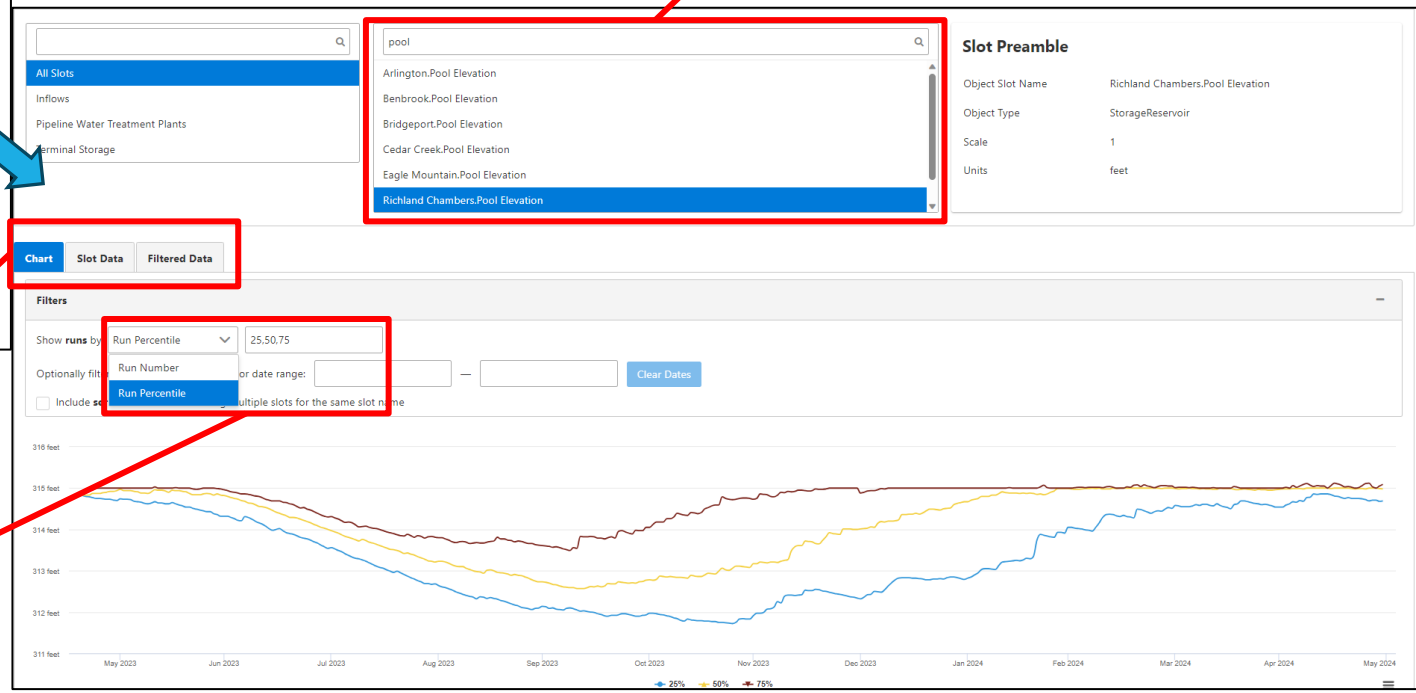
RIVERWARE SUPPORT TOOL



Slot Selection

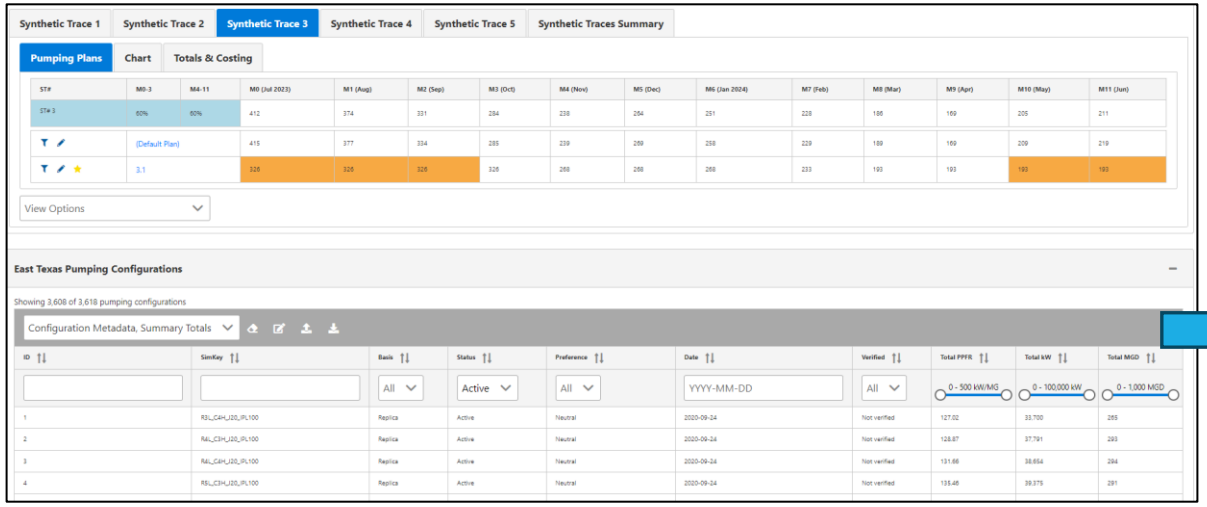


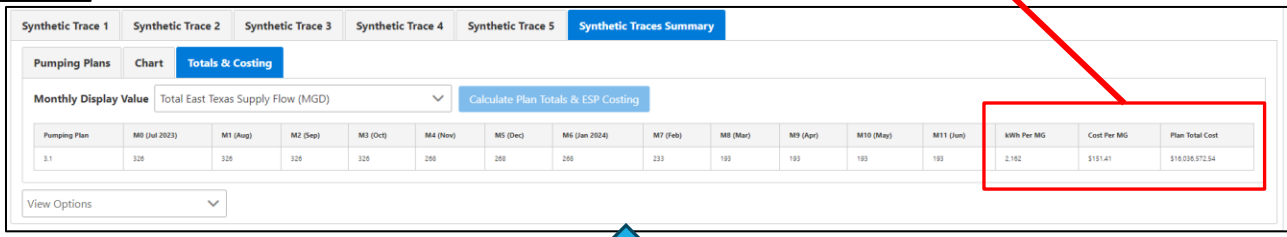
Plot/Tabular data

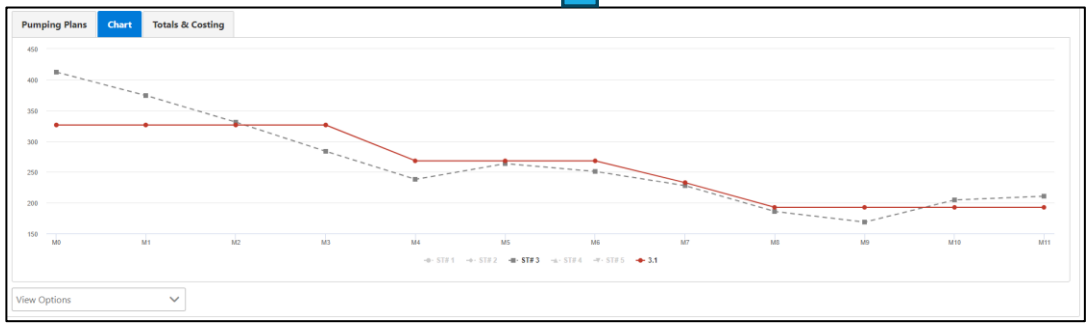
Percentile/Run selection

SUPPLYOPT TOOL

kWh Per MG	Cost Per MG	Plan Total Cost
2,162	$151.41	$16,036,572.54

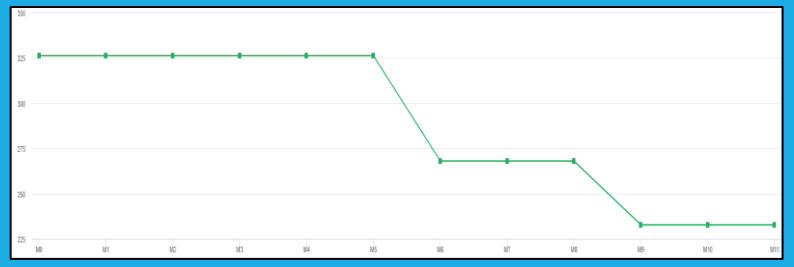


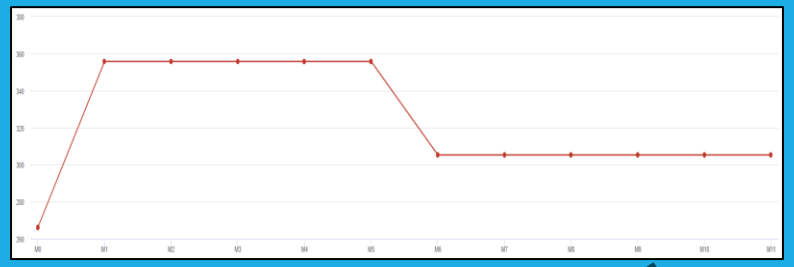


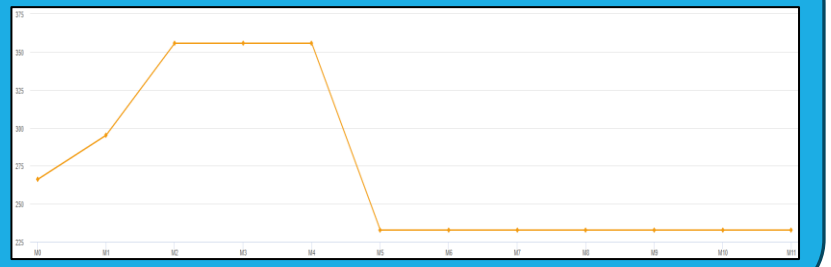


SUPPLYOPT TOOL

Pumping plans



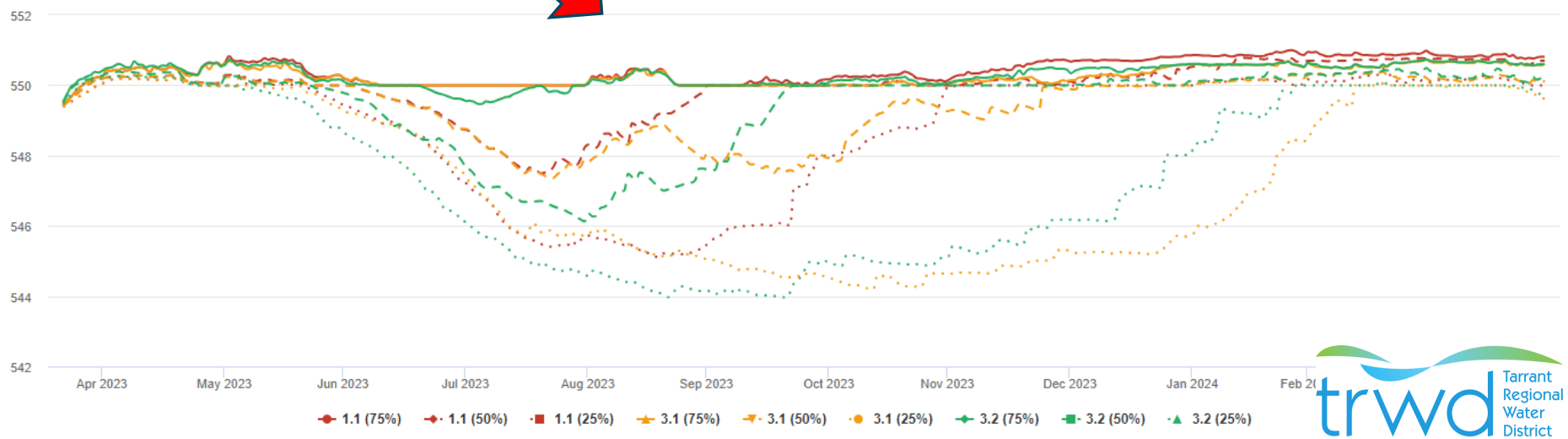




RiverWare

Pumping Plans Cost Summary

Validation RDF Slot Values



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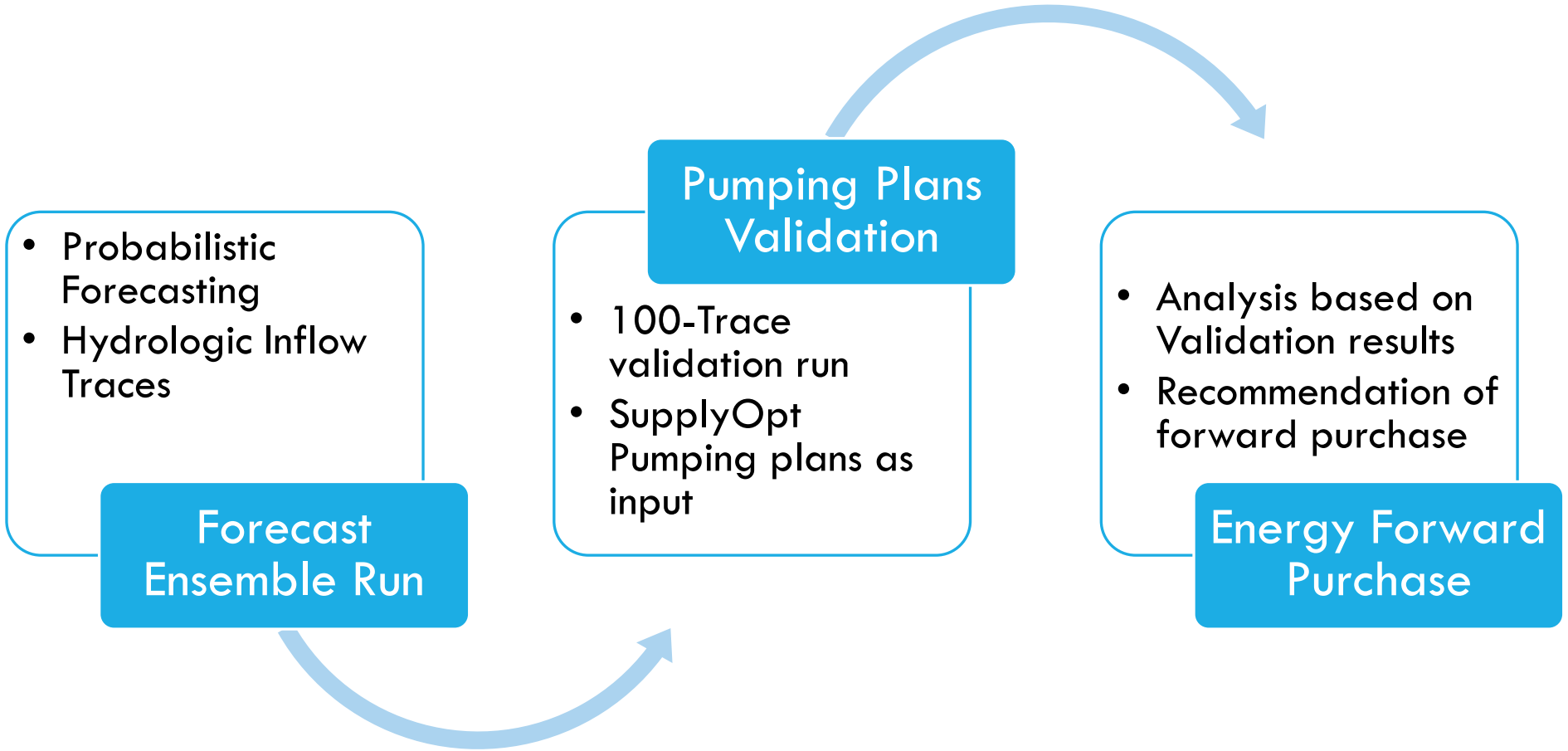
USING RIVERWARE AS A TOOL FOR OPTIMIZING ENERGY COSTS



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ENERGY PURCHASE ANALYSIS

- Range of pumping and market prices for the next 1-3 months
- System supply and demand
- Usually buy 50% of expected load (except summer)
- Set Operational Guidelines

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CP PERIODS AND PRICE SPIKE RESPONSE

System Goals & Constraints

- KBR Construction → CC PL down between Wax and KBR
- CP Response → Slow pumps down between 2pm and 7pm as storage allows
- BB1 Pumping to RH WTP (and BB2 as needed)
- **Target Running Higher Speeds at JCC1 Outside of CP Window**

Baseline Configuration [320 MGD ET]: RC1 3L (150 MGD), CC1 2L (55 MGD), JCC1 (115 MGD)

Facility	Operational Targets	CP 2-7 pm
JCC1	3P @ 90% when not in CP (75%-90%)	75%
JB3	3P @ 89% (80%-93%)	80%
5x15	Train 1 (Sm) @ 25%	
Wax	RC3H 3P @ 83% (60%-90%)	80%
1X10	100% Open	
2X12	RX Only: ~ 20 MGD (Max 35 MGD)	
RH2	Off	

Price Spike Response Strategy for Baseline Configuration (As Operational Constraints Allow)

Trigger – Real Time Cost	Response Strategy
> $250/MWH for 30 min	JCC1: 3p @ 75% JB3: 3p @ 80%
> $1,000/MWH for 30 min	JCC1: 2p @ 75% JB3: 2p @ 80% Slow BB1, RC3 as available for storage

*Return to Baseline once prices have stabilized for 1 hour.

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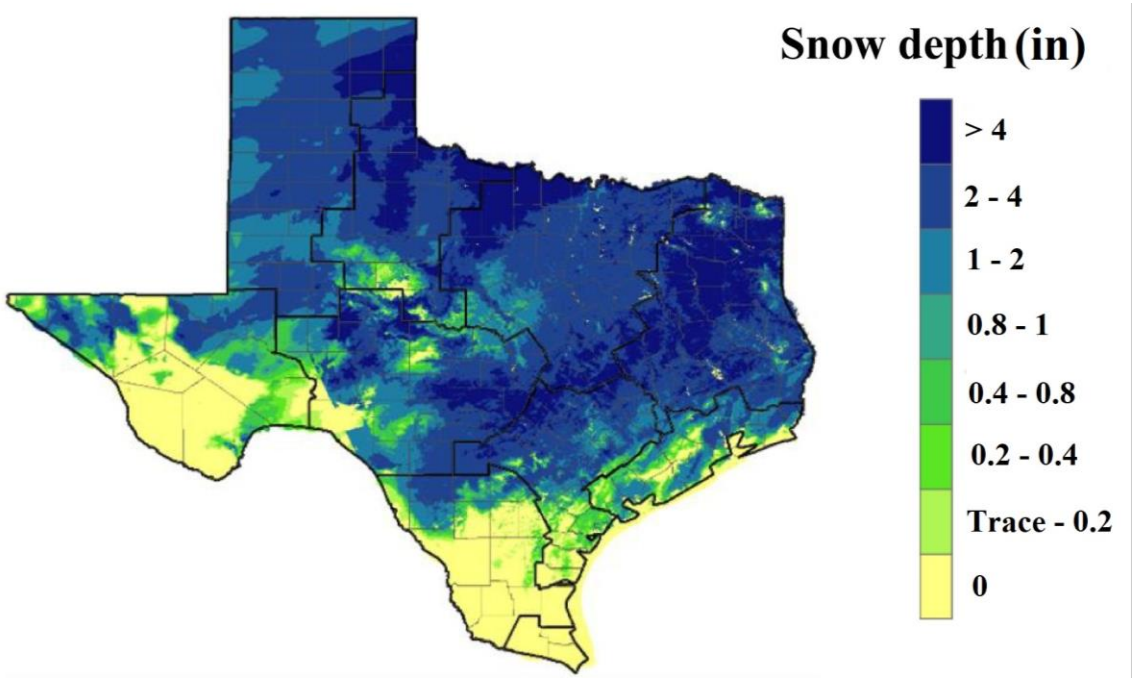
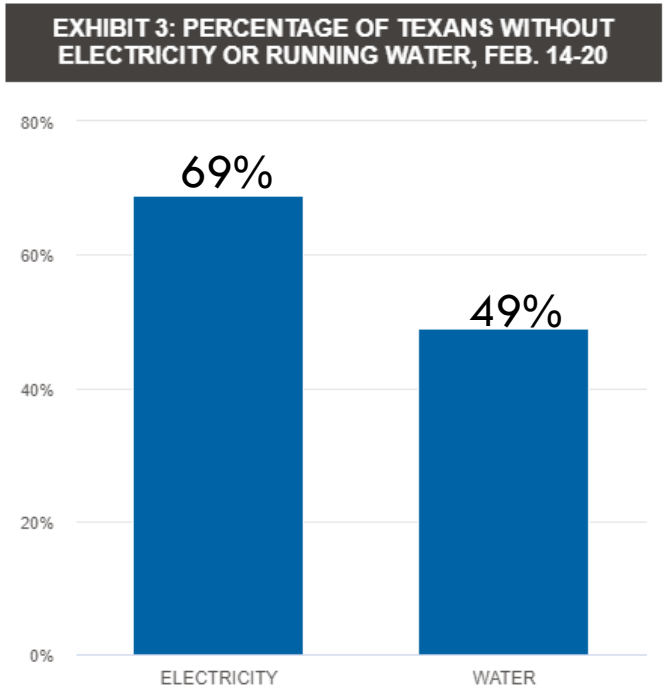
WINTER STORM URI

- From Feb 14-17, 2021 North Texas received over 5” of snow
  - DFW recorded 139 consecutive hours of at or below freezing temperatures



Adapted from: https://www.sciencedirect.com/science/article/pii/S0048969722024299#f0020



https://comptroller.texas.gov/economy/fiscal-notes/2021/oct/winter-storm-impact.php

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SPIKE PRICE RESPONSE – WINTER STORM URI

Total energy cost 2/12 – 2/19

~ $1.3 million

Other charges (ancillary): ~ 2 million

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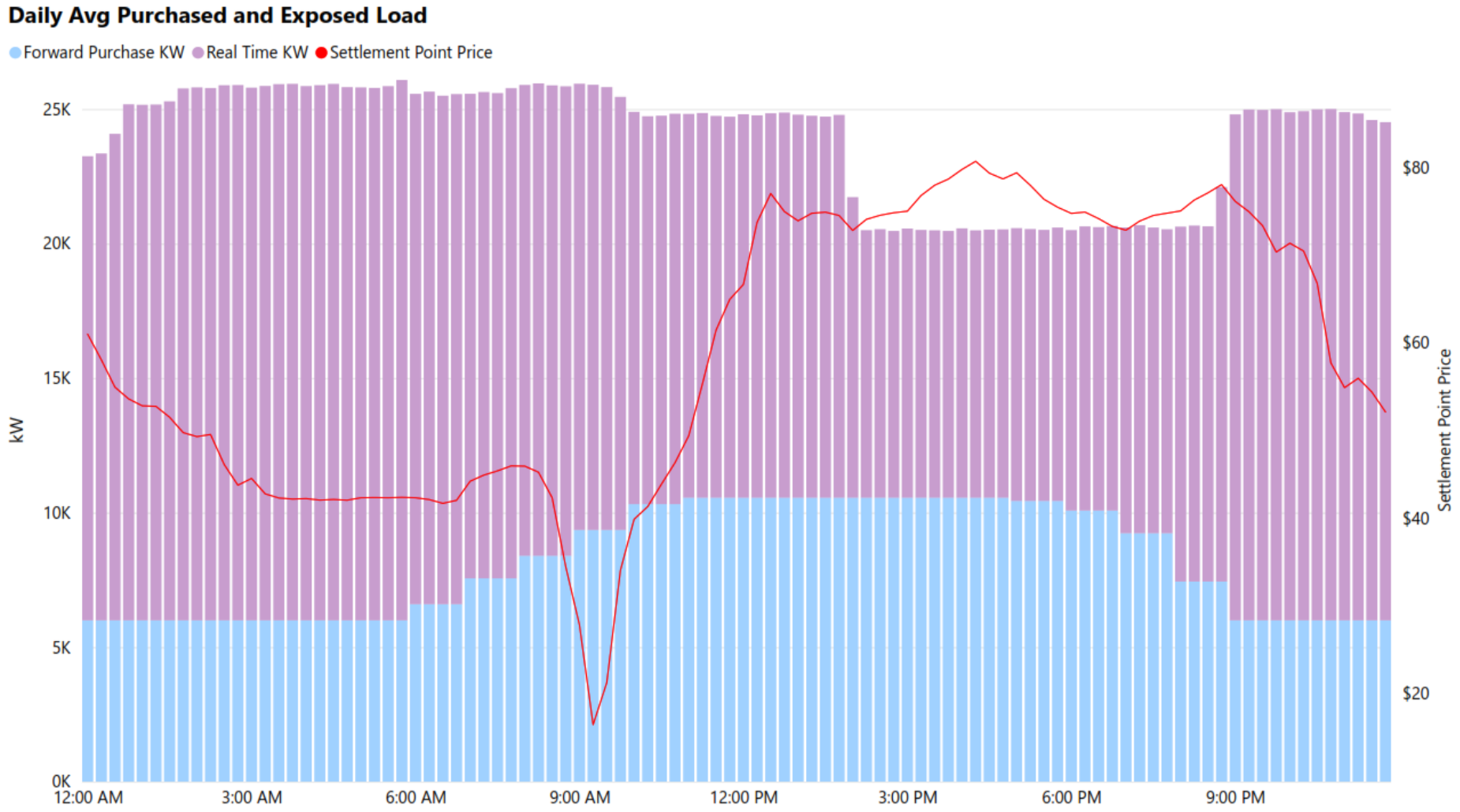
4CP RESPONSE – JULY 23,2022



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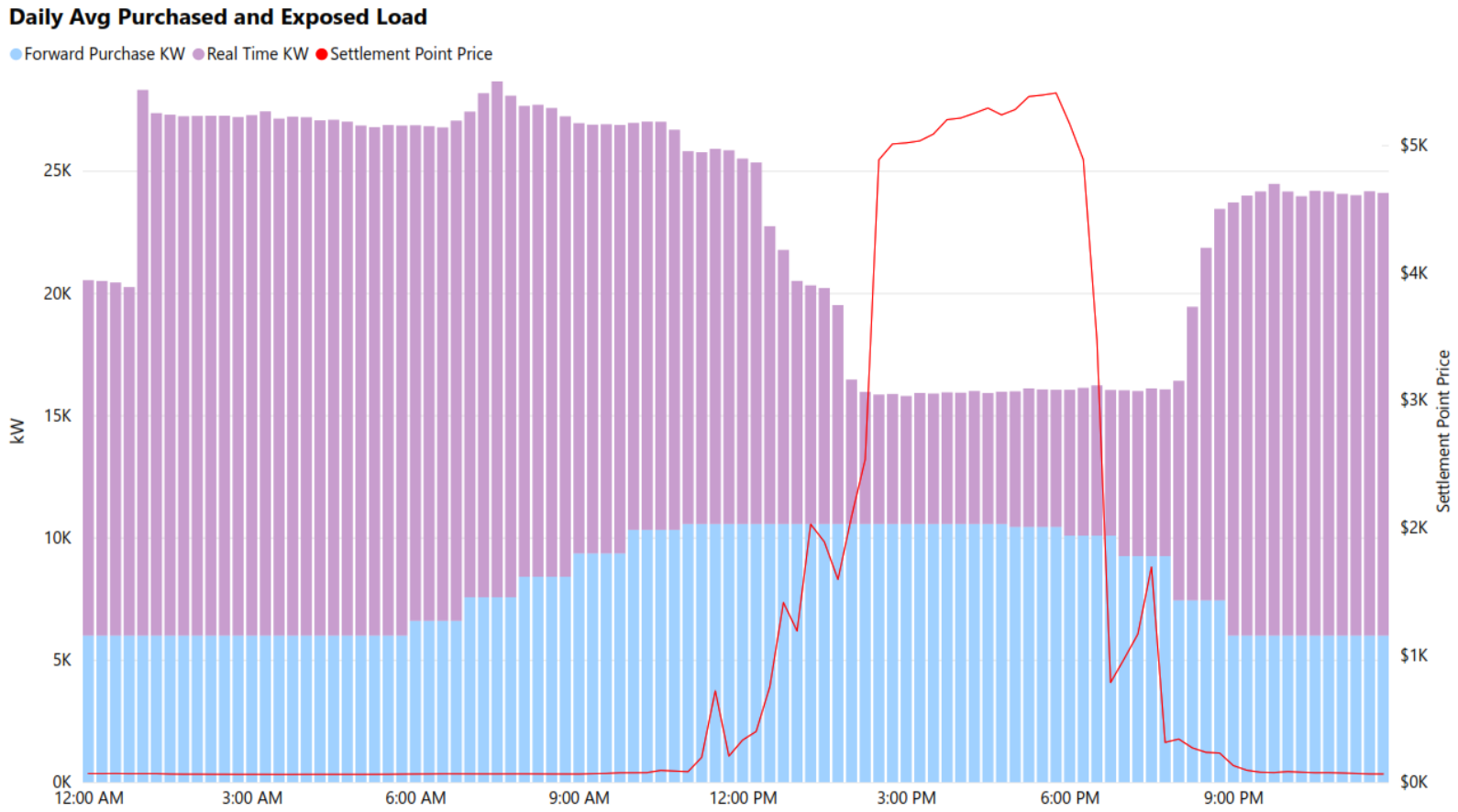
PRICE SPIKE RESPONSE – JULY 13, 2022



Afternoon Savings
$197,000

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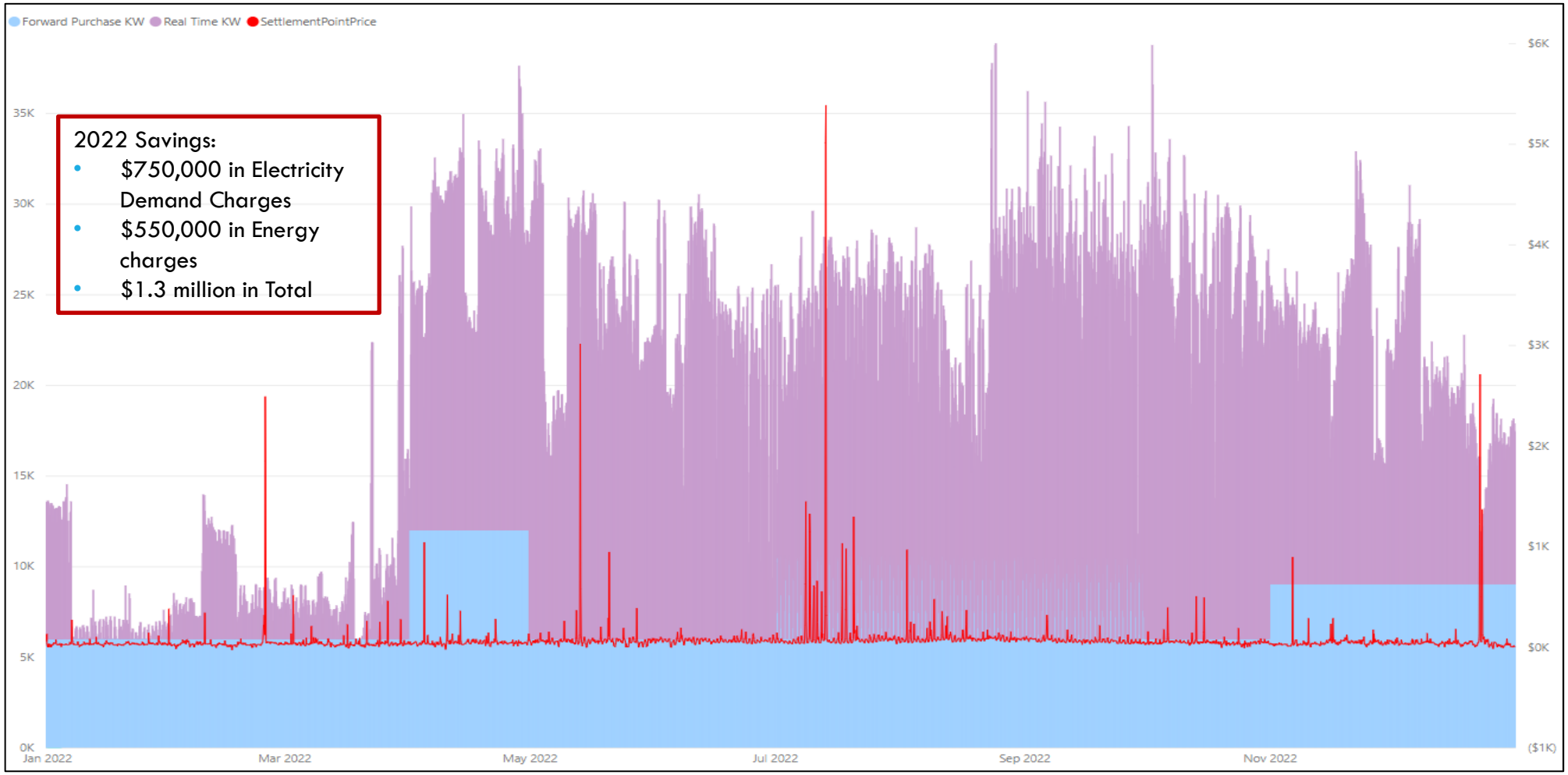
2022 ENERGY PRICE BREAKDOWN



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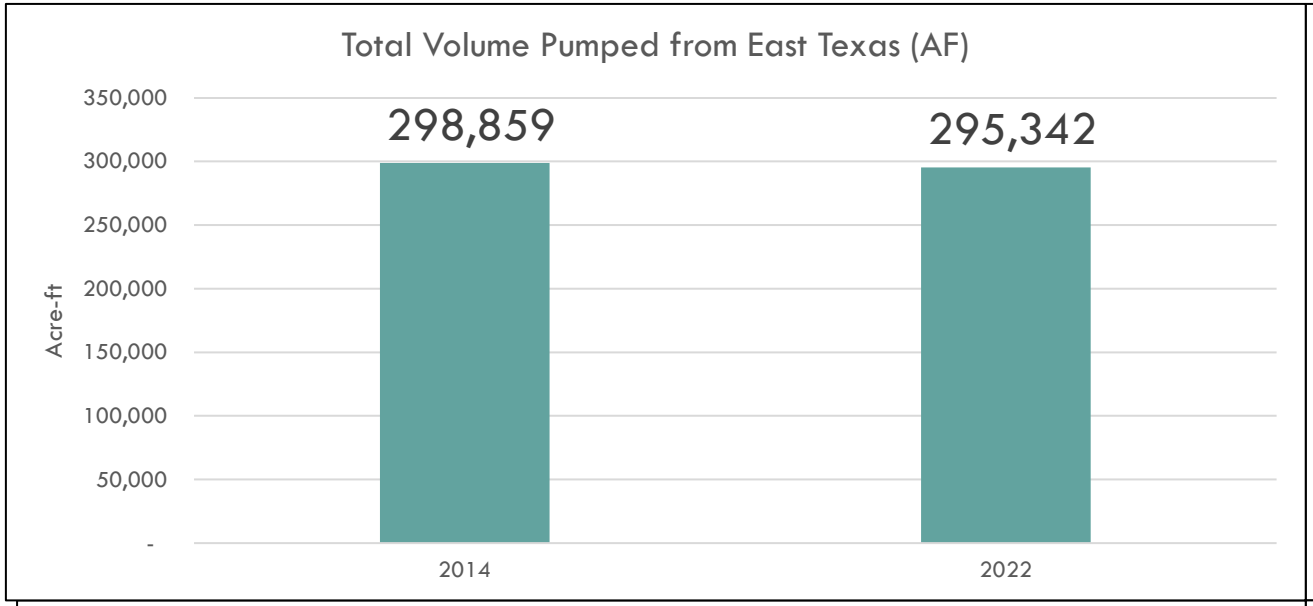
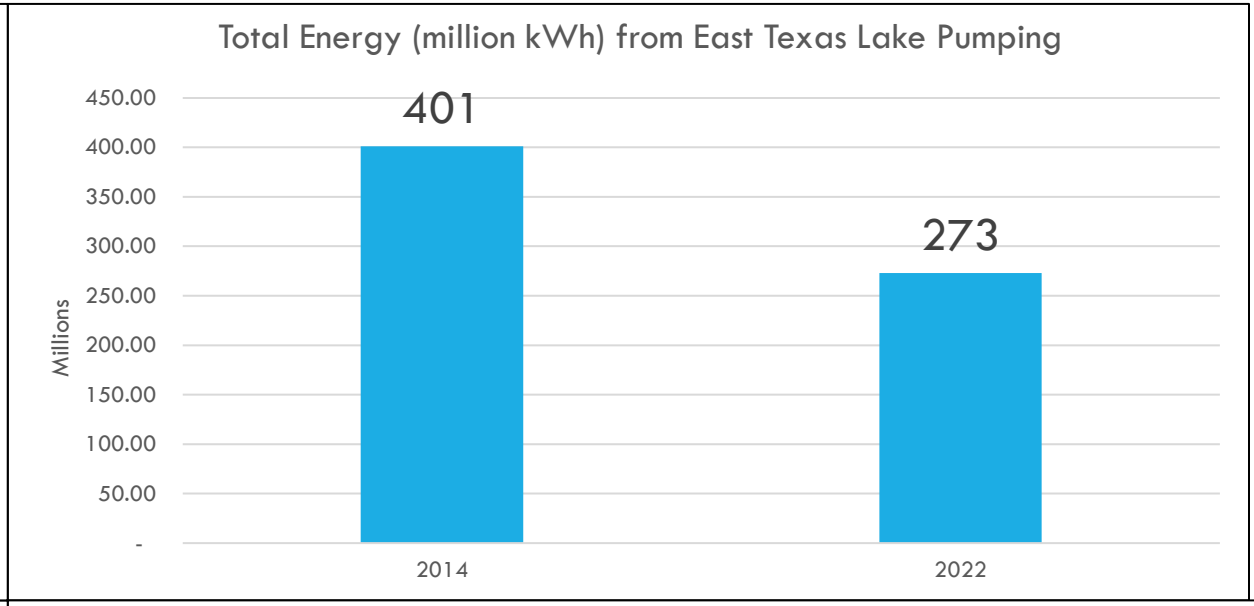
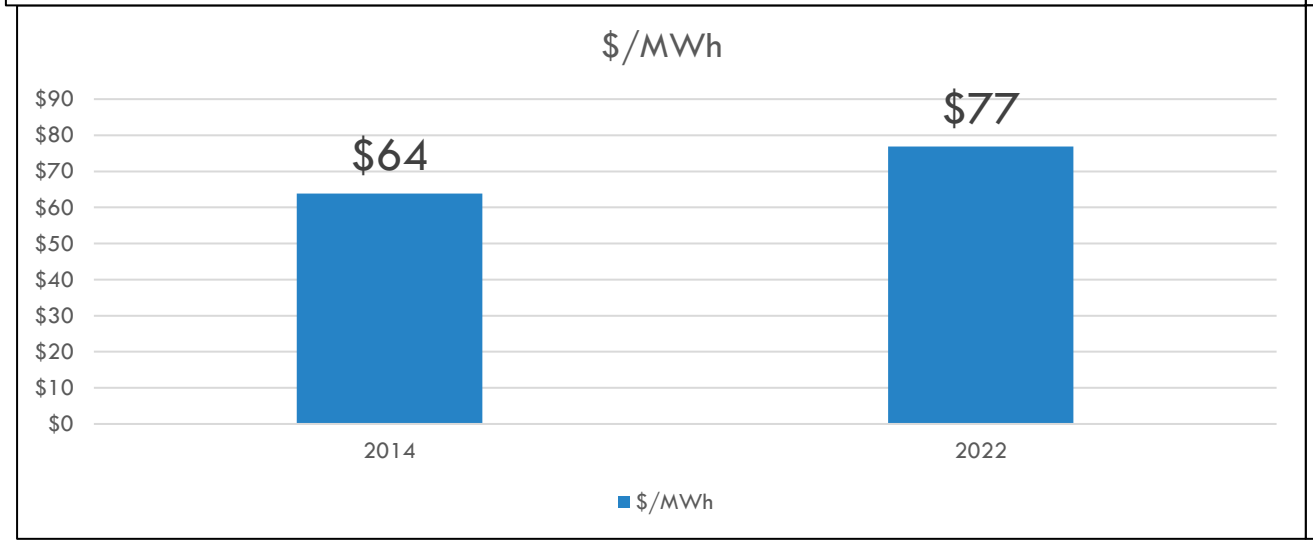
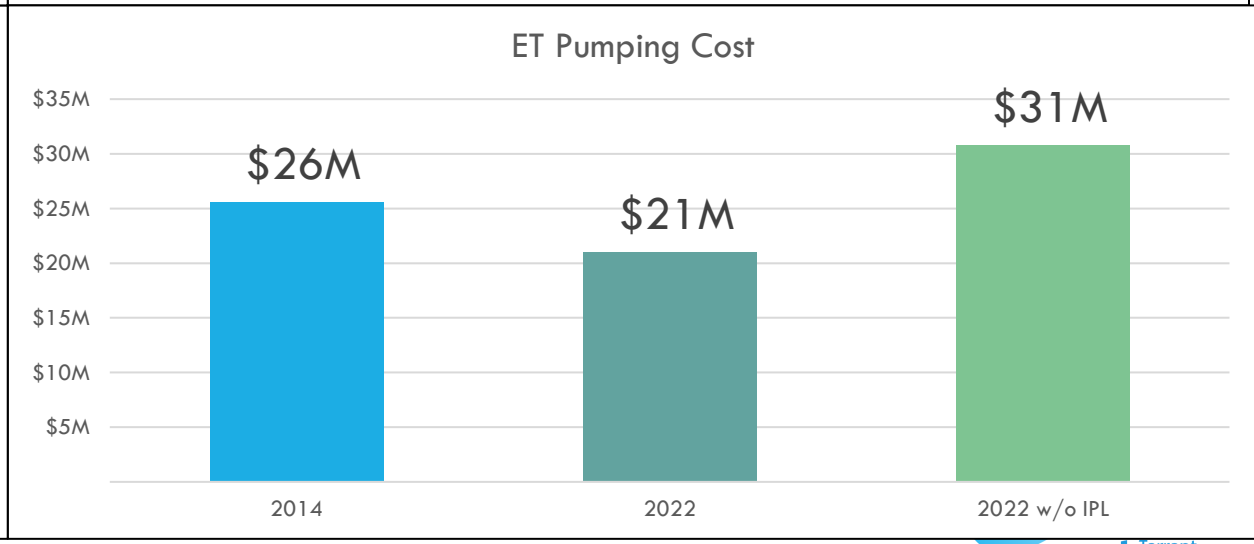
EAST TEXAS LAKES PUMPING AND ELECTRICITY









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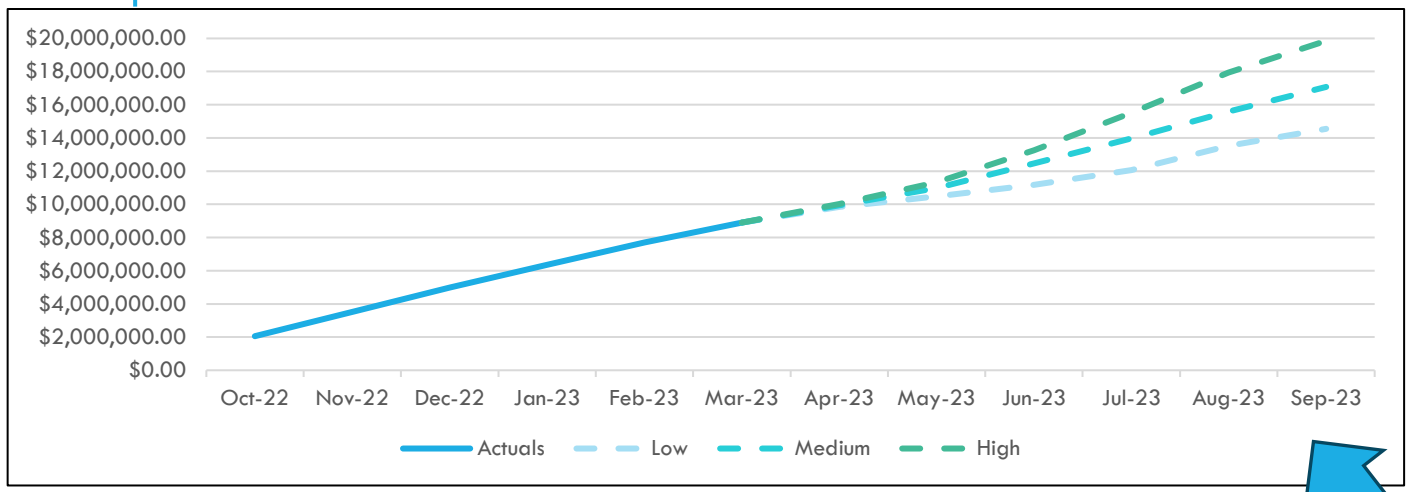
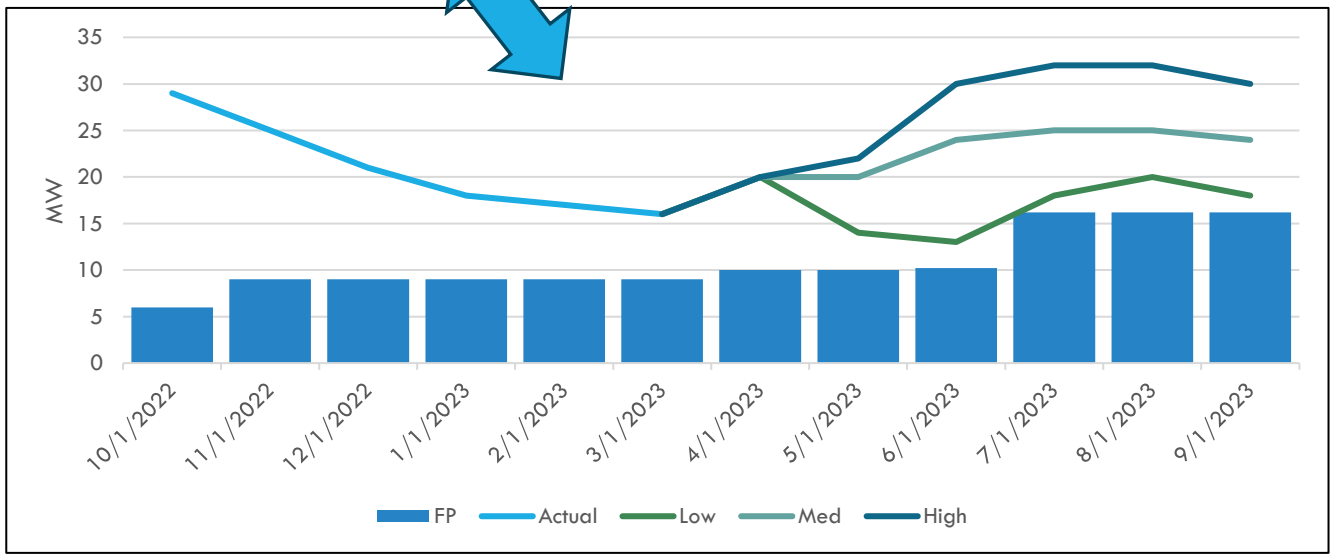
FY23 COST PROJECTIONS AND FORWARD PURCHASE



Cost Projections

Forward Purchase



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THANK YOU!

Questions?

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Nick Mander – mander@hydrosconsulting.com; WE ARE HIRING!