

DPO: Using Edge Analytics & Digital Twin to Improve Pump Performance

Singapore International Water Week, 19th April 2022

Presented by: Matt Rolls, Vice President Business Development EMEA

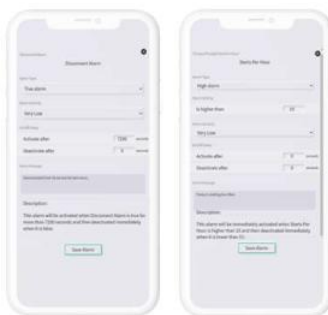



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DYNAMIC PUMP OPTIMIZER (DPO)

- Technology Introduction
- Platform Demonstration
- Case Study: A Utility Experience with DPO




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Our mission is to take the guesswork out of pump operations to free up operators to focus on all the remaining daily challenges of efficient, reliable utility operations to deliver on the promise of water.

- Founded in **2010** by CEO Perry Steger
- Headquartered in **Austin** with additional offices in Tennessee, New Jersey, and UK
- Over **150 installations** with customers including City of Houston, Gwinnett County, and City of Austin
- Specific Energy has over **2.5M hours** of proven run time in the field





Why a Dashboard?

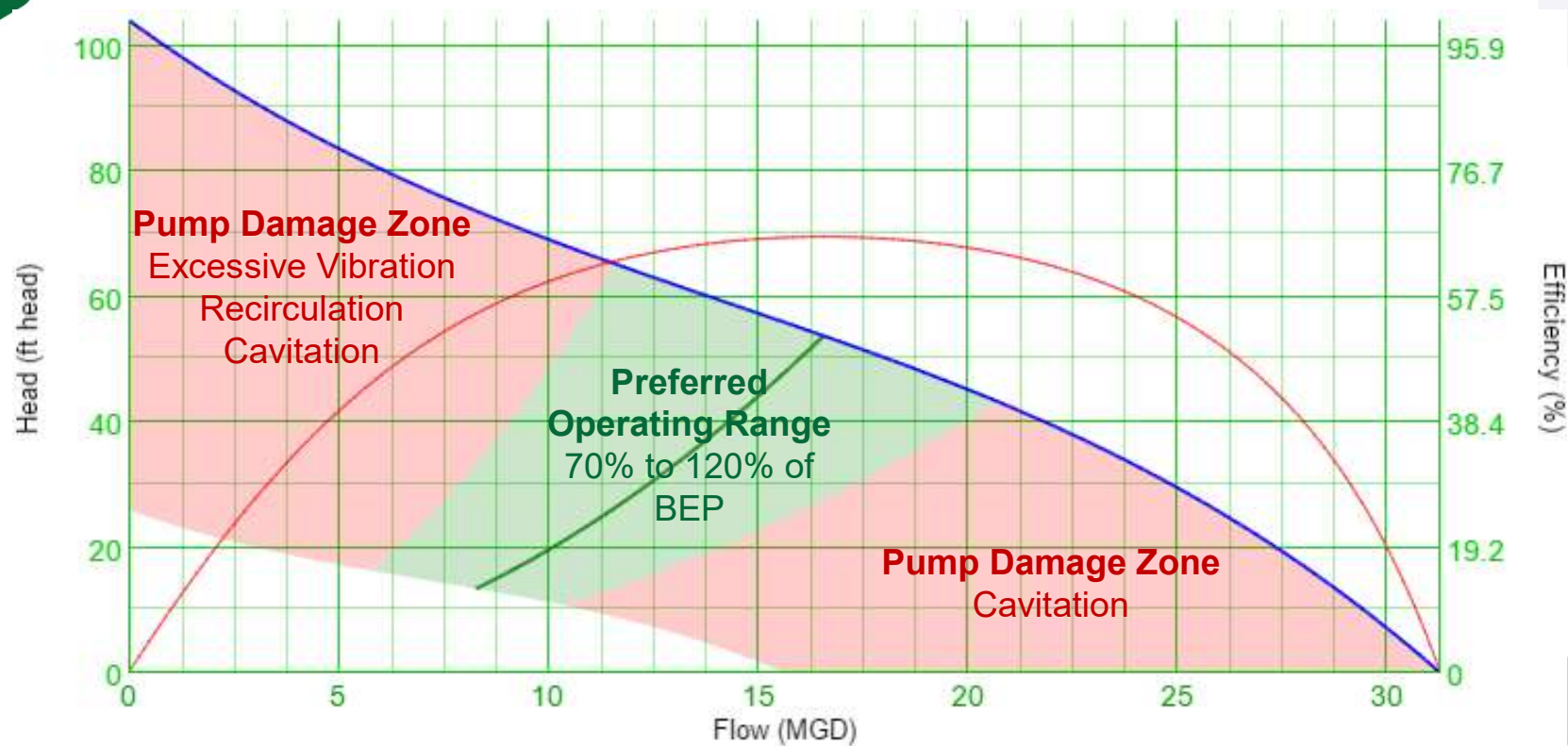



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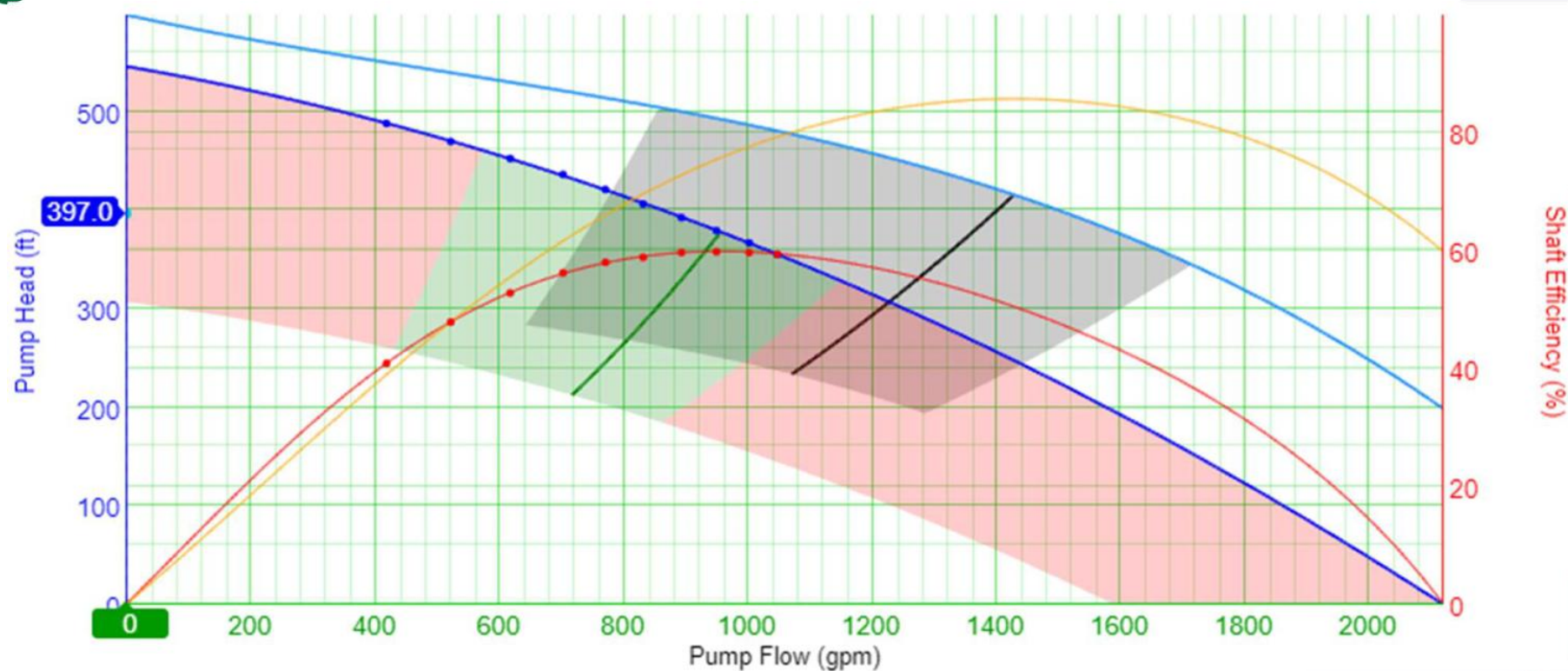
Preferred Operating Range: Why It Matters



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Preferred Operating Range: A Moving Target

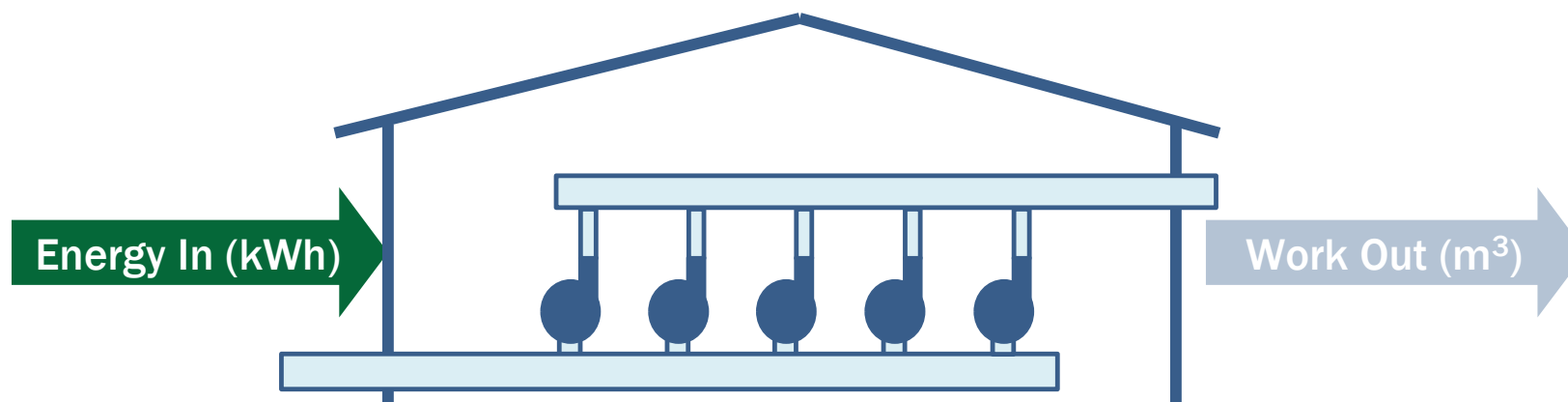


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Specific Energy Defined

Energy consumed per volume pumped

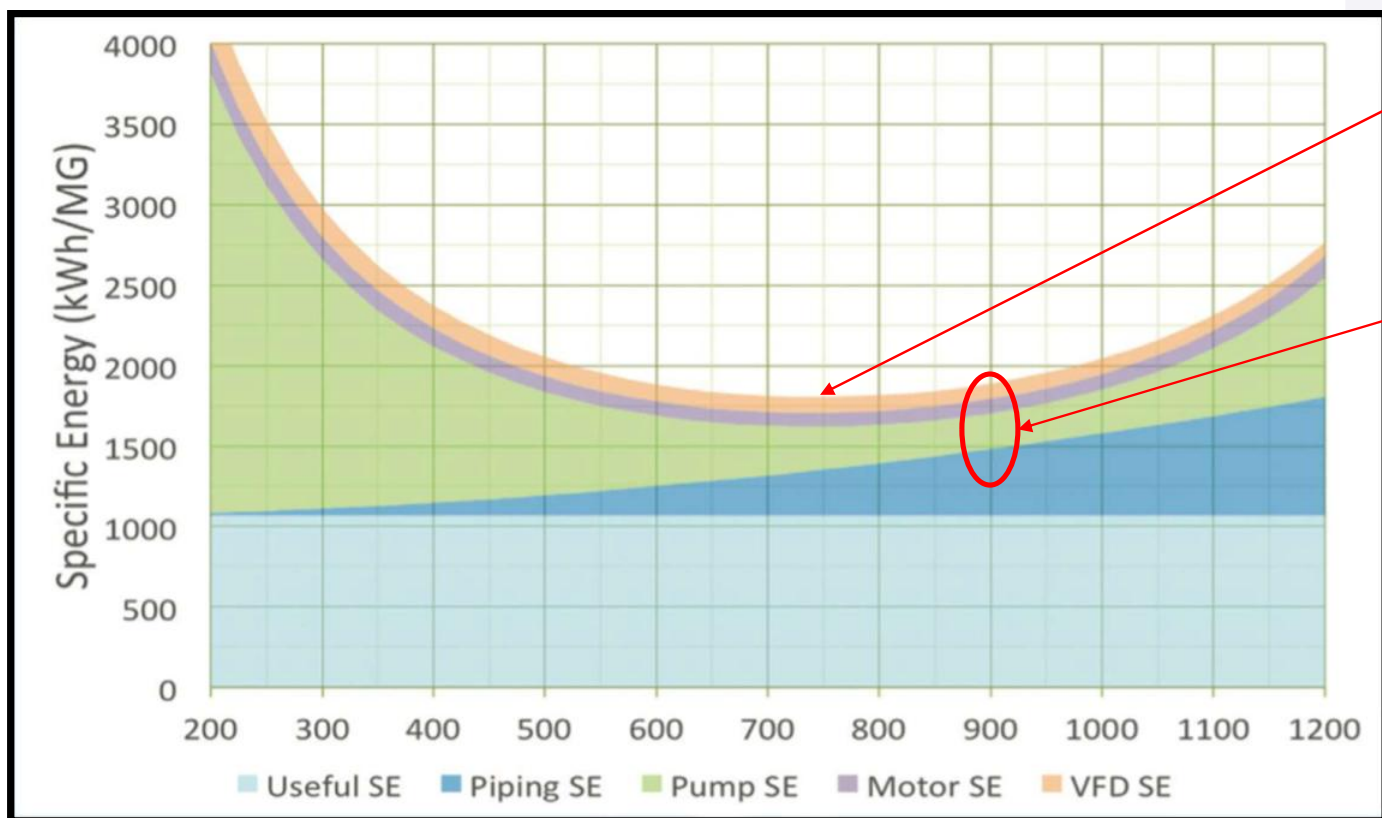


$$\text{Specific Energy} = \frac{\text{Energy [kWh]}}{\text{Volume [m}^3\text{]}} = \frac{\text{Power [kW]}}{\text{Flow [m}^3\text{/h]}}$$

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Specific Energy Illustrated



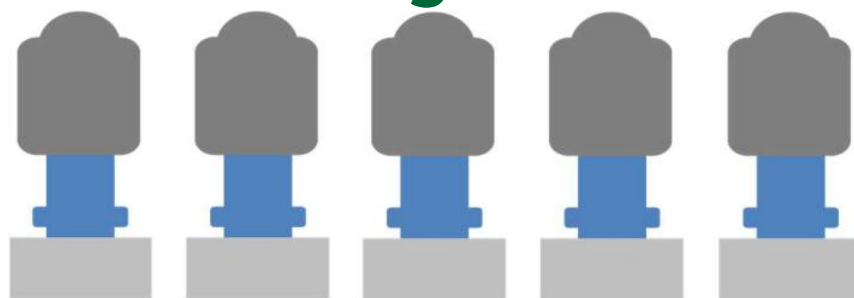
Lowest point is system minimum Specific Energy

Narrowest point is typically pump Best Efficiency Point (BEP)

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The Operators Challenge



2 x 2 x 2 x 2 x 2 = 32 combinations

ON / OFF
Control



31 x 31 x 31 x 31 x 31 = > 28 million combinations

VFD Speed Control
(0.5 Hz res.)



35 50 35 50 35 50 35 50 35 50

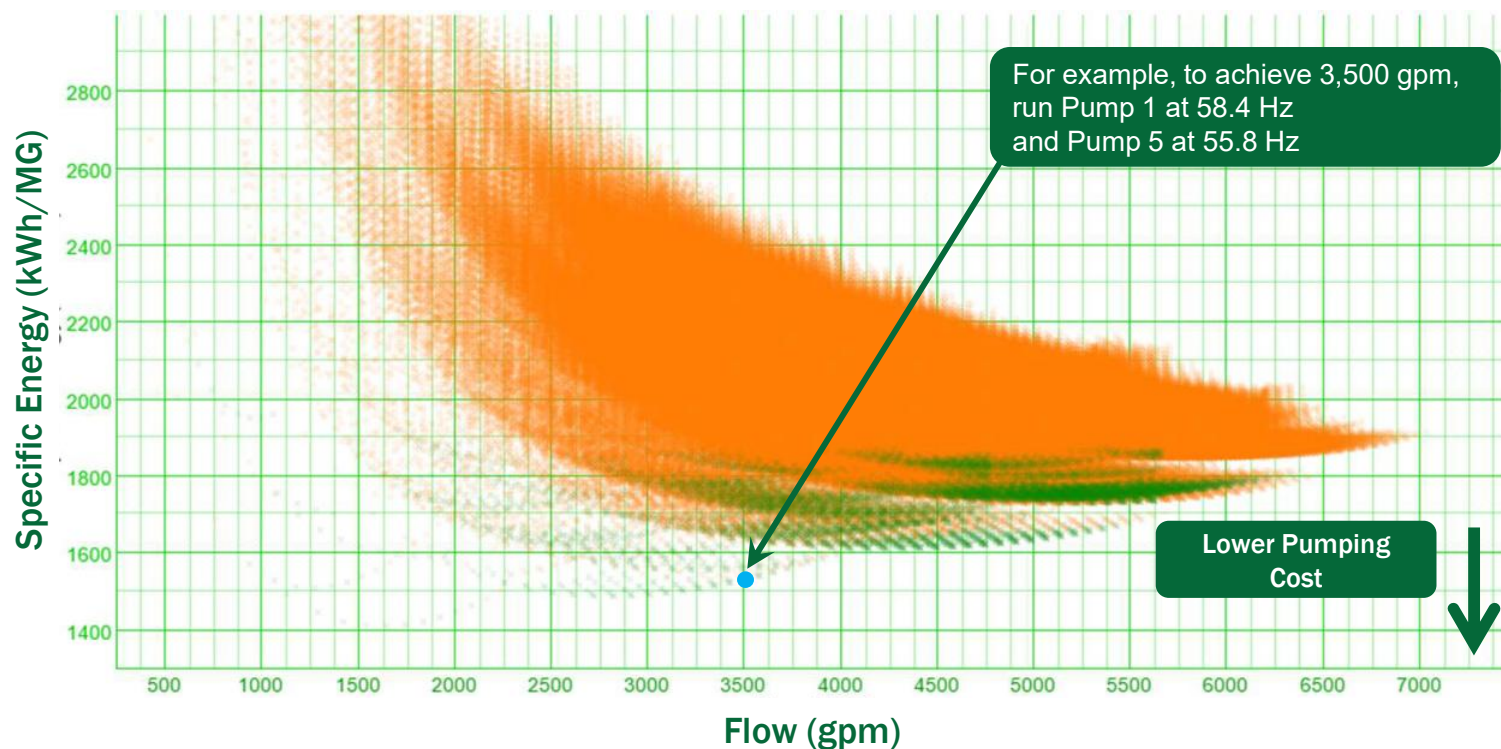
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The Operators Challenge

Green: All pumps in POR (1%)

Orange: One or more pumps outside POR (99%)



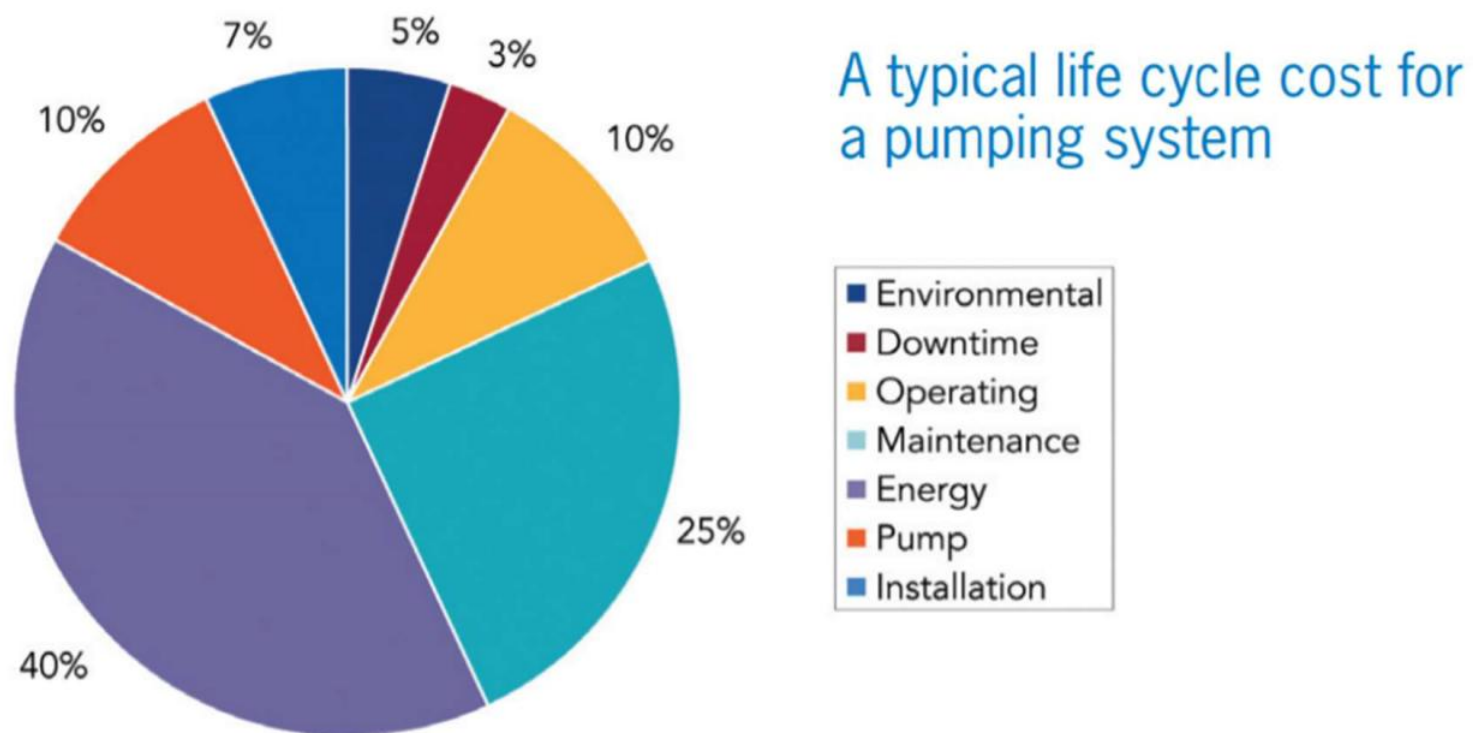
There are 28 million ways to run this pump station

Only one optimally satisfies current demand

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Energy & Maintenance: Why It Matters

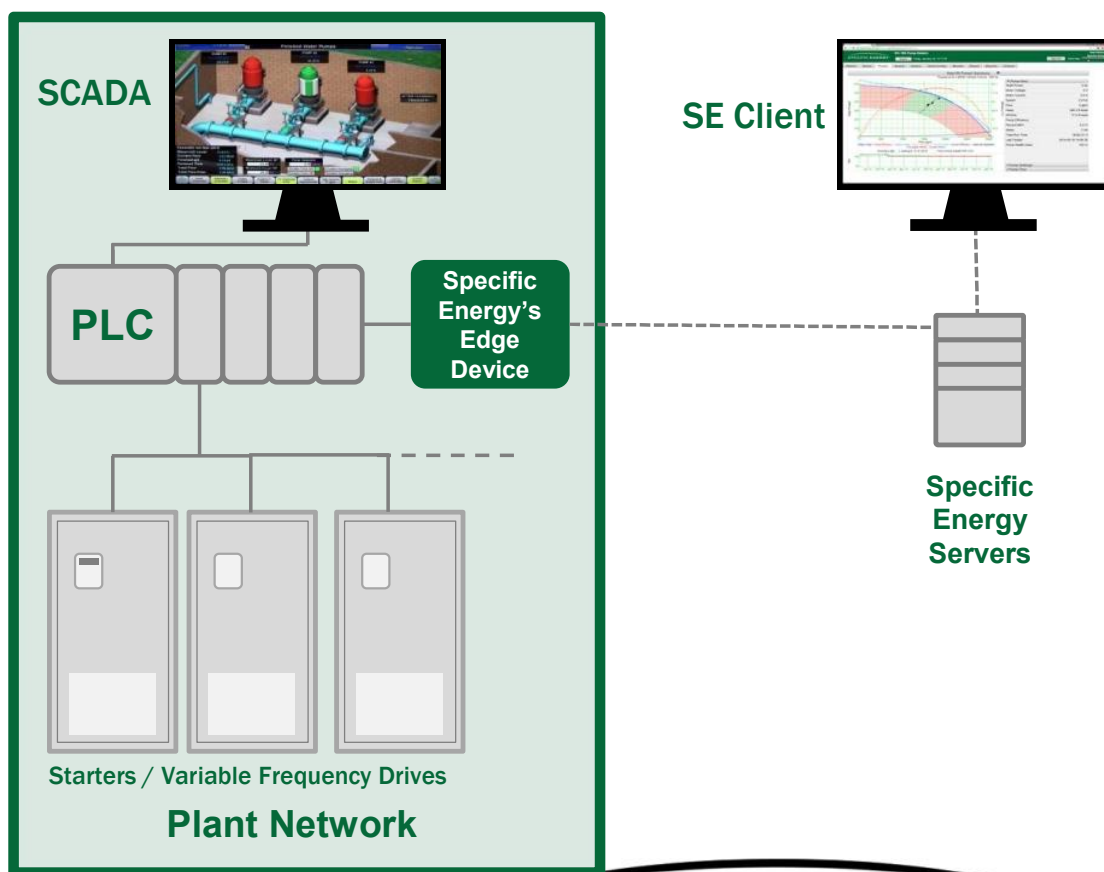


Source: [Energy.gov](https://www.energy.gov)


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Installing the DPO



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DPO Installed



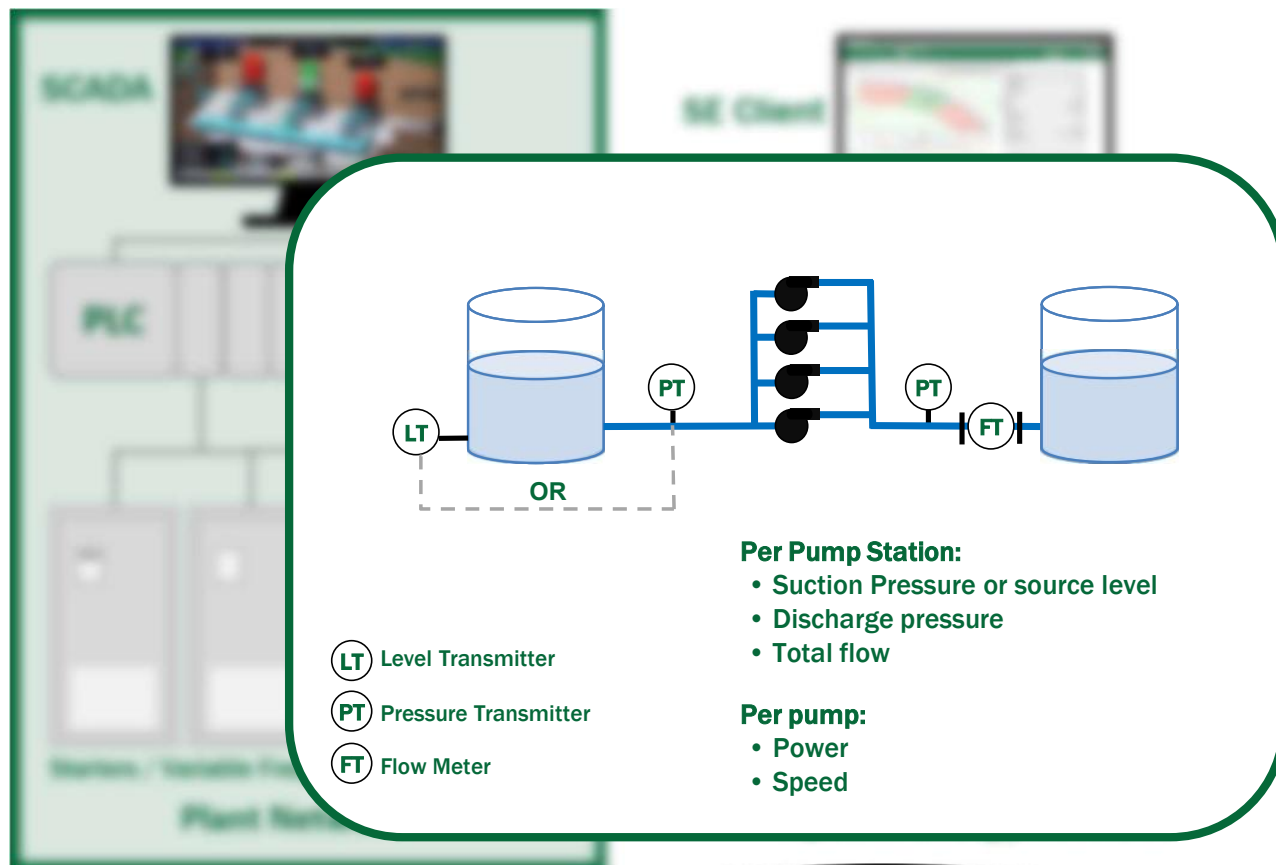
Cellular
antenna

DPO


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DPO Instrumentation



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DPO Key Benefits Summary

- ◆ Operates pumps as designed
- ◆ Track and react to changing pump and system conditions
- ◆ Minimize lifecycle costs associated with pumping
- ◆ Intelligent asset management insights for informed decision making





DPO Additional Benefits

- Phone / Tablet remote access
- Backup SCADA
- Customized system dashboards
- Customized SMS alarming
- Predict pump plugging
- Instantaneous system capacity check
- Piping analysis
- Distributed access to data
- Pressure transient control





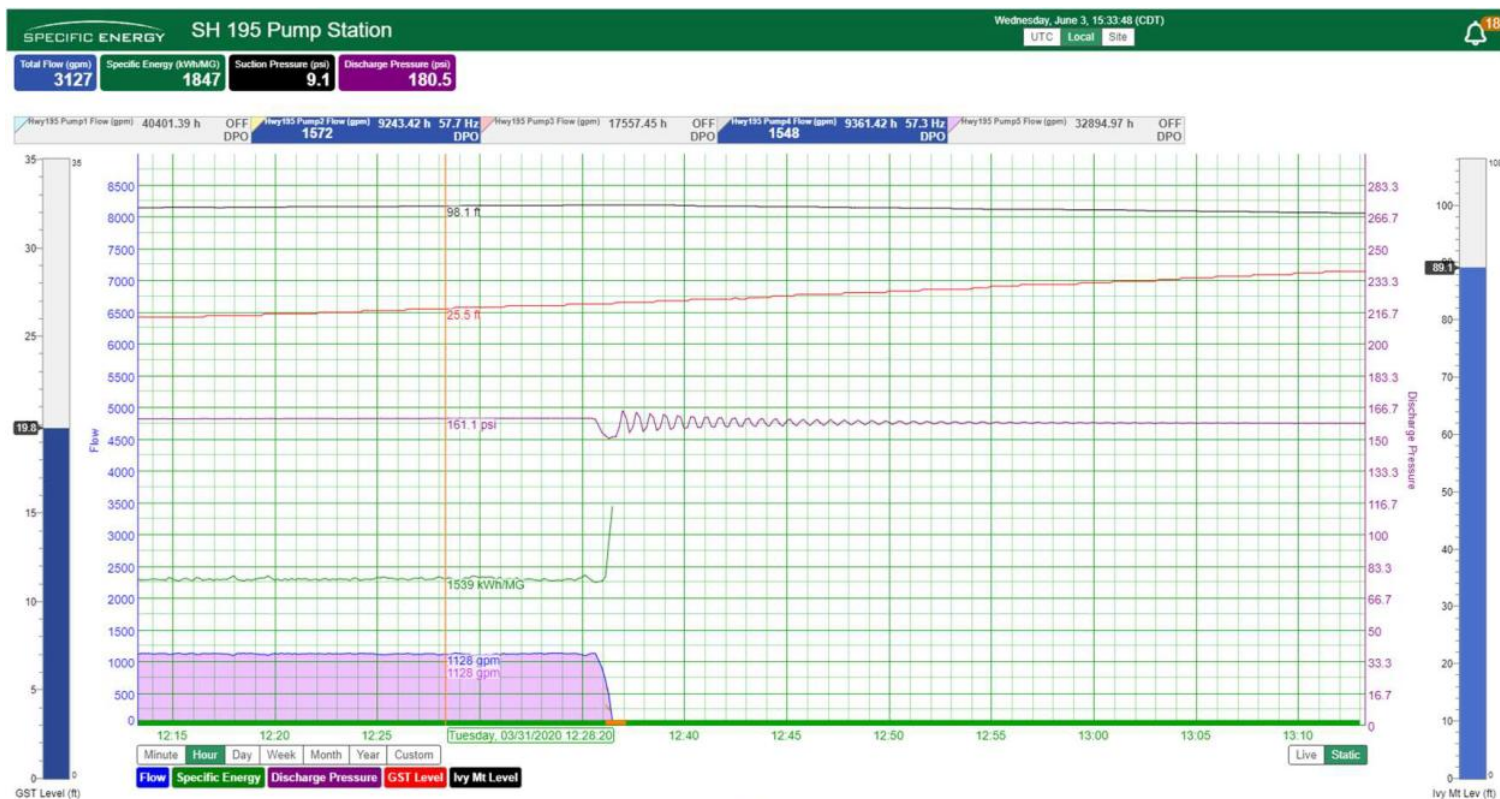
Pressure Transient Control – Without DPO



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Pressure Transient Control – With DPO



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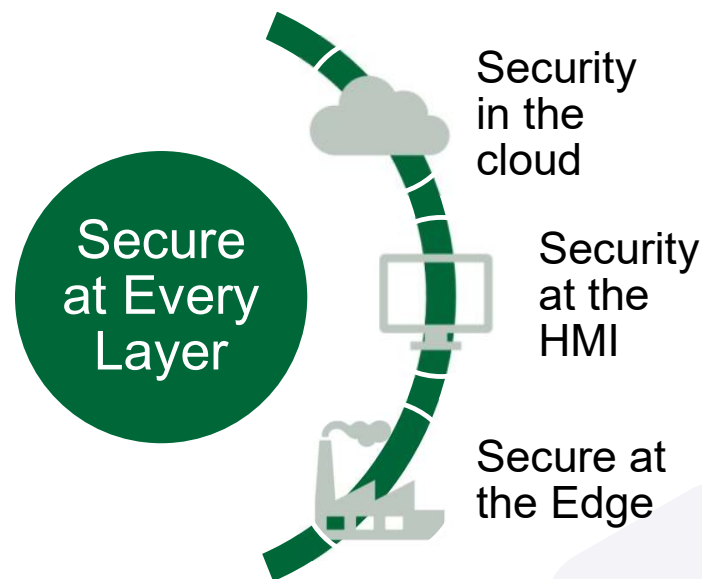


Specific Energy: Cybersecurity at a Glance

Specific Energy is on a mission is to transform operations data into meaningful insights, allowing our users to focus on the task at hand and trust data management to us.

Security Highlights:

- ✓ TLS 1.3 protocols, AES256 encryption
- ✓ Two-factor authentication required
- ✓ Daily patches deployed automatically to edge devices
- ✓ Data backed up on secure, redundant servers
- ✓ Linux Ubuntu Core IoT platform
- ✓ NIST Framework



For more information visit
<https://www.specifichenergy.com/security.html>

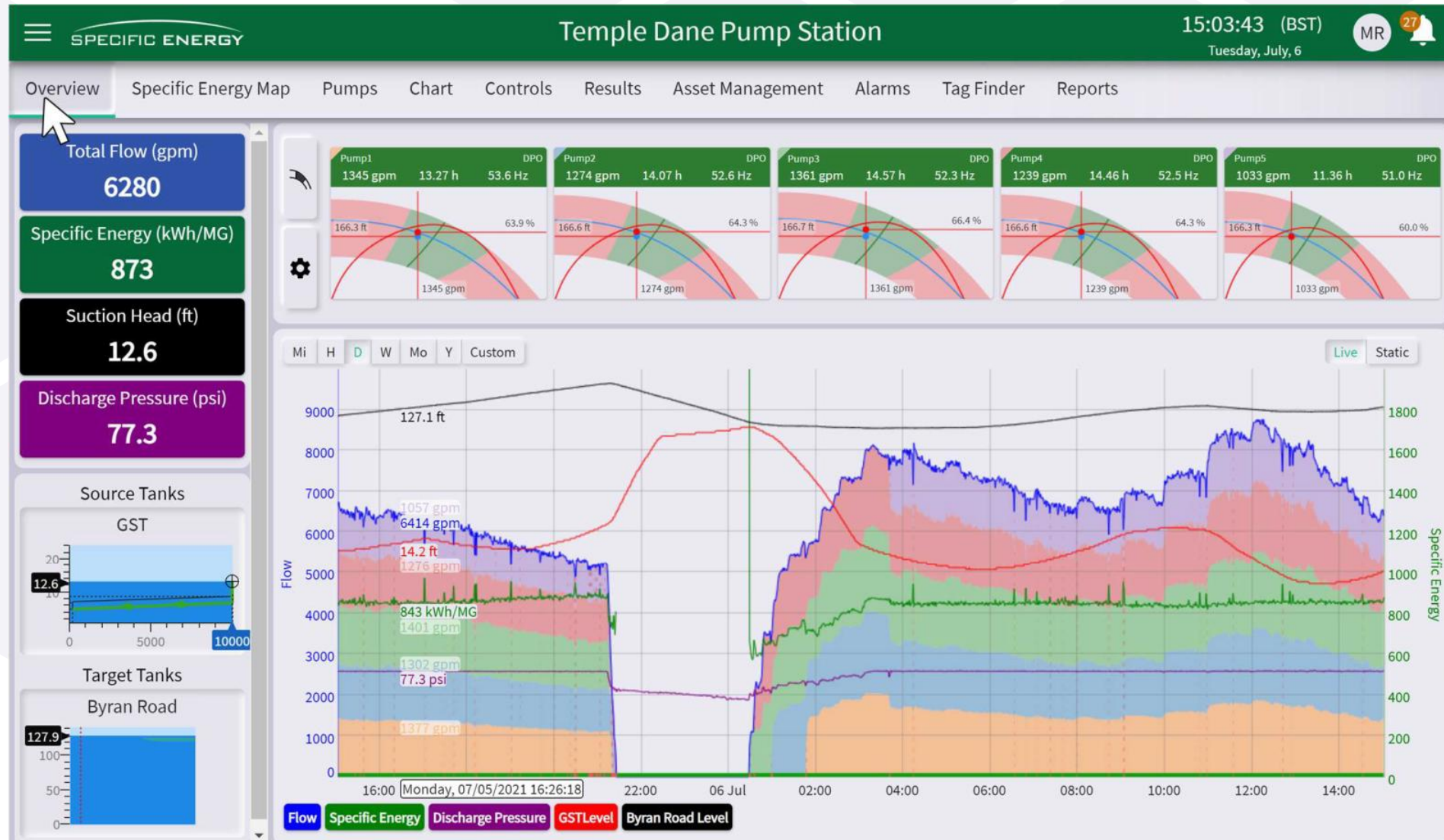
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DPO PLATFORM

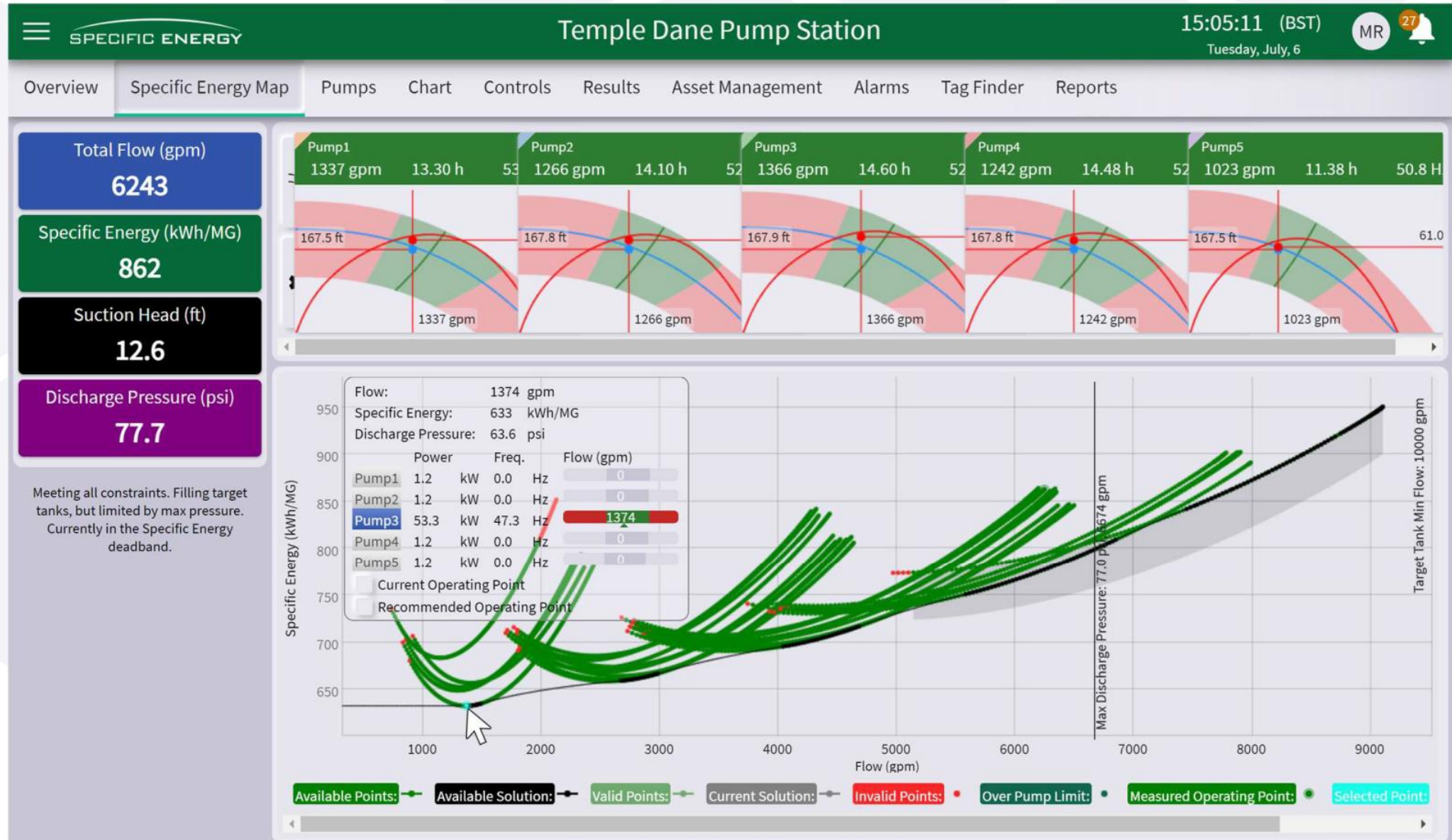
A snapshot of the DPO platform
and its capabilities in action.



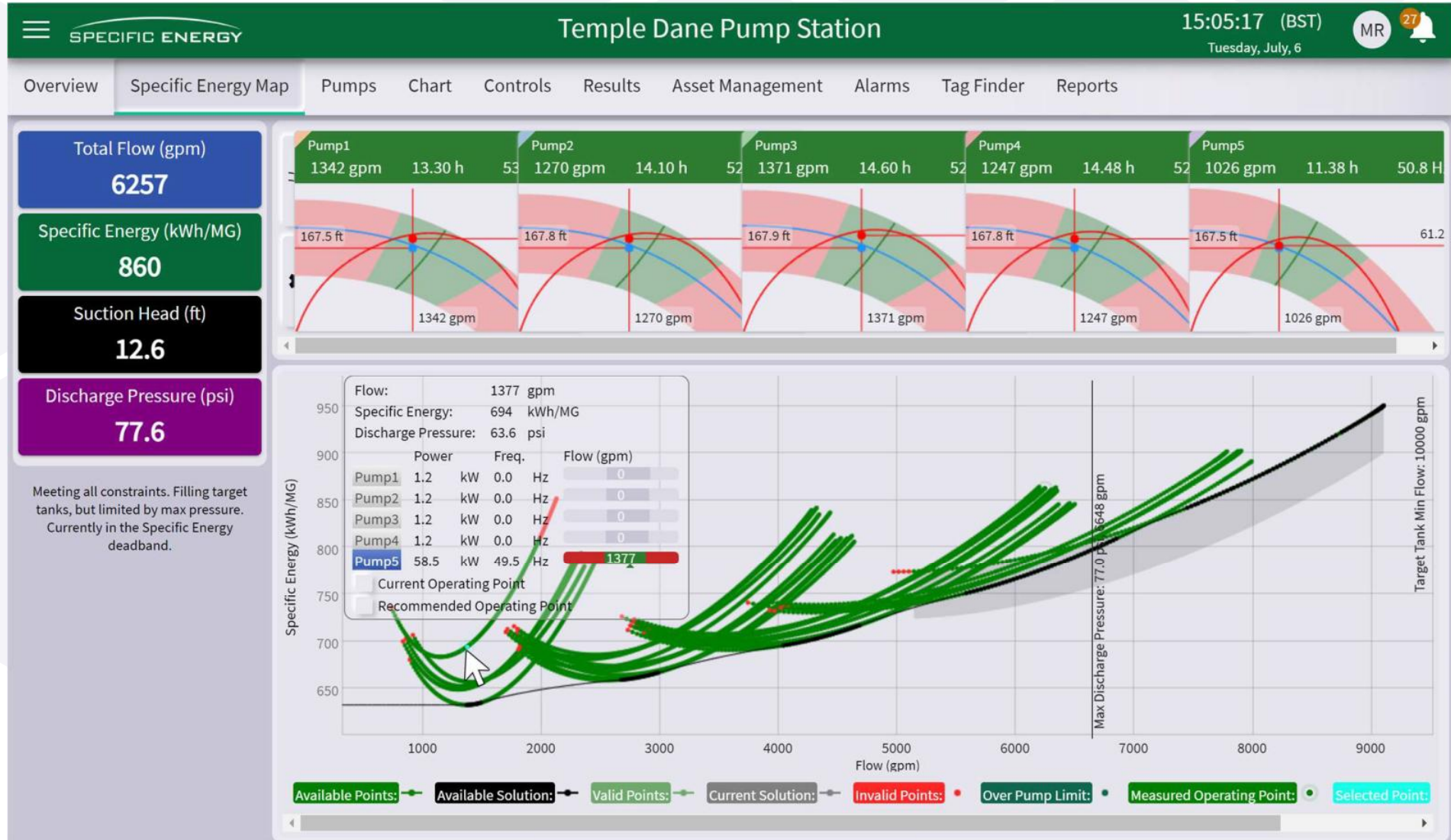
DPO Platform - Overview Tab



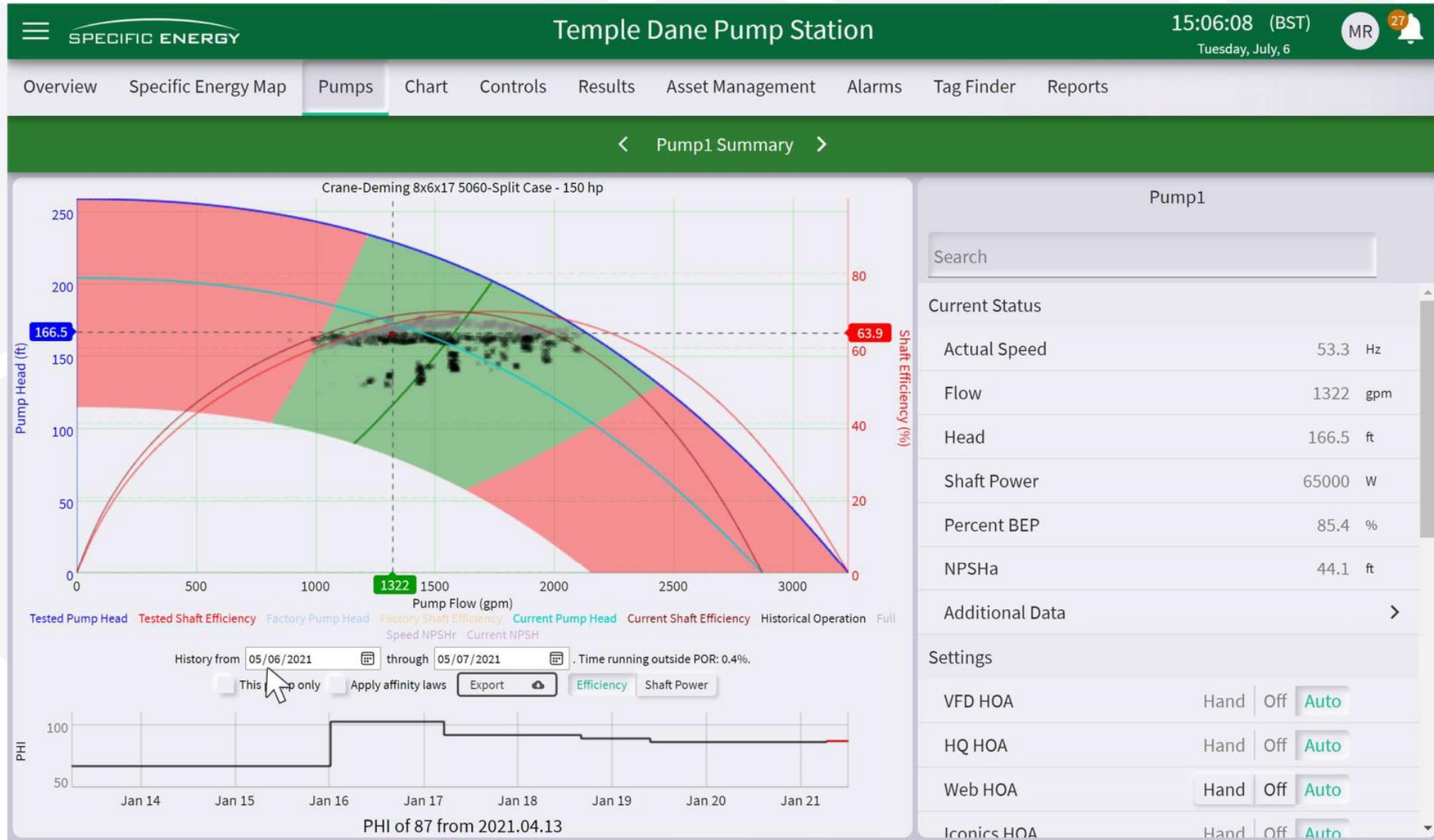
DPO Platform – Specific Energy Map



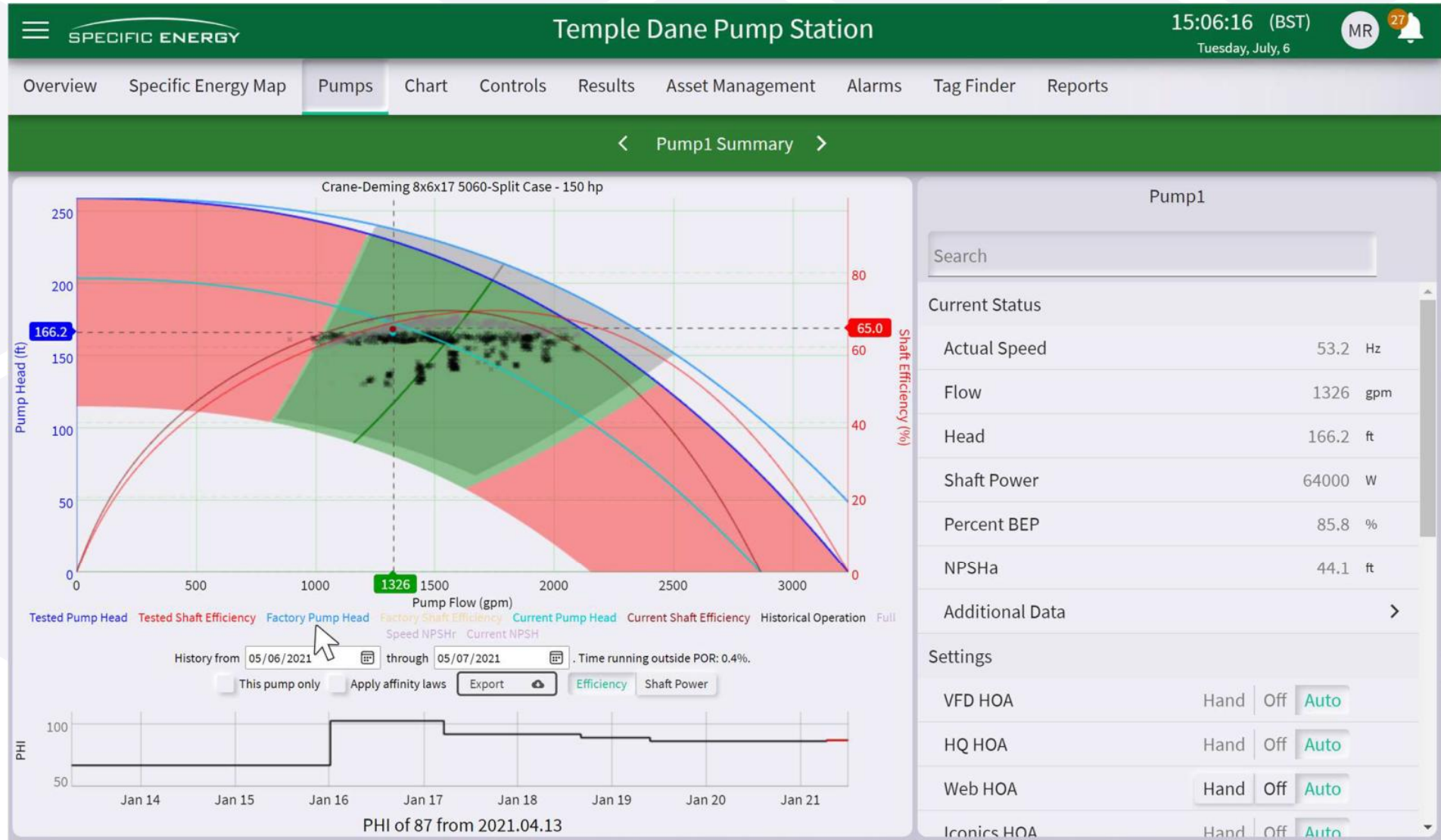
DPO Platform – Specific Energy Map



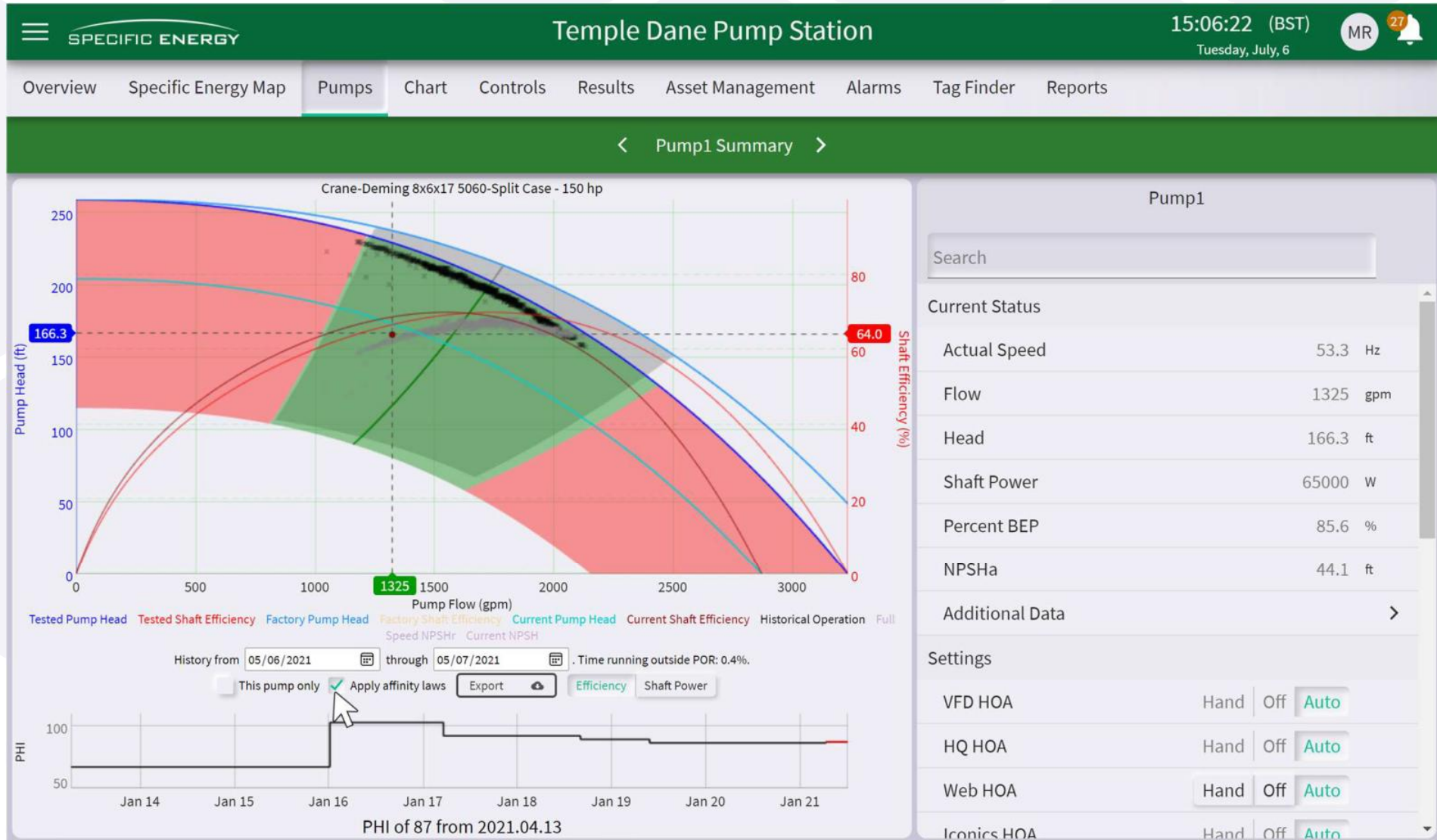
DPO Platform – Pump Summary Tab



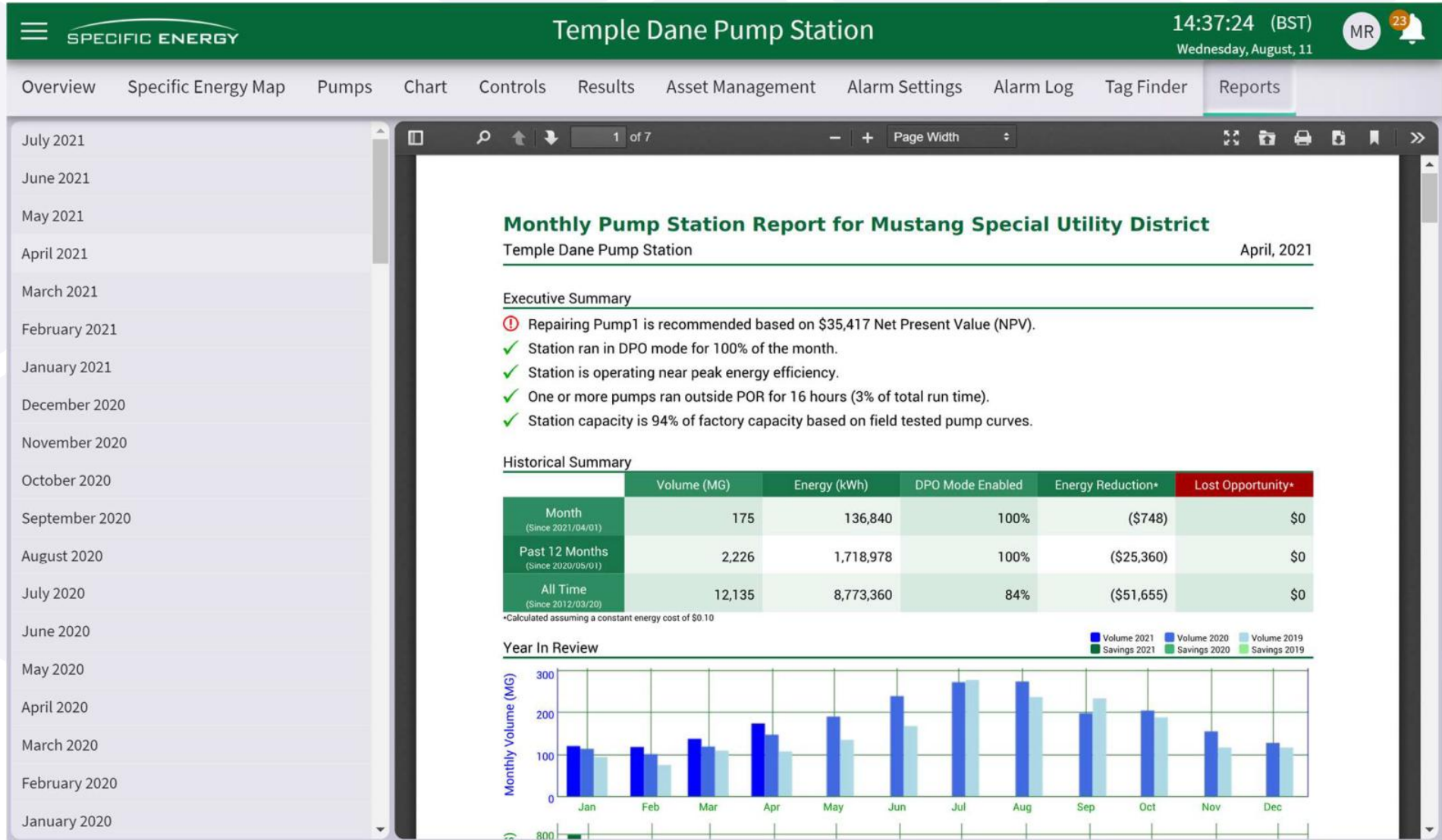
DPO Platform - Pump Summary Tab



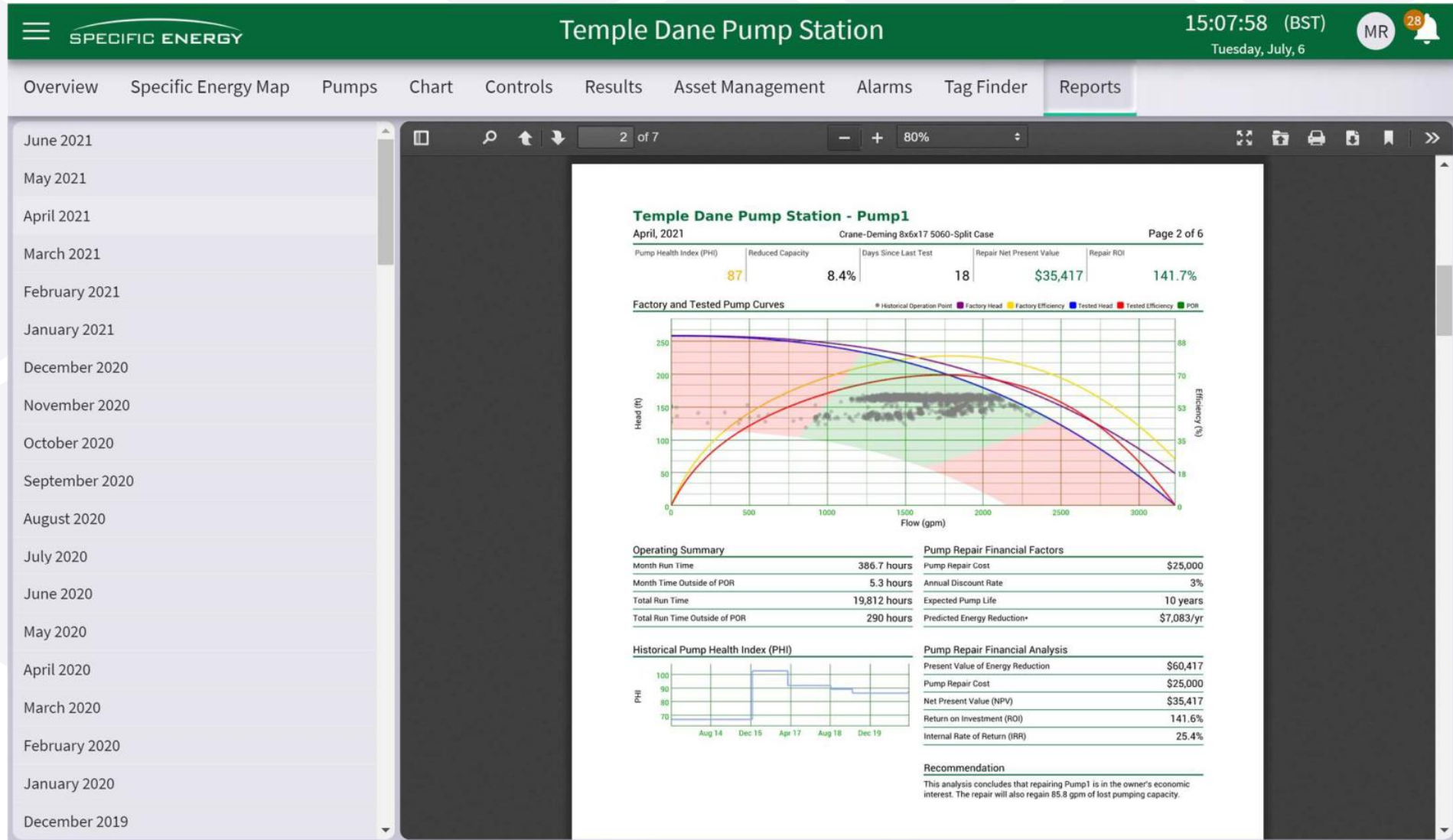
DPO Platform – Pump Summary Tab



DPO Platform - Monthly Reports Tab



DPO Platform - Monthly Reports Tab

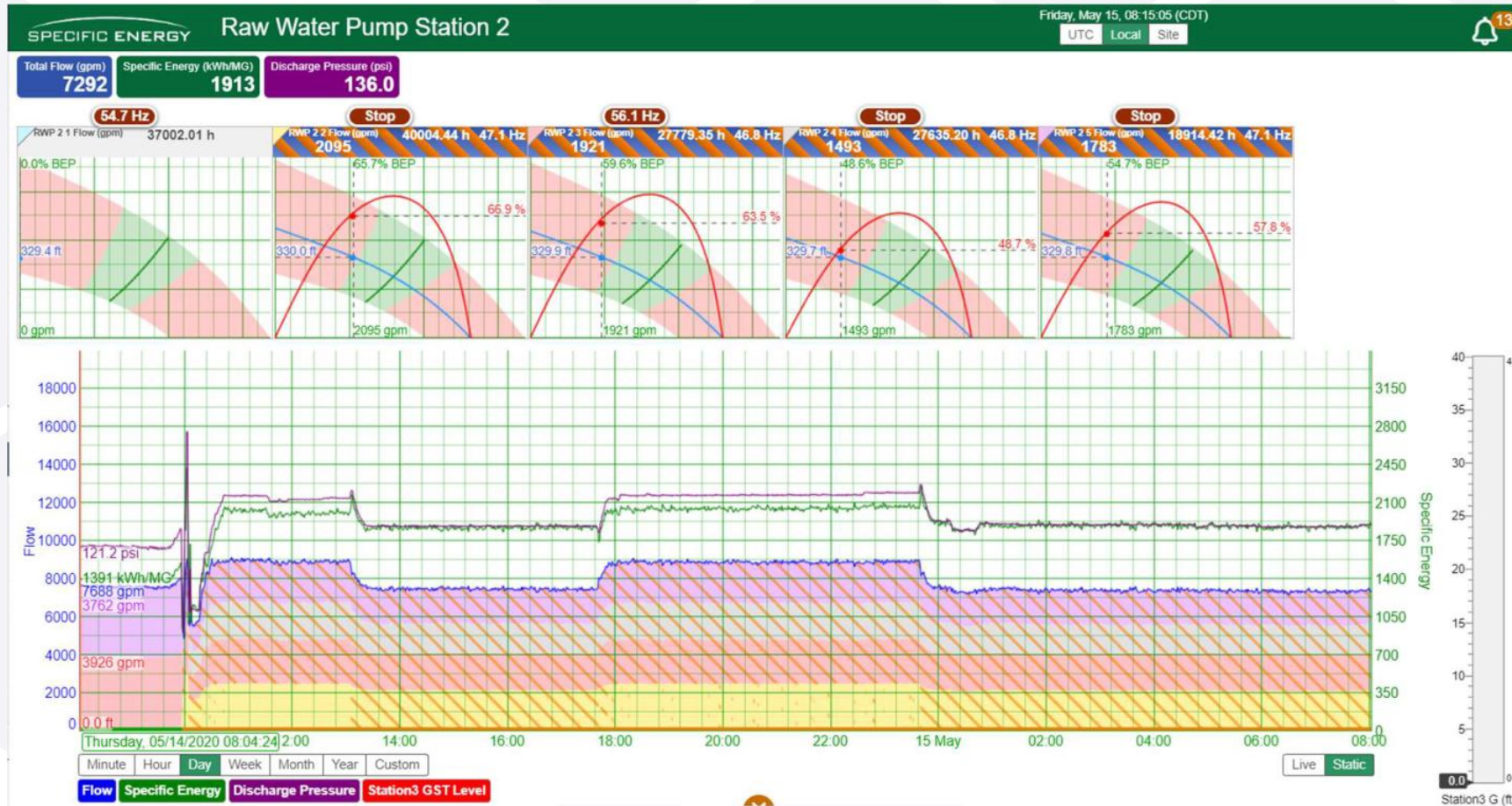


CASE STUDY

Guadalupe Blanco River Authority, TX
Raw Water Pump Station No. 2

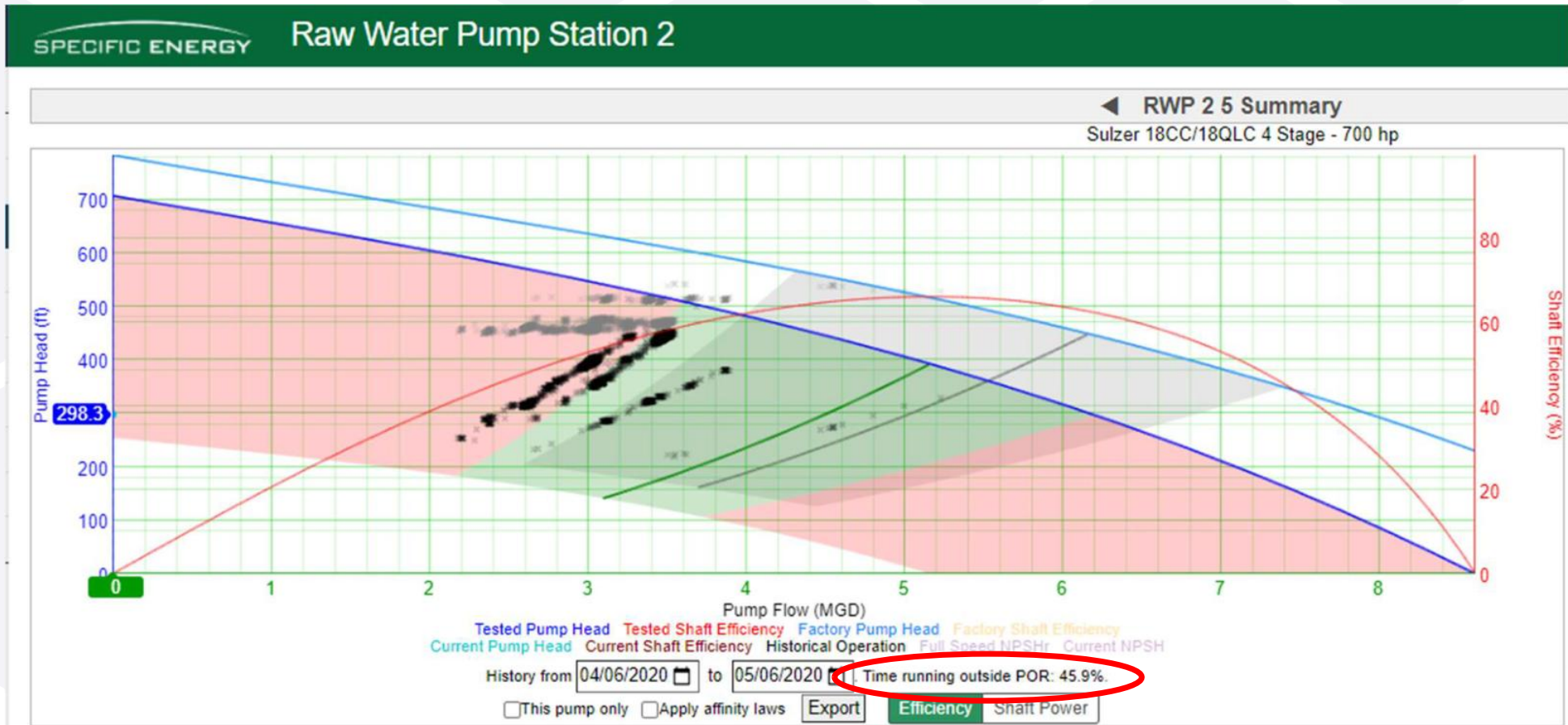


Case Study: Without DPO Operation

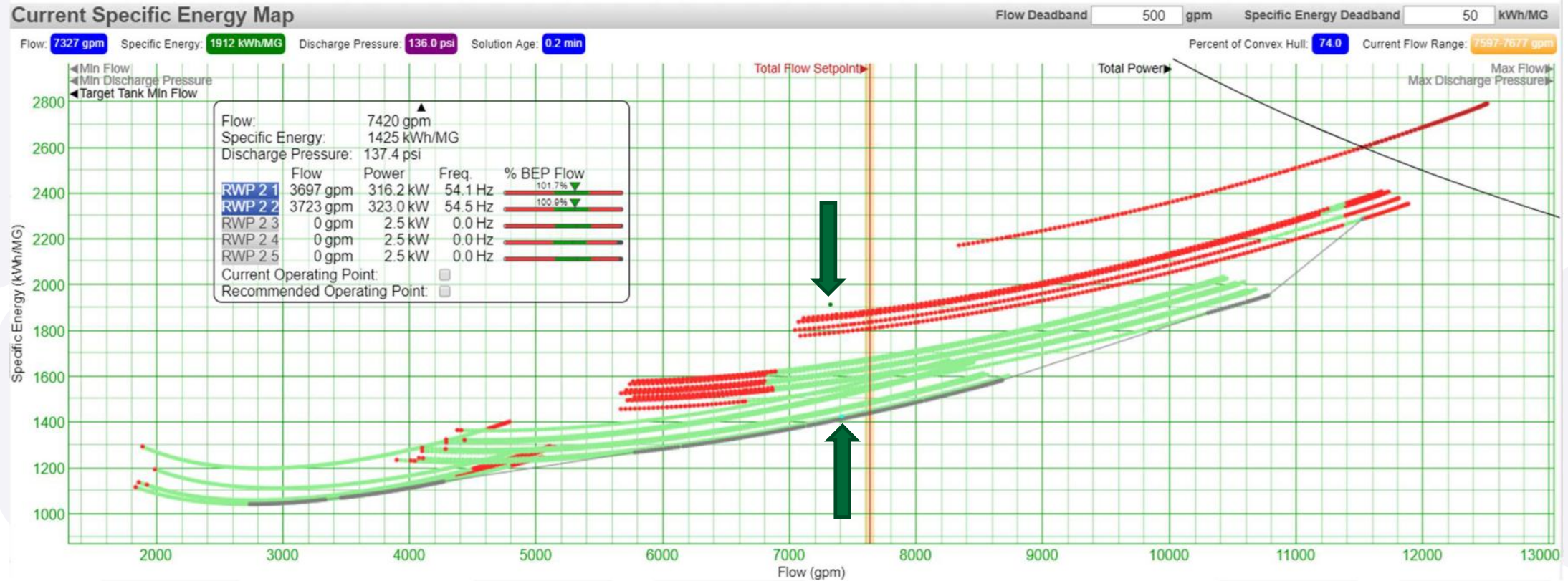


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Case Study: Without DPO Operation

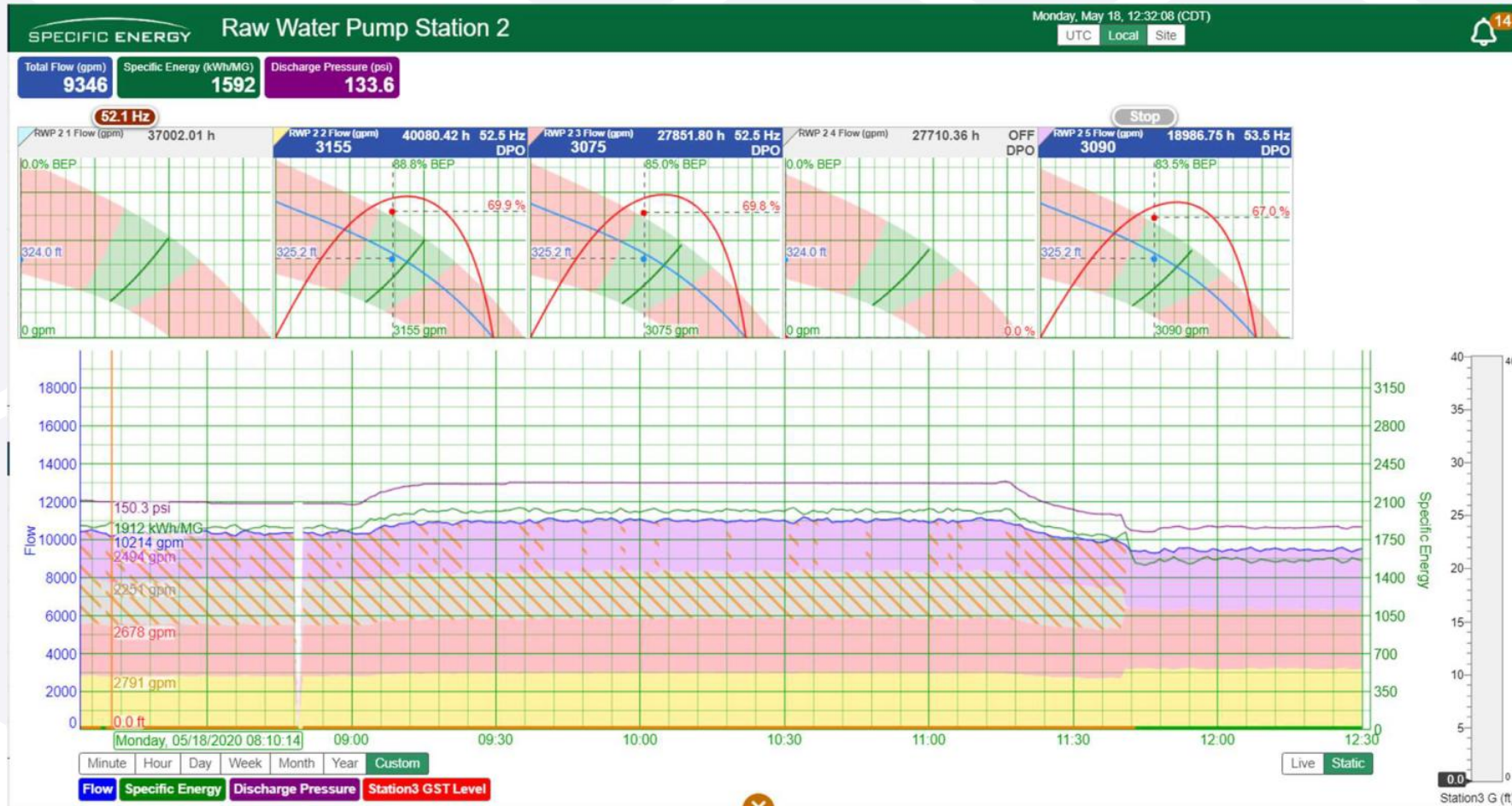


Case Study: Without DPO Operation



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Case Study: With DPO Operation



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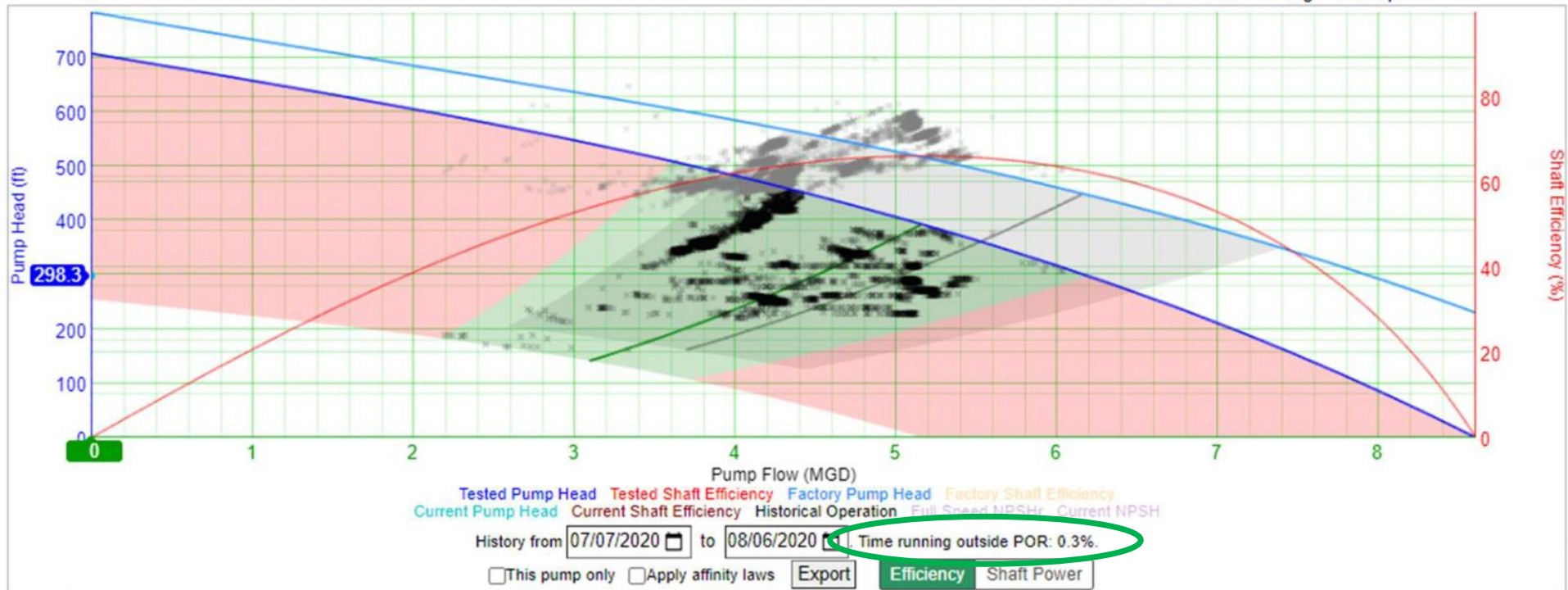
Case Study: With DPO Operation

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Raw Water Pump Station 2

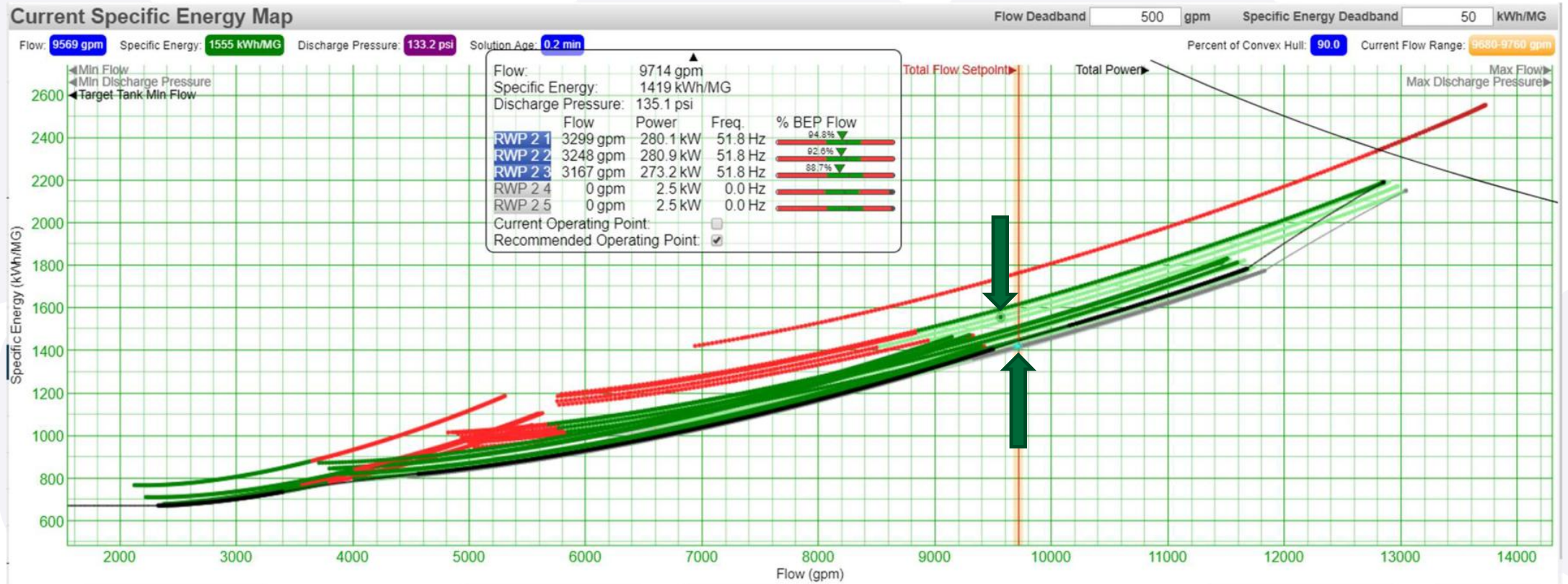
◀ RWP 2 5 Summary

Sulzer 18CC/18QLC 4 Stage - 700 hp



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Case Study: With DPO Operation



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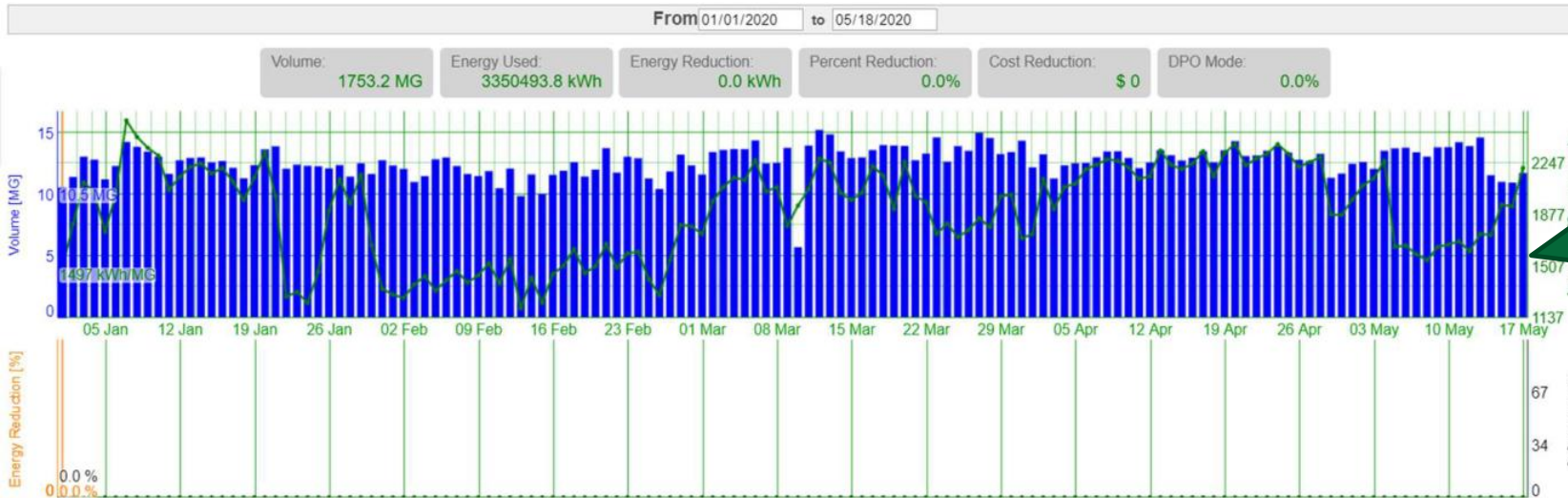
Case Study: Instantaneous Energy Savings

Date	From	To	Flow Setpoint	SEC	DPO?
5/18/2020	915	1116	11247	2019.893	No
5/18/2020	1500	1600	11247	1855.443	Yes
				8.14% Savings	@ high flow setpoint

Date	From	To	Flow Setpoint	SEC	DPO?
5/18/2020	2400	700	9720	2453.477	No
5/18/2020	1200	1445	9720	1567.096	Yes
				36.13% Savings	@ low flow setpoint

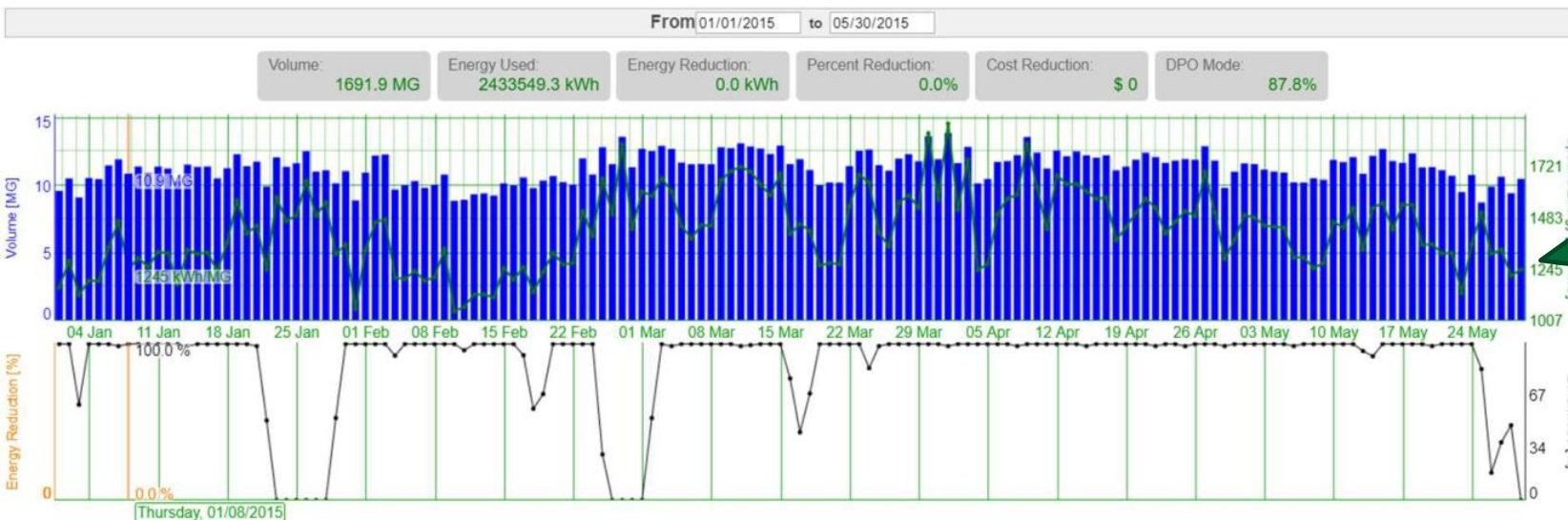


Case Study: Specific Energy Consumption



1911 kWh/MG

Potential Savings
of 24.7%



1438 kWh/MG



Additional Benefits of DPO at GBRA

Capacity Challenge

System design capacity is 25 MGD, DPO as Digital Twin identified current capacity limited to 18 MGD. Operations were unaware of the issue, partially caused by air entrainment and faulty air release valves adding ~250ft of additional head.

Operational Results

For \$20,000 USD investment to pig the line, GBRA regained ~2 MGD. Energy reductions due to efficient pump operation from DPO. Asset Management function scheduled pump repair based on NPV.

Solution

DPO identified and quantified root cause of the issues. Recommended GBRA pig the line and repair valves, costing approx. \$20,000 USD to regain ~2MGD of capacity. Scheduled repair of worn pumps to regain balance of capacity.

Financial Results

~2 MGD capacity recovered equivalent to **\$735,000/yr** in production capacity regained. Reduction in energy consumption resulted in **\$265,000/yr** savings.



Thank You

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