Distribution System Planning Introduction

2023 Avista Electric DSP

DPAG 2 – June 2023

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Welcome to DPAG meeting #2

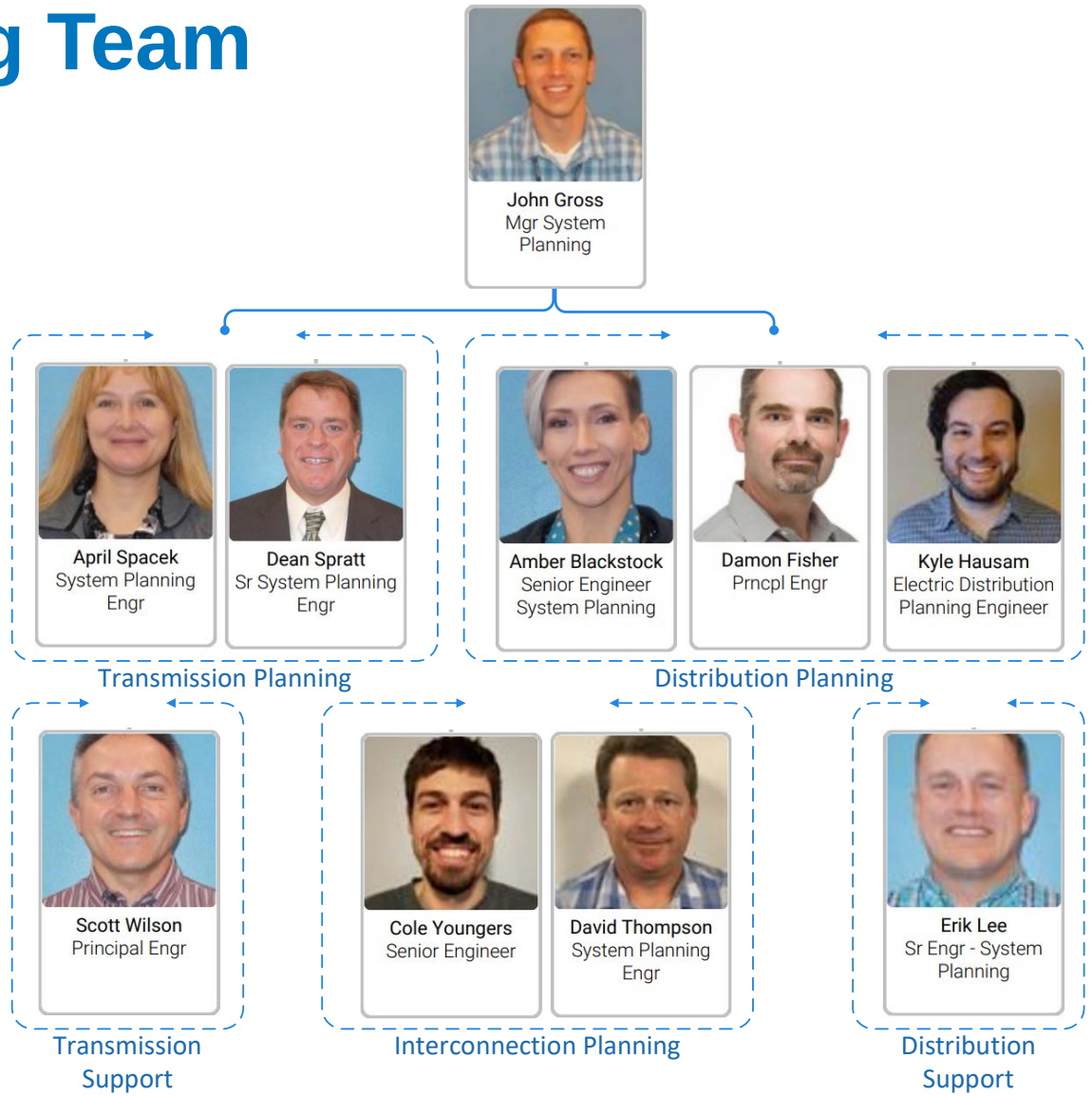
Today's Agenda

- Meeting Reminders
- Introductions
- Distribution Planning Advisory Group
- Planning Criteria
- Biannual System Assessment
- Potential Solutions
- Solution Examples
- Final thoughts and what's next

Virtual Meeting Reminders

- Please mute mics unless commenting or asking a question
- Raise hand or use the chat box for questions or comments
- Please try not to speak over the presenter or a speaker
- Public meeting – this meeting is being recorded

Avista's Planning Team



Distribution Planning Advisory Group Vision

- Provide expertise and support towards informing a transparent, robust, holistic planning process for electric system operations and investment.
- Contribute to and inform the long-term plan to ensure operational efficiency and customer value are maximized.

Distribution Planning Advisory Group Goals

- Inform stakeholders about the electric system
- Provide greater transparency in planning process
- Provide opportunity for feedback
- Open to all stakeholders
- Flexible to adjustments

Distribution Planning Advisory Group Strategy

	January - March	April - June	July - September	October - December
Meetings	2-3 hours in February	2-3 hours in April 2-3 hours in June	2-3 hours in August	TBD
Topics	• DPAG Introduction • Distribution System and Electrical Concepts • Avista's Distribution System Overview • Planning Processes • Load Forecast and DER Potential Assessment	• Distribution Planning Process • Performance Criteria • System Needs Identification • Identify Solutions • Solution Examples	• Review Solution Selection • DER Potential Assessment Update • Hosting Capacity • Review System Plan	• To be determined

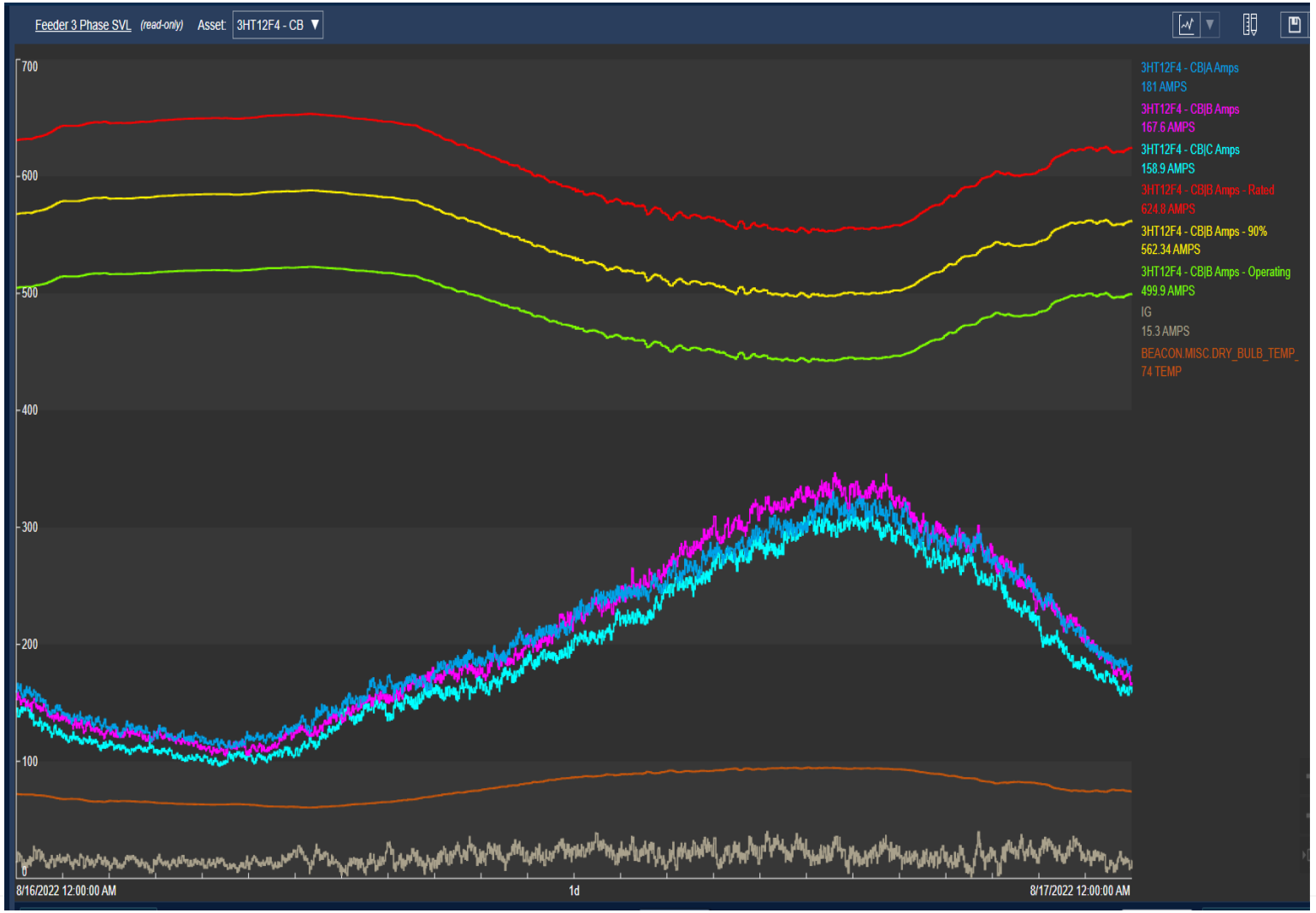
Distribution Planning

- Performance Criteria

Category[2]	Outage[3]	Thermal Performance	Voltage Performance[4]	Regulator Performance	Current Imbalance	Voltage Imbalance	Customers Experiencing Interruption[5]	Customers Experiencing Sustained Outage Longer than 2 Hours[6]	Notes
D0 - No Contingency	None	< 80% *Continuous*[7]	118V < Volt < 127V	-12 < tap < +12	Line loading > 90%: 5% Line loading > 80%: 10% Line loading >70%: 15% Line loading < 70%: 20%	3%	N/A	N/A	• Seasonal load transfers can be used
D1 - Feeder Contingency	Loss of one of the following:	< 95% Continuous	114V[8] < Volt < 127V < 4V Deviation[9]	-15 < tap < +15	Line loading > 90%: 10% Line loading < 90%: NA	5%			• Field switching can be used to restore customers • Generator curtailment may be required for restoration
	1. Feeder Lockout						3000 or 10MVA	Suburban: 500 Rural: 3000	
	2. Generator Outage/Off						0	0	
	3. Automatic Transfer Switch Operation						N/A	N/A	
D2 – Multiple Contingency (Common Structure[10])	Loss of one of the following:	< 95% Continuous	114V< Volt < 127V		None	5%	4000	500	
	1. Loss of two feeders on common structure								
	2. Loss of three feeders on common structure								
D3 - Substation Contingency	Loss of one of the following:	< 95% Continuous	114V< Volt < 127V	-15 < tap < +15	None	5%			• Feeder breaker and/or regulator bypass is acceptable
	1. Feeder Regulator						3000	0	
	2. Feeder Breaker						3000	0	
	3. Substation Transformer						6000	Suburban: 0 Rural: 1500	

Thermal Performance explanation

- Thermal Performance
- Amps = Heat
- Heat = Degradation
- Heat = Sagging
- Heat = Material Failure
- Heat = Insulation Failure



System Assessment Preliminary Results

FEEDERID	Year 0 %	Year 0 amps	Year 5 %	Year 5 amps	Year 10 %	Year 10 amps
PRA221	90.2	462	117.8	603	153.9	788
HUE142	100.8	606	123	739	149.8	900
PRA222	86.7	444	110.5	566	141	722
NE12F4	79.7	479	104.2	626	136.3	819
TEN1254	81.6	418	102	522	127.3	652
L&S12F4	86.4	519	104.8	630	127.1	764
LIB12F3	70.6	436	90.8	561	116.7	721
TEN1257	84.9	510	97.8	588	112.6	677
ROS12F5	84.5	458	97.6	529	112.5	610
RAT231	77.9	399	93.4	478	111.7	572
ROS12F1	86.4	431	97.6	487	110.4	551
FWT12F3	79.1	405	93.4	478	110.2	564
L&S12F2	87.7	527	98	589	109.5	658
IDR253	83.4	427	95.5	489	109.4	560
MEA12F1	84.4	432	95.9	491	108.8	557
KAM1291	76.8	238	91.3	283	108.7	337
GLN12F1	95.7	490	100.4	514	105.3	539
M15514	84.2	505	94	564	105	630
GRA12F1	78.8	467	90.7	538	104.4	619
LOL1266	81.3	416	92	471	104.1	533
GLN12F2	91.2	467	97.5	499	103.9	532
NE12F1	70.3	360	84	430	100.6	515
DAL131	81.5	490	90.3	543	100.3	603
NW12F1	74.4	381	86.3	442	100.2	513
COB12F2	77.1	395	86.9	445	97.9	501

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HUE142	100.8	606	123	739	149.8	900
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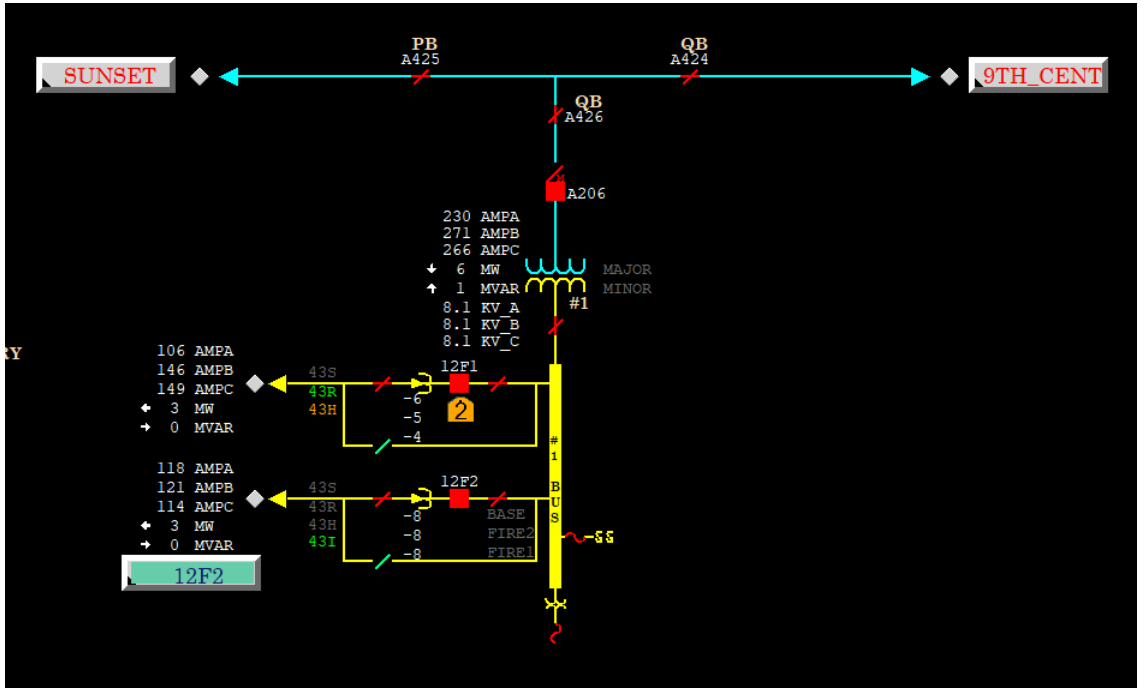
ROS12F1	86.4	431	97.6	487	110.4	551
GLN12F2	91.2	467	97.5	499	103.9	532
STM632	96.2	229	96.2	229	96.2	229
MEA12F1	84.4	432	95.9	491	108.8	557
IDR253	83.4	427	95.5	489	109.4	560
L1312F1	95.4	145	95.4	145	95.4	145
BKR12F1	94.2	471	94.2	471	94.2	471
M15514	84.2	505	94	564	105	630
RAT231	77.9	399	93.4	478	111.7	572
FWT12F3	79.1	405	93.4	478	110.2	564
3HT12F4	92.4	473	92.8	475	93.2	477
LOL1266	81.3	416	92	471	104.1	533
LIB12F1	91.6	469	91.6	469	91.6	469
DVP12F1	91.6	185	91.6	185	91.6	185
CDA125	91.5	537	91.5	537	91.5	537

Detailed look at Glenrose Substation

Station Details

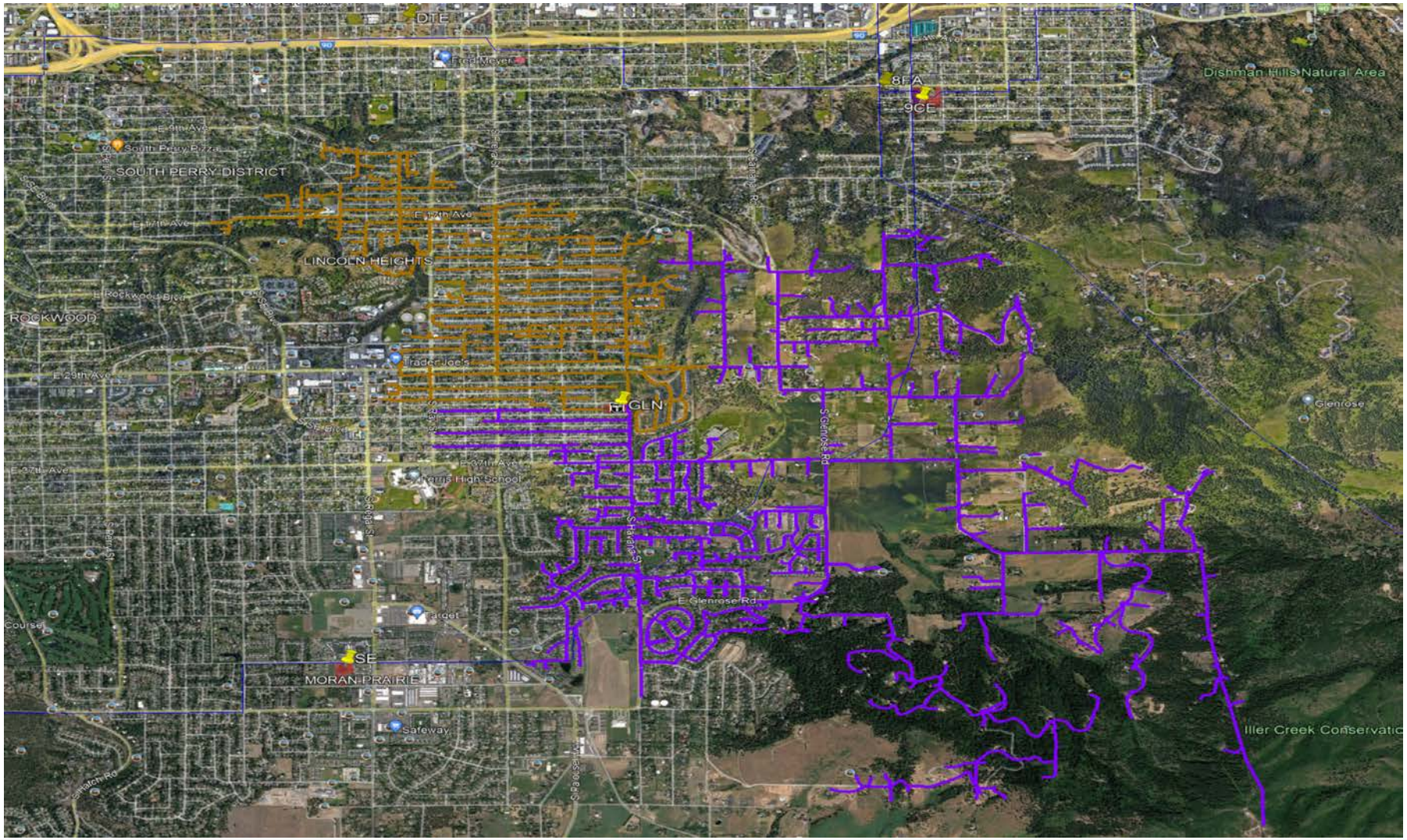
- Single 20MVA transformer and two feeders
- ~5,500 Customers
- Each feeder capable of 512 Amps in the summer that is limited by the voltage regulator capacity.
- The transformer is capable of 956 Amps in the summer.

SCADA Screen



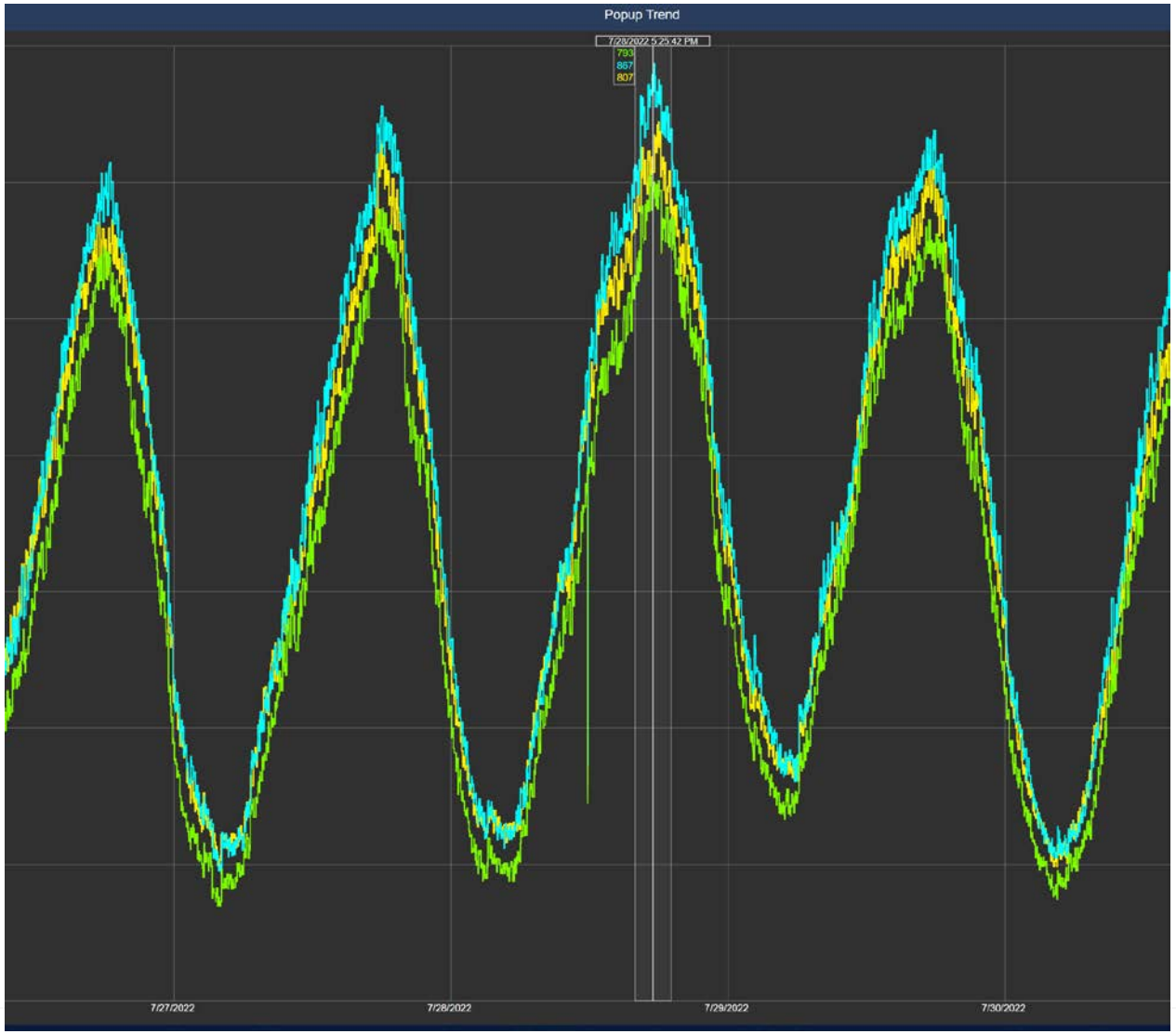
Detailed Look at Glenrose Substation

- Brown 12F1
- Purple 12F2



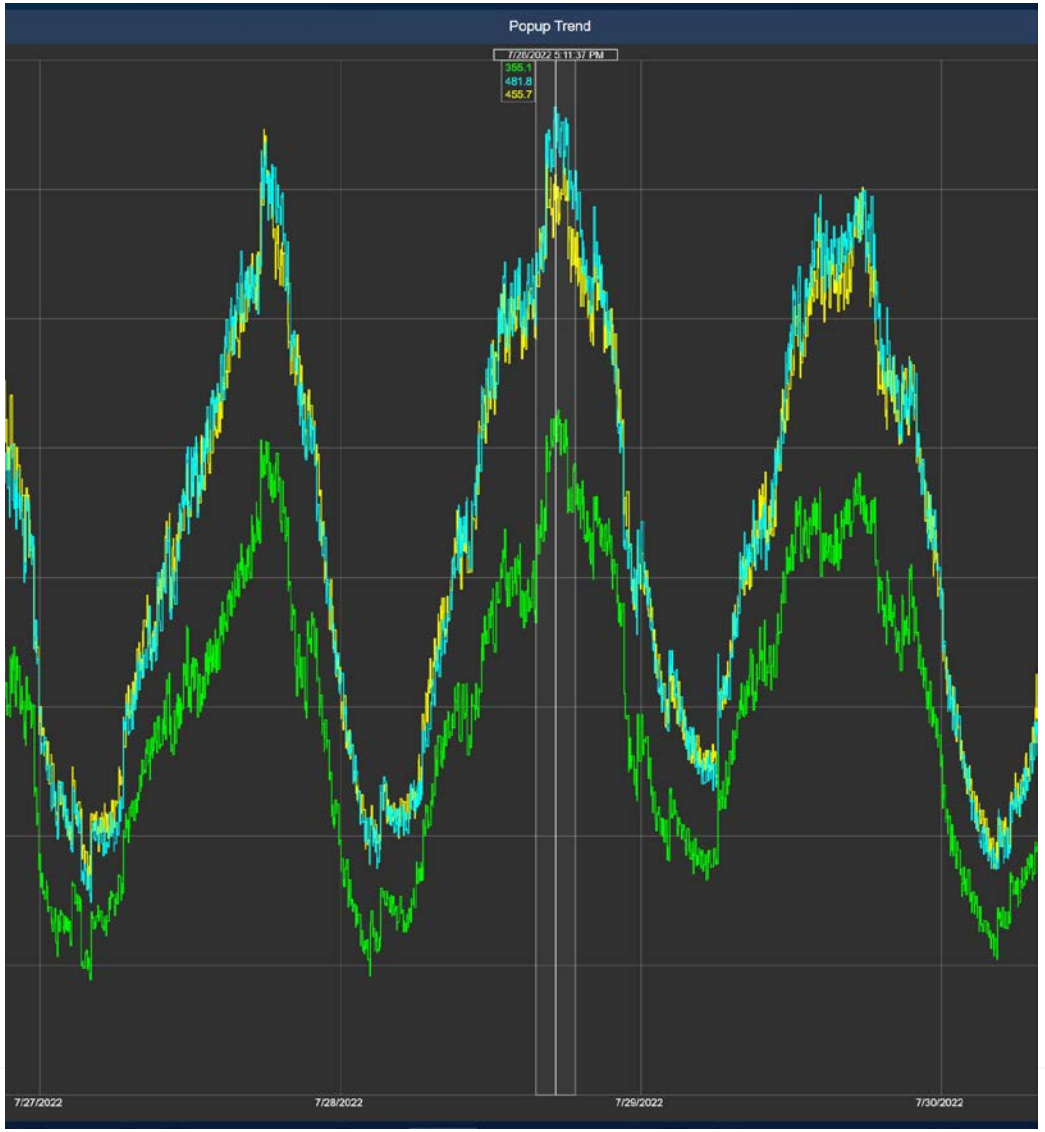
Detailed Look at Glenrose Substation

- Transformer Loading
  - Approaching Capacity
  - Unbalanced



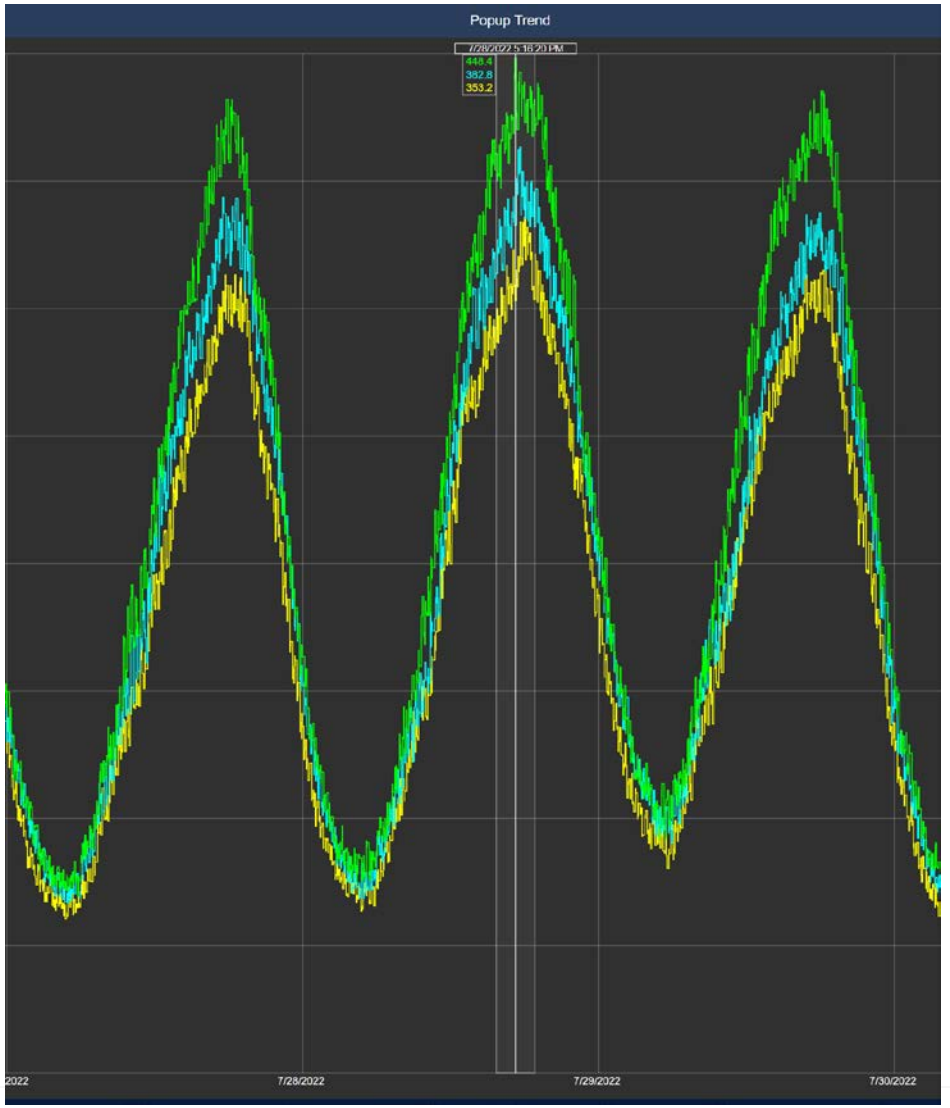
Detailed Look at Glenrose Substation

- Feeder Loading
  - 12F1 Approaching capacity
  - 12F1 Unbalanced
  - Interesting load anomaly

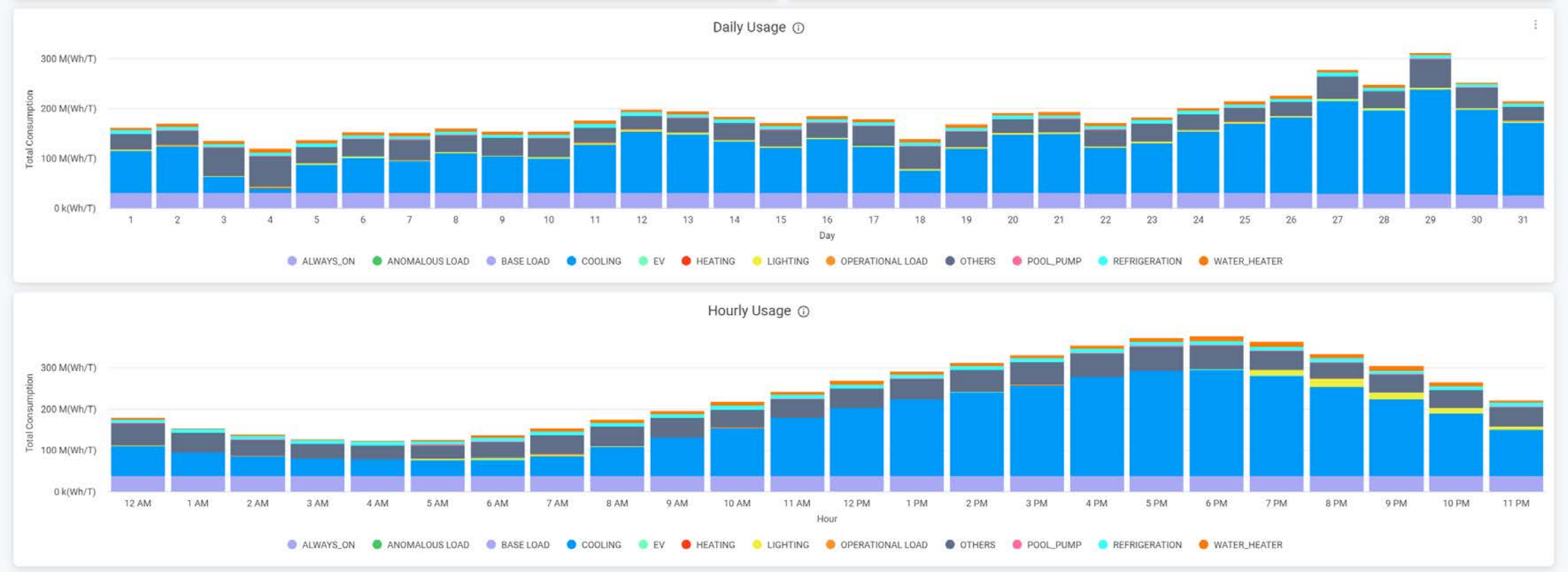


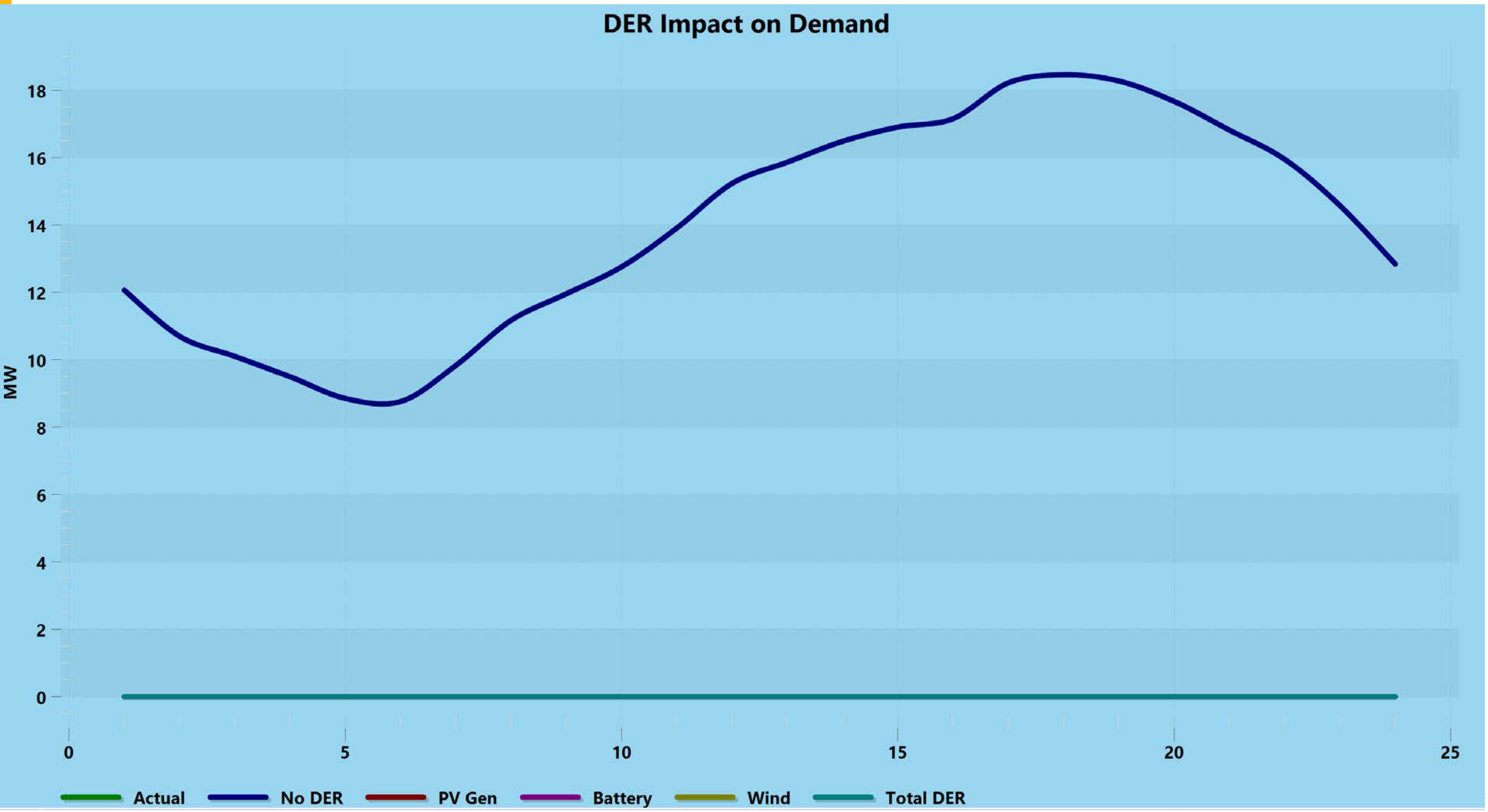
Detailed Look at Glenrose Substation

- Feeder Loading
  - 12F2 Nearing capacity
  - 12F2 Unbalanced



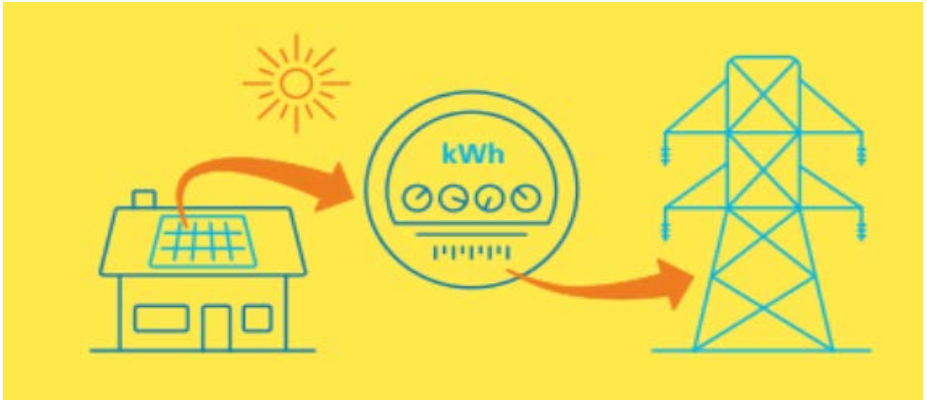
AMI Data Disaggregated



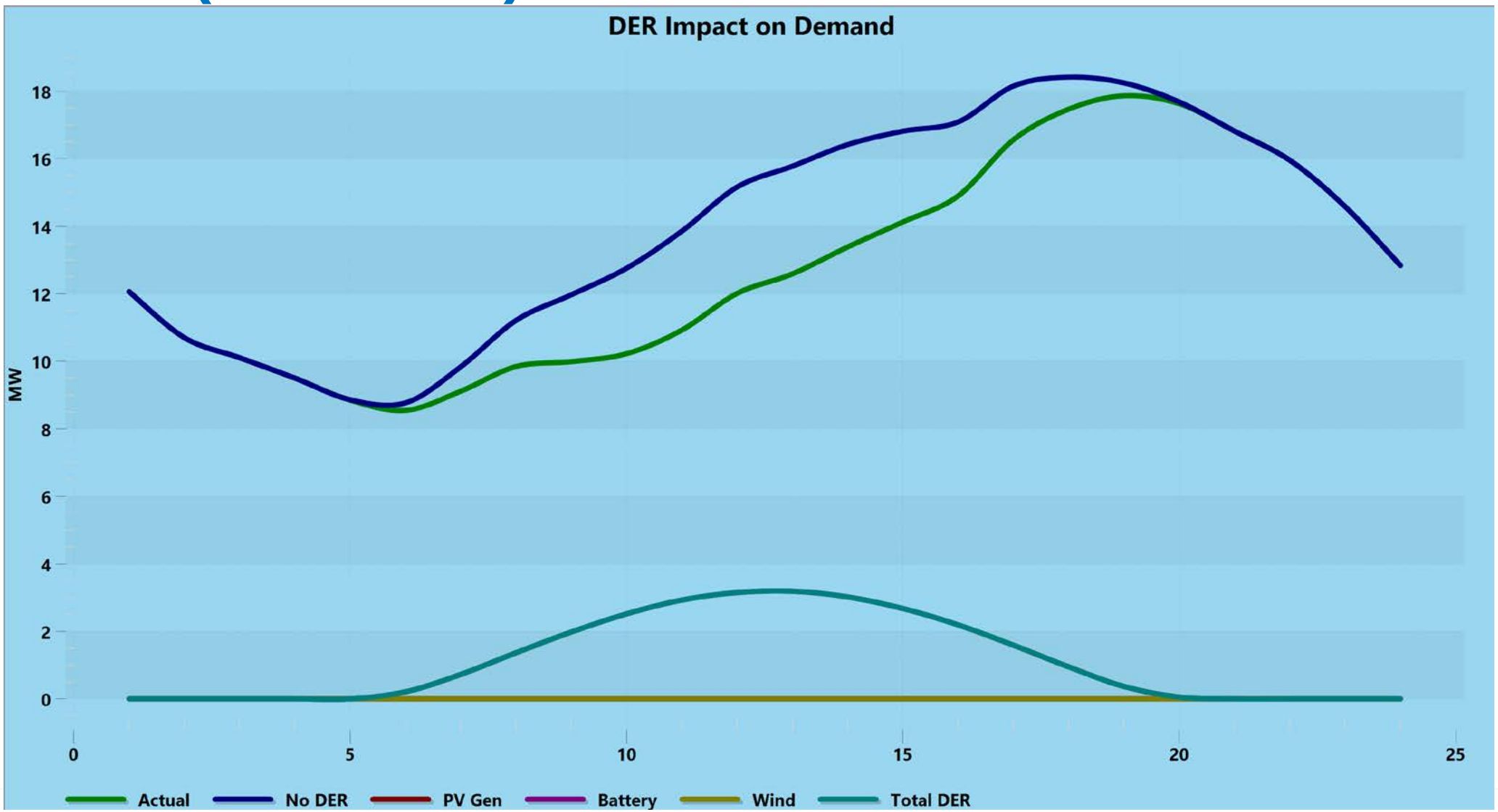

DER Impact on Demand
MW
18
16
14
12
10
8
6
4
2
0
0
5
10
15
20
25
Actual
No DER
PV Gen
Battery
Wind
Total DER

Possible Solutions

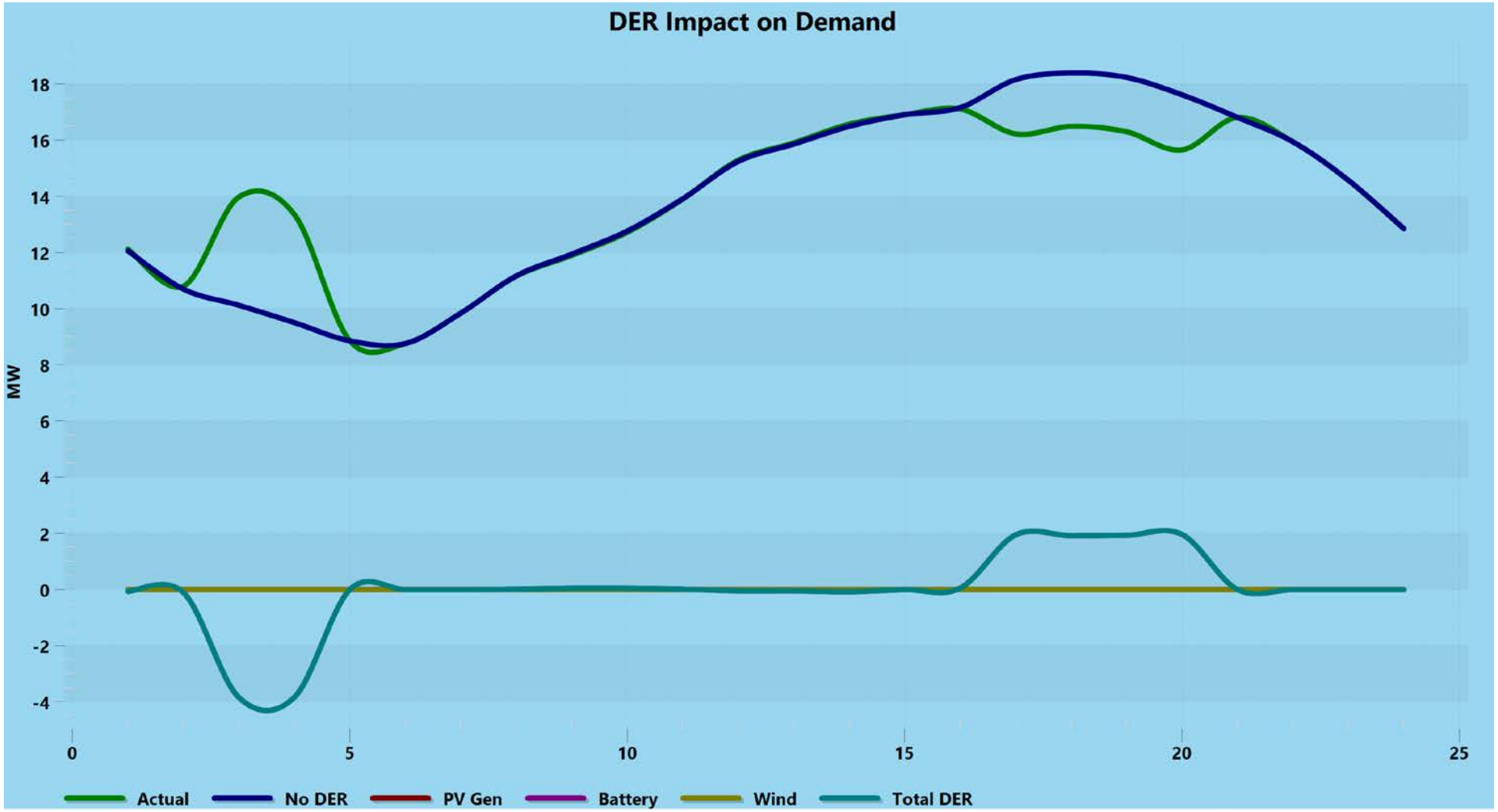
- Distributed Energy Resource (DER)
  - Solar
  - Batteries
  - Demand Response
  - Energy Efficiency
- Upgrade Existing Station
- Expand Existing Station
- New Station



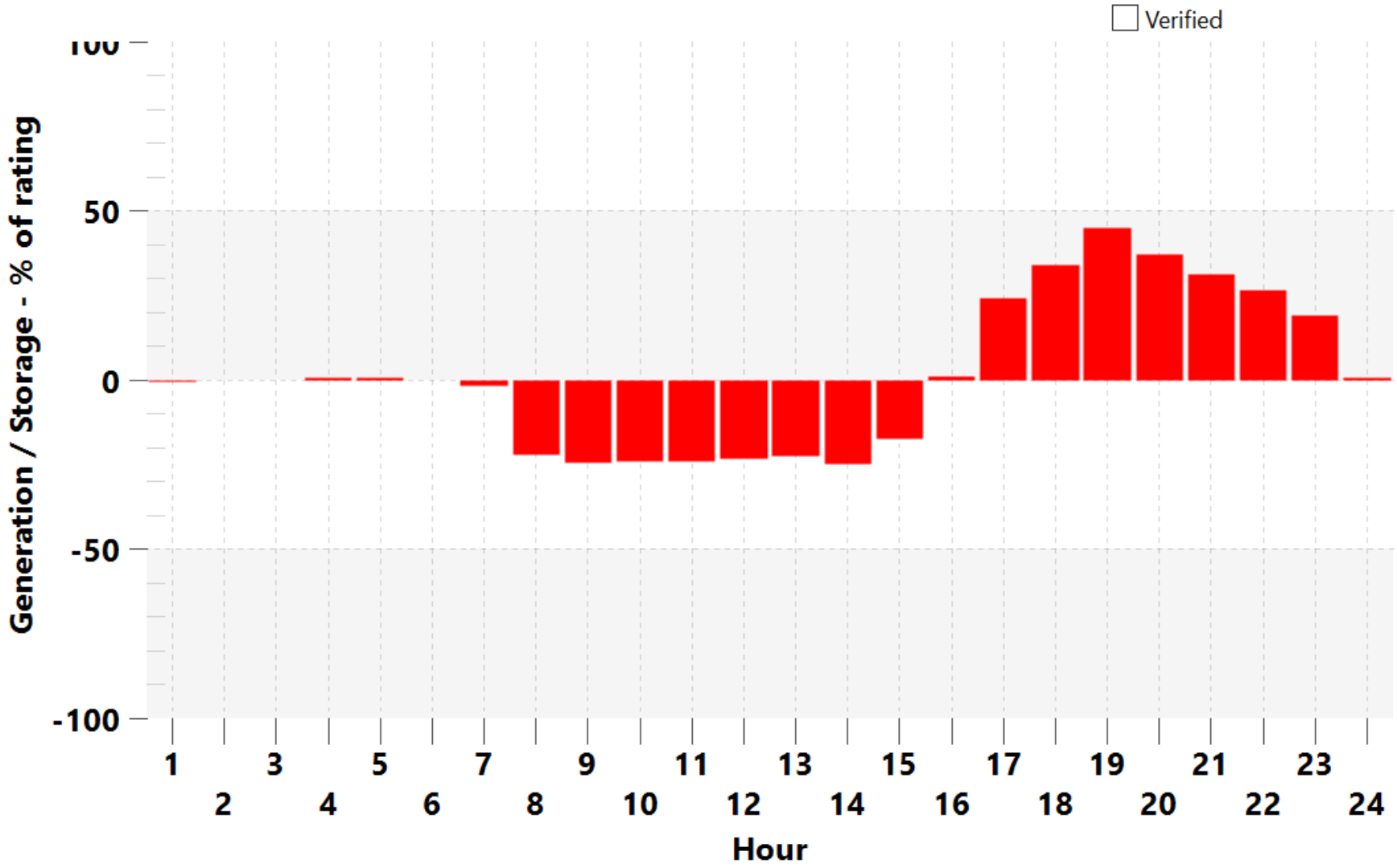
Solar (4MW total)



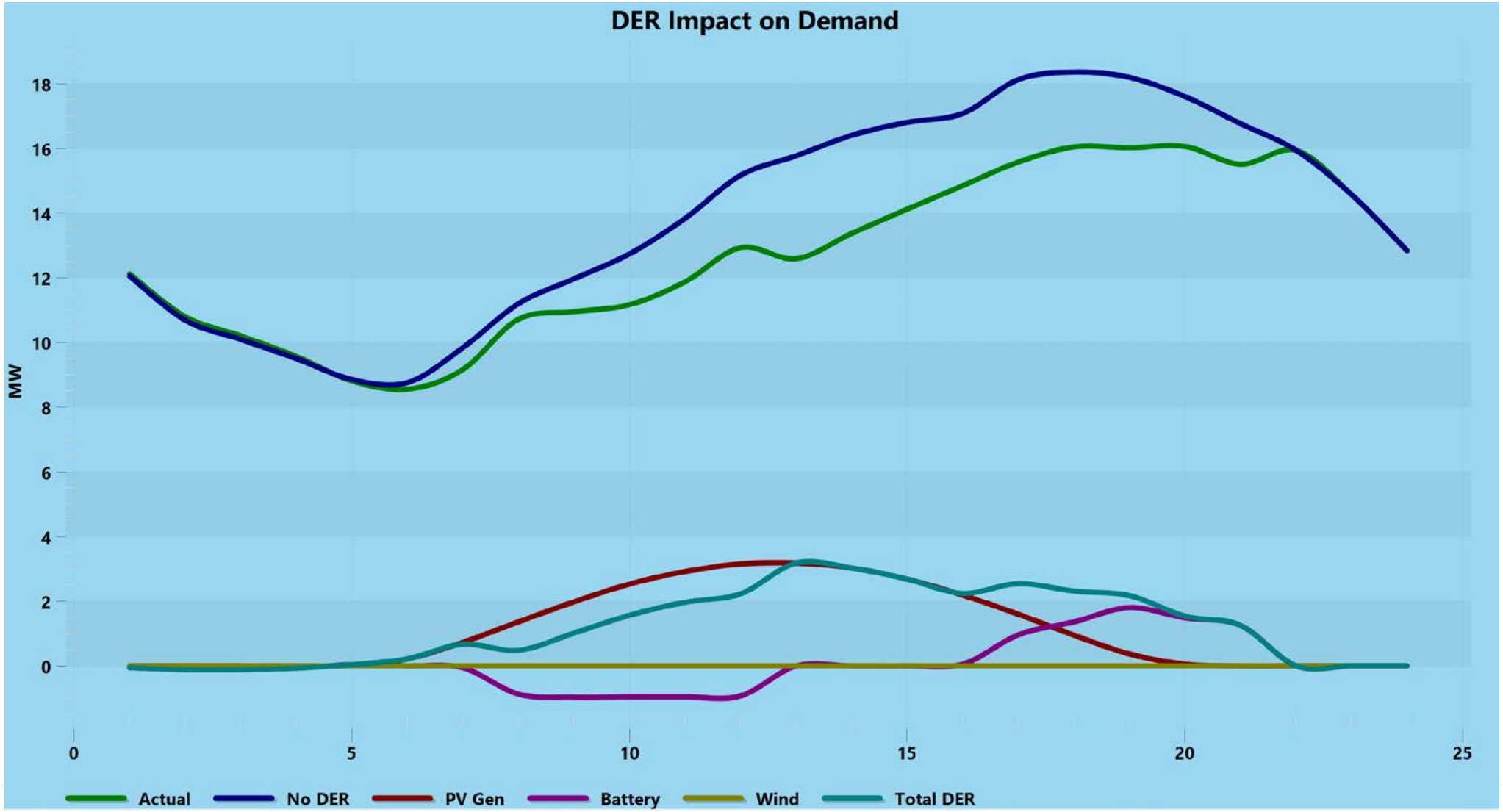
Batteries (4MW total)



Solar + Batteries



Solar + Batteries



Upgrade Existing Station

- Larger Transformer 20MVA to 30MVA
- Larger Voltage Regulators 512A to 601A

Before

Transformer Id	Feeder Id	Demand kVA	% pf	Amps	% Ldng	Connected Customers	kVA
		21920	89	112	98	5459	45038
		21920	89	112	98	5459	45038
GLN - XFMR #1		21920	89	112	96	5459	45038
	GLN12F1	10313	95	514	100	2985	19966
	GLN12F2	10145	95	486	95	2474	25071

After

Transformer Id	Feeder Id	Demand kVA	% pf	Amps	% Ldng	Connected Customers	kVA
		21458	91	110	96	5459	45038
		21458	91	110	96	5459	45038
GLN - XFMR #1		21458	91	110	63	5459	45038
	GLN12F1	10320	95	502	84	2985	19966
	GLN12F2	10121	95	475	79	2474	25071

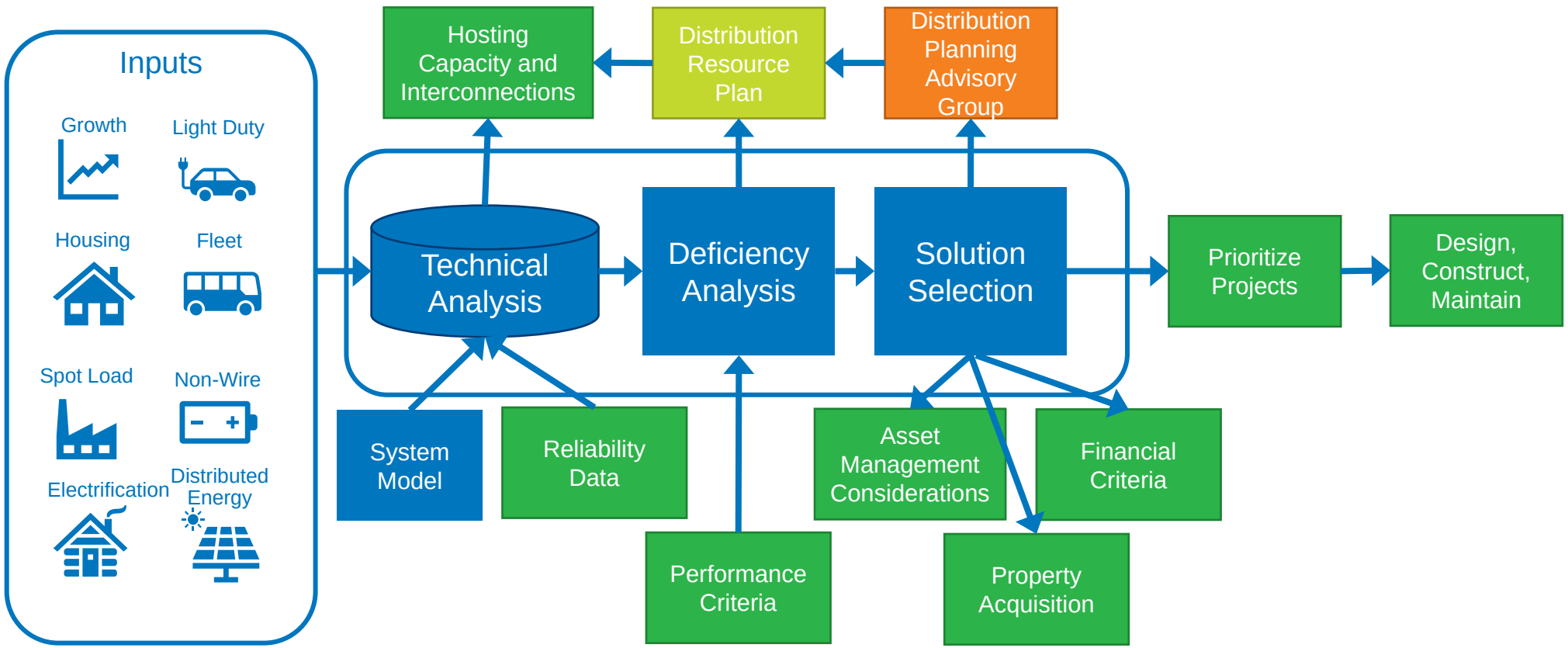
VROM Cost Comparison

Project	Equipment	Unit Cost	QTY	Total
Solar	Single Family Installation ~4MW total	$15,000	1100	$16,500,000
Utility Solar	2MW	$2,000,000	2	$4,000,000
Battery	2MW 4HR Battery	$4,000,000	2	$8,000,000
Upgrade	30MVA Transformer	$1,500,000	1	$1,500,000
	Voltage Regulator Bank	$100,000	2	$200,000

Other considerations

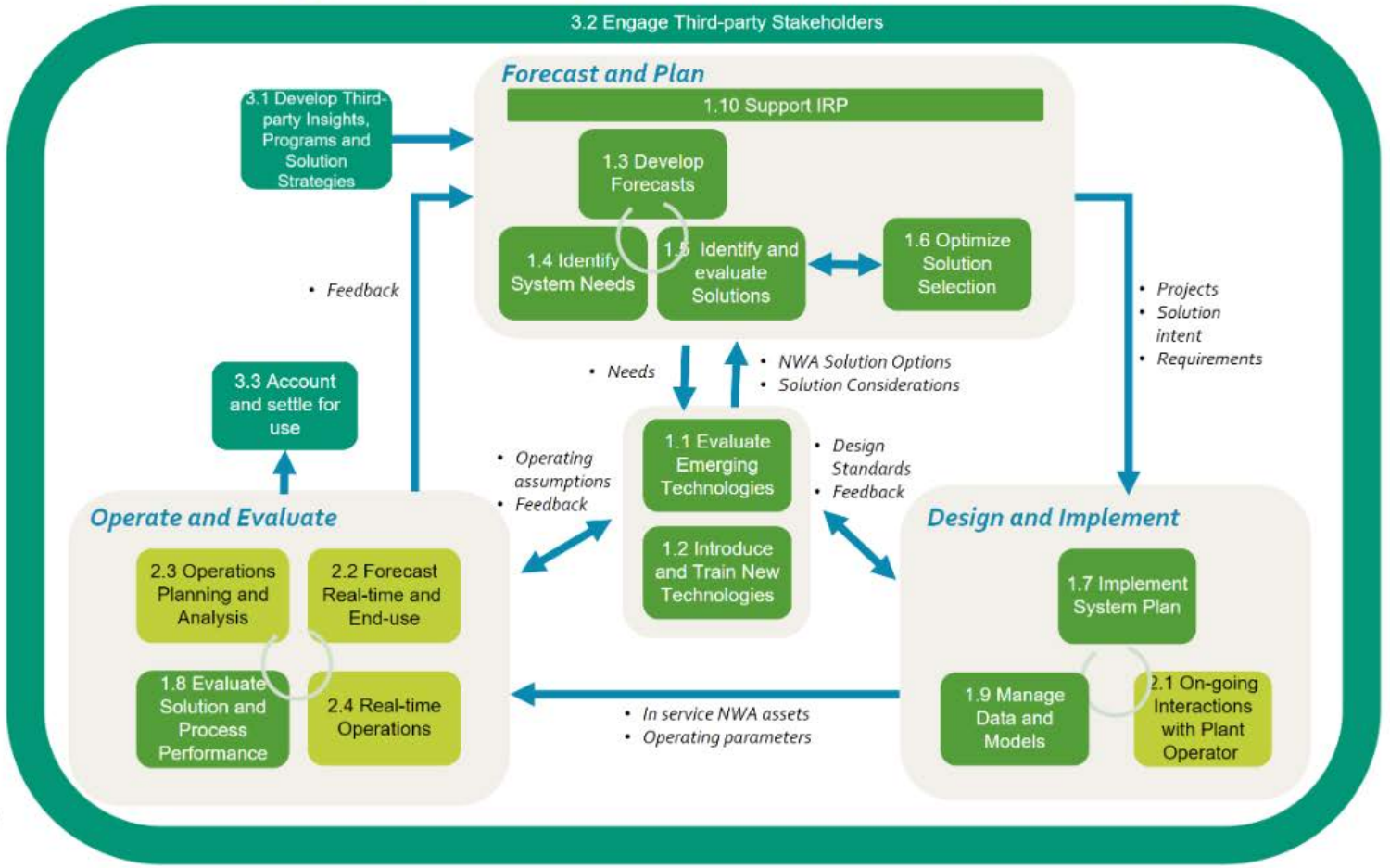
- Deferring capital investment
- Supply Chain
- Operational Flexibility
- Life Cycle Costs

Distribution Planning



The Process

Avista Planning, Engineering and Operations Operating Model



Questions?

Next steps

- We are working on the system assessment. Expect an update on the findings.
- Update on the DER potential study that kicked off last month.
- Discuss the hosting capacity map.
- If you have a topic suggestion, please send it to- DistributionPlanning@avistacorp.com