Distribution System Planning Introduction

2023 Avista Electric DSP

DPAG 3 – December 2023

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Welcome to DPAG meeting #3

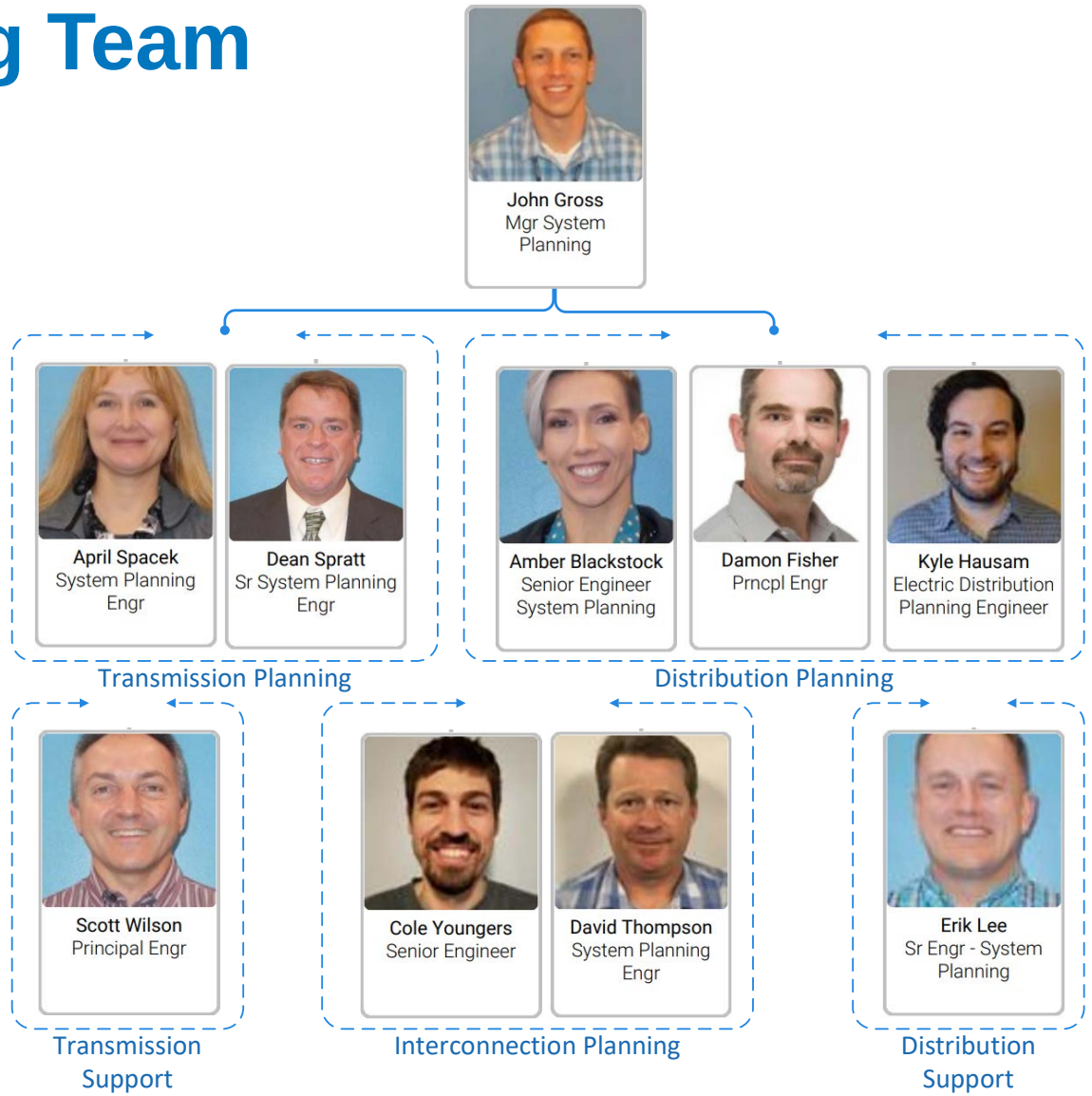
Today's Agenda

Topic	Time
Introductions	9:00am
Meeting Logistics	9:10am
System Assessment Overview System Needs Conceptual Solutions	9:15am
DER Potential Assessment Update	10:15am
Hosting Capacity Map	10:30am
Next Steps	10:50am
Adjourn	11:00am

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 March	TBD	TBD	TBD
Topics	• Vender presentation: DER Potential Assessment	• TBD	• TBD	• TBD

Distribution System Assessment

- Comprehensive evaluation of the system against desired performance criteria
- 2-year cycle
- 10-year outlook
- Includes: Thermal performance, short-circuit and transfer-switch analysis

Distribution System Assessment

- Snapshot of the system as it existed April 2023
- The loads characterized in the model used loading data from 2020, 2021, 2022, and 2023
- Heavy Summer Aug 15, 2023
- Heavy Winter extrapolated from Dec 22, 2022
- 10-year forecast developed using multivariate regression
- The highest growth rates were observed in the Coeur d'Alene, Rathdrum, and Post Falls areas.

Assessment Performance Criteria

- Performance Criteria

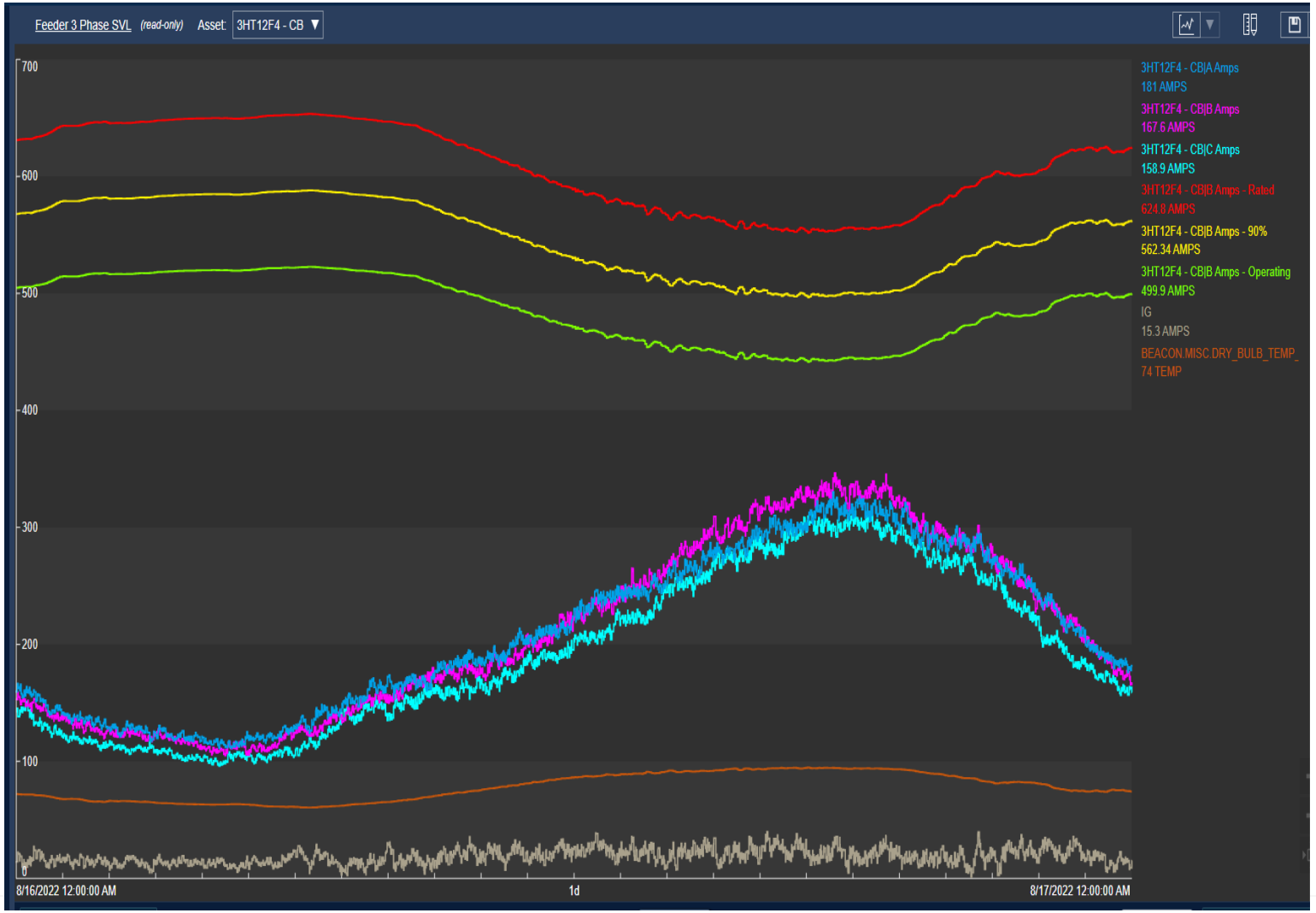
Category[2]	Outage[3]	Thermal Performance	Voltage Performance[4]	Regulator Performance	Current Imbalance	Voltage Imbalance	Customers Experiencing Interruption[5]	Customers Experiencing Sustained Outage Longer than 2 Hours[6]	Notes
D0 - No Contingency	None	< 80% *Continuous*[7]	118V < Volt < 127V	-12 < 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	

Assessment: System Conditions

Scenario	Description	Ambient Temperature Represented[12]
Heavy Summer	Day-time peak load occurring between June and August with loads representing a 1 in 10 probability	40°C (104°F)
Heavy Winter	Day-time peak load occurring between December and March with loads representing a 1 in 10 probability	-28.9°C (-20°F)
Heavy Summer Sensitivity	Same scenario as Heavy Summer with loads representing the highest summer temperature on record	42.8°C (109°F)

Thermal Performance explanation

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



Assessment Results

Issue	Corrective Action Plan			System Impact			TPL?
	Project Name	Planning Scope	Desired In-service Timeline	Worst Performance Criteria Issue	Impacted Facilities	Impact Timeline	
12	**Liberty Lake Capacity**	TBD	5 years	Peak summer capacity	LIB12F1, LIB12F3, Xfmr 2	Existing	No
13	**Moscow Capacity**	Load transfers, new SEL Station, rebuild M15	5-10 years	Peak summer capacity	M15512, M15514, Xfmr 1	Existing	No
14	**North Spokane Distribution Reinforcement**	INT expansion, NE expansion, feeder re-configuration, MEA expansion	5-10 years	Peak summer capacity	BEA, COB, F&C, INT, L&S, MEA, NE, WAK	Existing	No
15	**Rathdrum Capacity Mitigation**	Add one additional feeder to off load RAT231 and RAT233	5-10 years	Peak summer capacity	RAT231	2027	No
16	**Orin Capacity**	TBD	TBD	Peak winter capacity	ORI12F3, Xfmr 1	Existing	No
17	**Wilbur Capacity**	Upgrade WIL transformer	2-3 years	Peak winter capacity	Xfmr 1	Existing	No
18	**Valley Capacity**	Upgrade VAL transformer	TBD	Peak winter capacity	Xfmr 1	Existing	No
9	**Airway Heights Capacity**	Transfer load to FLN12F1	1 year	Peak summer capacity	AIR12F1, Xfmr 2	2026	No
10	**Glenrose Capacity**	New East Central Station	5 years	Peak summer capacity	GLN12F1, GLN12F2, Xfmr 1	Existing	No
11	**Lewiston Capacity**	Rebuild SLW, expand TEN, and new LOID and WHT Stations	5-10 years	Peak summer capacity	TEN, LOL, NLW, SLW	Existing	No

Assessment Results

The AIR12F1 feeder exceeds the performance criteria starting in 2026 and approaches 100% of its facility rating in the 10-year planning horizon based on the calculated growth rate. The Airway Heights 115/13kV Transformer 2, which serves AIR12F1, also becomes heavily loaded.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
AIRWYHGT.CB.12F1	74.9	77.1	79.3	81.5	83.9	86.3	88.7	91.3	93.9	96.6	99.3
AIRWYHGT.XFMR.2	66.4	68.1	69.9	71.6	73.4	75.3	77.2	79.2	81.2	83.3	85.4

The GLN12F1 and GLN12F2 feeders have exceeded the performance criteria in operational conditions. Some feeder transfer capacity is available and is utilized as necessary during peak summer conditions. It is expected GLN12F2 will approach 100% of its facility rating within the five-year planning horizon based on the calculated growth rate. The Glenrose 115/13kV Transformer 1 is also observed to be heavily loaded.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
GLENROSE.CB.12F1	86.5	87.6	88.8	89.9	91.1	92.3	93.5	94.7	96.0	97.2	98.5
GLENROSE.CB.12F2	86.4	90.2	94.2	98.3	102.6	107.1	111.8	116.7	121.9	127.2	132.8
GLENROSE.XFMR.1	85.5	86.3	87.1	87.9	88.8	89.6	90.4	91.3	92.2	93.0	93.9

Assessment Results

The Sandpoint 115/20kV Transformers 1 and 2 are shown to exceed the performance criteria within the five-year planning horizon based on the calculated growth rate. The two transformers are operated in parallel with each other therefore their loading should reasonably be equivalent.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
SANDPNT.XFMR.1	81.8	83.1	84.3	85.6	86.9	88.3	89.6	91.0	92.4	93.8	95.2
SANDPNT.XFMR.2	76.8	77.7	78.6	79.5	80.4	81.3	82.3	83.2	84.2	85.2	86.2

The LIB12F1 feeder exceeds the performance criteria starting in 2028 and approaches 100% of its facility rating in the 10-year planning horizon based on the calculated growth rate. The LIB12F3 and Liberty Lake 115/13kV Transformer 2, which serves LIB12F3 and LIB12F4, also exceed the performance criteria. Little to no growth is expected on LIB12F3.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
LIBRTYLK.CB.12F1	63.7	67.0	70.5	74.1	77.9	81.9	86.1	90.6	95.2	100.2	105.3
LIBRTYLK.CB.12F3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
LIBRTYLK.XFMR.2	66.0	68.4	70.9	73.5	76.2	79.0	81.9	85.0	88.1	91.3	94.7

Assessment Results

The Moscow area is projected to experience load growth over the next 10 years mostly with new housing developments and new local manufacturing facilities. The Moscow City 115/13kV Transformer 1 has exceeded the performance criteria in operational conditions. M15512 and M15514 feeders are shown to exceed the performance criteria within the 10-year planning horizon based on the calculated growth rate.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
MOSCOW.CB.512	78.0	79.2	80.5	81.7	83.0	84.3	85.7	87.0	88.4	89.8	91.2
MOSCOW.CB.514	67.2	68.7	70.2	71.8	73.4	75.1	76.7	78.4	80.2	82.0	83.8
MOSCOW.XFMR.1	86.8	87.3	87.8	88.2	88.7	89.2	89.7	90.2	90.7	91.2	91.8

Assessment Results (North Spokane)

Some equipment has exceeded the performance criteria in operational conditions. The projected growth rate is driven by new housing developments, apartment complexes, general commercial, and light industrial expansion in the area.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
BEACON.CB.12F2	77.2	78.7	80.1	81.6	83.1	84.6	86.2	87.8	89.4	91.1	92.8
COLBERT.CB.12F1	68.6	70.2	71.9	73.6	75.4	77.2	79.1	81.0	83.0	85.0	87.0
COLBERT.XFMR.BPAT_ COLBERT	84.8	85.8	86.9	88.0	89.1	90.2	91.4	92.5	93.6	94.8	96.0
FRAN_CDR.CB.12F2	82.9	82.9	82.9	82.9	82.9	82.9	82.9	82.9	82.9	82.9	82.9
FRAN_CDR.CB.12F4	75.3	76.2	77.2	78.1	79.1	80.1	81.1	82.1	83.1	84.2	85.2
FRAN_CDR.XFMR.2	79.1	80.0	81.0	82.1	83.1	84.1	85.2	86.2	87.3	88.4	89.5
INDIANTR.CB.12F1	78.6	79.5	80.3	81.2	82.0	82.9	83.8	84.7	85.6	86.5	87.4
INDIANTR.XFMR.1	73.8	74.9	75.9	77.0	78.0	79.1	80.2	81.3	82.5	83.6	84.8
LYON_STD.CB.12F2	73.2	74.9	76.6	78.3	80.0	81.8	83.7	85.6	87.5	89.5	91.5
LYON_STD.CB.12F3	68.5	70.0	71.6	73.2	74.9	76.6	78.3	80.0	81.8	83.7	85.6
LYON_STD.CB.12F4	67.7	70.4	73.1	76.0	79.0	82.1	85.4	88.7	92.2	95.8	99.6
LYON_STD.XFMR.1	74.5	76.1	77.9	79.6	81.4	83.2	85.1	87.0	89.0	91.0	93.0
MEAD.CB.12F1	64.9	66.6	68.3	70.1	71.9	73.7	75.6	77.6	79.6	81.7	83.8
NRTHEAST.CB.12F1	67.1	69.6	72.1	74.7	77.5	80.3	83.2	86.3	89.4	92.7	96.0
NRTHEAST.CB.12F2	71.5	73.0	74.6	76.2	77.8	79.5	81.2	82.9	84.7	86.5	88.3
NRTHEAST.CB.12F3	49.7	53.0	56.6	60.4	64.4	68.8	73.4	78.3	83.5	89.1	95.1
NRTHEAST.CB.12F4	69.1	73.0	77.0	81.2	85.7	90.4	95.4	100.7	106.2	112.1	118.2
WAIKIKI.CB.12F3	81.6	81.6	81.6	81.6	81.6	81.6	81.6	81.6	81.6	81.6	81.6
WAIKIKI.CB.12F4	75.4	76.5	77.7	78.9	80.1	81.3	82.5	83.8	85.0	86.3	87.6
WAIKIKI.XFMR.115_13_1	85.3	85.3	85.3	85.3	85.3	85.3	85.3	85.3	85.3	85.3	85.3
WAIKIKI.XFMR.115_13_2	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5	84.5

Assessment Results

The Rathdrum Prairie is projected to experience load growth over the next 10 to 20 years, with the City of Post Falls anticipating a doubling of its population in that timeframe. The undeveloped areas are often considered for commercial and industrial growth.

Present feeder loading is reasonable, but the loading is expected to increase significantly through the next 10 years, with the expectation the RAT231 and RAT233 feeder will exceed the performance criteria in 2027 and 2026 and reaches 100% of their facility ratings in the 10-year planning horizon based on the calculated growth rate.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
RATHDRUM.CB.231	69.0	71.8	74.6	77.6	80.6	83.8	87.2	90.6	94.2	98.0	101.9
RATHDRUM.CB.233	73.2	76.1	79.1	82.3	85.5	88.9	92.4	96.1	99.9	103.9	108.0

Assessment Results

Several feeders and transformers in the Lewiston, Idaho area are shown to exceed the performance criteria within the five-year planning horizon based on the calculated growth rate. Some equipment has exceeded the performance criteria in operational conditions. The projected growth rate is driven by new housing developments in the area

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
10TH_STW.CB.1254	86.6	90.6	94.7	99.0	103.5	108.2	113.1	118.3	123.7	129.3	135.2
10TH_STW.CB.1257	76.0	78.2	80.5	82.8	85.1	87.6	90.1	92.7	95.3	98.1	100.9
10TH_STW.XFMR.1	66.5	68.6	70.8	73.1	75.4	77.8	80.3	82.9	85.5	88.3	91.1
10TH_STW.XFMR.2	83.9	86.0	88.2	90.4	92.6	95.0	97.3	99.8	102.3	104.8	107.4
LOLO.CB.1359	83.1	83.1	83.1	83.1	83.1	83.1	83.1	83.1	83.1	83.1	83.1
LOLO.XFMR.3	82.8	84.2	85.5	86.9	88.3	89.7	91.2	92.6	94.1	95.7	97.2
NLEWISTN.XFMR.115_13_1	64.2	65.6	67.1	68.6	70.1	71.7	73.3	74.9	76.6	78.3	80.0
SLEWISTN.CB.1358	59.5	61.7	63.9	66.1	68.5	71.0	73.5	76.1	78.8	81.6	84.6
SLEWISTN.XFMR.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1	84.1

Assessment Results

Summer capacity concerns and project proposals were discussed above in Section 5.7.1.7 Moscow Capacity. This project will also address winter performance concerns.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
MOSCOW.XFMR.1	92.6	93.4	94.6	95.6	96.4	97.2	98.5	99.5	100.4	101.5	102.4
MOSCOW.CB.512	74.3	75.5	77.2	78.5	79.8	81.1	82.8	84.2	85.6	87.0	88.4
MOSCOW.CB.514	74.5	76.3	78.1	80.4	82.3	84.2	86.7	88.7	90.9	93.5	95.7

The Wilbur area is projected to experience load growth over the next 10 years, consisting mostly of new housing developments and local manufacturing facilities. The Wilbur 115/13kV Transformer 1 has exceeded the performance criteria in operational conditions and approaches 100% of its facility rating in the 10-year planning horizon based on the calculated growth rate.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
WILBUR.XFMR.1	91.1	92.3	93.6	95.0	96.5	97.9	99.2	100.7	102.2	103.8	105.4

Assessment Results

The Sandpoint area is projected to experience load growth over the next 10 years mostly with new housing developments. Sandpoint 115/13kV Transformer 1 and Transformer 2 have exceeded the performance criteria in operational conditions and approach 100% of its facility rating in the 10-year planning horizon based on the calculated growth rate. SPT4S21, which serves the rural area west of Sandpoint is expected to have the most growth in the area and exceeds performance criteria in operational conditions in the 10-year planning horizon.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
SANDPNT.XFMR.1	90.0	92.3	94.6	97.2	99.7	102.0	104.8	107.7	110.7	113.7	117.1
SANDPNT.XFMR.2	90.0	92.3	94.6	97.2	99.7	101.9	104.7	107.6	110.6	113.7	117.1
SANDPNT.CB.4S21	47.5	50.3	53.0	56.1	59.3	62.2	65.6	69.4	73.4	77.5	81.9

Valley Station is a 115kV to 13.8kV distribution station located south of Valley, Washington. Valley 115/13kV Transformer 1 is a 7.5MVA transformer with three feeders, serving approximately 2400 service points. The station is fed by the Addy-Devil's Gap 115kV Transmission Line.

Valley 115/13kV Transformer and VAL12F1 feeder have exceeded the performance criteria in operational conditions.

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Valley XFMR	100.32	100.32	100.32	100.32	100.32	100.32	100.32	100.32	100.32	100.32	100.32
VAL12F1	85.91	85.91	85.91	85.91	85.91	85.91	85.91	85.91	85.91	85.91	85.91

Assessment Results

- ATS analysis did not identify any system deficiencies.

Feeder ID - N/C Switch Feeder	Switch ID - N/C Switch Feeder	Case	N/C Switch Feeder (kVA)	N/C Switch Feeder (Amps)	Loading - N/C Switch Feeder (%)	Feeder ID - N/O Switch Feeder	Switch ID - N/O Switch Feeder	N/O Switch Feeder (kVA)	N/O Switch Feeder (Amps)	Loading - N/O Switch Feeder (%)
CDA124	ZC912AT-1	Normal	9,405	412.3	65.1	APW113	ZC912AT-2	6,507	333.6	65.1
CDA124	ZC912AT-1	Switched	8,708	381.4	60.6	APW113	ZC912AT-2	7,185	362.9	70.9
TEN1253	ZL1410E-2	Normal	8,608	407.7	70.7	TEN1255	ZL1410E-1	8,254	405.5	67.5
TEN1253	ZL1410E-2	Switched	6,796	324.4	53.2	TEN1255	ZL1410E-1	10,099	488.3	81.2
FWT12F3	Z554AT-1	Normal	5,767	265.0	43.2	NW12F2	Z554AT-2	6,115	275.0	53.7
FWT12F3	Z554AT-1	Switched	2,396	111.3	27.1	NW12F2	Z554AT-2	10,265	483.8	94.5
HOL1205	ZL1421E-1	Normal	3,292	157.5	36.5	SLW1316	ZL1421E-2	5,965	282.2	55.1
HOL1205	ZL1421E-1	Switched	2,567	121.7	28.2	SLW1316	ZL1421E-2	6,730	321.5	62.8
3HT12F7	Z614AT-1	Normal	9,521	429.4	64.6	3HT12F1	Z614AT-2	4,665	208.1	40.6
3HT12F7	Z614AT-1	Switched	4,684	221.7	62.7	3HT12F1	Z614AT-2	9,483	422.0	82.4
3HT12F1	Z1311AT-1	Normal	4,665	208.1	33.7	3HT12F7	Z1311AT-2	9,521	429.4	77.2
3HT12F1	Z1311AT-1	Switched	3,771	167.3	31.0	3HT12F7	Z1311AT-2	10,440	472.8	85.0
C&W12F4	Z365AT-1	Normal	6,279	314.4	63.7	3HT12F6	Z365AT-2	6,941	319.7	62.4
C&W12F4	Z365AT-1	Switched	3,408	180.7	35.0	3HT12F6	Z365AT-2	9,959	458.7	89.6
3HT12F5	688AT-3	Normal	8,363	376.1	59.1	3HT12F1	688AT-2	4,665	208.1	40.6
3HT12F5	688AT-3	Switched	8,111	365.5	58.4	3HT12F1	688AT-2	4,907	218.2	42.6
AIR12F3	Z669AT-1	Normal	4,206	224.8	41.5	FLN12F4	Z669AT-2	1,745	79.6	13.2
AIR12F3	Z669AT-1	Switched	2,086	120.0	19.8	FLN12F4	Z669AT-2	4,206	184.0	31.8

Assessment Results

- Fault rating

Feeder	Equipment Type	Equipment Location	Interrupting Ability (Amps)	3PH-G Fault	1PH-G Fault	%Duty
CDA121	Recloser	C909R Midline	2000	3086	2296	154%
SPI12F2	Recloser	E170 Midline	2000	3259	3281	164%
SLW1358	Breaker	Station	2000	6425	6560	328%
SLW1348	Breaker	Station	2000	6425	6560	328%

Distributed Energy Resource (DER) Potential Study

- Stated goal: Determine a reasonable potential of new generation, storage, and controllable load impacts on a localized basis (census block)
- This study is a requirement of Avista's 'Clean Energy Implantation Plan' (CEIP)
- Contract awarded to Applied Energy Group (AEG) via RFP process
  - with Cadeo & Vedant as subcontractors to AEG
- Project started June 2023 with a completion date of June 2024

DER Potential Study Scope

- Electric Vehicles: For each Washington census block, Consultant shall estimate electric vehicle demand (“Estimated Demand”) for every five (5) years, beginning in 2025 through 2050
  - Residential & commercial charging for vehicle classes 1-8
  - Consultant shall use the best literature available to develop a probable electrification forecast (“Forecast”) for medium and heavy-duty vehicles using Classes 3 – 8 as a baseline scenario

- New Generation and Storage: Consultant shall evaluate the impact for potential customer-owned solar, storage, and other renewable generation by census block and distribution feeder, for every five (5) years beginning in 2025 through 2050
  - Residential and Commercial Solar
  - Residential and Commercial Storage
  - Other Renewables (i.e., wind, small hydro, fuel cell, internal combustion engines (ICE)

DER Potential Study Deliverables

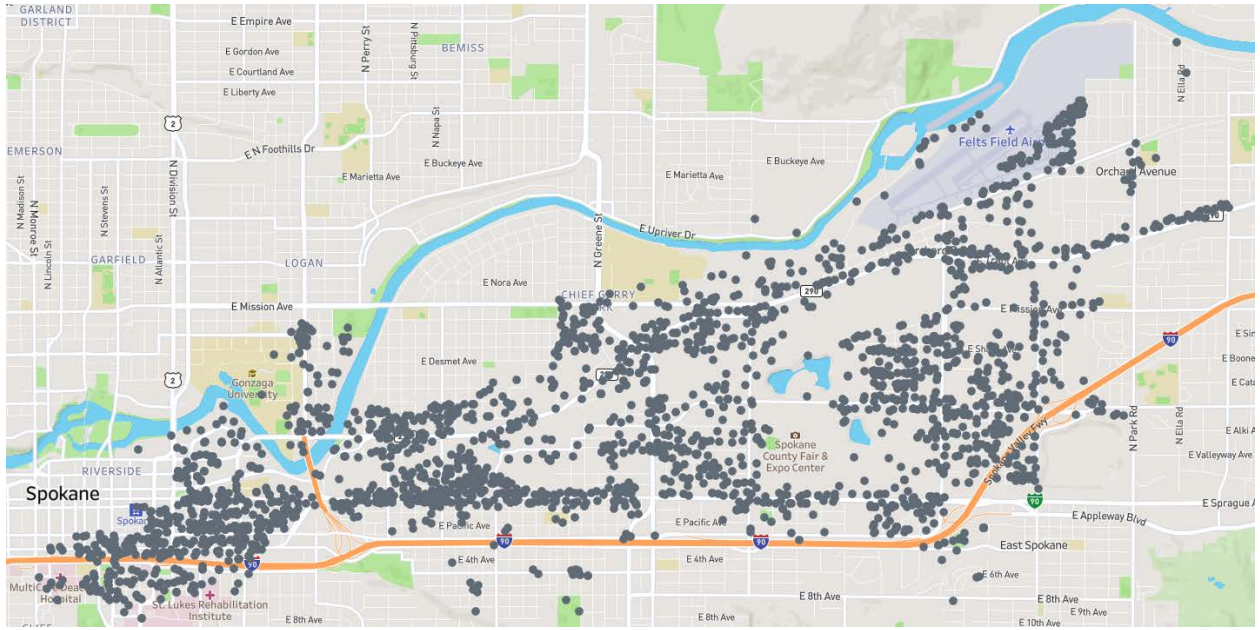
- Task 1: Utility survey of similar DER potential studies (complete)
- Task 2: Detailed explanation of methodology to produce forecasts & hourly load shapes (complete)
- Task 3: EV forecast results by feeder w/aggregate load shapes for each vehicle class (& second results matrix for Named Communities)
- Task 4: DER forecast results for each resource type, by customer class

DER Potential Study Deliverables (continued…)

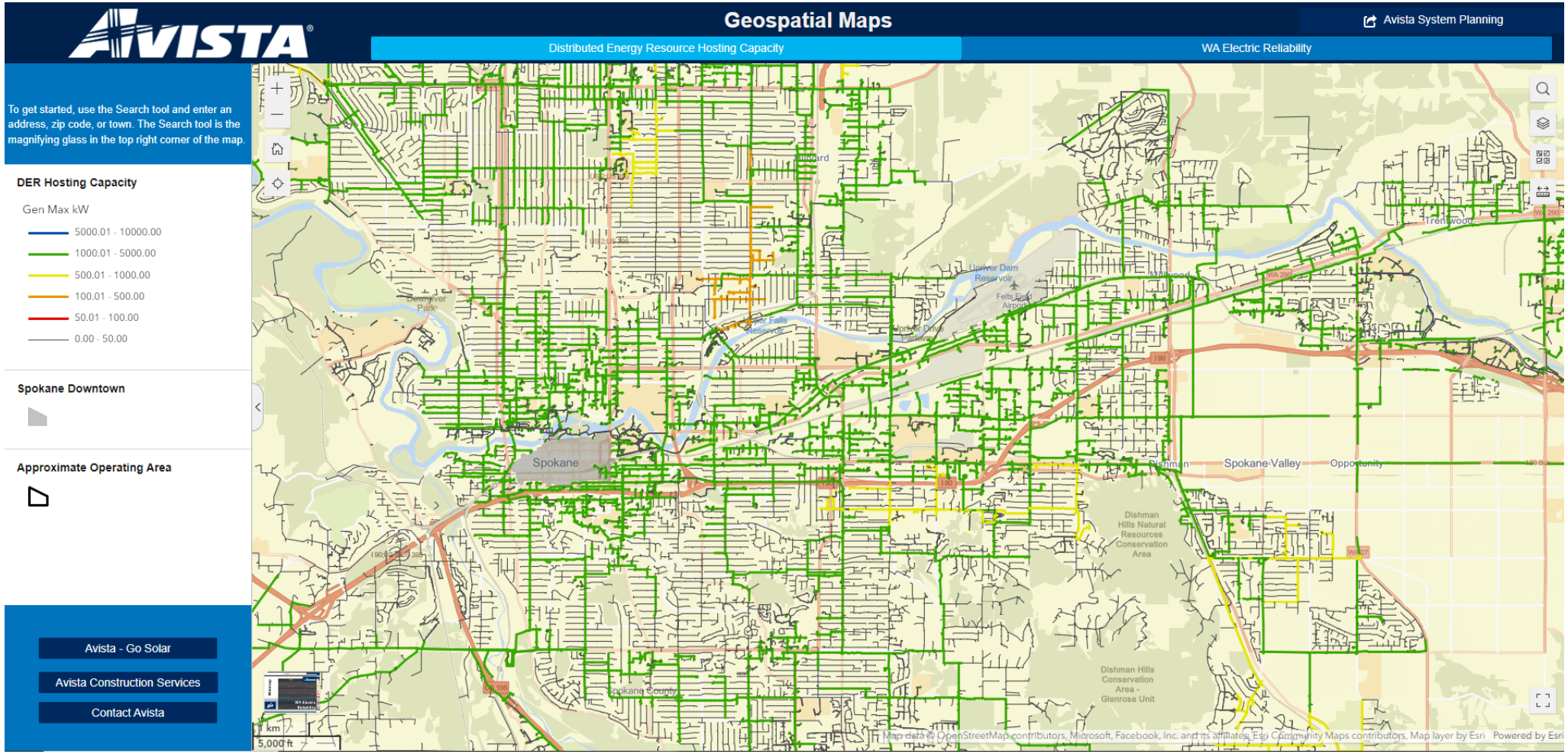
- Task 5: Present draft results to Avista's Advisory Committees
  - This will take place in the Q1 DPAG meeting at the end of March
  - One hour presentation with 1 hour Q&A
- Task 6: Final Report
  - To include documentation of methods and procedures to enable Avista to update the forecasts for future use

DER Potential Study: Fleet Survey

- It was determined that fleet electrification forecast required a customer survey
- Corporate Communications coordinated a survey targeting east Spokane commercial/industrial area
- Enough responses were gathered to help inform the forecast

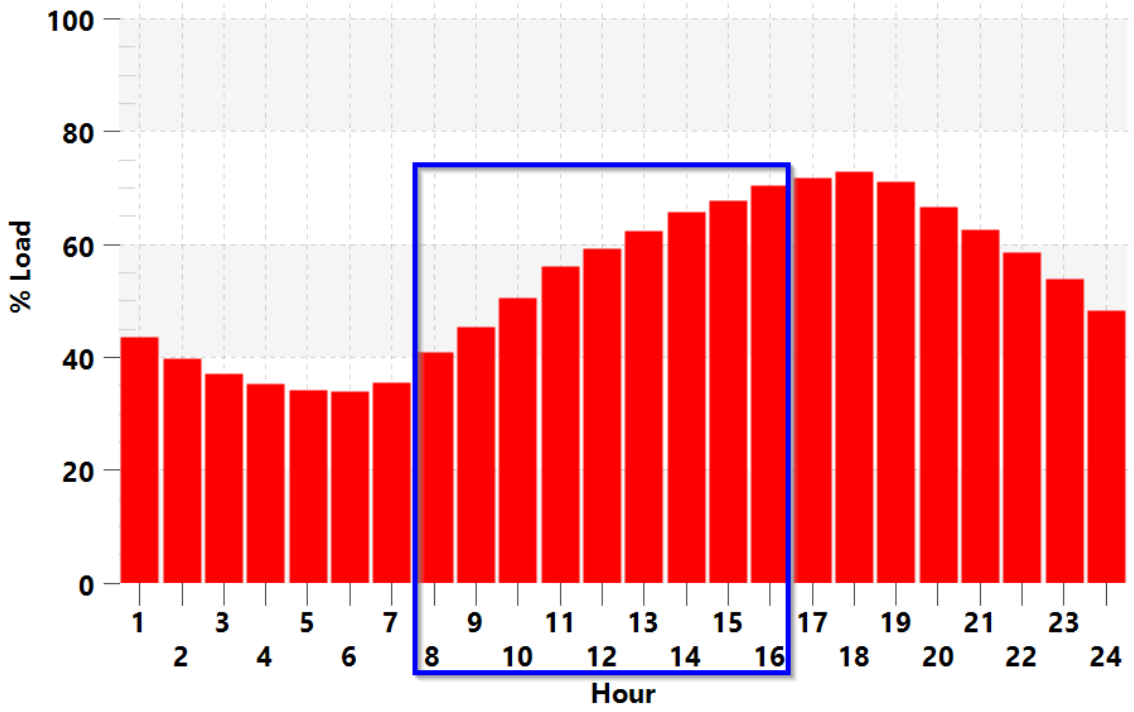


PV Hosting Capacity Map [Map]

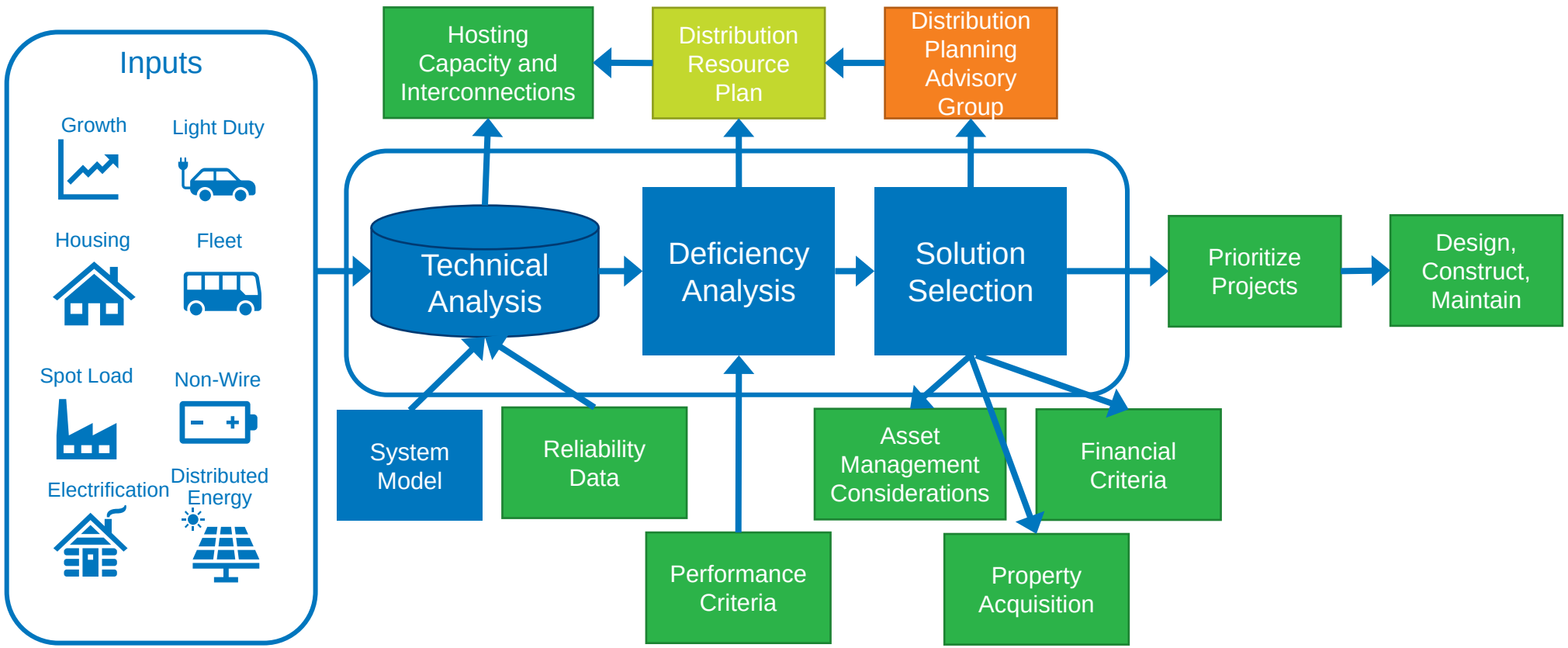


PV Hosting Capacity Map

- Shows immediately available solar generation capacity
- 3 Phase lines limited to 50% of the minimum daytime load (8am to 4pm)
- Single phase lines limited to 50kW
- Non-SCADA limited to 50KW

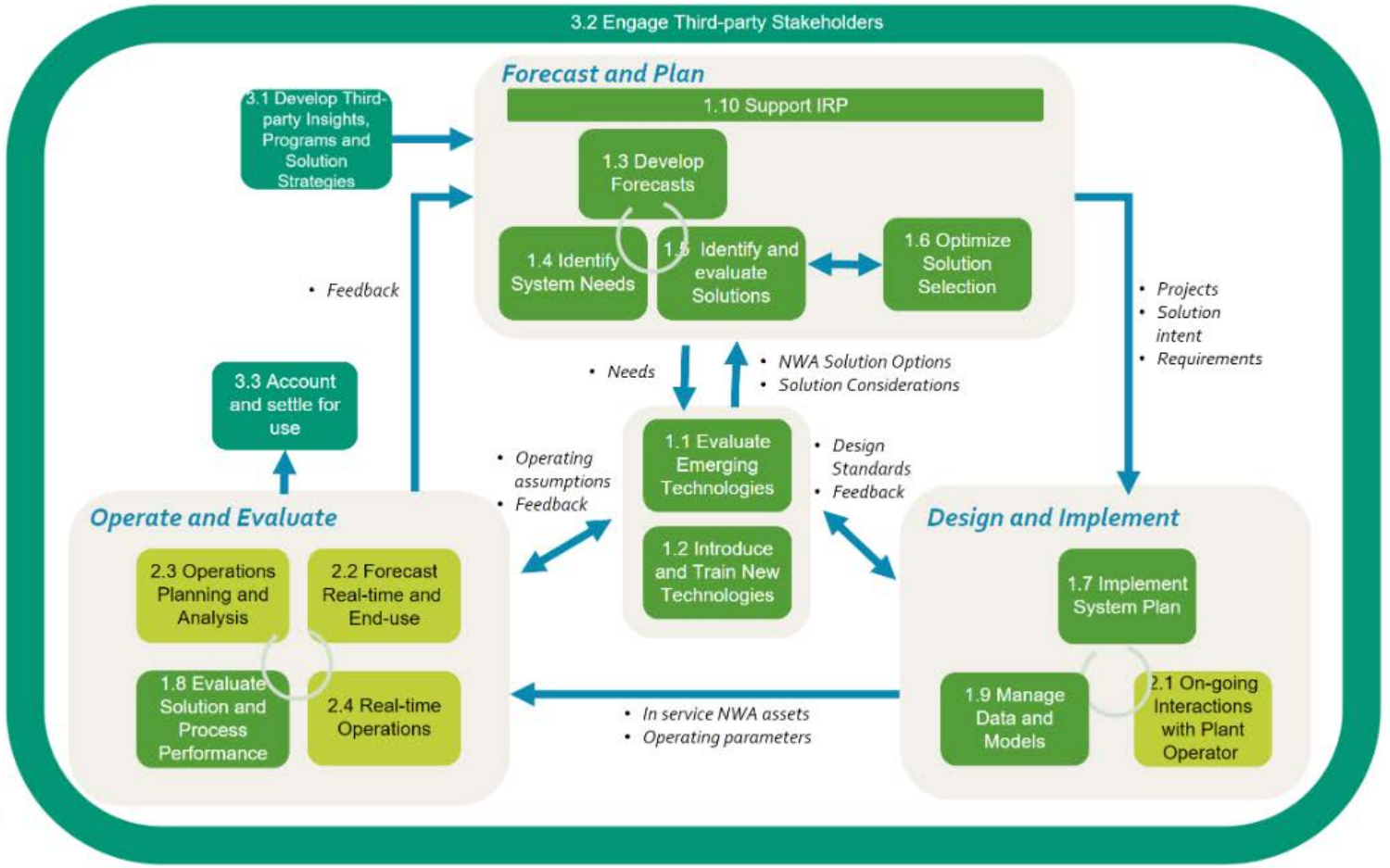


Distribution Planning



The Process

Avista Planning, Engineering and Operations Operating Model



Questions?

Next steps

- We are working on studying and mitigating the system assessment findings.
- Update on the DER potential study.
- If you have a topic suggestion, please send it to- DistributionPlanning@avistacorp.com