Los Alamos County
30 Years Electrification Forecast

Board of Public Utilities
June 4th 2025

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Outline

- Electrification Scenarios
  - Scenario 1 | Climate Action Plan
  - Scenario 2 | Current Policies
  - Scenario 3 | Natural Behavior
- Electrification Impact Study
  - Existing System Initial Observations
  - Impact Analysis
  - Hosting Capacity Analysis

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Why is this Forecast Needed?

Achieving carbon neutrality* will require significant efforts by the County.

All solutions needed to do so are commercially available **today.**
This is a deployment & policy challenge, not a technology challenge.

Climate Action Plan - County Government Targets

-30%	-80%	-100%
By 2030	**By 2040**	**By 2050**
Primarily driven by federal and state policies	Significant EV adoption, home electrification, and green building standards across the county	Final ~12% very challenging to achieve and may depend on new public policies

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*Carbon neutrality compared to 2022 sector-based community-wide baseline emissions

Reference: *Los Alamos Climate Action Plan*

Scenarios

Electrification Scenarios

Climate Action Plan Scenario 1	Current Policy Scenario 2	Natural Behavior Scenario 3
Comply with the Climate Action Plan	Comply with Current Policies	Assume Government Regs. Play No Role
100% EV Adoption by 2055	Historical EV Trend in LAC	Historical EV Trend Statewide
100% Home & Commercial Electrification By 2055 20% Building Efficiency	50% Home & Commercial Electrification By 2055 10% Building Efficiency	25% Home & Commercial Electrification By 2055 0% Building Efficiency
50% Homes with Solar 20% Homes with Batteries	25% Homes with Solar 10% Homes with Batteries	10% Homes with Solar 5% Homes with Batteries

Input | EV Charging Behavior

The charging behavior and frequency of EV drivers can widely vary based on how far they drive, daily schedules, whether they can charge at home and more.

1898 & Co. assumes that 80% of drivers charge at home and that the peak demand of vehicles is likely to be co-incident or occurring only 30% of the time on any day. This could also be viewed as some drivers charging every 2nd or 3rd day.

Within the population of EV drivers, we have assumed 30% may charge immediately upon coming home, 40% may schedule their charging for later in the night, and 30% may opt for Level 1 charging over a much longer time.

The net effect of these assumptions is that while many EVs can be in a community, they never charge simultaneously.

EV Charging Populations		
30%	40%	30%
Immediately Charge When They Get Home	Schedule Charging For A Later Time	Level 1 Charging

Diversity Factor*	% Charging at Home**
30%	80%

* Potential Range: 20-100%, assumption based on published research such as Coincidence Factors for Domestic EV Charging from Driving and Plug-in Behavior

**This reports help fame assumption of home charging split: https://avt.inl.gov/sites/default/files/pdf/arra/PluggedInSummaryReport.pdf

Non-Coincident Load =
No. of Forecast EV's X Charger Power X % Charging at Home

Coincident Load =
No. of Forecast EV's X Charger Power X % Charging at Home X Diversity Factor

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Input | Building Efficiency

The Los Alamos County's Climate Action Plan identified residential and commercial buildings as significant energy users, responsible for **55%** of sector-based emissions.

Improving insulation, windows, HVAC systems, and lighting could reduce energy usage by up to **20%**.

The heat generated by heat pumps and water heaters stays inside the building instead of being lost via air leaks.

Reference: https://unsplash.com/photos/green-long-leafed-plant-4gg4q12cDZQ

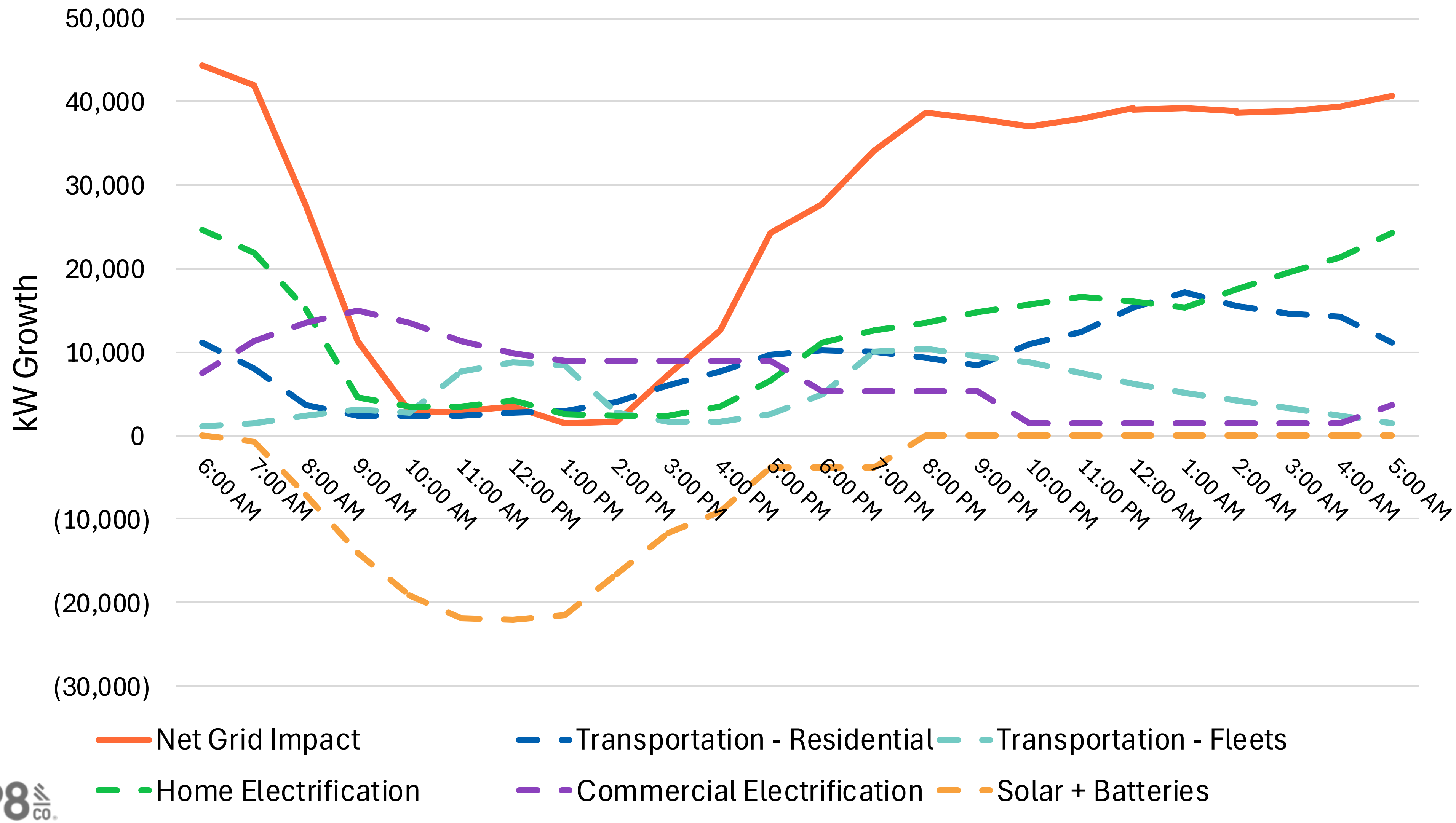
Forecast Summary for 2040 and 2055

2040 Electrification Forecast		
	Adoption % by 2040	MW Growth by 2040
EV Adoption		
Scenario 3 (Low)	15%	3.5
Scenario 2 (Med)	31%	7.1
Scenario 1 (High)	50%	11.5
Building Electrification		
Scenario 3 (Low)	22%	2.2
Scenario 2 (Med)	25%	4.1
Scenario 1 (High)	55%	16.0
Total Additional Electrification Peak Load		
Scenario 3 (Low)	NA	4.4
Scenario 2 (Med)	NA	8.5
Scenario 1 (High)	NA	20.9

2055 Electrification Forecast		
	Adoption % by 2055	MW Growth by 2055
EV Adoption		
Scenario 3 (Low)	30%	8.1
Scenario 2 (Med)	79%	18.2
Scenario 1 (High)	97%	22.4
Building Electrification		
Scenario 3 (Low)	38%	9.9
Scenario 2 (Med)	59%	18.7
Scenario 1 (High)	100%	33.3
Total Additional Electrification Peak Load		
Scenario 3 (Low)	NA	13.5
Scenario 2 (Med)	NA	28.0
Scenario 1 (High)	NA	44.4

We estimate that the Los Alamos County's DPU currently peaks around **17 MW**.
All estimates shown above are additional growth due to EVs and Building Electrification.

Scenario 1 | January 2055 (30 Years)



New Additional Load

Peak: 44 MW at 6 AM

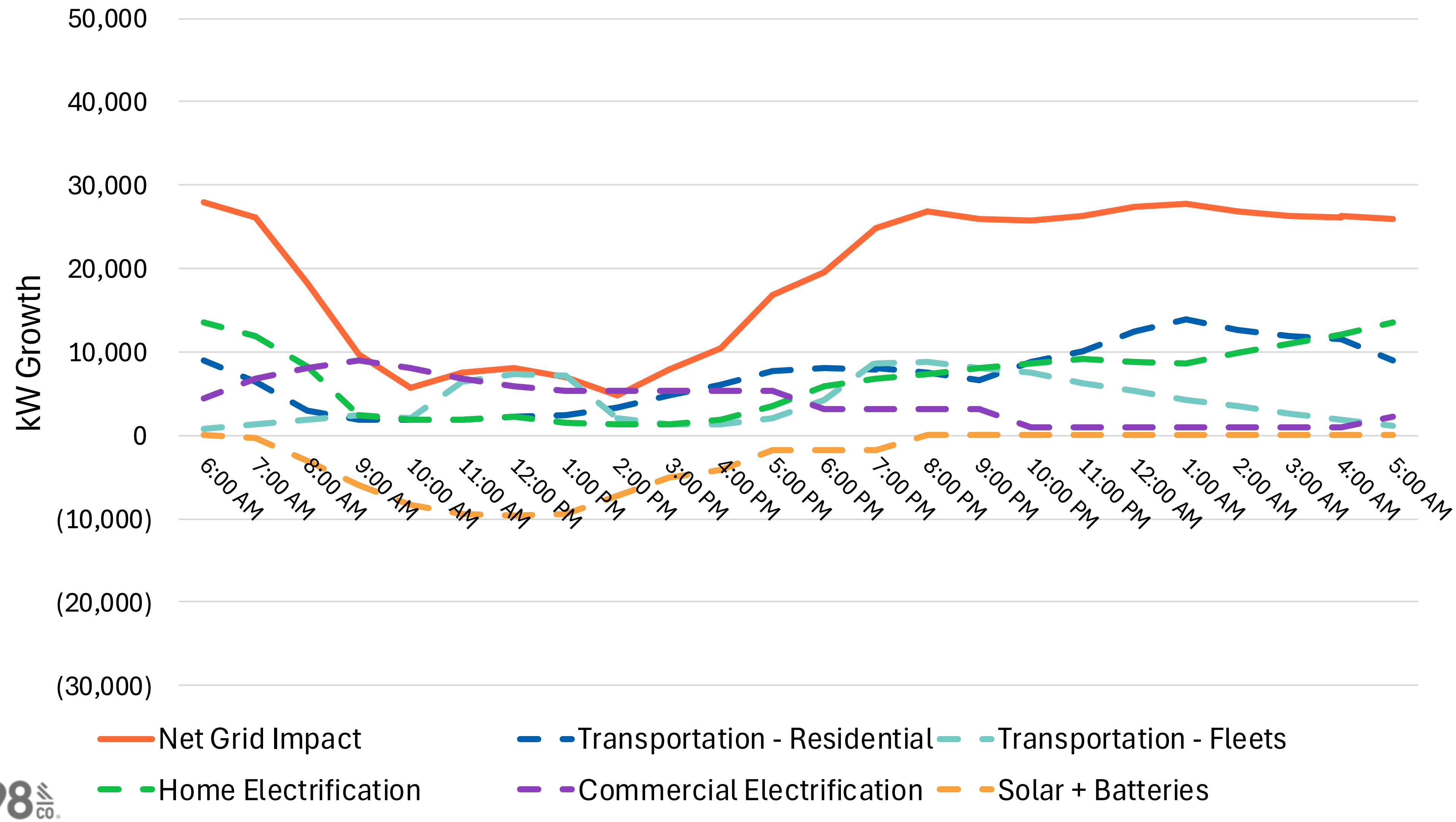
Minimum: 1.5 MW at 1 PM

Customer-owned solar can mitigate almost all electrification growth during the middle of the day. Electric school buses and some county-owned EVs can take advantage of this.

In the late afternoon, reduced solar production coincided with increased demand for residential and fleet EV charging. Customer-owned batteries can slightly offset this.

At night, residential space heating drives the majority of all demand within home electrification.

Scenario 2 | January 2055 (30 Years)



New Additional Load

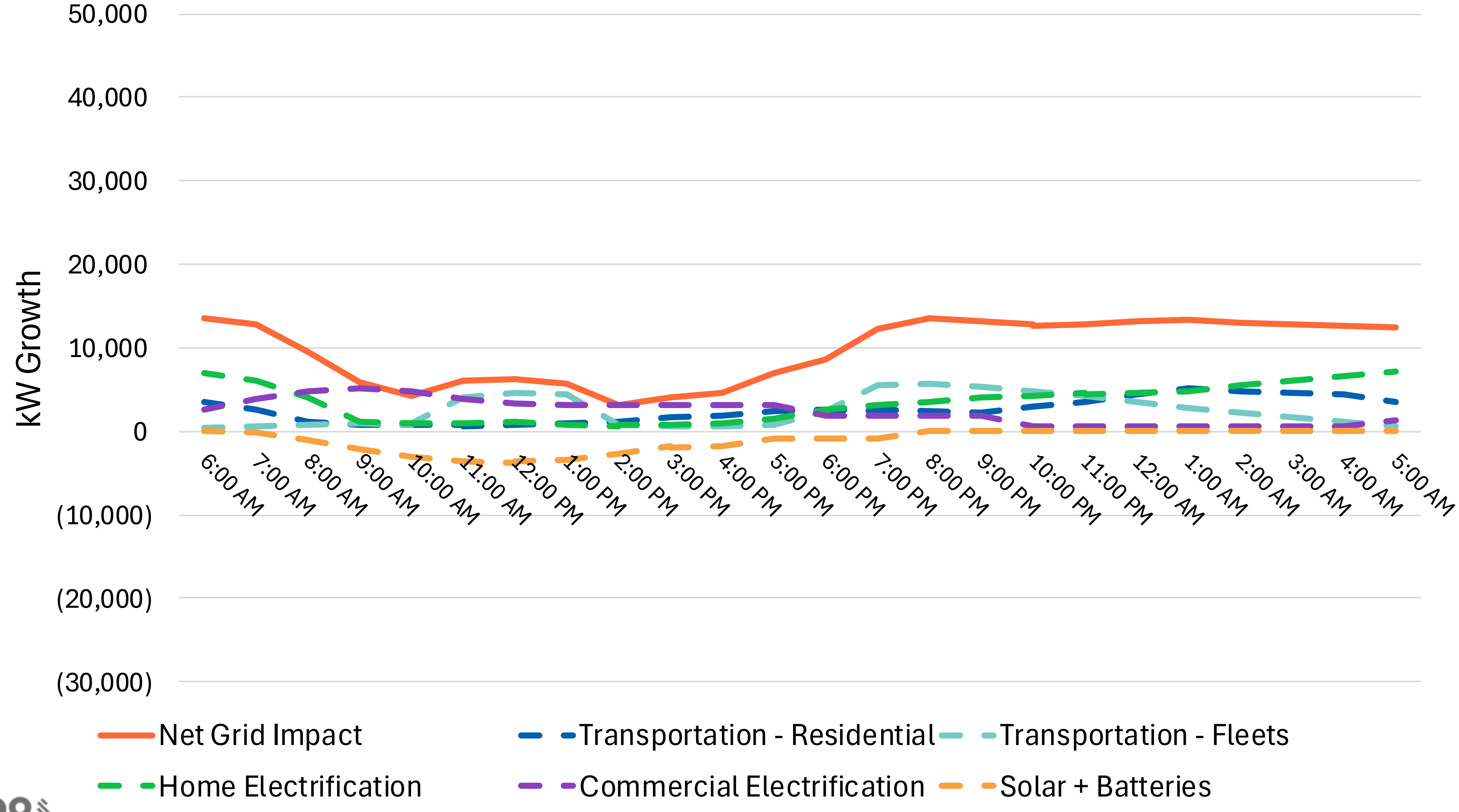
Peak: 28 MW at 1 AM

Minimum: 4.8 MW at 2 PM

Residential EV charging plays a more critical role in this scenario. There are two peaks for this demand: first, at 5-7 p.m., when most people come home, followed by a second peak around 1 a.m. when people schedule their charging to be finished by a specific time later in the day (i.e., 6 a.m.).

Residential space heating continues to be a significant demand during nighttime hours.

Scenario 3 | January 2055 (30 Years)



New Additional Load

Peak: 13.5 MW at 6 AM

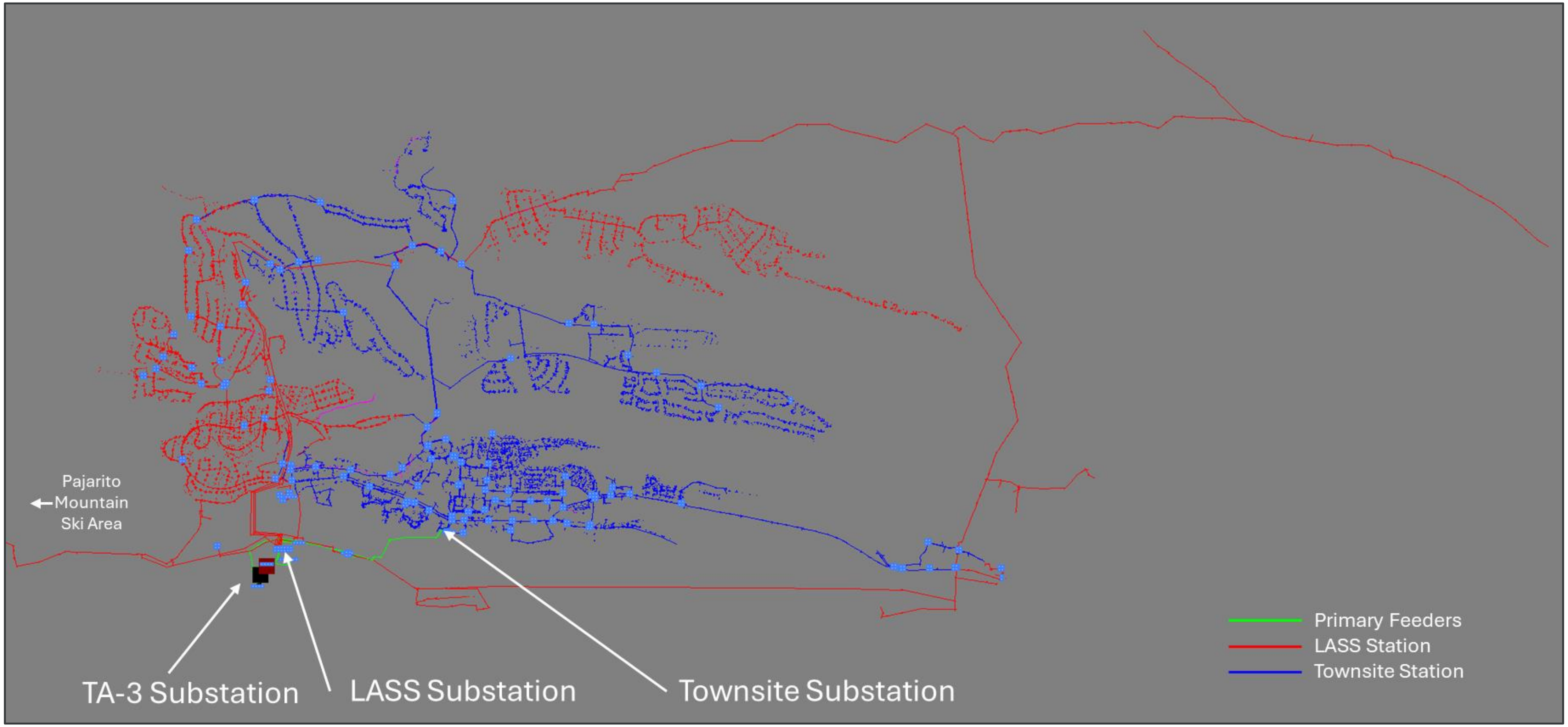
Minimum: 3.2 MW at 2 PM

Fleet EV charging and reduced solar production drive the ramp-up in demand at 7 p.m., and residential EV charging and home electrification maintain that demand for the rest of the night.

Although only 5 of the school buses would be all-electric in this scenario, charging them during the middle of the day would have a noticeable impact on the grid.

Initial Power Flow Results

Los Alamos System - LASS Energized



Los Alamos System - Power Flow Results

Feeder	kW	kVAR	kVA	Max Phase Amps	Min Voltage
13	1,123	-92	1,141	61	122.9
14	2,304	761	2,427	110	122.5
15	1,148	342	1,198	61	122.8
16	1,244	352	1,294	69	121.8
17	1,836	605	1,933	83	124.0
18	710	236	749	33	123.6
Townsite Station	8,409	2,221	8,698	370	-

- The Townsite Station feeders maintained all planning criteria in the new configuration. Load will be reduced from several of these feeders with LASS energized.
- No highly loaded lines were observed in the normal configuration. Remaining capacity can be used for contingency restoration efforts.

Service transformers and secondary conductor will be significantly impacted by electrification. This will be discussed qualitatively in the study.

Feeder	kW	kVAR	kVA	Max Phase Amps	Min Voltage
LASS 13T	1,605	770	1,781	82	123.6
LASS NS6	1,270	247	1,294	54	124.8
LASS 15T	1,246	372	1,300	77.1	123.1
LASS NSM6	-	-	-	-	-
LASS 16T	1,280	397	1,340	69	122.2
LASS NS3	621	89	628	99	124.8
LASS NS18	1,864	636	1,970	87	120.0
LASS 18	502	240	557	24	123.6
LASS Station	8,468	2,918	8,958	492	-

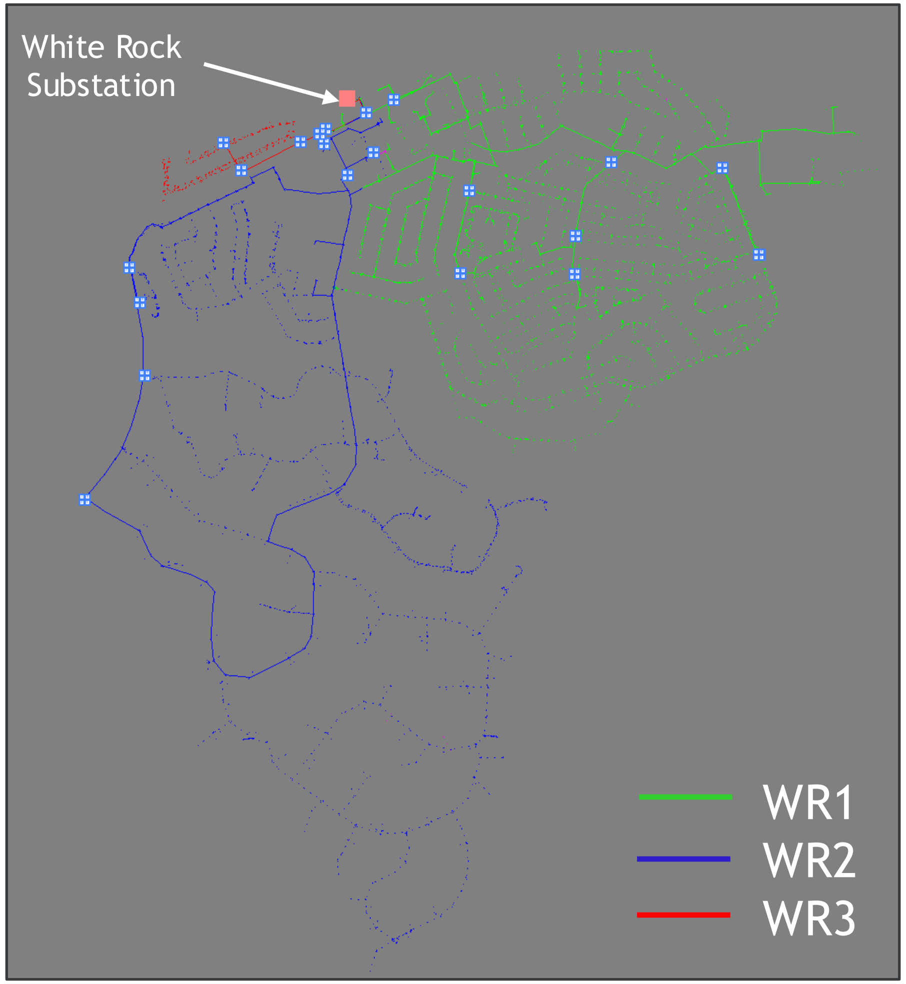
- The LASS Station feeders maintained all planning criteria in the new configuration. LASS is used to serve loads historically connected to LANL.
- Feeders 13T, 15T, 16T, and 18 are used to serve loads historically connected to the Townsite Station.
- No highly loaded lines were observed in the normal configuration. Remaining capacity can be used for contingency restoration efforts.

Los Alamos Townsite System Contingency Review

Contingency Scenario	Customer Load to Restore kVA	Total Applicable Customer Load kVA	Remaining Applicable Capacity kVA	Loading Violations?	Voltage Violations?	Comments
Loss of XFMR 1	9,038	17,811	20,000	No	No	Primary feeders TC2 and LC2 are used to restore customer load. Transformer 2 is the most limiting element in this contingency.
Loss of XFMR 2	8,443	17,811	20,000	No	No	Primary feeders TC1 and LC1 are used to restore customer load. Transformer 1 is the most limiting element in this contingency.
Loss of TC1	4,719	8,682	14,100	No	No	Primary feeder TC2 is used to restore customer load through the Townsite switchgear. The TC2 1000 MCM CU cable is the most limiting element in this contingency.
Loss of TC2	3,963	8,682	16,000	No	No	Primary feeder TC1 is used to restore customer load through the Townsite switchgear. The TC1 parallel 500 MCM CU cable is the most limiting element in this contingency.
Loss of LC1	4,483	8,831	14,100	No	No	Primary feeder LC2 is used to restore customer load through the LASS switchgear. The LC2 1000 MCM CU cable is the most limiting element in this contingency.
Loss of LC2	4,348	8,831	14,100	No	No	Primary feeder LC1 is used to restore customer load through the LASS switchgear. The LC1 1000 MCM CU cable is the most limiting element in this contingency.

The Los Alamos Townsite system can successfully maintain service to all customers in the event of the loss of either a substation transformer or any primary feeder.

White Rock System - Power Flow Results



Feeder	kW	kVAR	kVA	Max Phase Amps	Min Voltage
WR1	2,075	710	2,193	112	120.6
WR2	1,455	505	1,540	82	121.2
WR3	163	54	171	10	124.3
Transformer	3,693	1,270	3,905	193	-

- The White Rock system was observed to maintain all planning criteria for the primary system (12.47 kV)
- Electrification will stress the White Rock system, impacting equipment loading and voltage performance. Substation transformer upgrades could be required.
- Electrification will significantly impact lateral lines, service transformers and secondary conductors. The study will discuss this qualitatively.

White Rock Contingency Review

Contingency Scenario	Customer Load to Restore kVA	Total Applicable Customer Load kVA	Remaining Applicable Capacity kVA	Loading Violations?	Voltage Violations?	Comments
Loss of XFMR 1	3,905	3,905	5,000	No	No	Transformer 1, which has a higher 7,500 kVA rating, normally serves the load. Transformer 2 has sufficient capacity to restore all the White Rock load. Feeder 16 and 17 restore all customers through distribution feeder ties. Transformer 2 is the most limiting element in this contingency.

The White Rock system can successfully maintain service to all customers despite the loss of Transformer 1. This contingency shows that there is limited capacity for further load growth.

Next Steps

Electrification Impact Analysis

- Electrification load will be spread throughout each system model to understand the power flow impacts.
- Build projects to mitigate planning criteria violations. Construct new substation capacity, new distribution feeders, new equipment, etc., within the system.
- Show that planning criteria can be maintained with the proposed system improvements.

System	Existing Load kVA	2055 High Scenario Load kVA	2055 High Scenario Total Load kVA
Los Alamos	17,811	32,035	49,846
White Rock	3,905	12,356	16,261
Total	21,716*	44,391	66,107

System	Existing Load kVA	2055 Med Scenario Load kVA	2055 Med Scenario Total Load kVA
Los Alamos	17,811	20,108	37,919
White Rock	3,905	7,845	11,750
Total	21,716*	27,953	49,669

System	Existing Load kVA	2055 Low Scenario Load kVA	2055 Low Scenario Total Load kVA
Los Alamos	17,811	9,720	27,531
White Rock	3,905	3,752	7,657
Total	21,716*	13,472	35,188

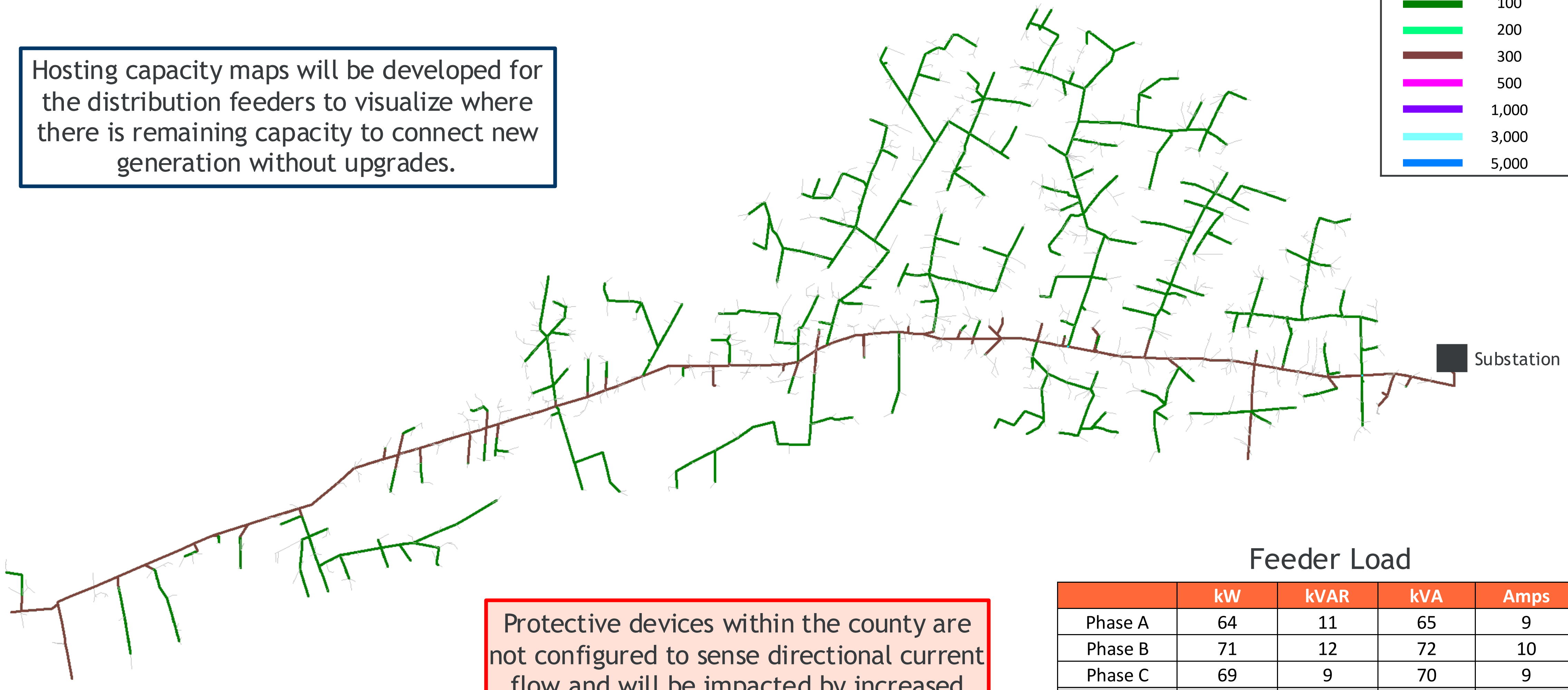
*The total existing load represented in this table is higher than the historical peak demand for the LAC system. This is due to the non-coincident substation peak demands being used in this study.

Anticipated Challenges with Electrification

- Transmission service – What is required from the transmission system to serve the increased load?
- Substation Capacity – Are new substations and transformers required to deliver the power demanded?
- Distribution Feeder Capacity – Are there enough distribution feeders? Are the distribution feeders constructed to serve increased power demand?
- Service Transformers/Secondary Conductor – Upgrades will be necessary to meet the higher power demand from all electric customers.

Hosting Capacity Analysis - Example

Hosting capacity maps will be developed for the distribution feeders to visualize where there is remaining capacity to connect new generation without upgrades.



Legend

	Greater than (kW)	Less than (kW)
	0	50
	50	100
	100	200
	200	300
	300	500
	500	1,000
	1,000	3,000
	3,000	5,000
	5,000	10,000

Feeder Load

	kW	kVAR	kVA	Amps
Phase A	64	11	65	9
Phase B	71	12	72	10
Phase C	69	9	70	9
Total	**204**	**32**	**207**	**-**

Protective devices within the county are not configured to sense directional current flow and will be impacted by increased rooftop PV penetration.

Additional Analysis In Progress

- Transmission System Review
- Power Generation Resource Review
- Rules and Regulations Review
- LAC Staffing Requirement - Workforce Review

Electrification Study Milestones

- July 9th, 2025 submittal of the draft report and executive summary presentation
- July 16th, 2025 in-person presentation of the electrification study executive summary
- July 30th, 2025 submittal of the final report

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