

Electrification Assessment Results

Presentation to Economic Development, Technology, and City Light
Committee

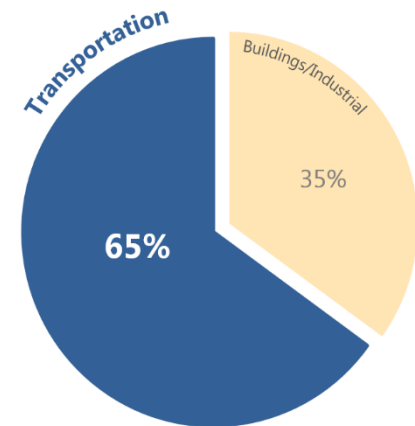
March 9, 2022

Motivation

What are the high-level impacts of electrification to SCL's service territory?



City of Seattle Policies:	Targets		
	2030	2040	2050
2018 Climate Action Plan	58% below 2008 emissions	N/A	Net Zero GHG emissions
Green New Deal	"Free of climate pollutants...by 2030"	Continued	Continued
Other:			
Washington State Energy Strategy	45% below 1990 emissions	70% below 1990	95% below 1990 with net zero emissions
NWPPC 2021 Power Plan—"Path to Decarbonization"	N/A	50% of 1990	80% of 1990



City Light's Approach to Our Energy Future

- Start with equity
 - Burdened communities see benefits first
- Build for the future
 - Modernize & reimagine the grid
 - Leverage technology
- Lean into partnerships
 - Next level customer relationship
 - One City
 - Work with experts – Pacific Northwest National Labs, Community Groups, Regional Utilities
- Be bold, be ready
 - Thriving out of adversity with Utility Next

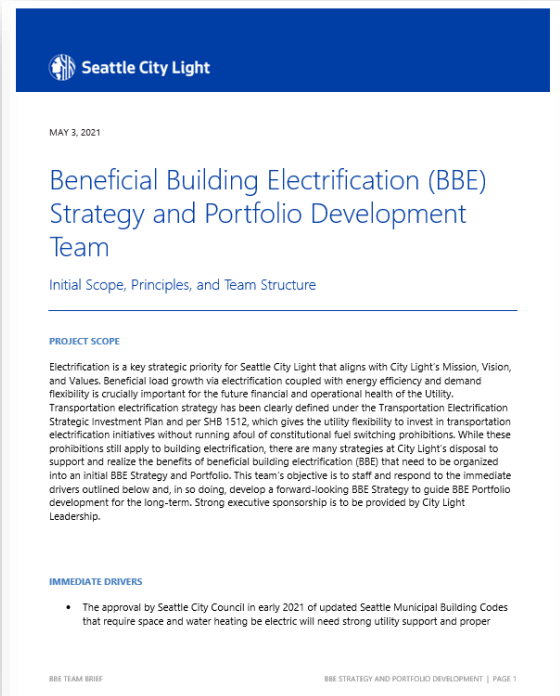
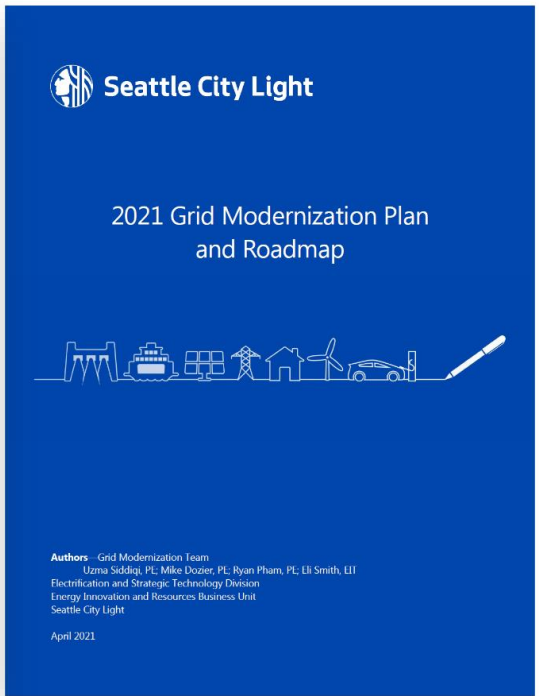


Source: Seattle's Equity & Environment Agenda.

Long-term Strategies In Place or Developing



Create our Energy Future



Environmental Stewardship



Equitable Community Connections



Operational and Financial Excellence

Overview of Key Insights



- Electrification provides a path to meet the City's climate goals.
- Electrification will increase SCL's load; impact to the distribution grid will vary based on time and location.
- This analysis is the beginning of a larger undertaking to plan for a decarbonized future.

Scope of the Electrification Assessment

In Scope:



- Two primary components:
 - Scenario analysis to determine the energy and capacity needed for the electrification of buildings, transportation, and commercial & industrial applications.
 - Analysis of SCL's current grid load and grid capacity.
- Additional analysis includes:
 - High-level overview of potential for flexibility of new electric loads.
 - Potential strategies to help tackle electrification adoption challenges.

Out of Scope:



- Areas for later analysis:
 - Conservation/energy efficiency
 - Demand Response
 - Transmission system-level analysis and bulk energy resource needs
 - Costs & rate impact

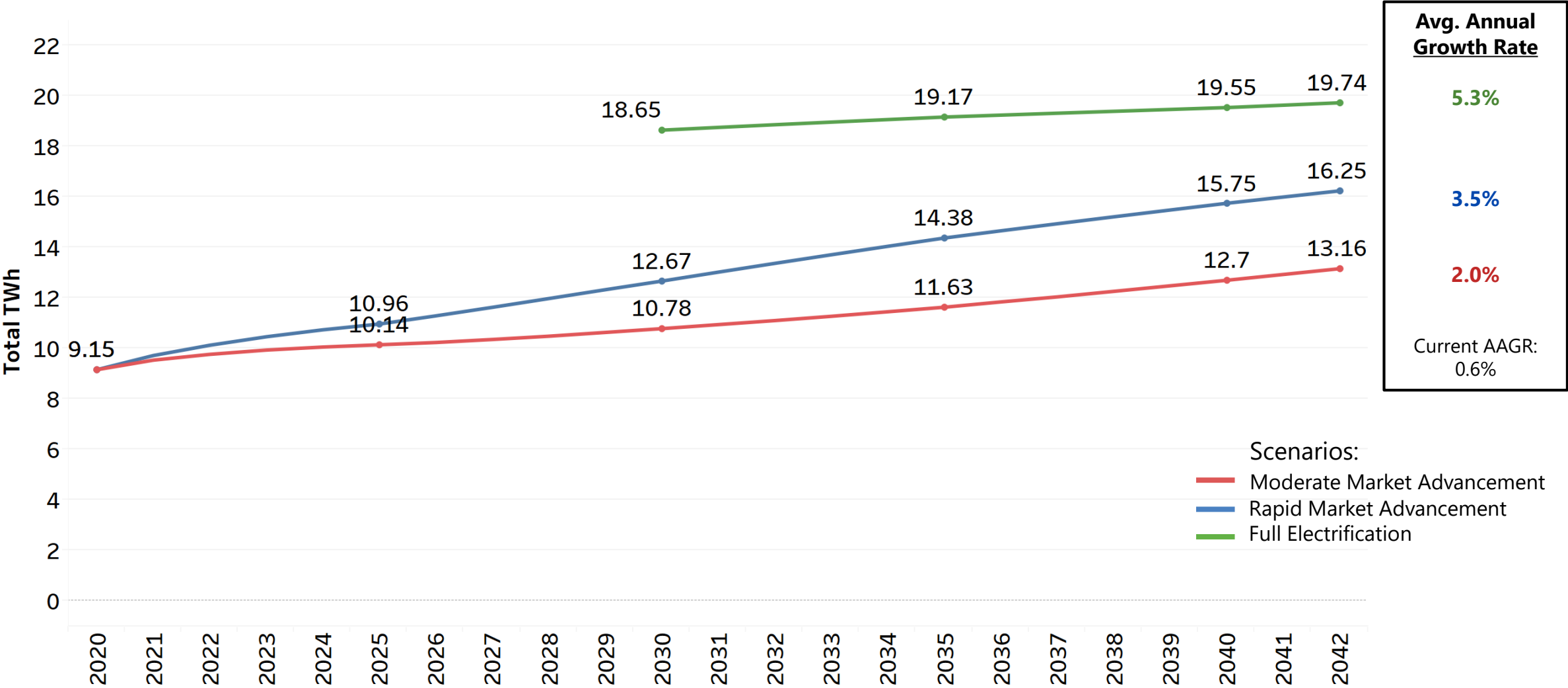
Electrification Energy and Capacity Scenario Analysis



Scenarios

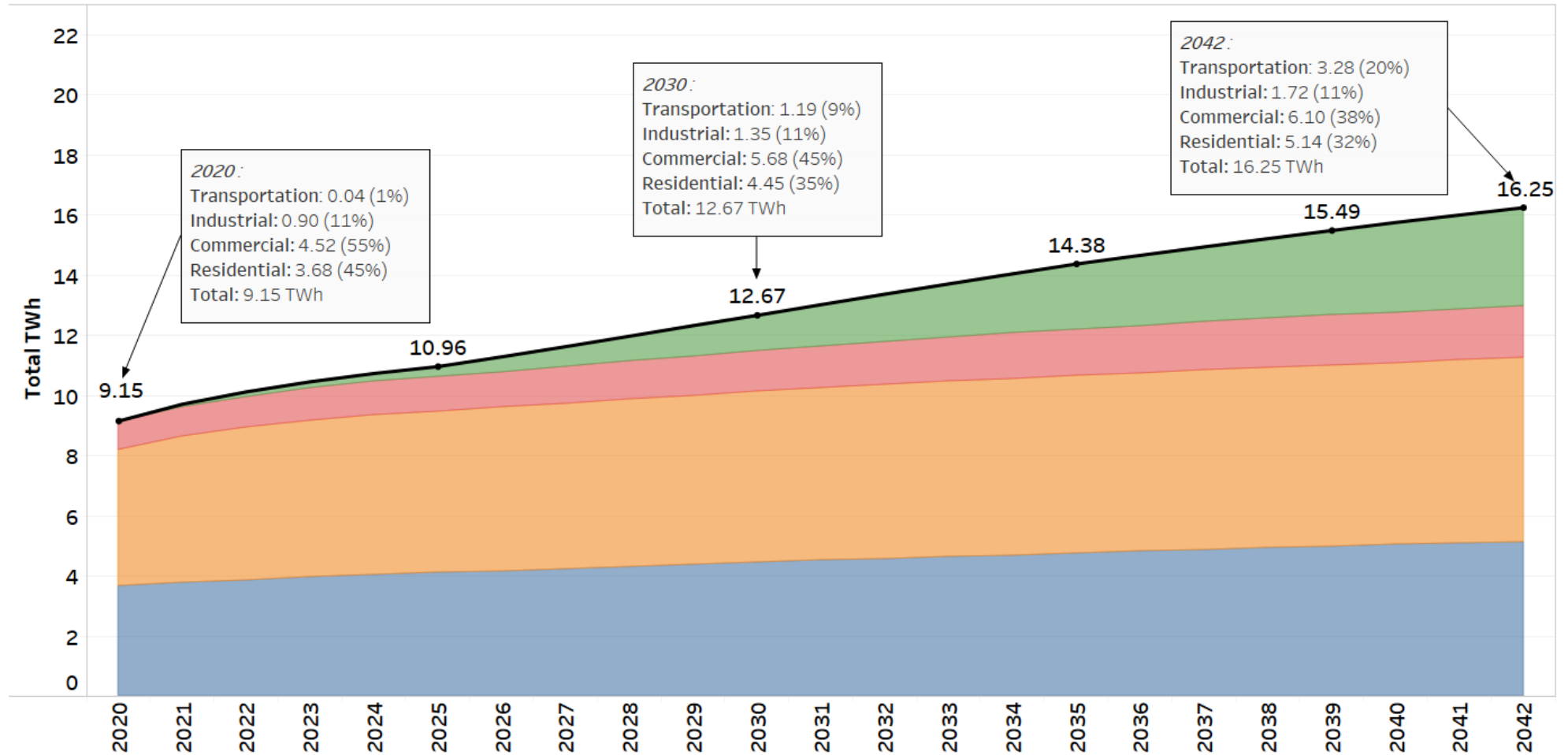
Scenario Name	Basis	Electric Transportation (electrified vehicle stock in 2030)	Buildings and Industry
01 Moderate Market Advancement	<ul style="list-style-type: none"> Baseline trajectory based on external projection/research 	<ul style="list-style-type: none"> Passenger vehicles: 11% Transit & school bus: 6-7% Light commercial, refuse, short-haul trucks: 3-4% Long-haul truck & intercity bus: 0-0.3% 	<ul style="list-style-type: none"> Future years driven by market growth, energy efficiency, and customer choice based on relative economics
02 Rapid Market Advancement	<ul style="list-style-type: none"> Aggressive trajectory consistent with the Climate Action Plan (CAP), Drive Clean Seattle, Seattle’s Clean Transportation Electrification Blueprint and ICCT 	<ul style="list-style-type: none"> Passenger vehicles: 30% Transit & school bus: 82% Light commercial, refuse, short-haul trucks: 27-30% Long-haul truck & intercity bus: 0-1% 	<ul style="list-style-type: none"> Increased electric adoption above and beyond moderate market advancement to align with 2017 CAP emissions targets
03 Full Adoption of Electrification Technologies [single point estimation]	<ul style="list-style-type: none"> City of Seattle’s Green New Deal and reference scenario that underlines the requirements for full electrification 	<ul style="list-style-type: none"> Passenger vehicles and all MDHD vehicle classes: 100% 	<ul style="list-style-type: none"> Full adoption of available electric technologies by 2030

Scenario Comparison: Total Load



Note: Total system capacity summed from hourly capacity

Total Load, Scenario 2: Rapid Market Advancement



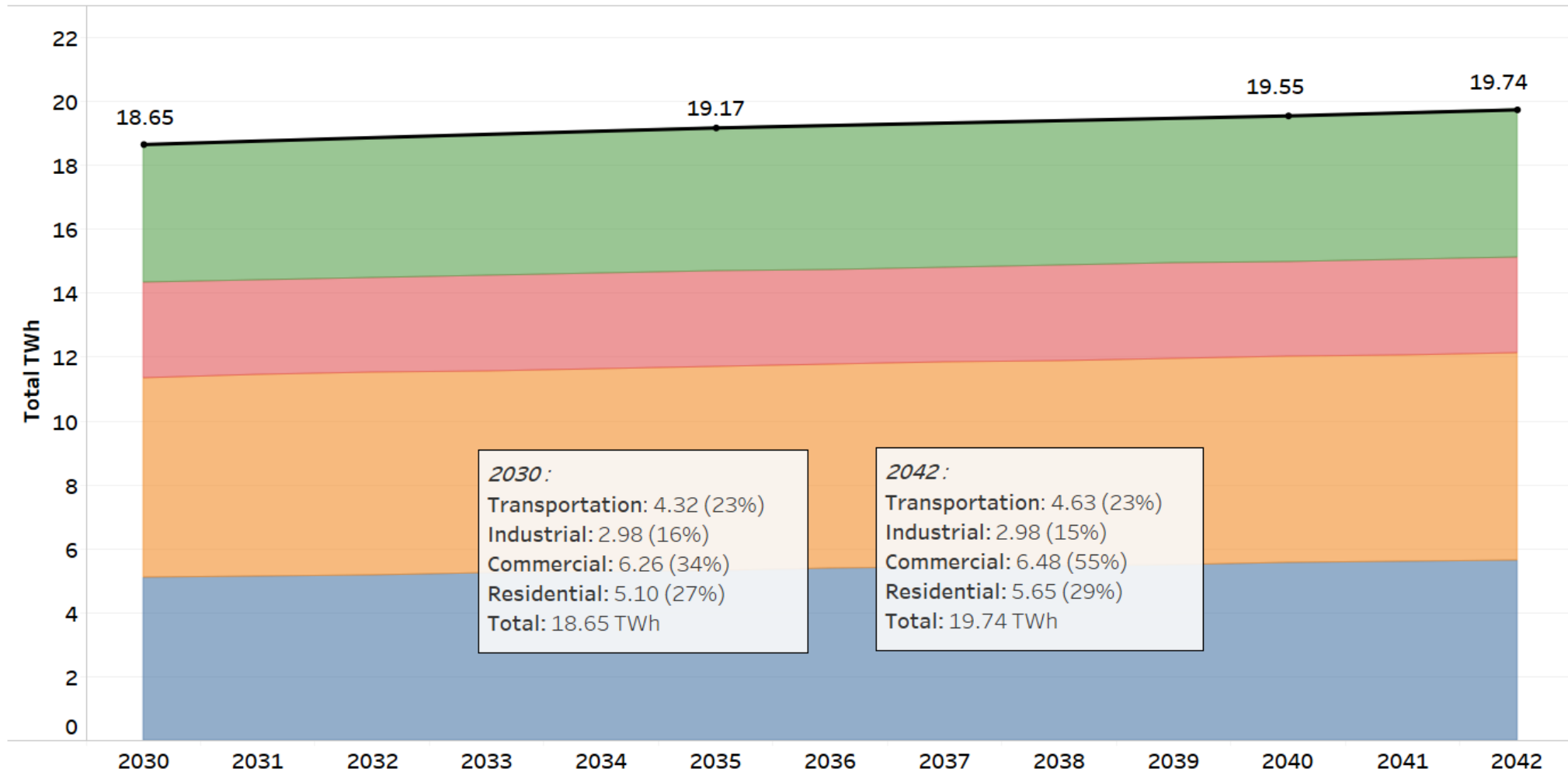
Note: Total system capacity summed from hourly capacity.

Source: EPRI, Seattle City Light Electrification Assessment, Figure 1-3.

Sectors

■ Total ■ Transportation ■ Industrial ■ Commercial ■ Residential

Total Load, Scenario 3: Full Electrification

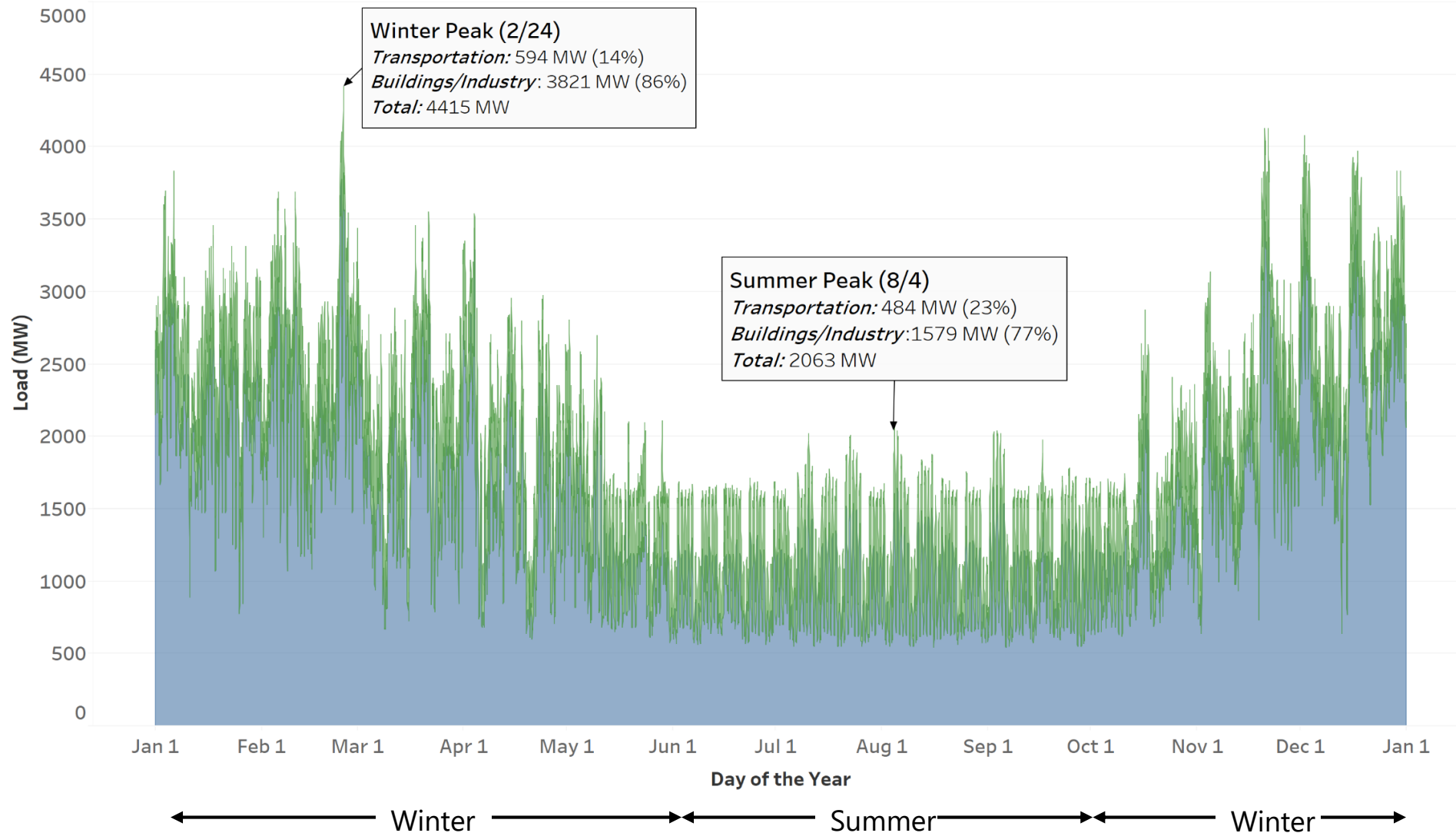


Note: Total system capacity summed from hourly capacity

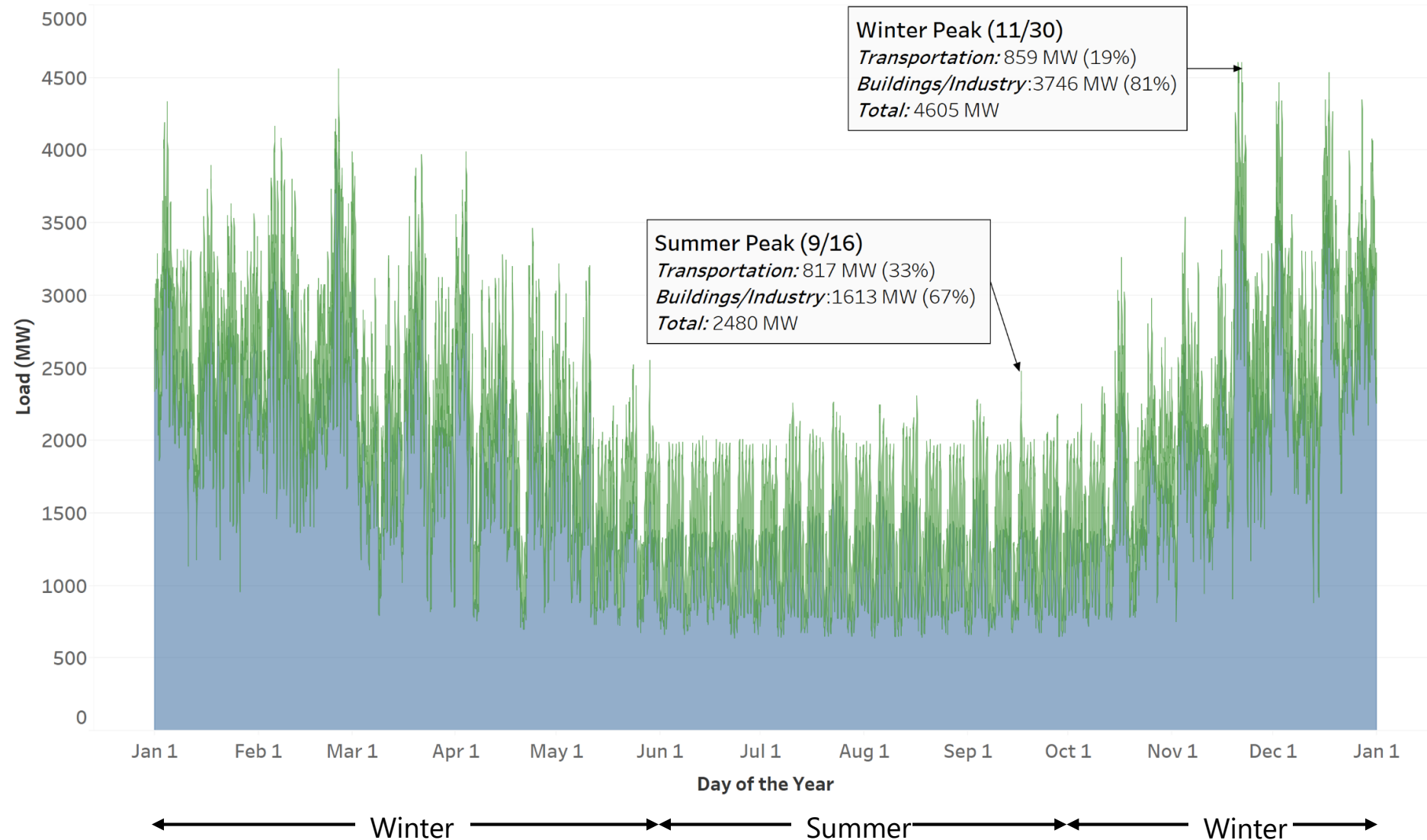
Sectors

■ Total ■ Transportation ■ Industrial ■ Commercial ■ Residential

2042 yearly load, Scenario 2: Rapid Market Advancement



2042 yearly load, Scenario 3: Full Electrification



Grid Impacts Assessment



Grid Analysis Approach

Research Question: What capacity does the existing distribution grid have for electrified load?



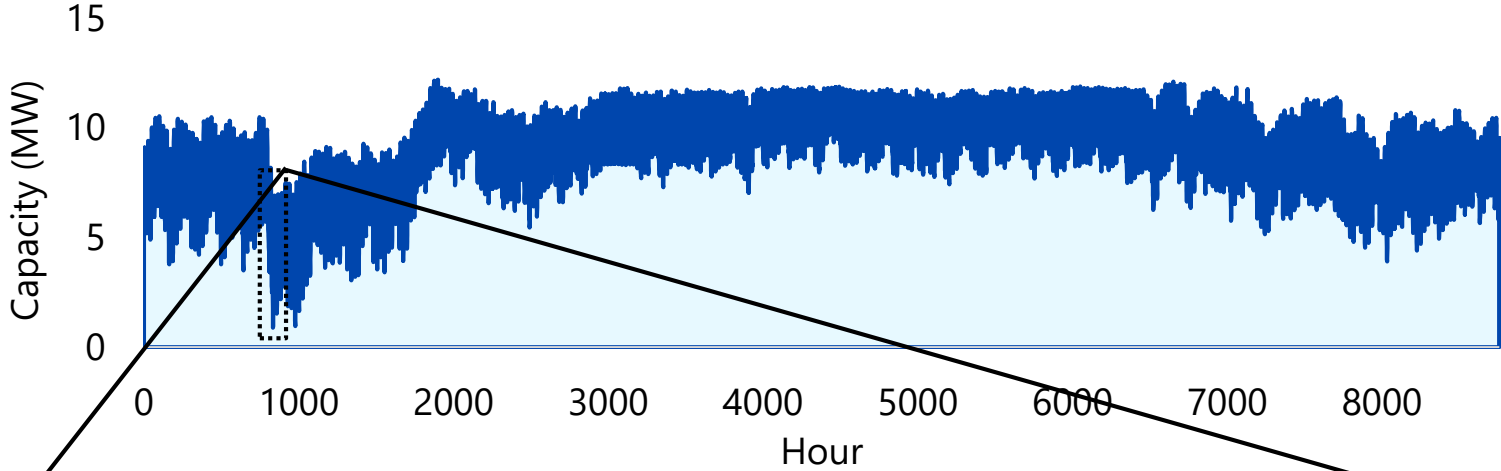
- Detailed system-wide load hosting capacity assessment
- Capacity calculated from specific location level to feeder and substation levels
 - Both centralized and distributed load deployments considered



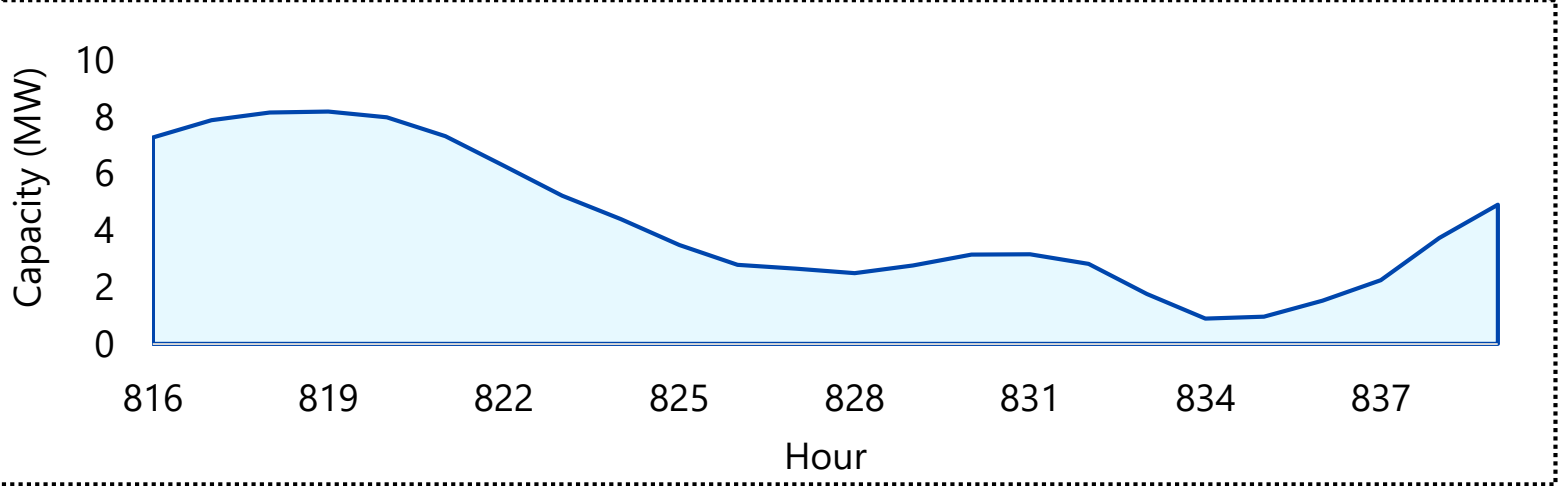
- Considers both voltage and thermal issues
- Time-specific to align with electrified load needs

Hosting capacity results estimate the amount of load/generation that can be accommodated without adversely impacting power quality or reliability under current configurations and without requiring infrastructure upgrades

Energy Capacity—Feeder 2612 Example



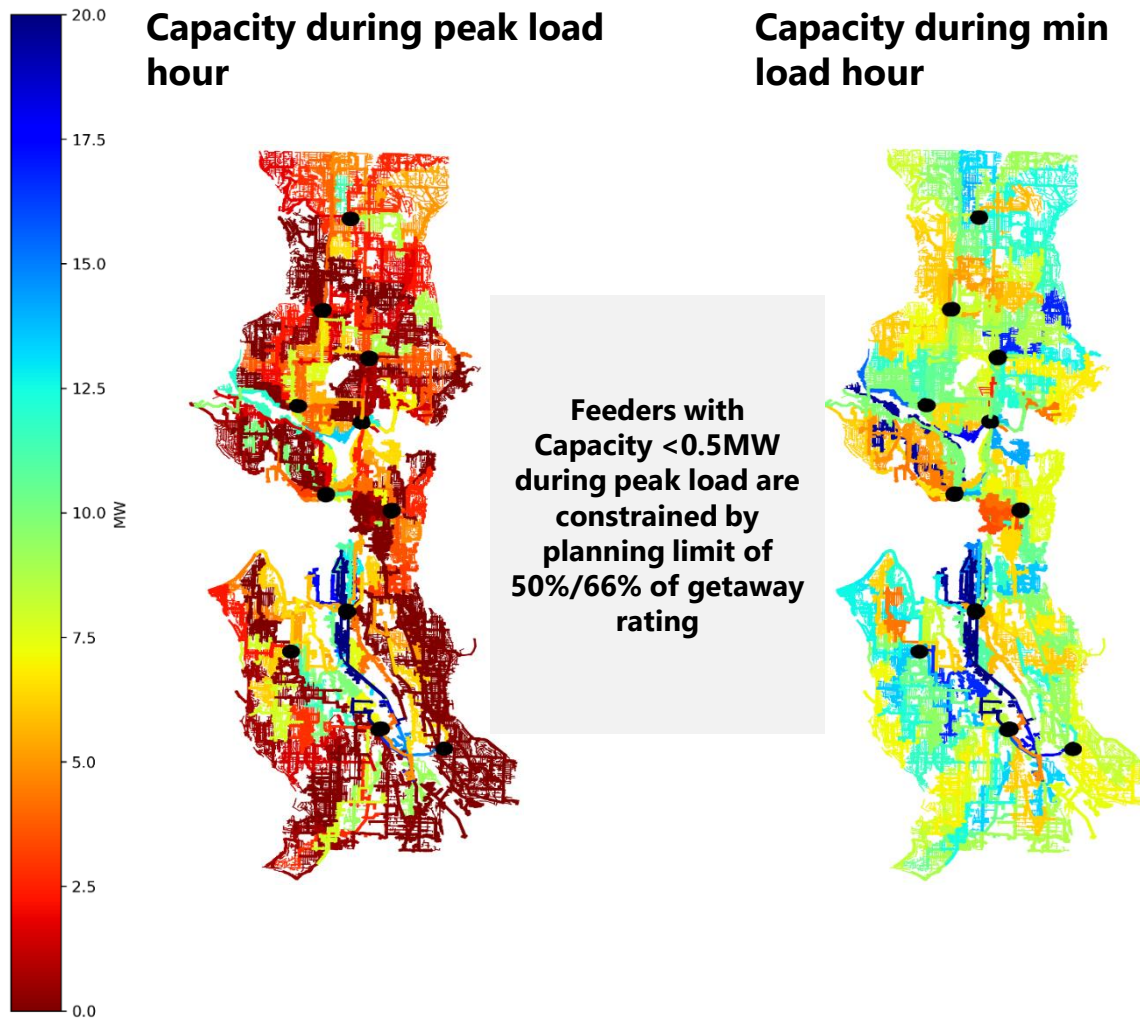
Σ [shaded area] = **Annual Energy Capacity**



Σ [shaded area] = **Minimum Daily Energy Capacity**

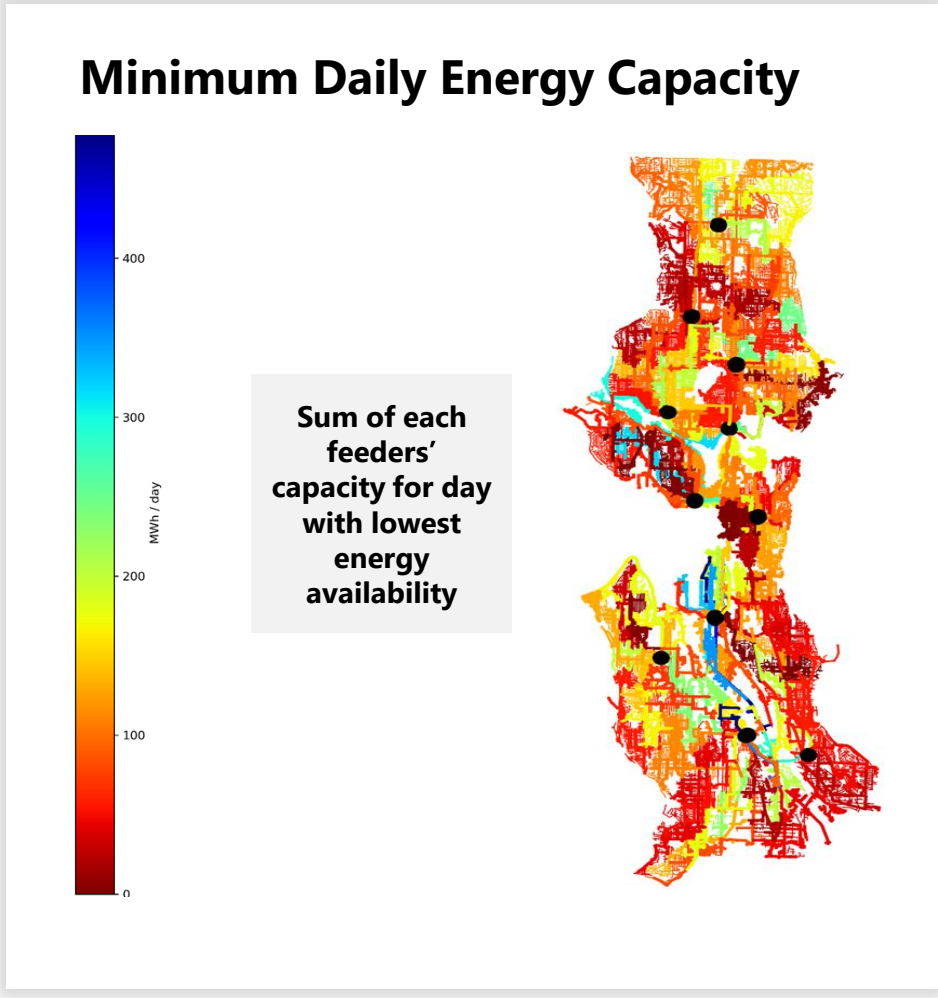
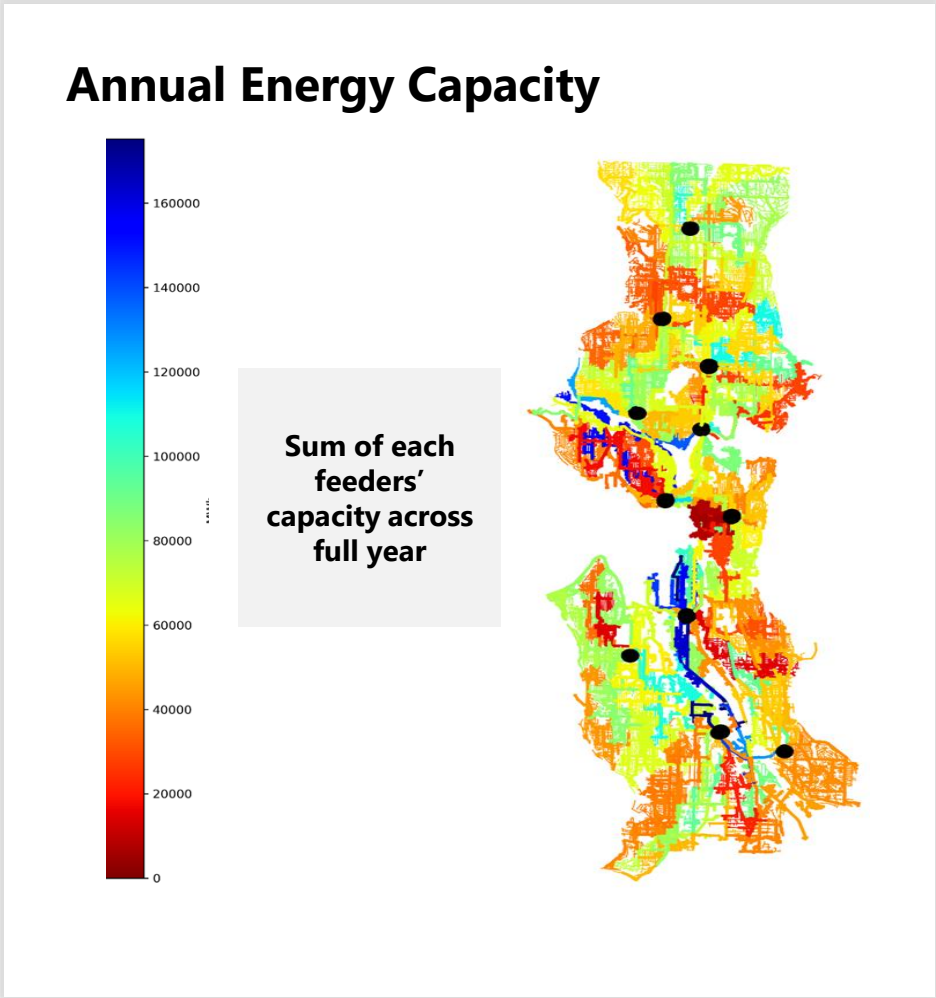
Source: EPRI, Seattle City Light Electrification Assessment, Figure 5-10.

Capacity for Additional Distributed Load at Peak and Min



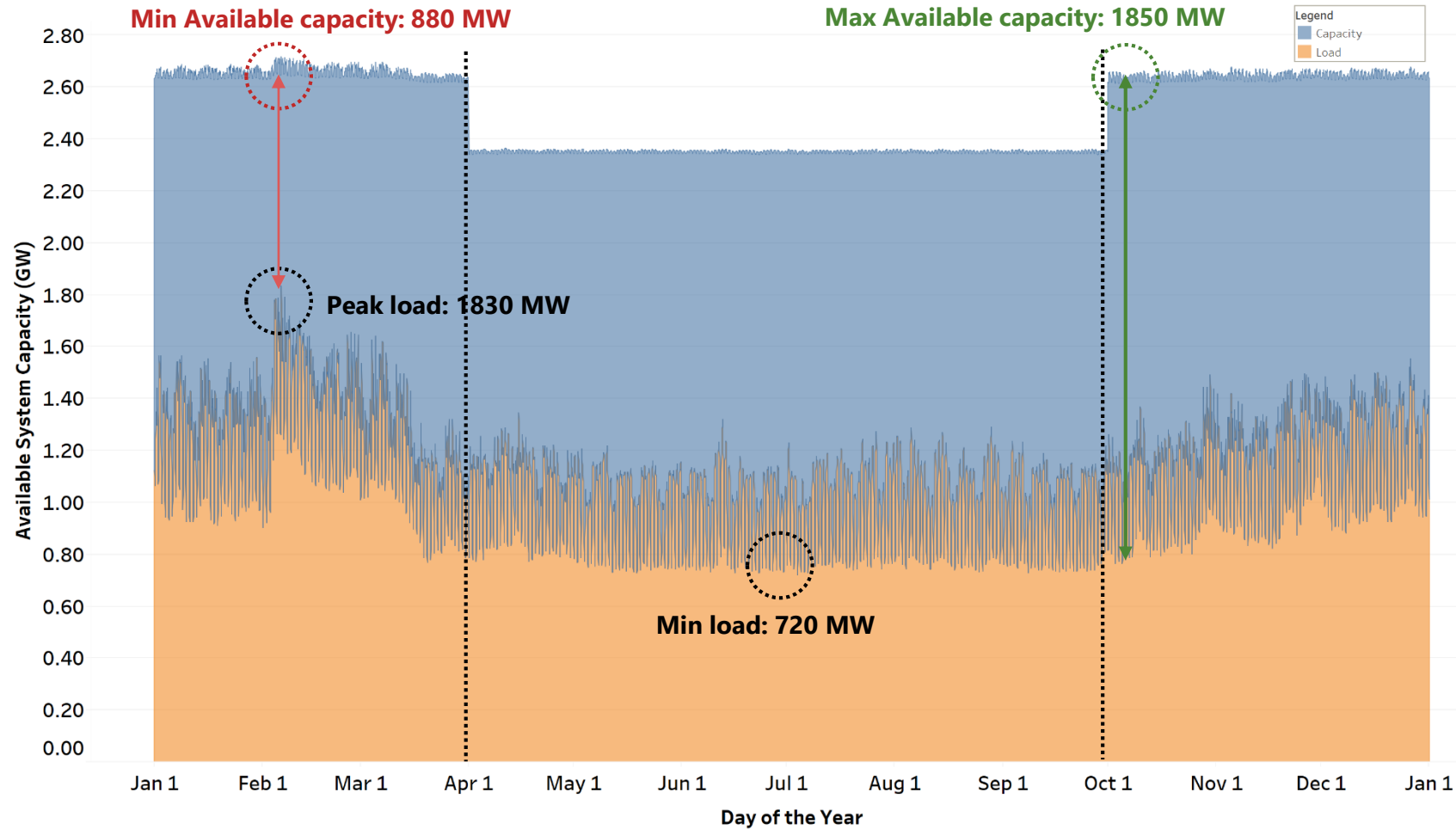
Substation	Capacity during peak Load (MW)	Capacity during min Load (MW)
Broad	51	152
Broad Annex	80	142
Canal	65	129
Creston	179	223
Delridge	120	200
Duwamish	159	257
EastPine	37	131
Massachusetts	29	43
North	125	204
Shoreline	44	129
South	161	264
Union	91	122
University	75	123
Viewland	77	173

Energy Capacity – Distributed Load Deployment



*Looped radial system only

2019 System-Wide Load and Capacity



Scenario Analysis 2042 Peaks:

Scenario 2: Rapid Market Advancement

- Summer: 2.1 GW
- Winter: 4.45 GW

Scenario 3: Full Electrification

- Summer: 2.5 GW
- Winter : 4.6 GW

*Available System Capacity= Demand + Available Additional Capacity

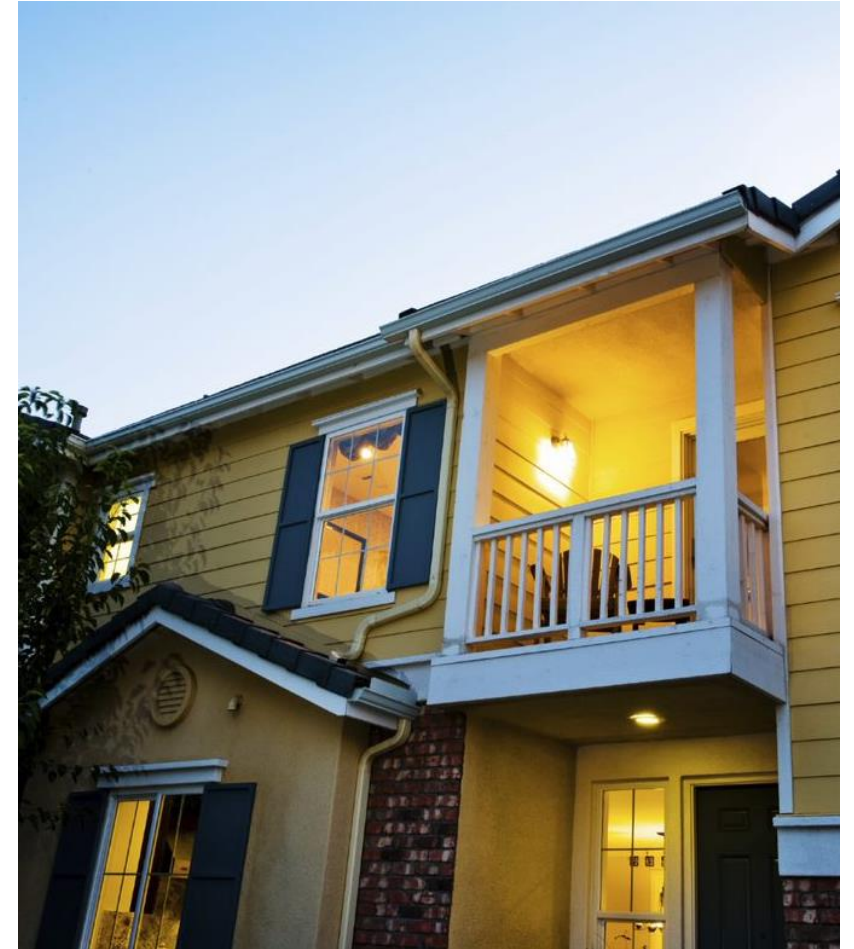
Conclusions, Insights, and Next Steps



Seattle City Light

Conclusions & Insights—Buildings and Industry

- Buildings & Industry account for most of the electrification-related increases in load.
 - Increase driven primarily by space heating, space cooling, and water heating
 - Without any energy efficiency or peak mitigation strategies, expect significant increase in system peaks.
- Flexibility and conservation will be important tools as we move forward to manage and reduce peaks.
 - Grid is built to meet local and system peaks, ensuring an even distribution of peak loads is key to efficient asset deployment and utilization.



Conclusions & Insights—Electric Transportation

- Energy impacts from transportation:
 - Passenger vehicles are primary in terms of total energy.
 - Transit buses might be an early player – technology available now.
 - Important to understand emerging fleet loads.
- Much of EV charging is flexible load; results highly dependent on customer behavior.
 - Potential area for programs to mitigate peaks.

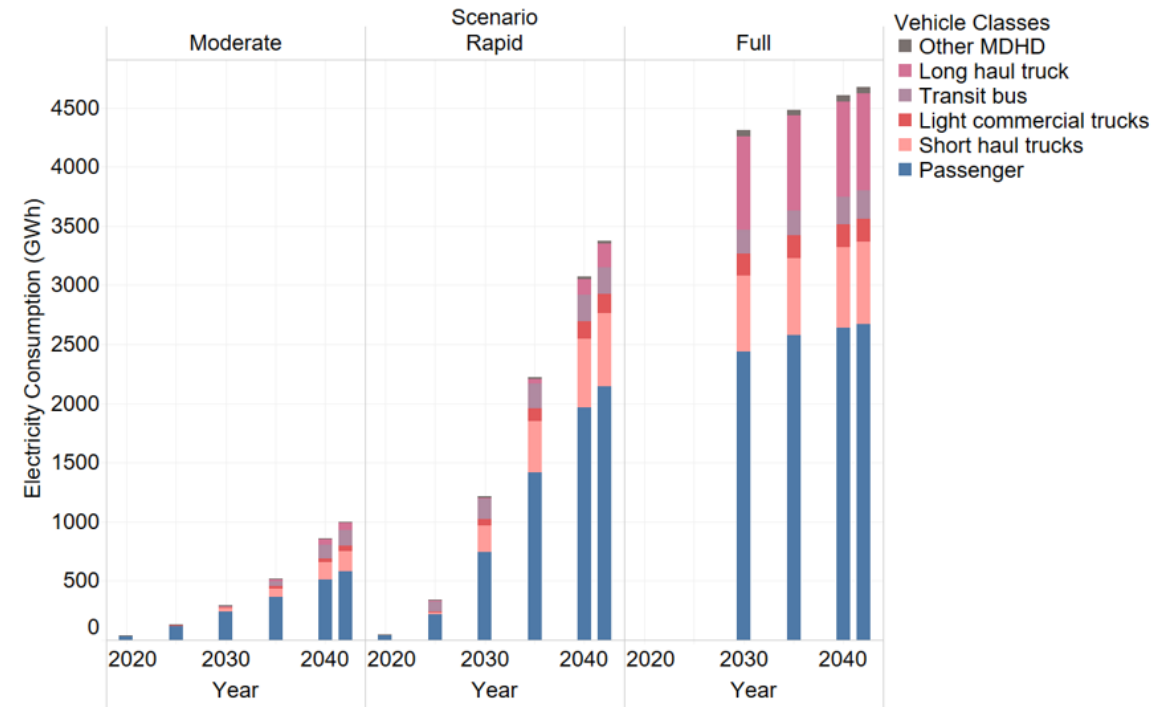
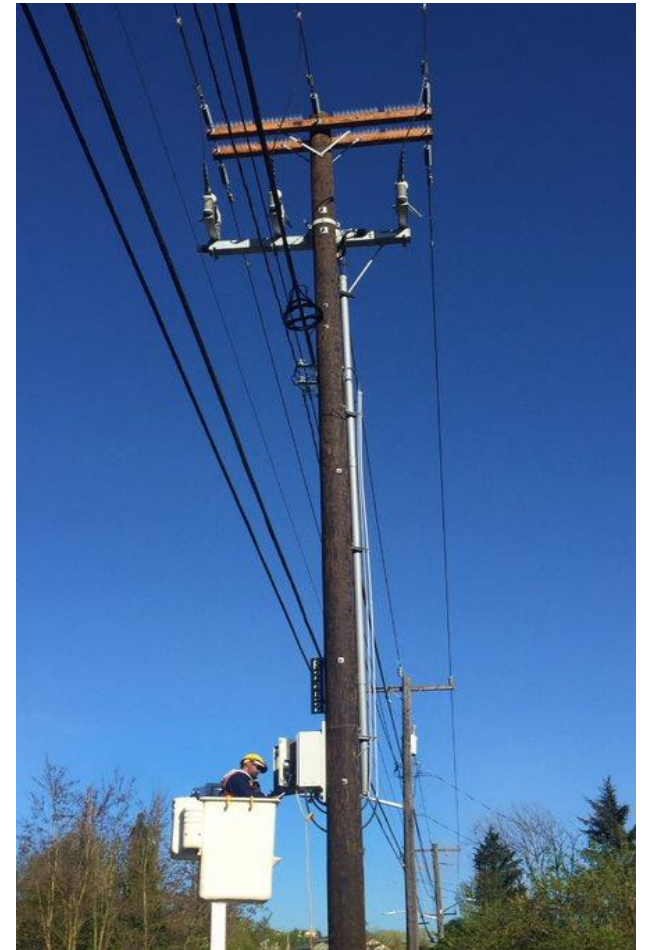


Figure 2-12
Annual electricity consumption (GWh) by vehicle class groups for all scenarios

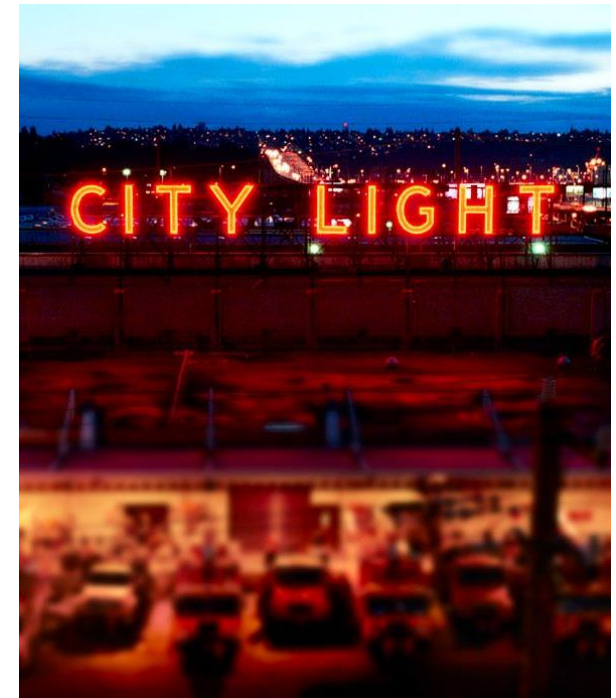
Conclusions & Insights—Grid Impacts

- SCL's distribution grid has significant capacity available much of the year.
 - However, areas of the grid and times of the day/year when the available capacity is limited.
- Local monitoring together with flexible load strategies may prove key to ensuring that electrification is not limited anywhere on SCL's grid.
 - Awareness of when and where loads are emerging—and implementing strategies to impact how they align with grid capacity—is critical.
- Understanding capacity limitations helps SCL consider new approaches as we plan to serve electrification loads.



What's Next?

- This analysis is the beginning of a larger undertaking to plan for a decarbonized future:
 - SCL planning processes
 - Policy and program decisions
 - Creation and adoption of new tools to meet changing circumstances.
- Follow-up efforts— “Phase 2”
 - Load forecasting, grid analysis (distribution and transmission), and medium duty/heavy duty EV fleet analysis.
- Implement demand flexibility demonstrations and pilots, complete building electrification strategy



THANK YOU



Seattle City Light



seattle.gov/city-light



Mission, Vision & Values

Mission

Seattle City Light provides our customers with affordable, reliable and environmentally responsible energy services.

Vision

Create a shared energy future by partnering with our customers to meet their energy needs in whatever way they choose.

Values



Customers First



Environmental Stewardship



Equitable Community Connections



Operational and Financial Excellence



Safe and Engaged Employees

Conclusions & Insights—Electric Transportation (cont)

- Charging Infrastructure needs are extensive:
 - Prioritize charging solutions for those without a dedicated charger.
 - Long distance travel will require charging outside of Seattle.
 - To meet targets in Scenario 2, requires >800K electric vehicles and >450K charging ports, including 23K public charging ports

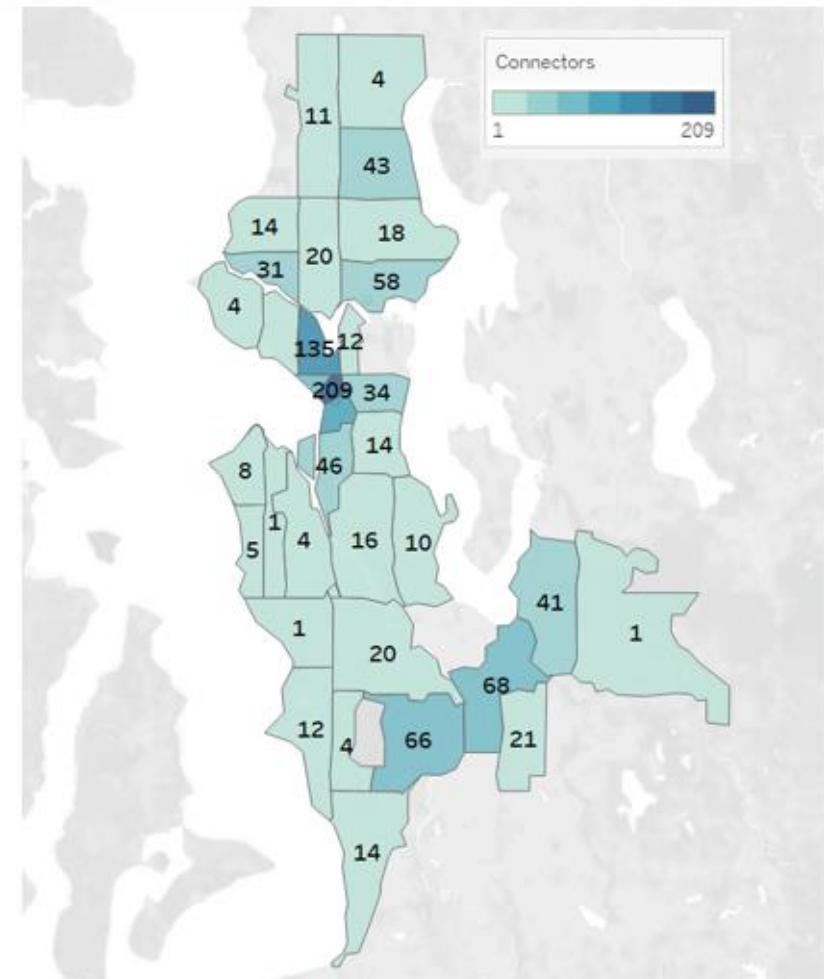
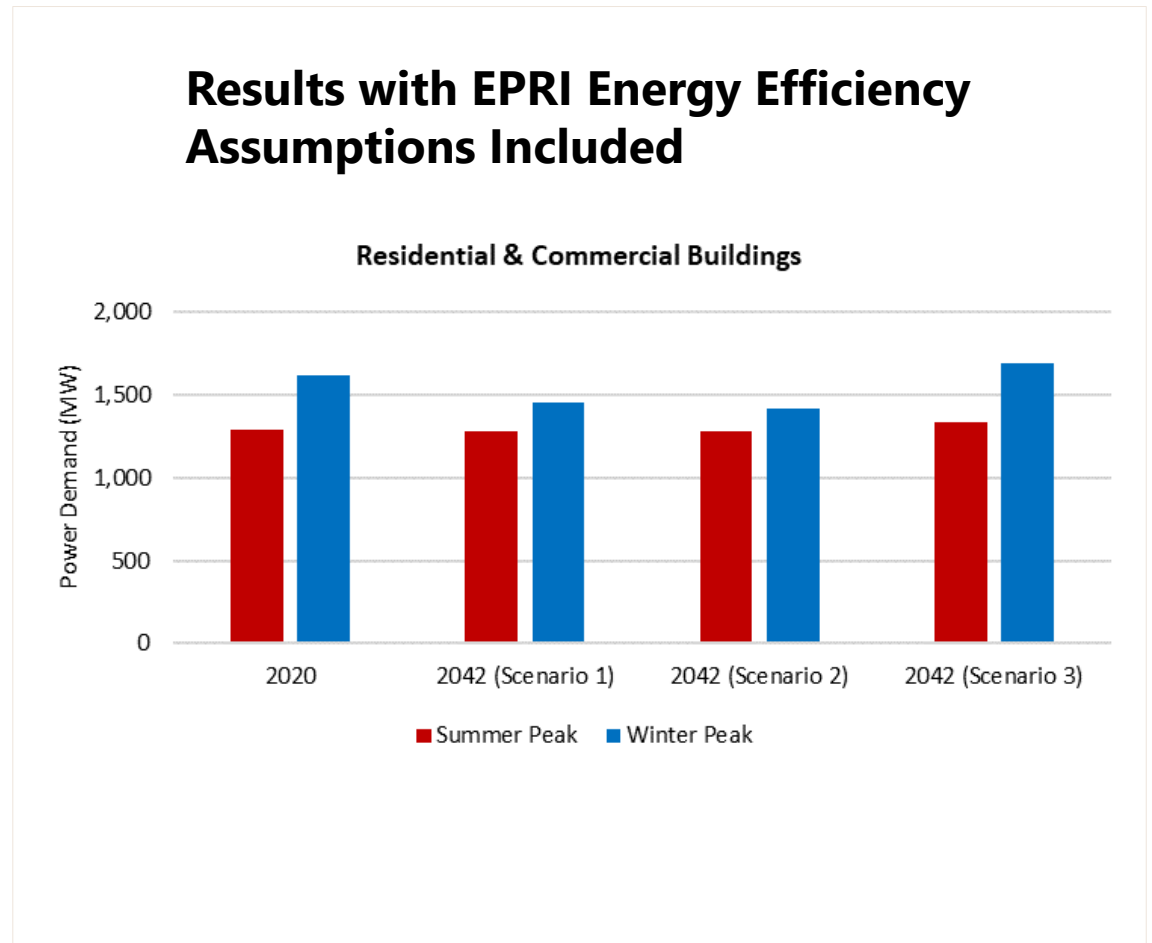


Figure 2-13
Current public EV charging connectors in Seattle

Conclusions & Insights—Buildings and Industry (cont)

- Technology advancement and other strategies can help to offset peak demand increases.
- EPRI's energy efficiency analysis found that conversions of resistance heat to heat pump technologies could potentially provide a significant offset to increases in peak.
- Use of dual-fuel space heating options can also limit impacts on system peak.



Clean Energy Transformation Act – What Is It?

- [Washington State Clean Energy Transformation Act](#)
- Washington State law signed by Governor May 7, 2019
- **Its intent is to create a carbon-free future. It guides the transition to a clean energy economy to address climate change**
- Aims for 100% of Washington’s electricity to be greenhouse gas-free by 2045
- Key deliverable:
Clean Energy Implementation Plan
(Utility's plan for *how* - 2022-2025; every 4 years)



Washington State
Department of
Commerce

