

The background image shows a scenic view of a forested mountain. A winding road curves through the lower right portion of the frame, bordered by a concrete wall with integrated lights. On the left, a small, light-colored building is situated near a rocky outcrop. The upper half of the image is dominated by a dense forest of tall evergreen trees under a cloudy sky.

2022 IRP Baseline Load Forecast & Scenario Planning

March 12th IRP Technical Advisory Committee Meeting



Seattle City Light

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Agenda

- Meeting purpose
- Revisit COVID impacts on load
- Methodology overview
- **Baseline** load forecast for 2022 IRP & CPA
- Load forecast scenario levers
- Scenario discussion & development
- Next meeting topics

Meeting Purpose (Questions to keep in mind)

- + Informing while also seeking feedback on the baseline load forecast.
- + Thoughts and considerations as we use the baseline forecast to establish the 2022 Conservation Potential Assessment (CPA) targets and possibly the Clean Energy Implementation Plan (CEIP) targets?
- + What drivers of change are most important to include in IRP Scenarios? What do you want to learn from the scenario work?

2020 COVID Retail Load Impacts



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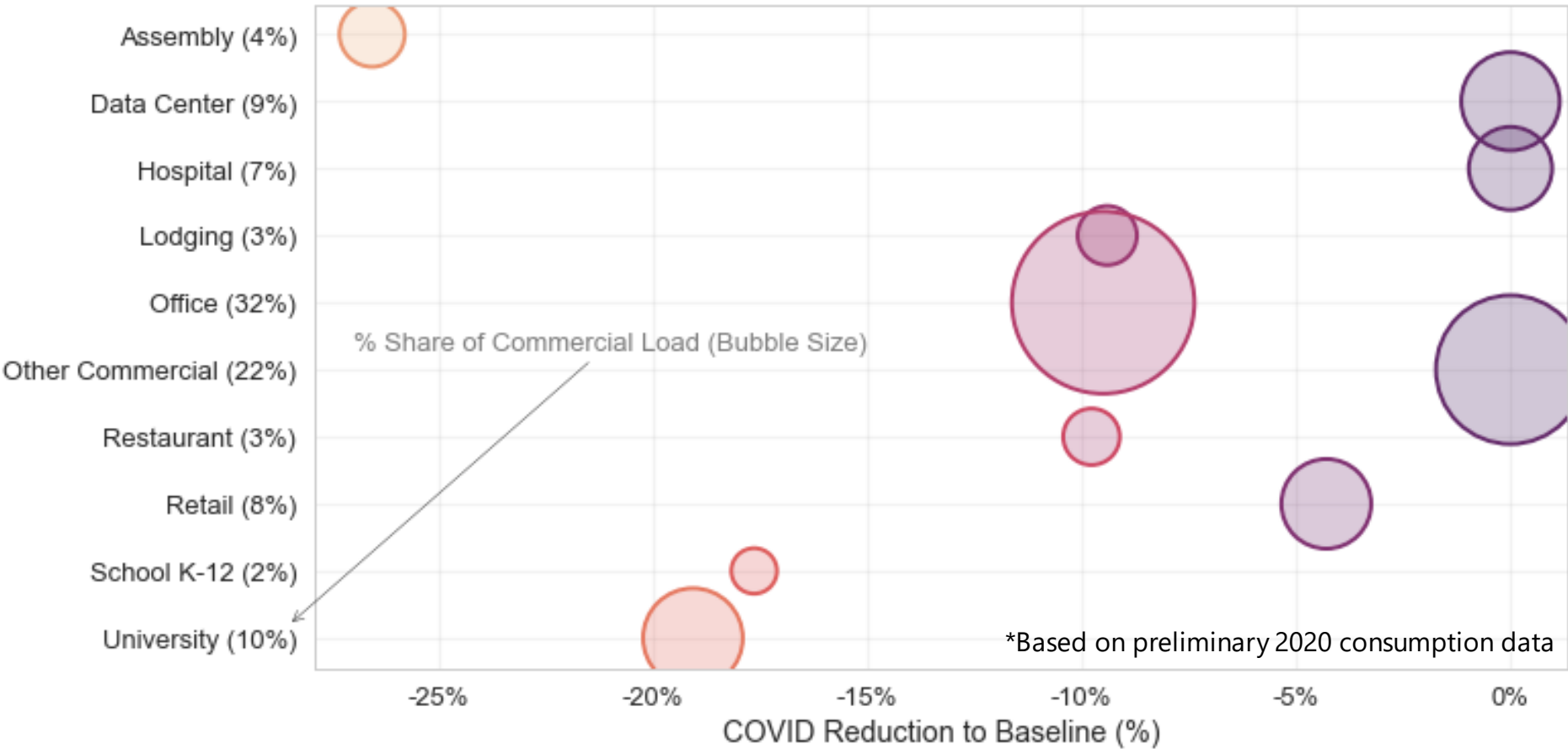


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COVID Impacts 2020 Retail Load



COVID Impacts Commercial Segments



More reduction

Less reduction

2022 CPA and 2022 IRP Baseline Forecast (based on 2020 Adopted Corporate Forecast)



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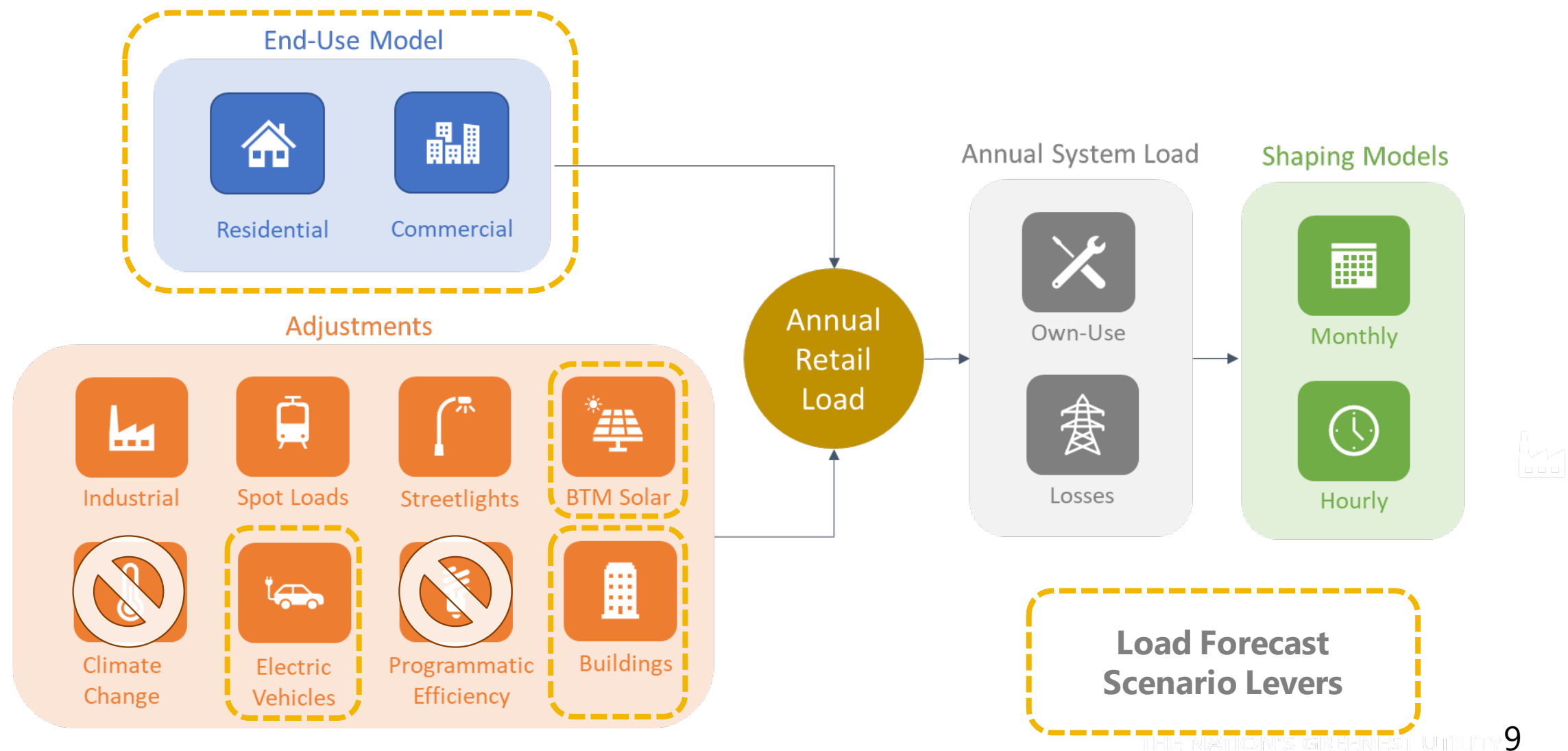


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Corporate vs IRP/CPA Baseline Load Forecast Views

Forecast View	Description	Planning Functions Impacted
Corporate	Expected delivered loads	Strategic plan, rate cases, financial planning, shorter-term resource planning, distribution system planning, external submittals, bond issues
IRP and CPA Baseline	Expected delivered loads <u>before</u> programmatic conservation	CPA and IRP - will produce a new programmatic conservation forecast from a portfolio valuation perspective that will get adopted into next iteration of the corporate forecast

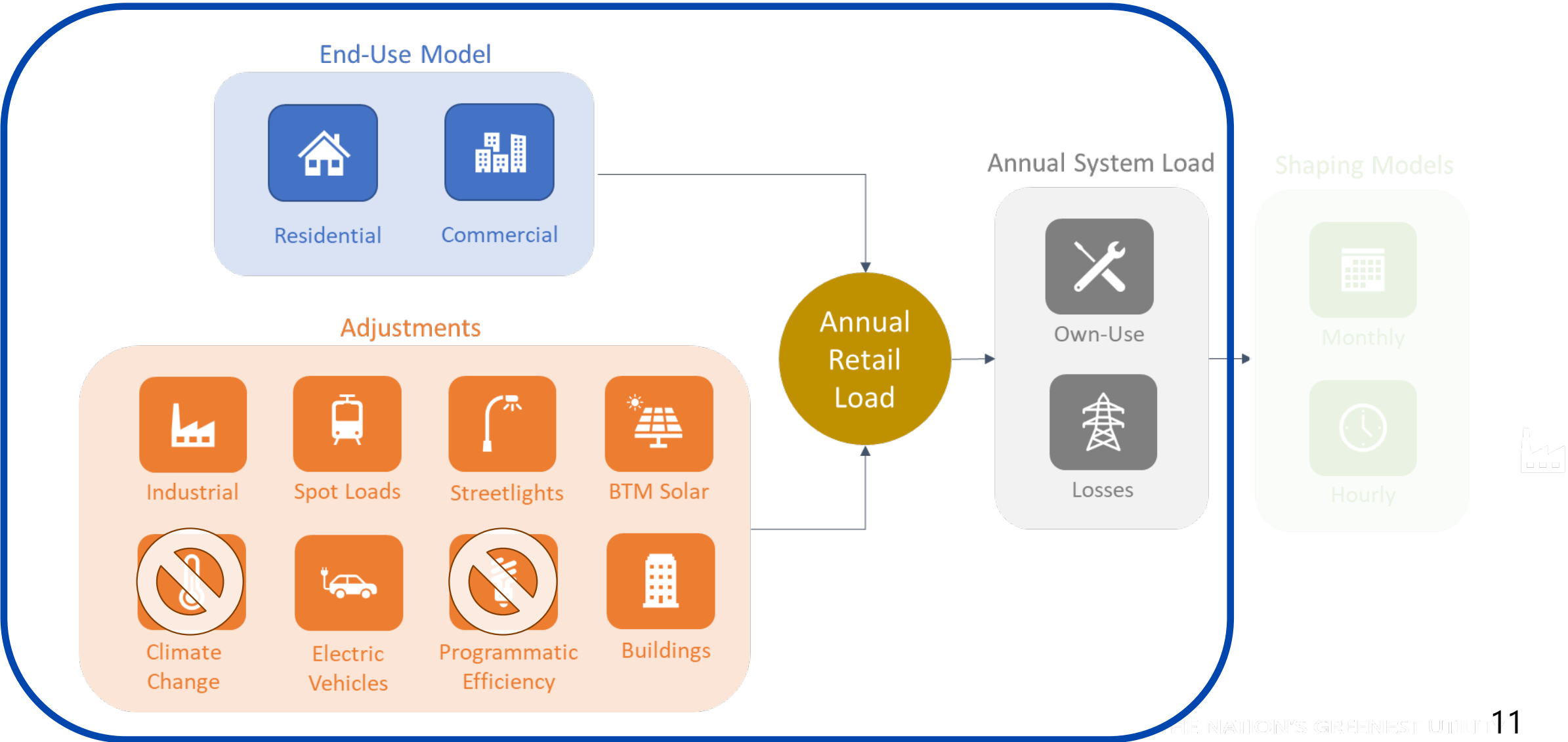
Load Forecast Process Overview



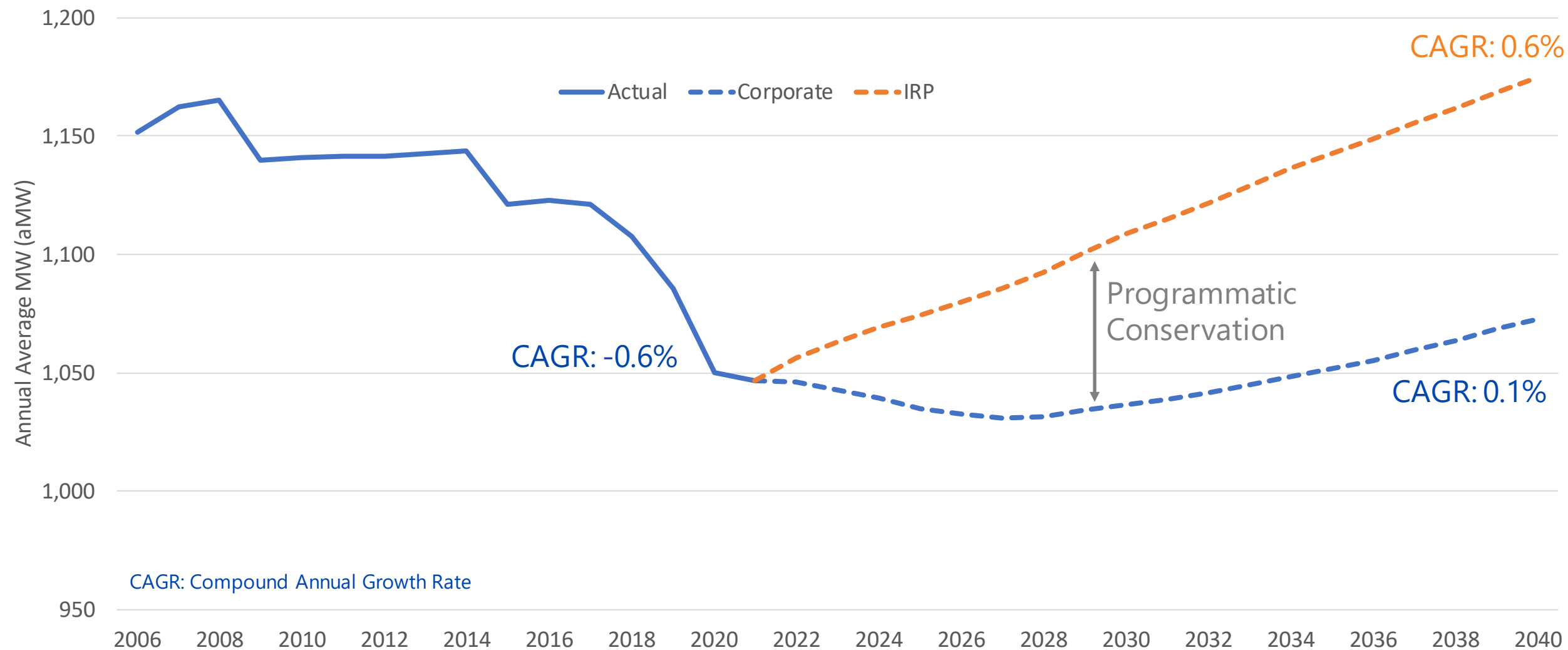
Key Changes between 2020 and 2019 Corporate Forecast

- COVID impacts to base-year load ⬇
- Updated economic forecast assumptions from CBO ⬇
- Placeholder for SDCI building code impact ⬆
- Updated electric vehicle forecast from EPRI ⬆
- New CPA/IRP study period 2021 - 2041

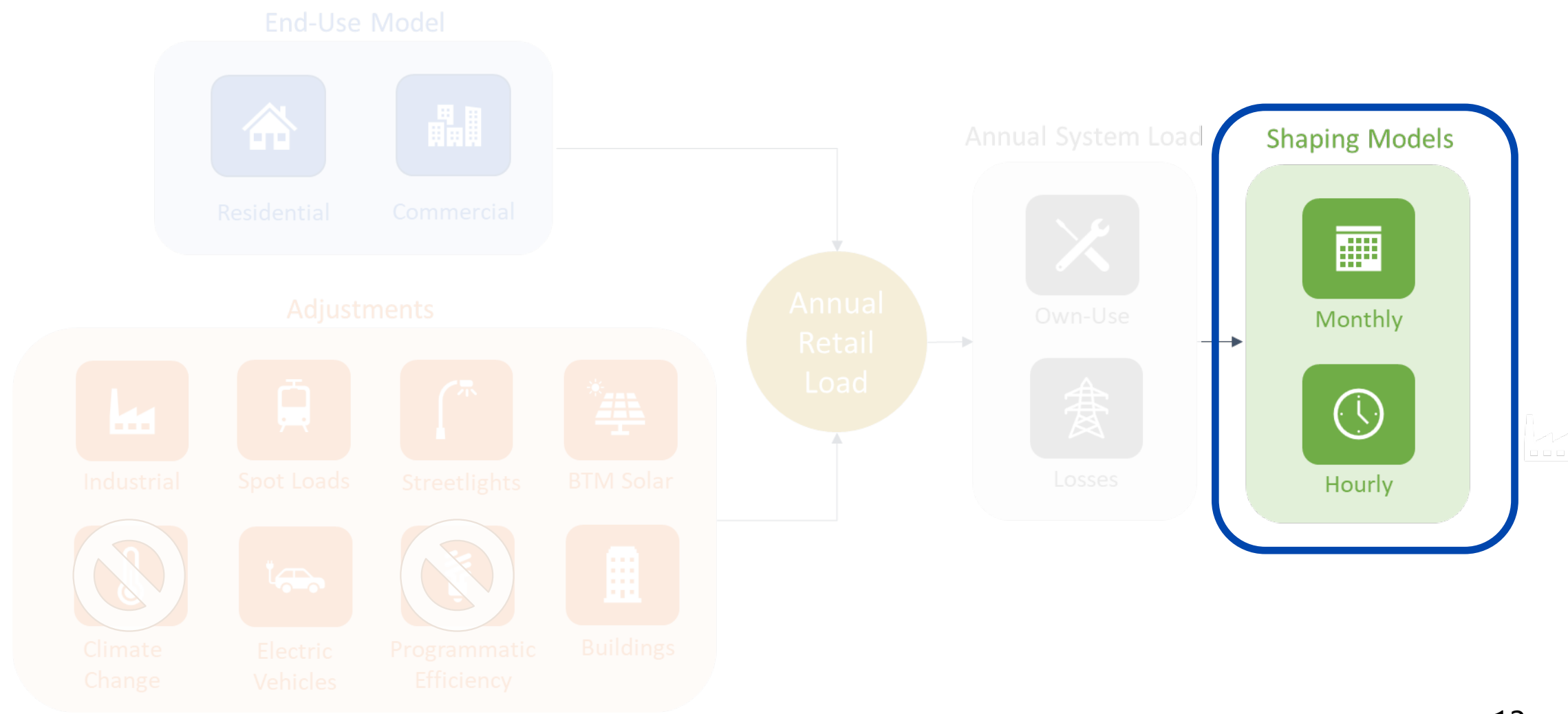
Load Forecast Process Overview – Annual



2020 Corporate and IRP Baseline Forecasts - Annual



Load Forecast Process Overview – Hourly

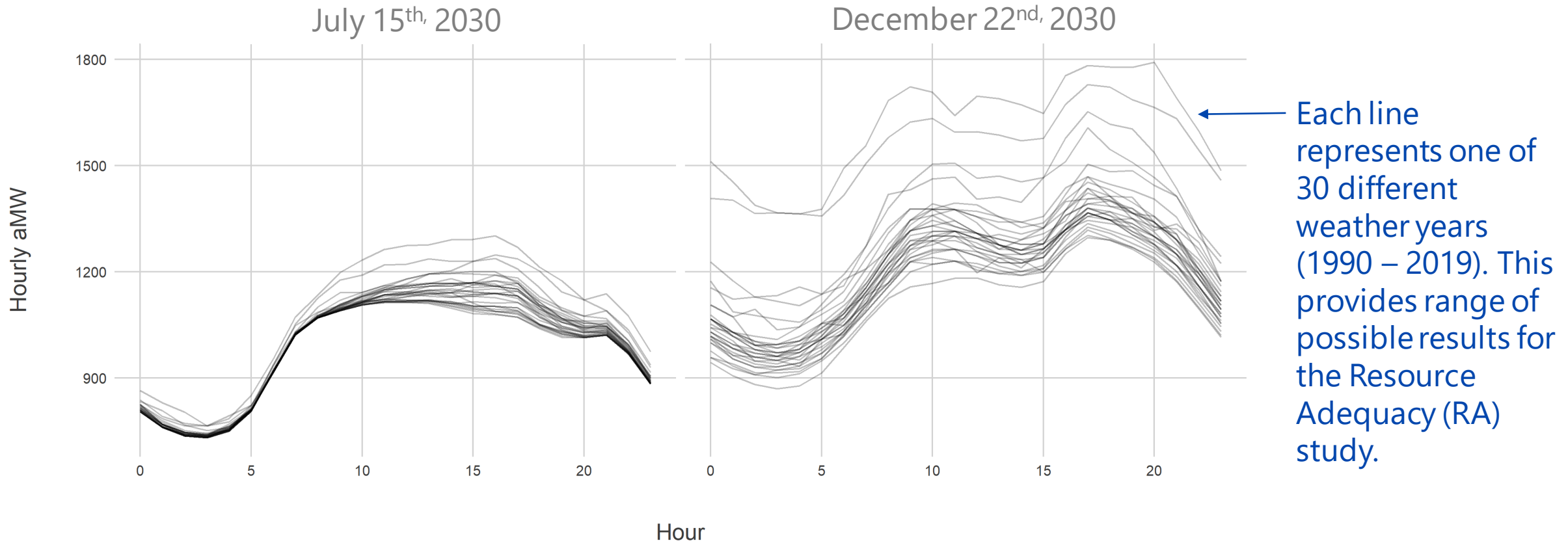


Overview of Hourly Shaping Process

Load Component	Shaping Approach
Core Load	Shaped using an hourly regression model based on historical system load data
Electric Vehicles (unmanaged charging)	Shaped using DOE EV Project data for WA state
Solar	NREL System Advisor Model (SAM)
Large Transit Projects	Varies – project-specific shaping
Residential AC	SEEM (Simplified Energy Enthalpy Model)
Building Electrification	Same shaping as core load

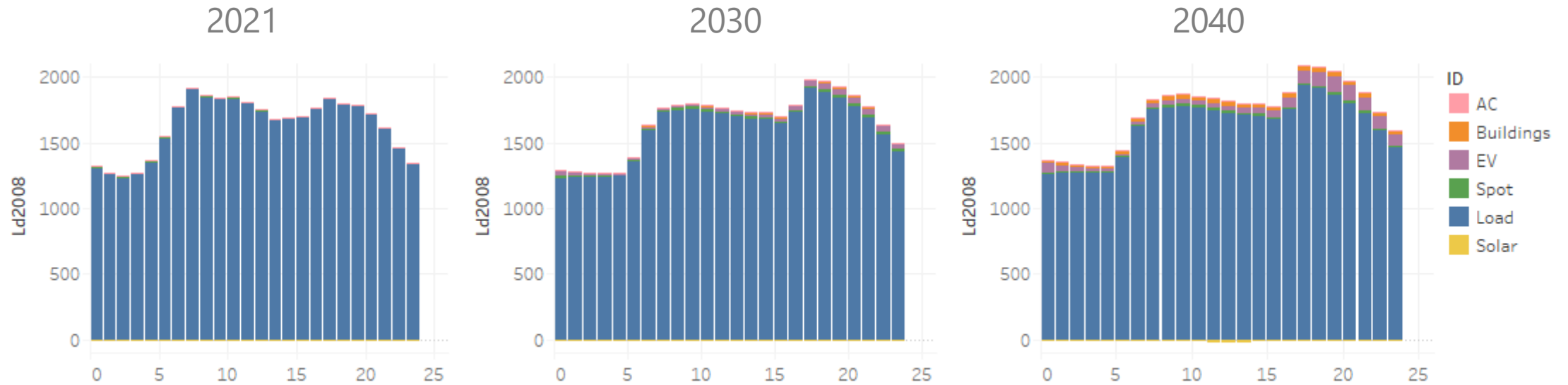
Understanding Probabilistic Load Shaping

Predicted range of load shapes for core load component on July 15th and December 22nd, 2030.

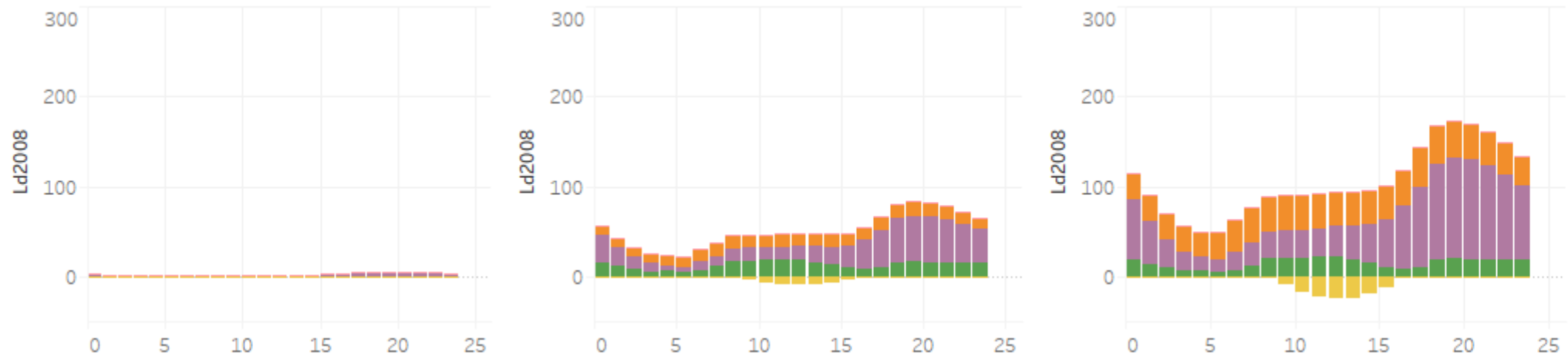


All Loads Hourly Forecast: December P90 Peaks

With Core Load



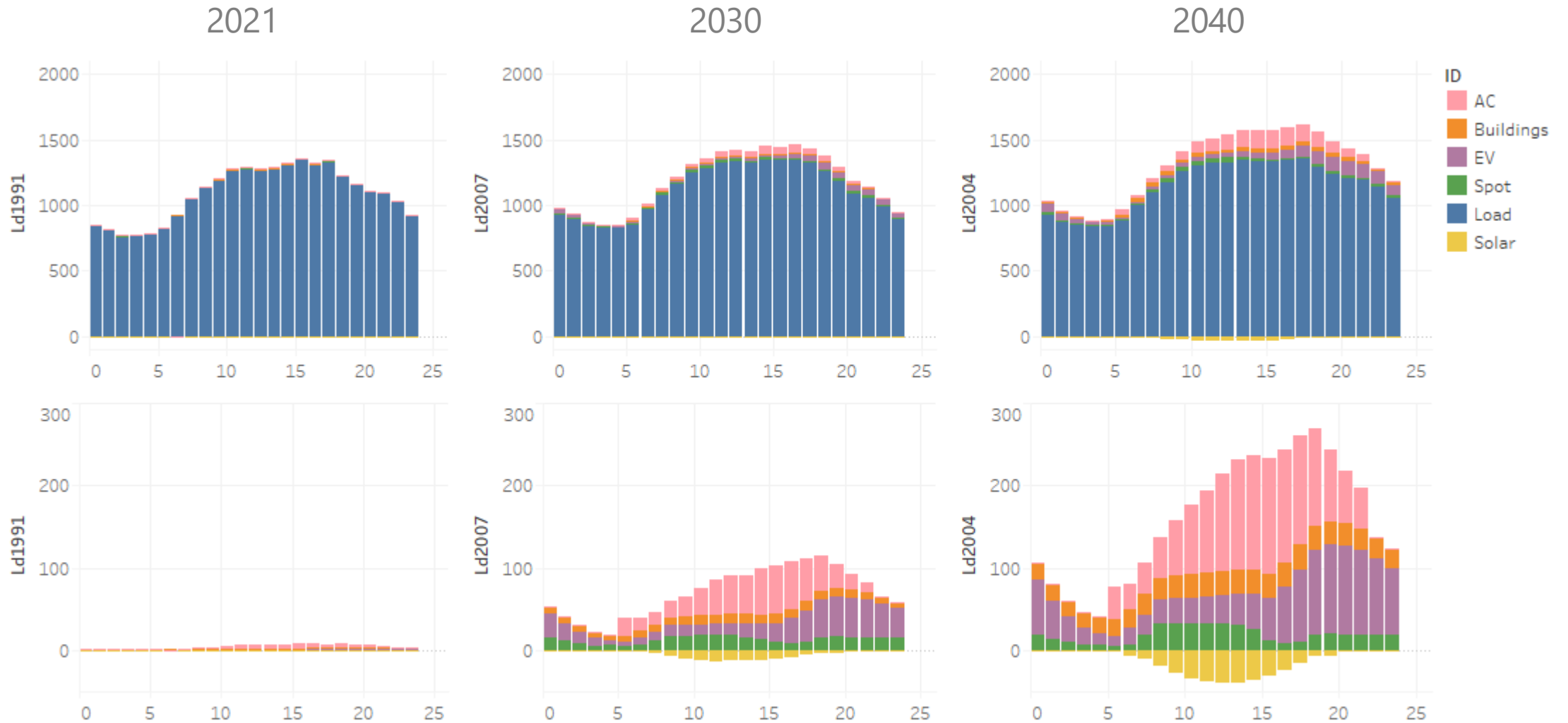
Without Core Load



All Loads Hourly Forecast: July P90 Peaks

With Core Load

Without Core Load



Feedback on 2022 IRP/CPA Baseline Load Forecast

What are your thoughts about the baseline load forecast?

2022 IRP Load Forecast Levers for Scenario Development

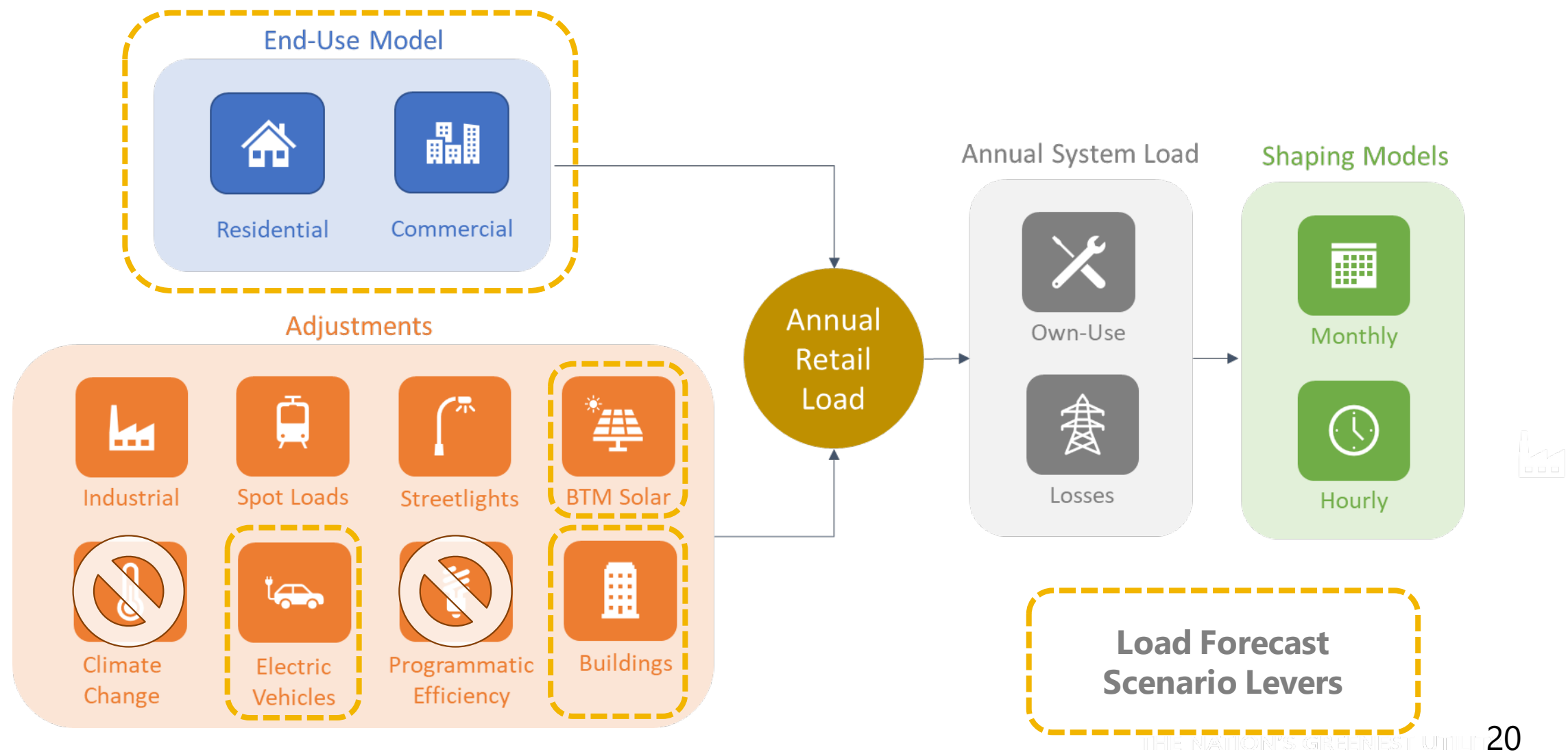


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Load Forecast Levers for Scenarios



End-Use Model Economic Input Assumptions

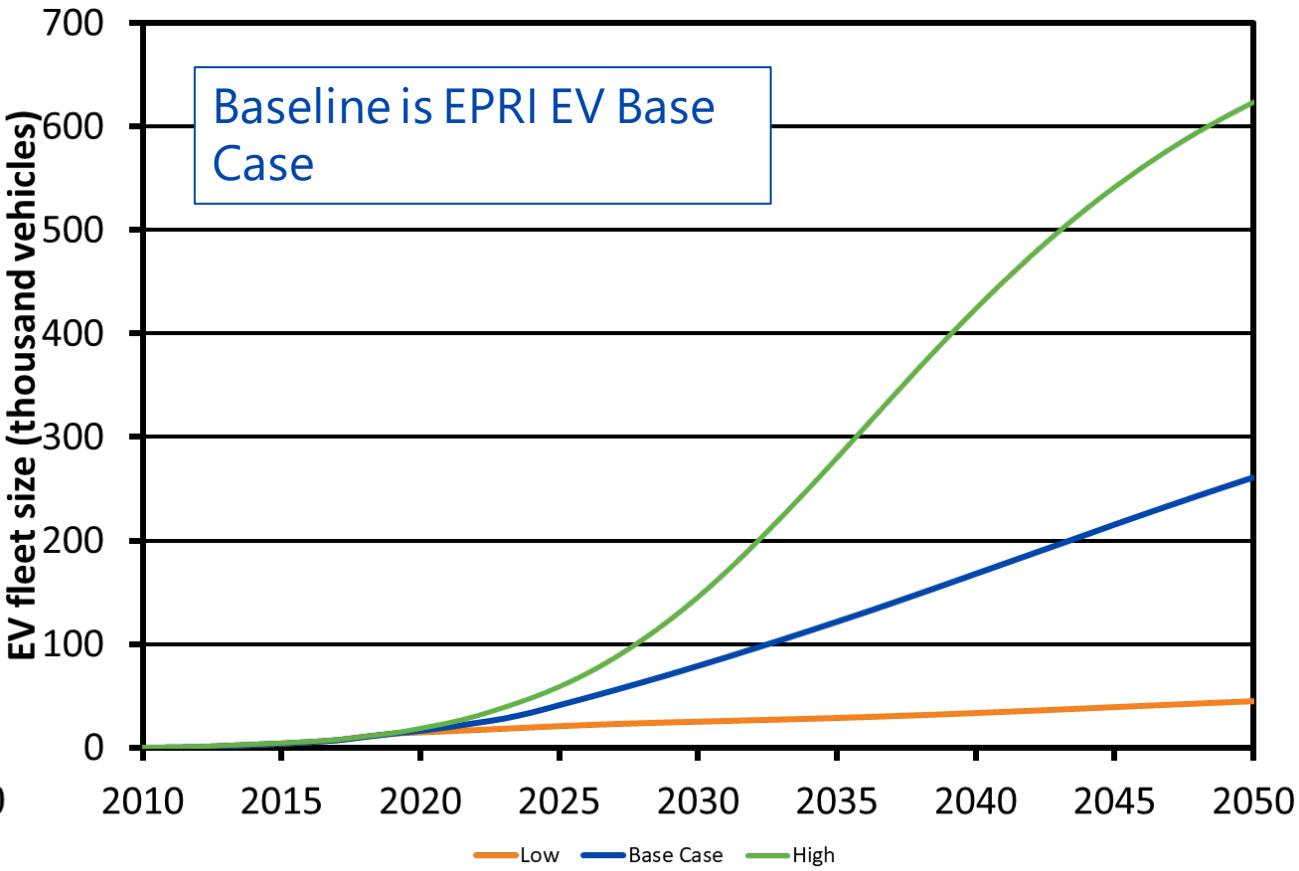
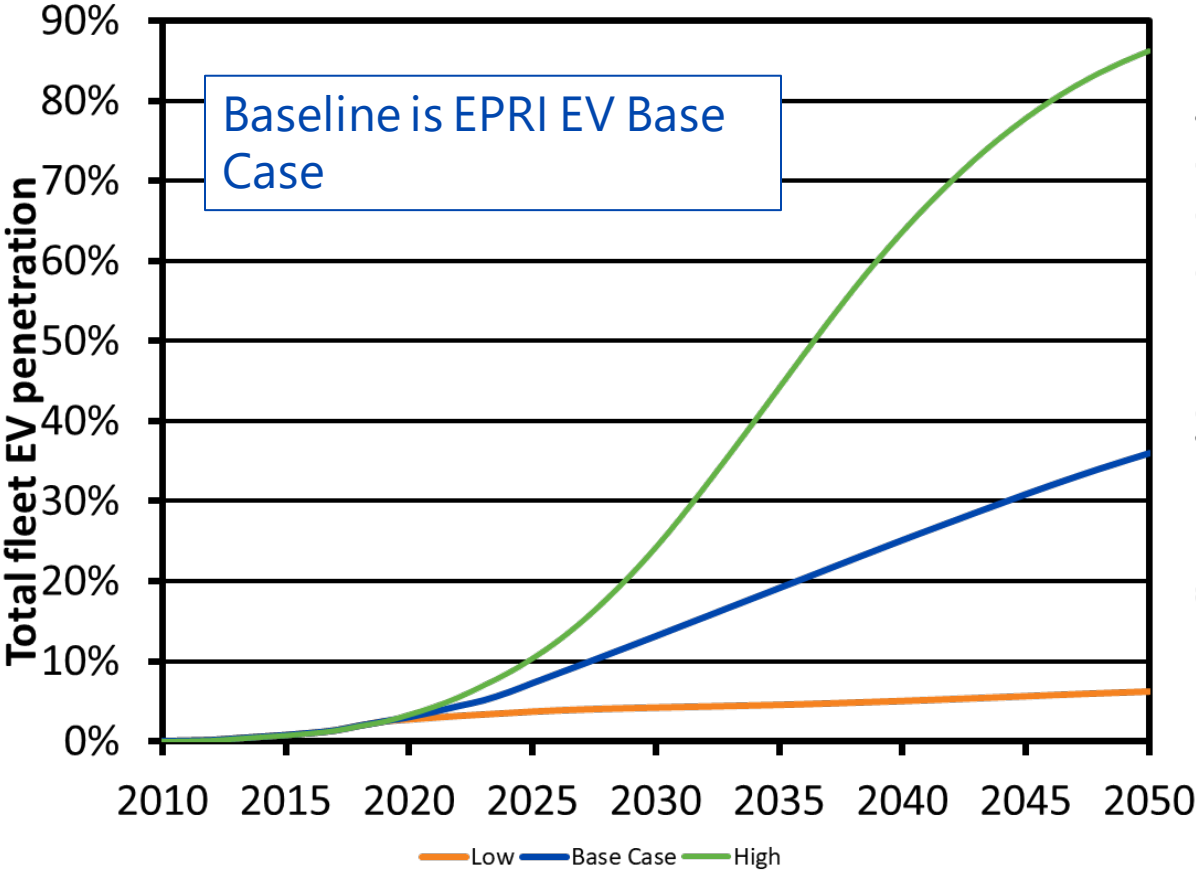
**What growth rates to use Population & Employment for different scenarios?
What are the drivers?**

	Historical and Annual Forecast Values					10 Year Change			10 Year CAGR		
Seattle City Budget Office Forecast	2010	2019	2020	2030	2040	2020	2030	2040	2020	2030	2040
Population (000s)	2,649	3,057	3,101	3,438	3,796	452	337	358	1.6%	1.0%	1.0%
Employment (000s)	1,396	1,764	1,660	1,987	2,213	264	327	226	1.7%	1.8%	1.1%

*These assumptions will flow through City Light's Household and Commercial Floorspace forecast

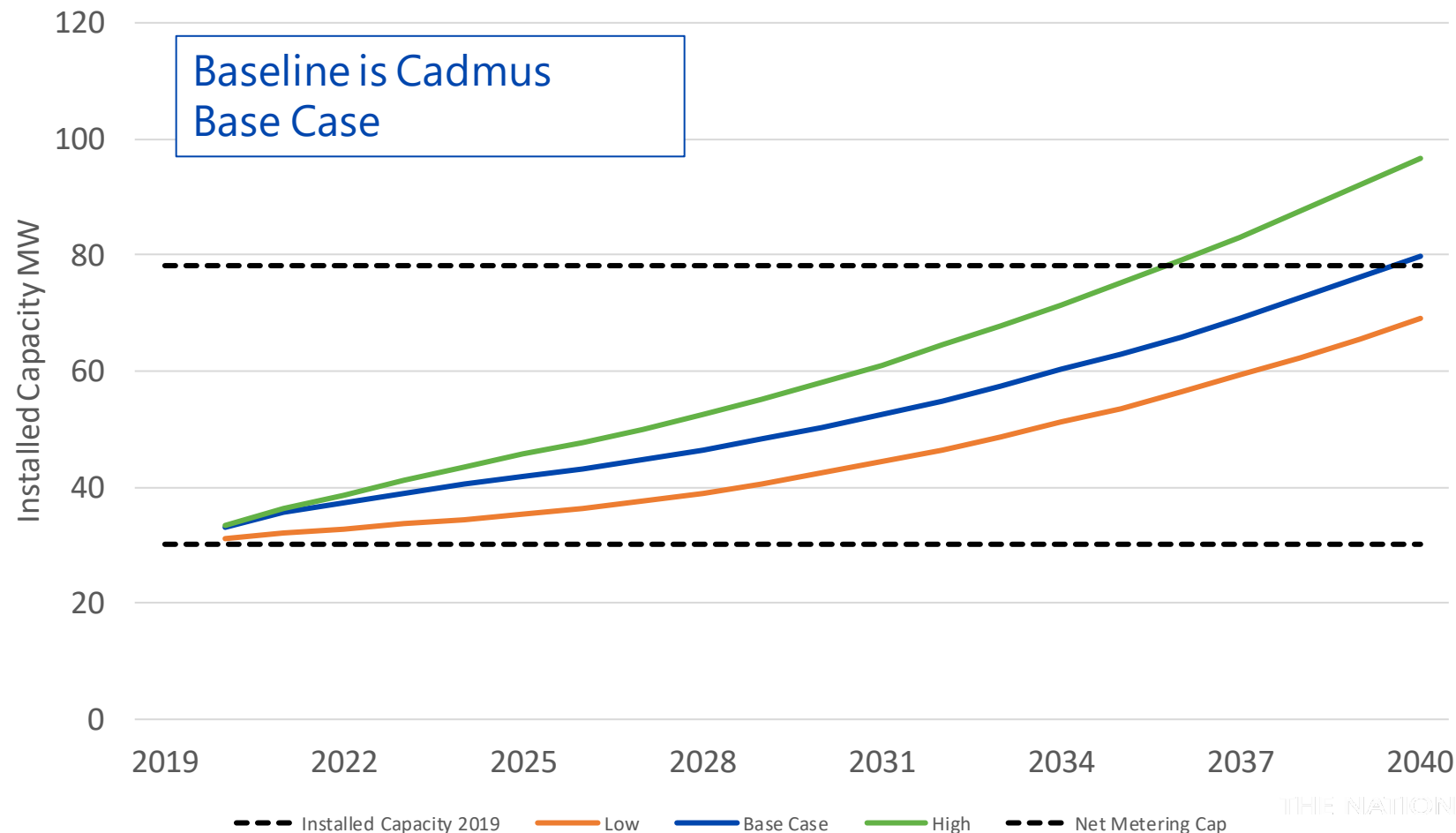
City Light Electric Vehicles (EV) Forecast - EPRI

**What drivers might change the adoption rate of Light Duty EVs?
Likelihood/Barriers?**



Behind the Meter (BTM) Solar Forecast - Cadmus

What drivers might change adoption rate of BTM Solar? Likelihood/Barriers?



New Building Code Gas Displacement – Placeholder

Waiting on EPRI analysis for electrification scenarios (not in time for CPA/CEIP timelines)

- Based on OSE Benchmarking data natural gas added in new commercial construction 2012 – 2017: **95,122,363 kBtu** per year on average
- Represents about **3 aMW** per year of displacement potential
- Assume that **50%** or about **1.5 aMW** of potential will be displaced per year starting in 2025

Building Placeholder Load Shaping Approach

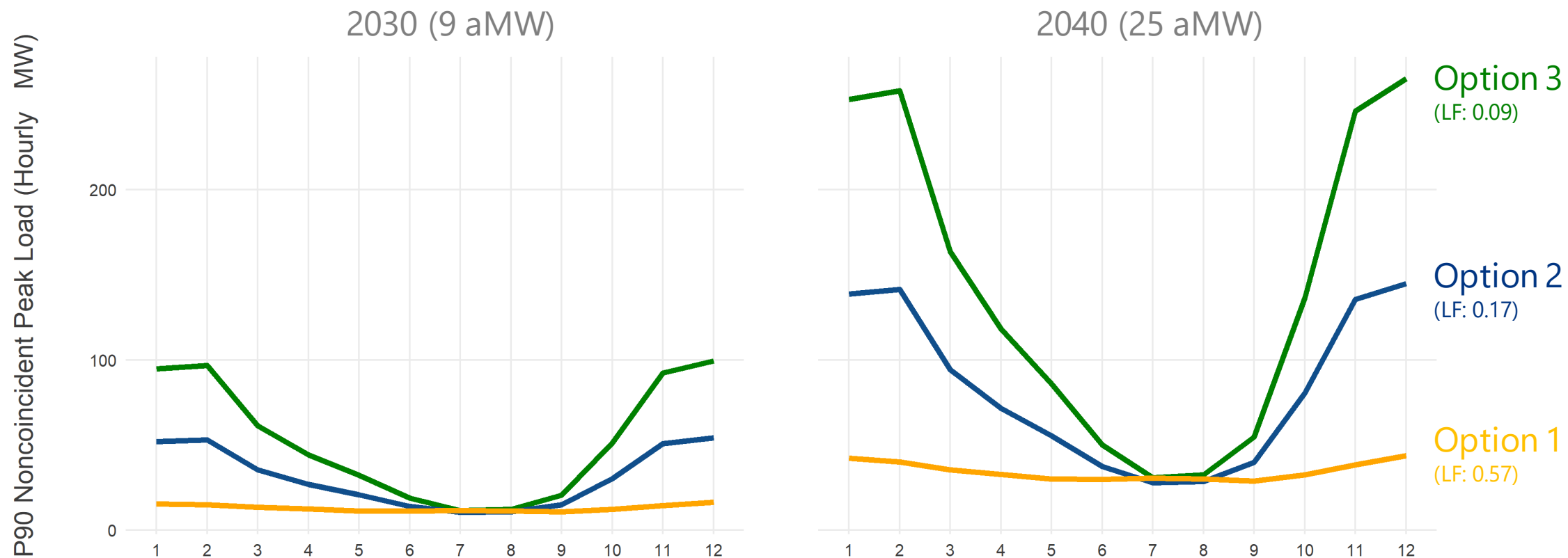
- Explored several approaches for modeling future impacts from hourly building electrification load while we wait for EPRI results.
- Three options:
 - **Option 1:** Shape building electrification the same as “core system load”. Buildings components not given a unique shape and has same seasonal pattern as “core system load”.
 - **Option 2:** Shape 50% of building electrification load as above but shape other 50% as flat to reflect water heating.
 - **Option 3:** Shape building electrification load using the heating-sensitive portion of overall system load.

Building Placeholder Load Shaping Considerations

Option 1: Same as System Load	Option 2: 50% Split Between Heating Sensitive System Load and Flat Profile	Option 3: Heating Sensitive System Load
<ul style="list-style-type: none">• Lowest impact option• Reflects that we may be overstating peak impacts in Options 2 and 3	<ul style="list-style-type: none">• “Middle” option• Assumes that water heating makes up 50% of natural gas conversion which has flatter load shape and higher share of gas water heating reduces electric peaks even more	<ul style="list-style-type: none">• Highest winter peaks• Reflects thinking that most building electrification will impact heating during winter

- All options do not reflect new technology and better building envelope efficiency which tend to lower peak loads.
- Might not be properly accounting for diversity across the new installed equipment.

Buildings Electrification P90 – Options 1-3



Month

Option 1 is used in adopted
2020 Corporate & Baseline
forecasts

Summary IRP Load Forecast Scenario Levers

Lever	Description	Energy Impact	Peak Impacts
Economic Inputs	Population and employment	Increasing (decreasing) growth rate of economic inputs will increase (decrease) load growth	Will move inline with annual energy impacts
Electric Vehicles	Light duty electric vehicle forecast	Increasing (decreasing) growth rate of electric vehicles will increase (decrease) load growth	Can increase winter and summer evening peak if electric vehicle load shape is unmanaged.
Distributed Generation	Behind the meter solar forecast	Increasing (decreasing) growth rate of distributed solar will decrease (increase) load growth	Can reduce summer peaks but will have little impact on coincident winter peak
Buildings Electrification	Conversion of buildings from gas to electric	Increasing (decreasing) growth rate of buildings electrification will increase (decrease) load growth	Will generally increase winter more than summer but magnitude depends on load shaping assumptions
What else?	?	?	?

Next meeting April 30, 2021

- + 2021 City Council Legislative Process and Considerations
- + CPA and Demand Response Potential Assessment Process
- + Clean Energy Implementation Plan Timing & Process
- + Additional 2022 IRP Scenario Considerations: Climate Change, EPRI Electrification Inputs

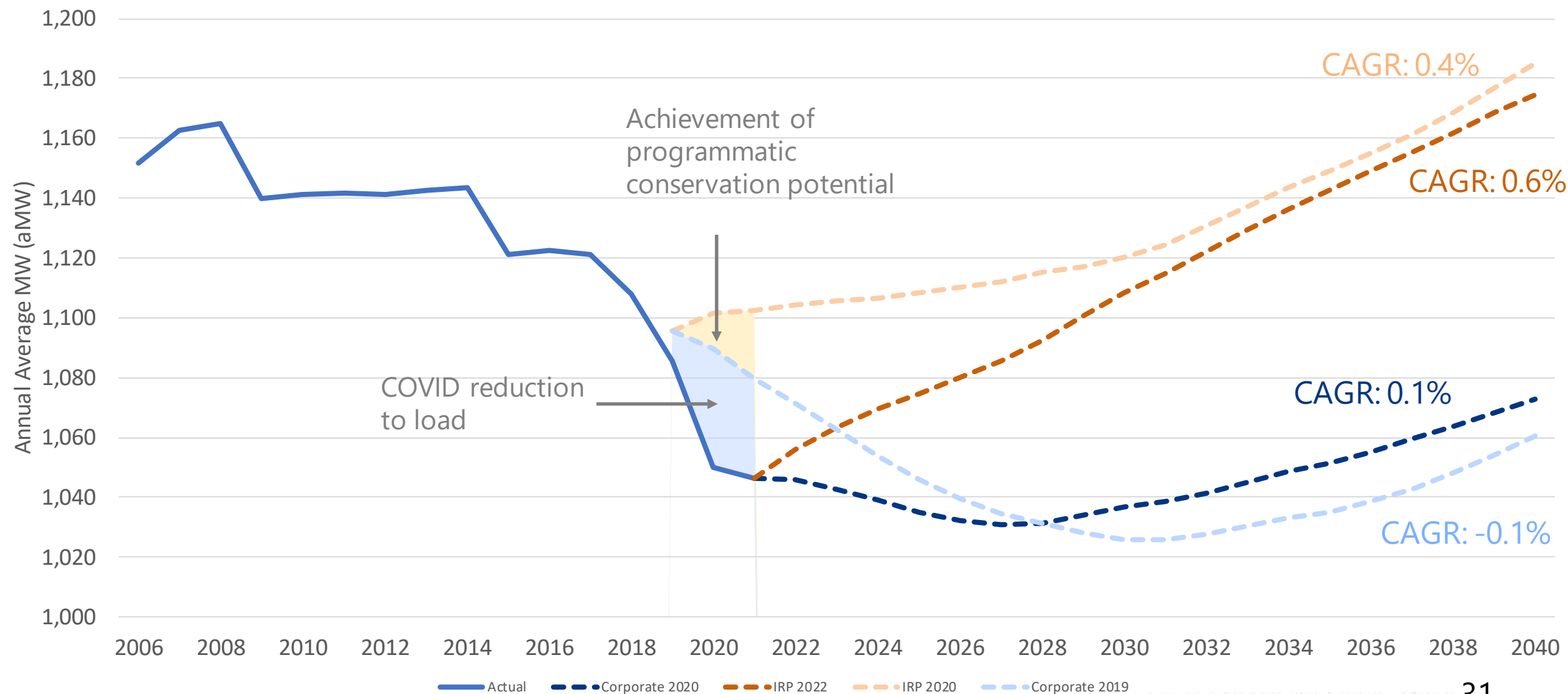
THANK YOU

What should the IRP scenarios inform

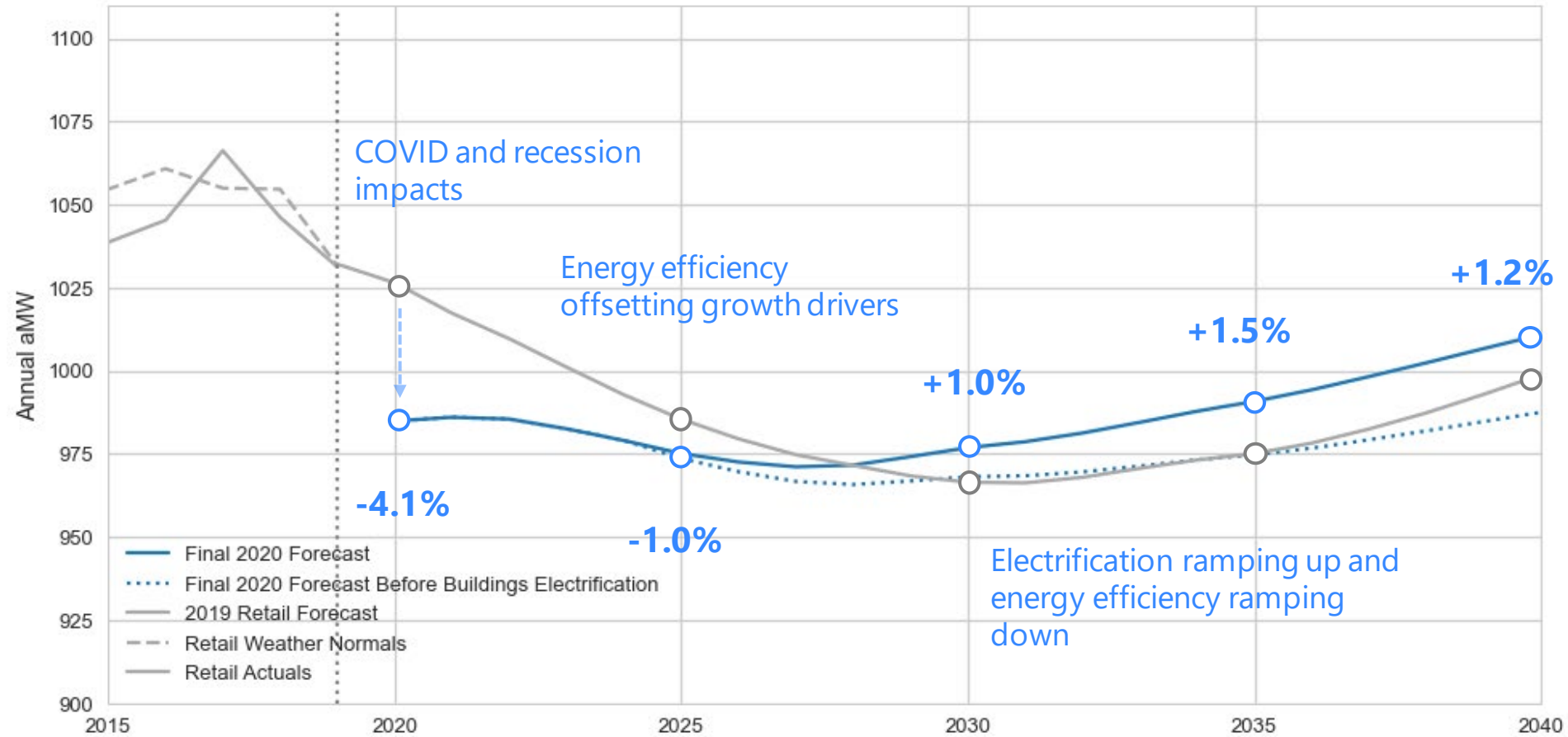


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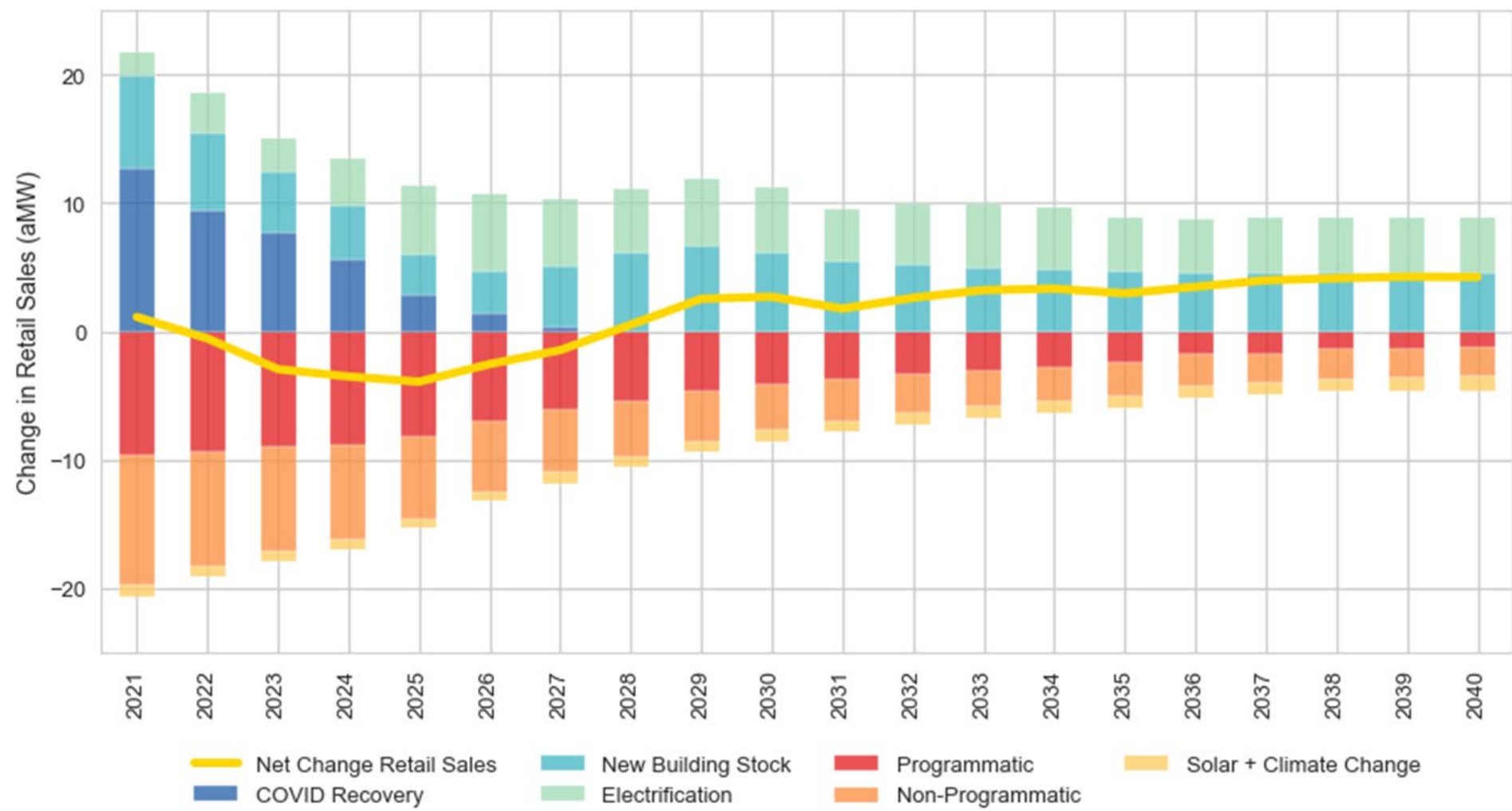
2020 Adopted Base Case Load Forecast - Annual



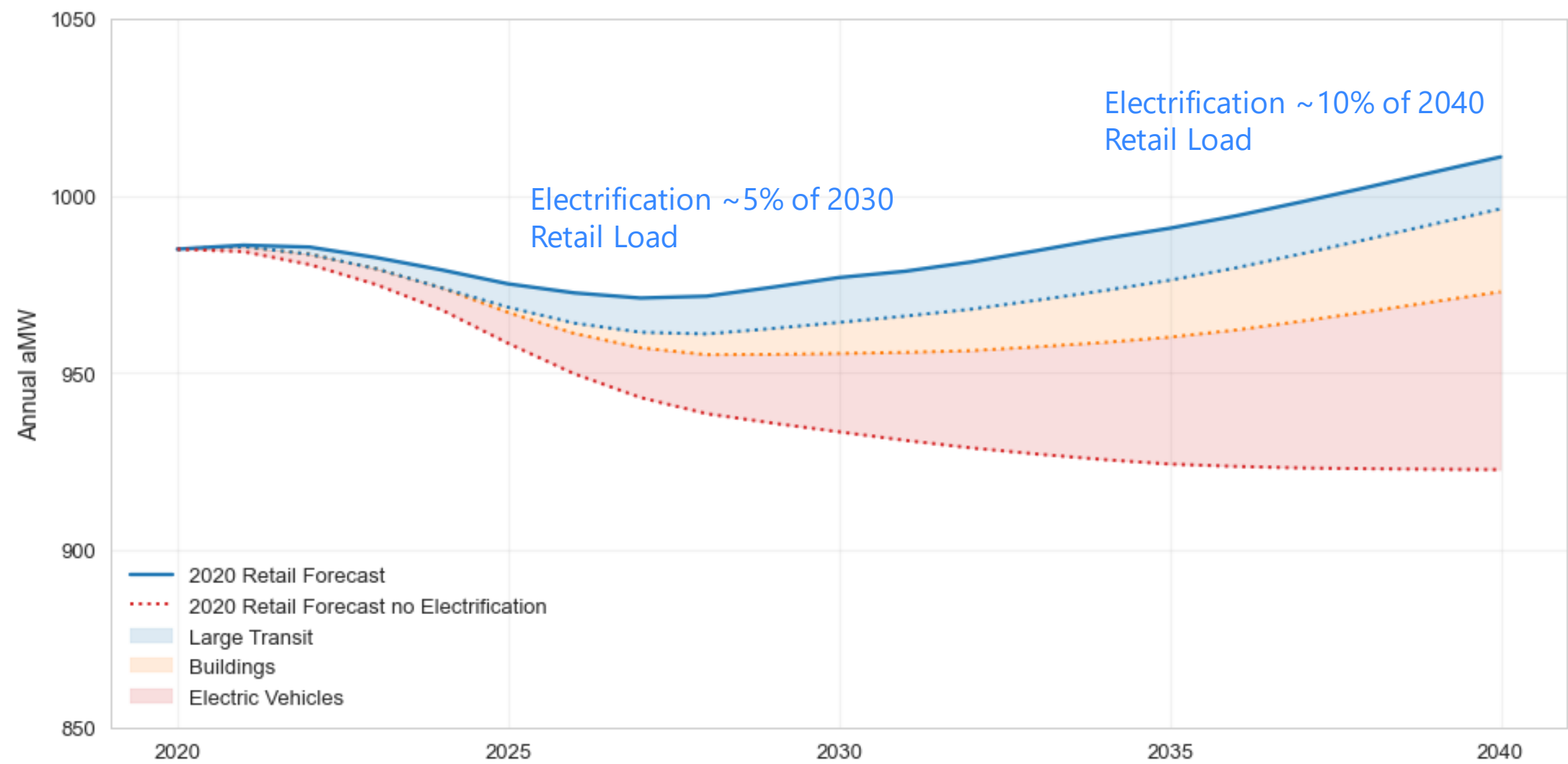
Adopted Base Case Load Forecast – Annual Retail



2020 Adopted Corporate Forecast Drivers Chart - Retail



Electrification in the 2020 Adopted Corporate Forecast



End-Use Model Economic Input Assumptions - Detail

	Historical and Annual Forecast Values					10 Year Change			10 Year CAGR		
Seattle City Budget Office Forecast	2010	2019	2020	2030	2040	2020	2030	2040	2020	2030	2040
Population (000s)	2,649	3,057	3,101	3,438	3,796	452	337	358	1.6%	1.0%	1.0%
Employment (000s)	1,396	1,764	1,660	1,987	2,213	264	327	226	1.7%	1.8%	1.1%
City Light End-Use Economic Drivers	2010	2019	2020	2030	2040	2020	2030	2040	2020	2030	2040
City Light Multi-Family Households (000s)	157	203	208	242	277	50	34	35	2.8%	1.5%	1.4%
City Light Single-Family Households (000s)	189	198	199	207	215	10	8	9	0.5%	0.4%	0.4%
City Light Commercial Floorspace (million sqft)			341	359	371		18	12		0.5%	0.3%
Floorspace per Employee (sqft per employee)			205	180	168		-25	-13		-1.3%	-0.7%
City Light Commercial Floorspace + Multi-Family Common Space (million sqft)			469	505	537		36	32		0.7%	0.6%