Achieving the "*Other*" Washington's Decarbonization Goals with Energy Efficiency and Load Flexibility

PANELIST: Ryan Hledik, The Brattle Group

The “other Washington” has big decarbonization ambitions…

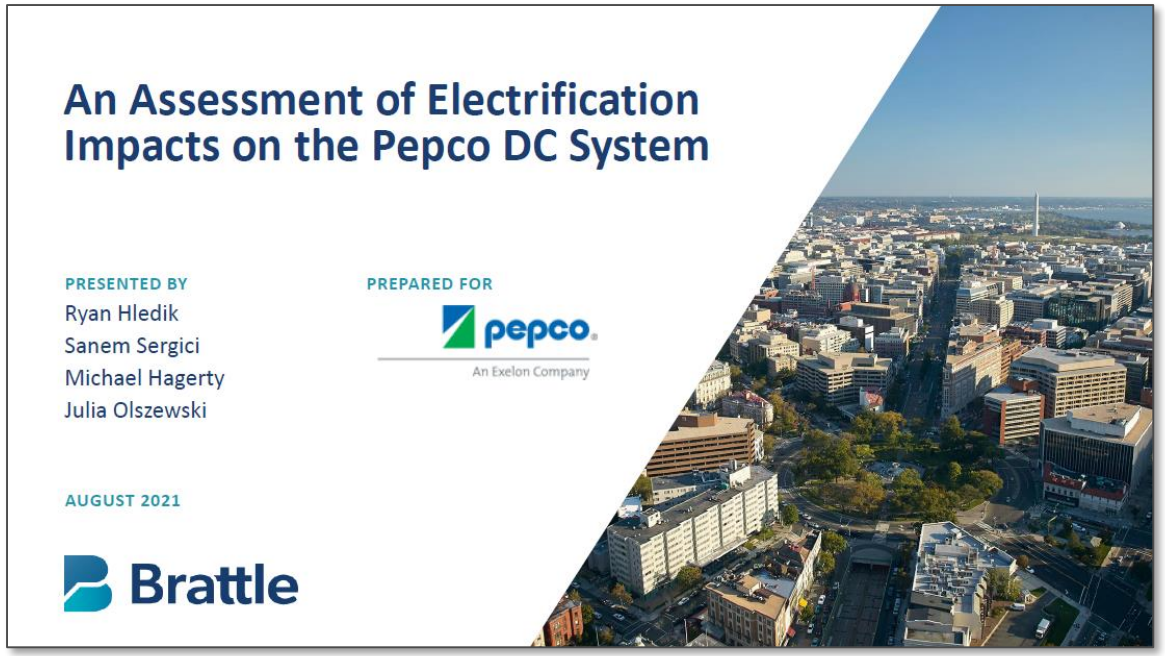
Some of Washington DC’s climate goals:

- Economy-wide carbon neutrality by 2050
- 100% clean electricity sector by 2032
- Strong policy emphasis on electrification

Key question: Can the District be electrified without overloading its power grid?

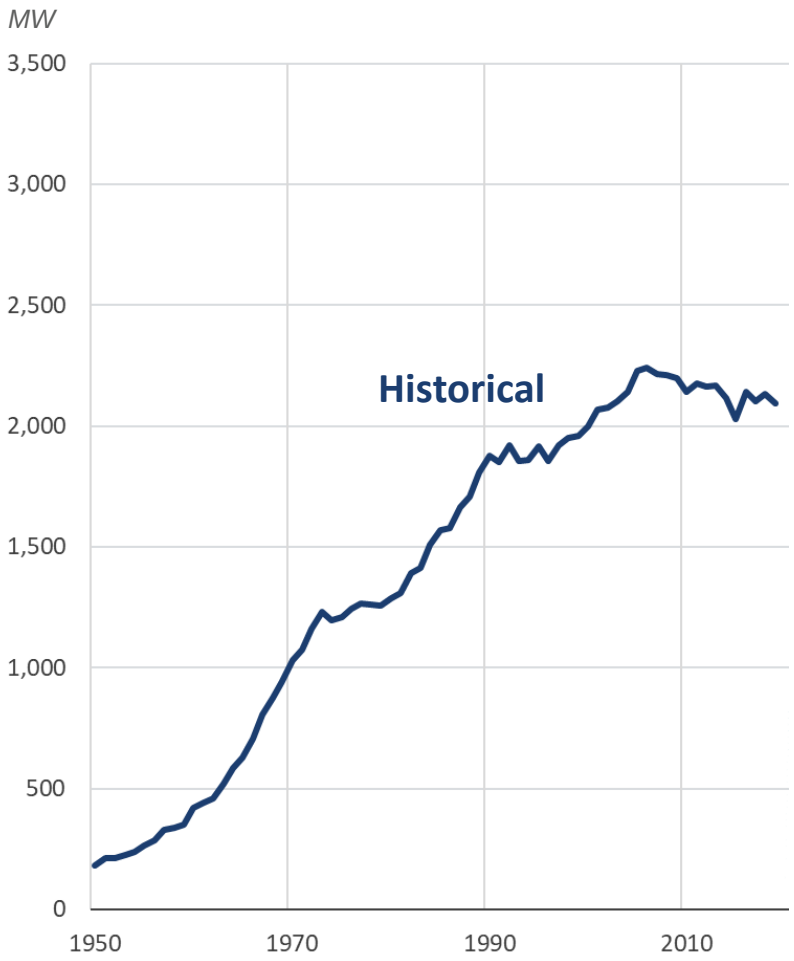
The purpose of our study

- **Assess impact of electrification on Pepco DC system**, assuming climate goals are met primarily through electrification
- **Explore role of energy efficiency (EE) and load flexibility** in managing system impacts



Download from: DC PSC Website.

Pepco DC's historical system peak demand



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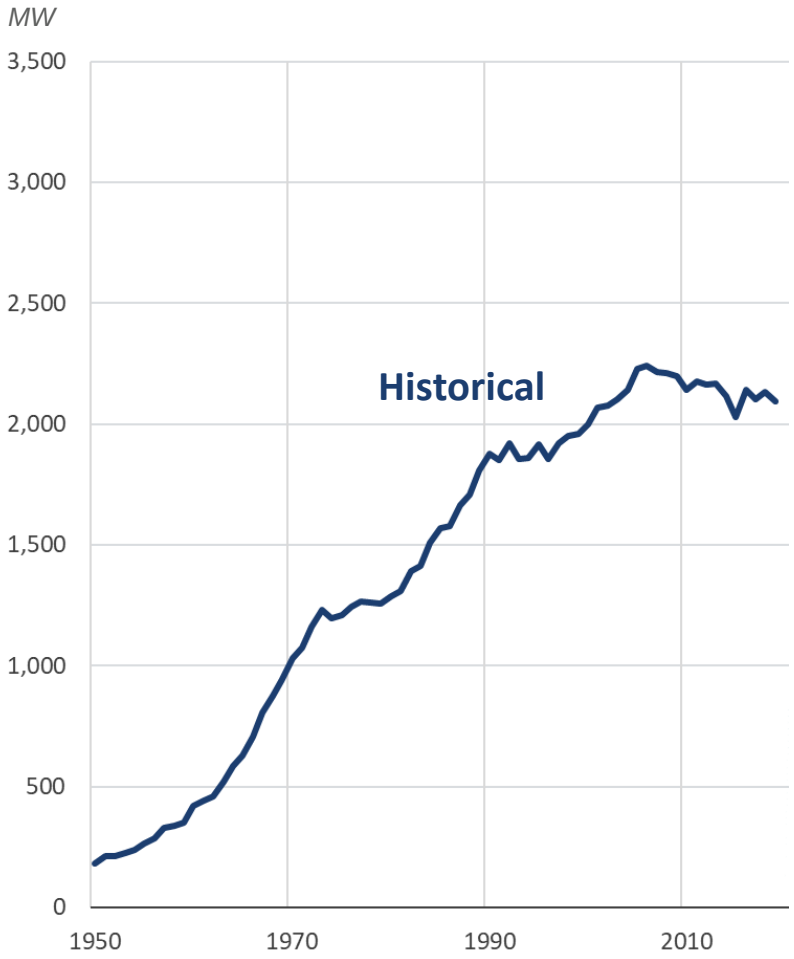
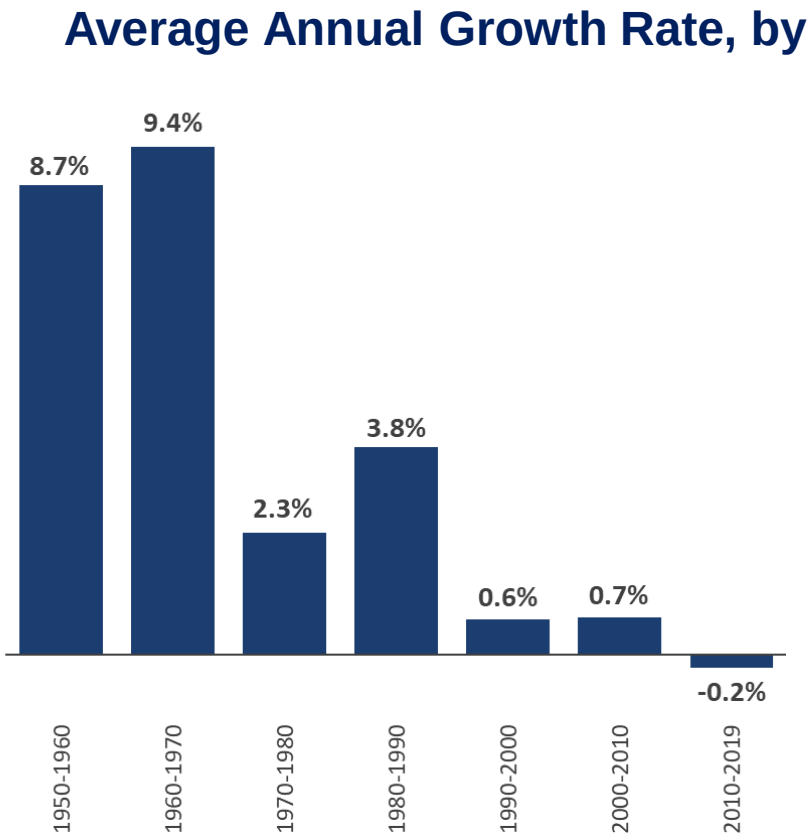


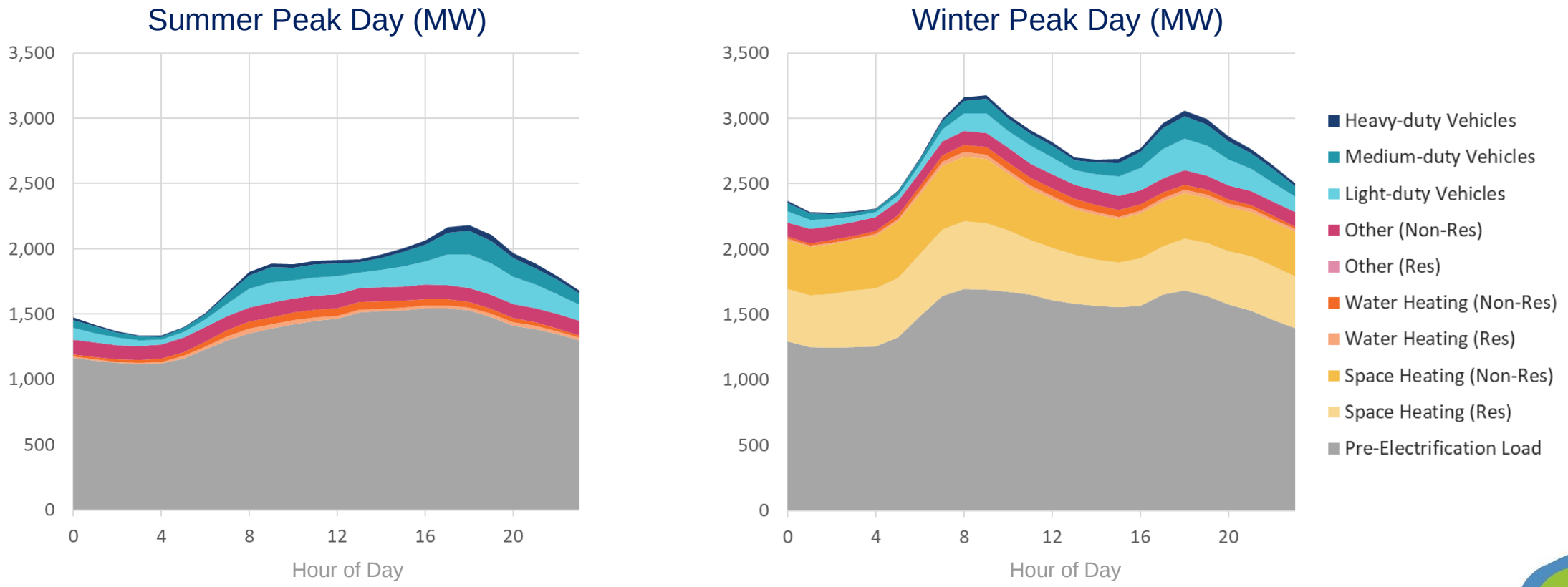


The system load impacts of full* electrification

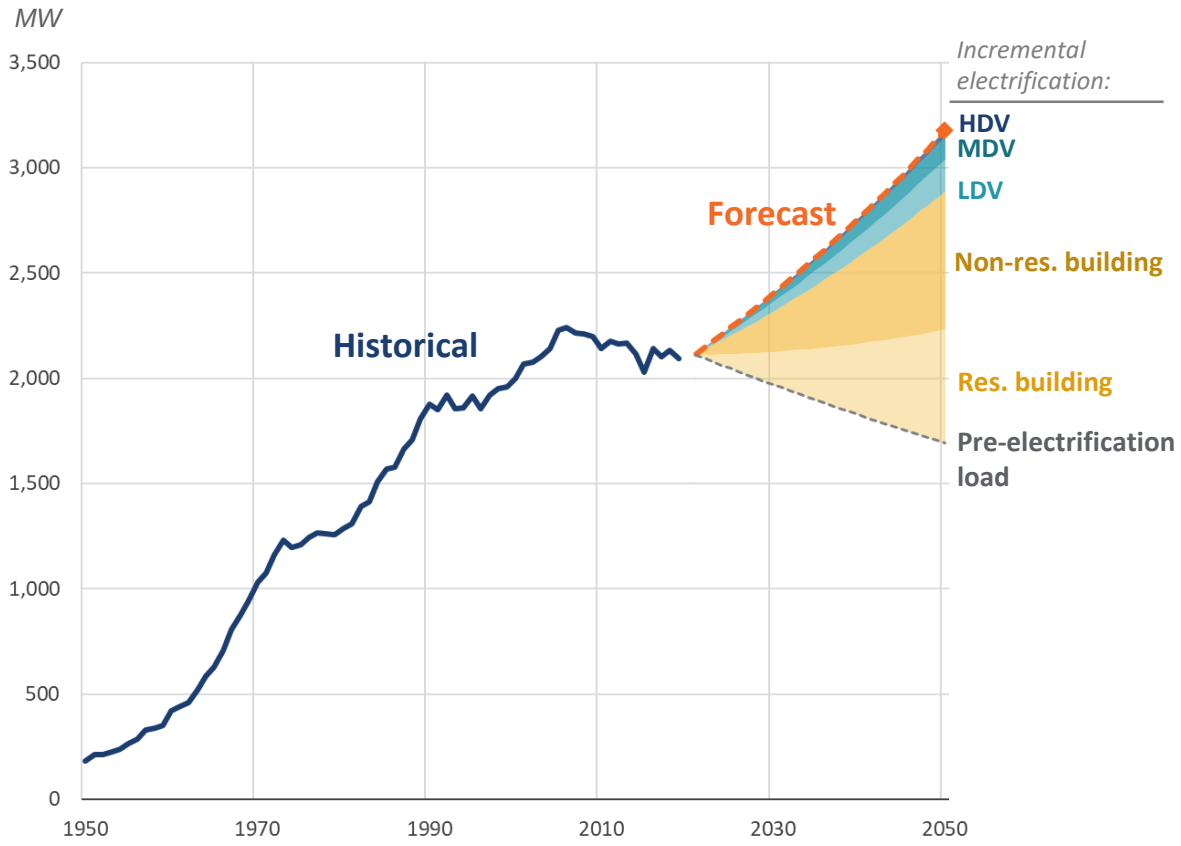
* 100% of light-duty vehicles and 95% of buildings

2050 Pepco DC Load Profile with Electrification

Before EE and Load Flexibility



Pepco DC's system peak demand w/electrification



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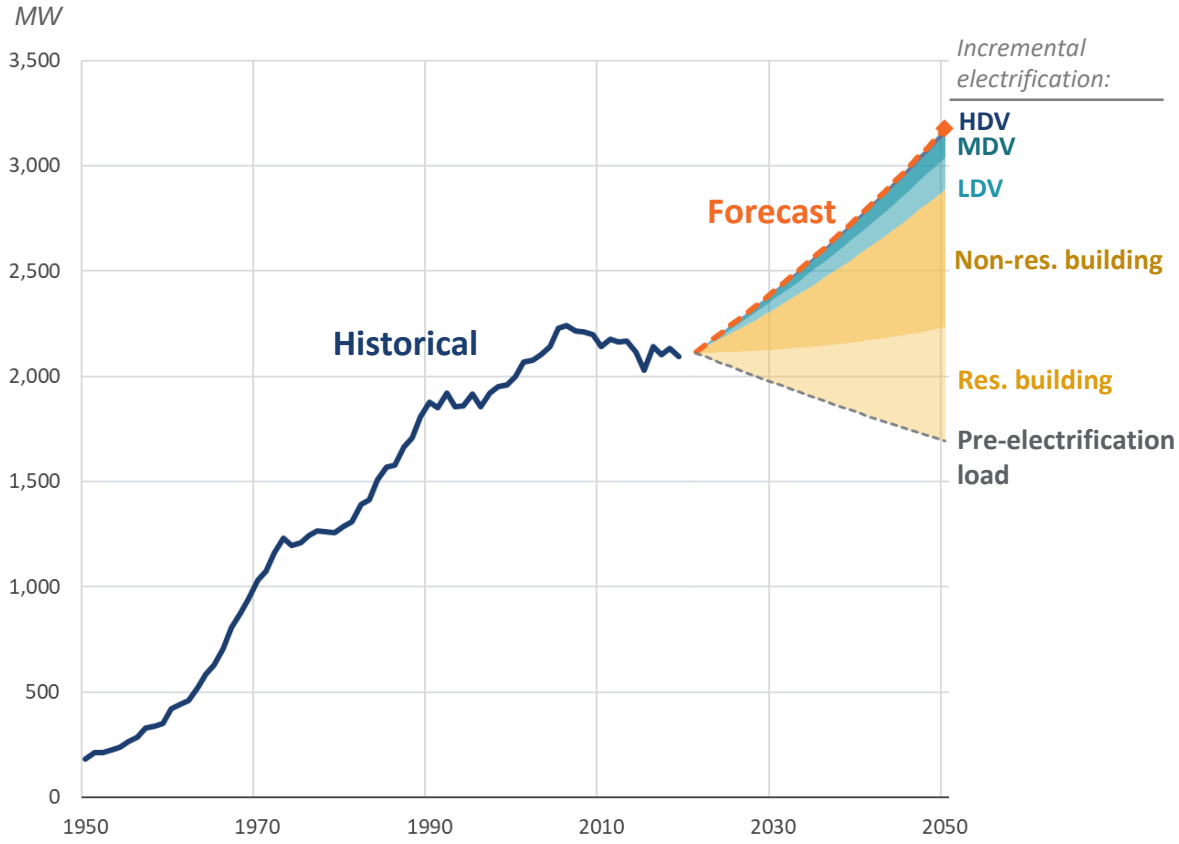
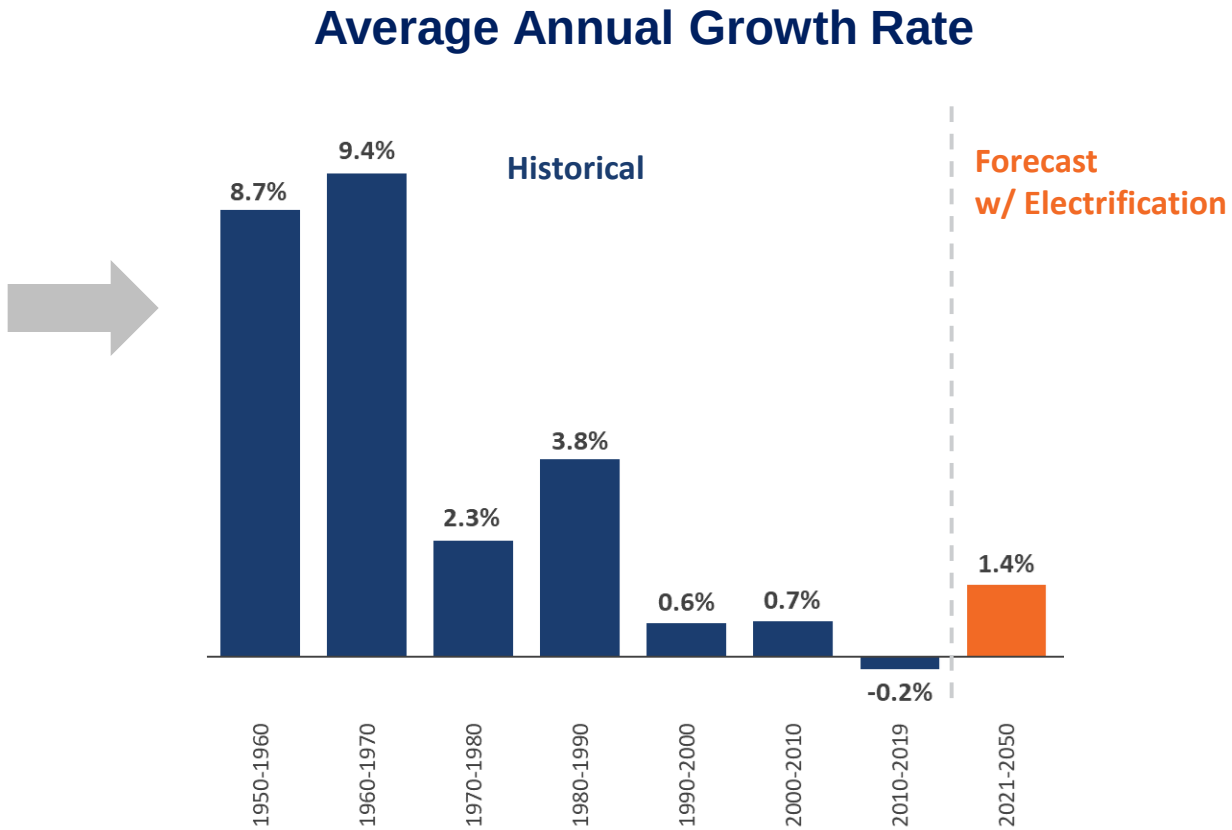




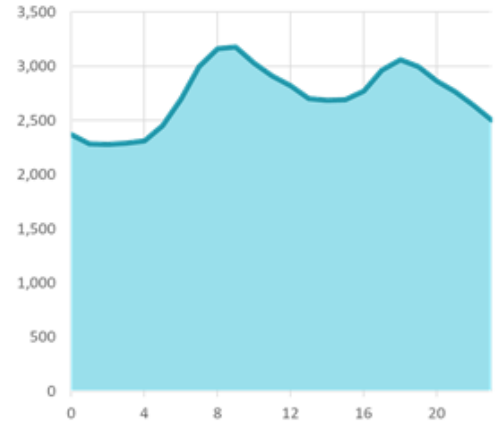
EE and Load Flexibility Programs

Modeled options are based on achievable levels of customer enrollment, target winter peak

	EE / Load Flexibility Options	Description	Modeled 2050 peak reduction potential
Energy Efficiency	High efficiency heat pumps	Higher efficiency heat pumps are adopted when converting building space heating to electricity	3.5% (110 MW)
	Expanded EE initiatives	New EE initiatives would exceed business-as-usual efforts that are embedded in the baseline load forecast (e.g., focused improvements in building thermal envelope)	4.2% (135 MW)
Residential Load Flexibility	Dynamic pricing	Opt-in critical peak pricing (CPP) rate, with critical peak price that is 10x higher than the off-peak price.	1.5% (45 MW)
	Smart thermostat pre-heating	Homes are pre-heated before the morning peak period in order to reduce heating needs during the peak period.	0.9% (30 MW)
	Home EV charging TOU	TOU rates shift evening home EV charging load later in the night.	4.7% (140 MW)
	Behind-the-meter (BTM) storage	Customers with BTM batteries are eligible to participate in a storage load flexibility program, in which Pepco can discharge the battery on a limited number of days per year.	2.4% (75 MW)
Non-residential Load Flexibility	Interruptible tariff	Large commercial customers agree to curtail usage during the morning peak period for a limited number of events per year.	3.7% (115 MW)
	Dynamic pricing	A CPP rate with a critical peak price during the winter morning peak period.	1.8% (60 MW)
	Pre-heating	Similar to the residential program, commercial heating load is shifted from the morning peak period to earlier in the day by pre-heating the building.	0.4% (15 MW)

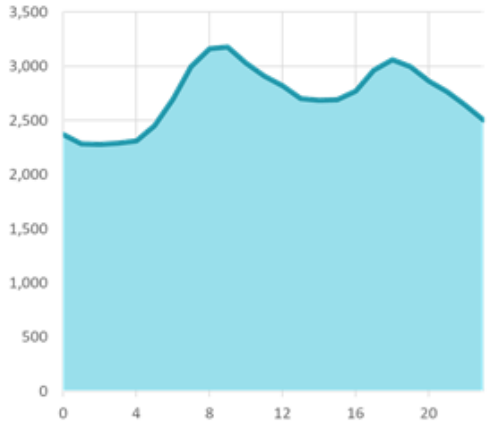
The impact of EE and load flexibility

1 Unmitigated 2050 Pepco DC load on winter peak day

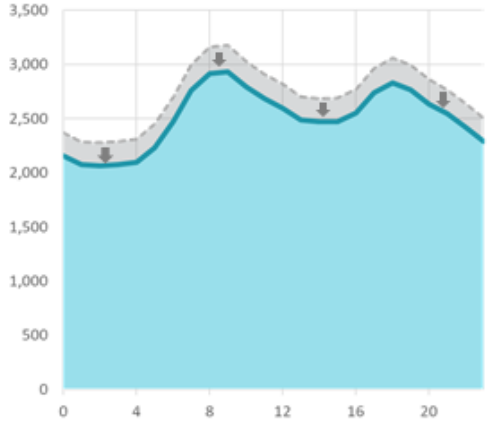


The impact of EE and load flexibility

① Unmitigated 2050 Pepco DC load on winter peak day



② Energy efficiency reduces load during all hours



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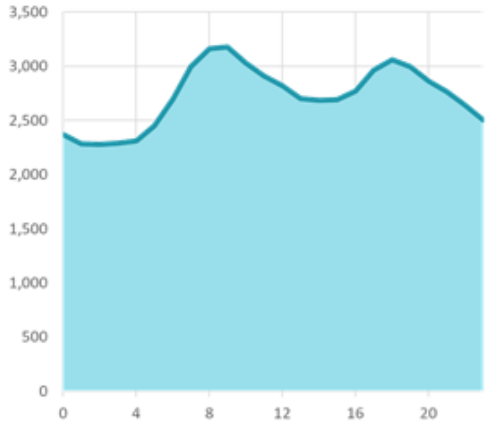

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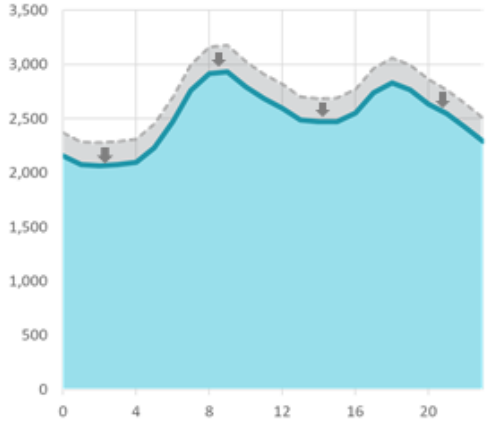
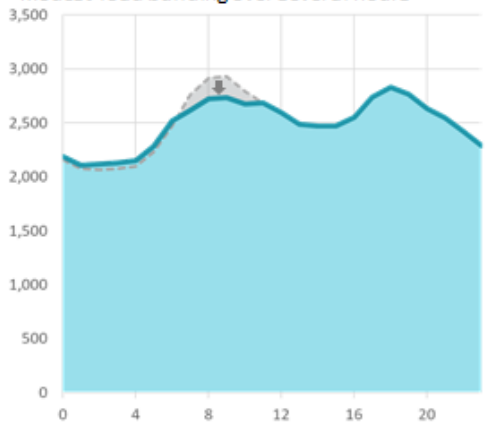


3 Dynamic pricing, interruptible tariffs, pre-heating, and BTM storage clip the morning peak with modest load building over several hours



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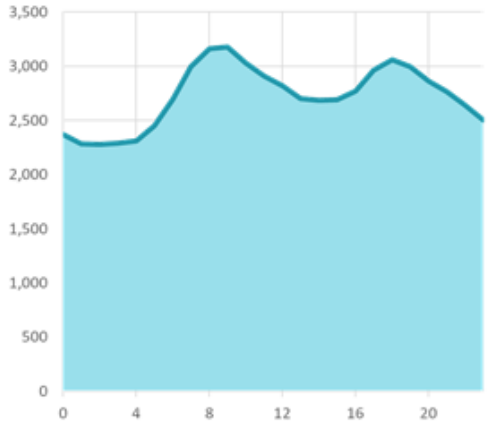

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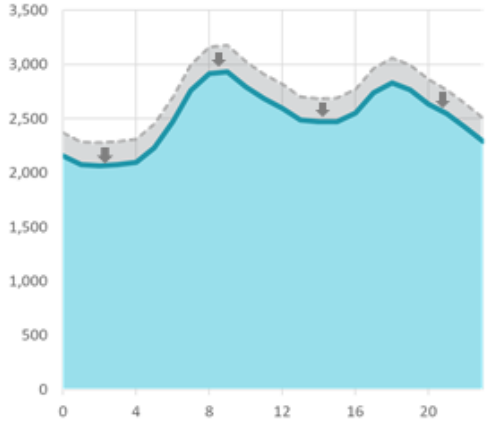

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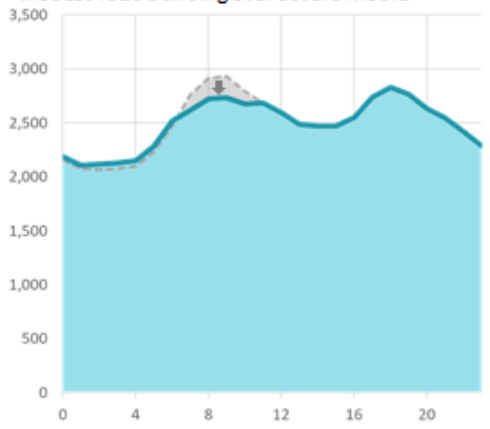
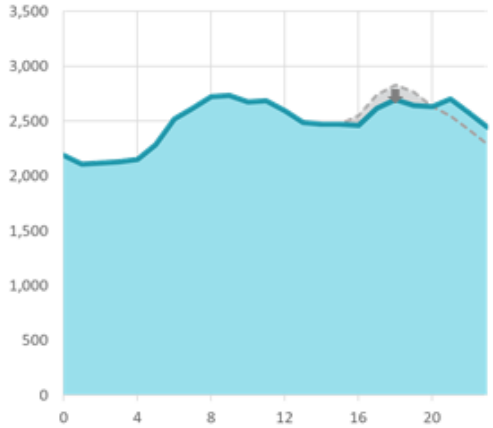


4 EV TOU reduces evening peak, shifting charging load to later hours



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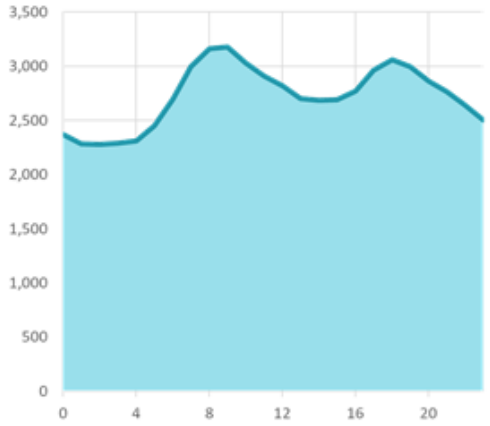

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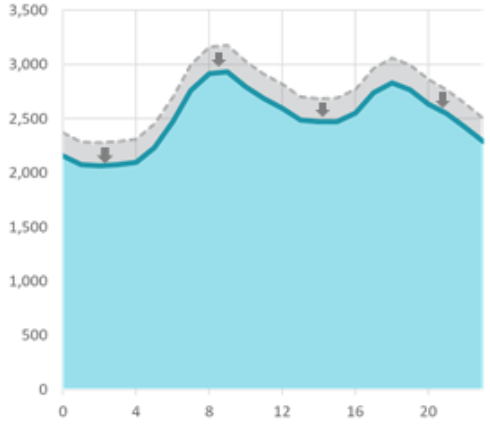

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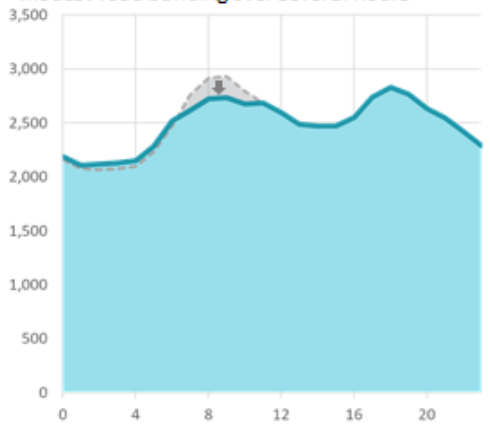

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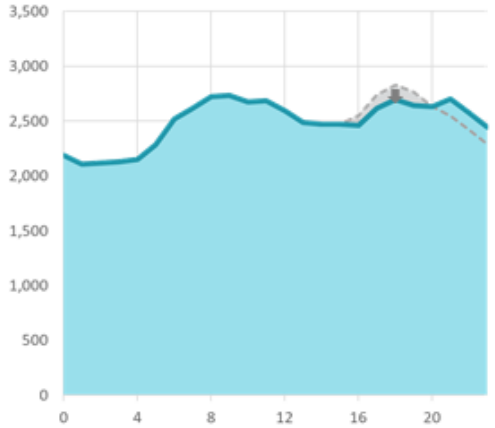
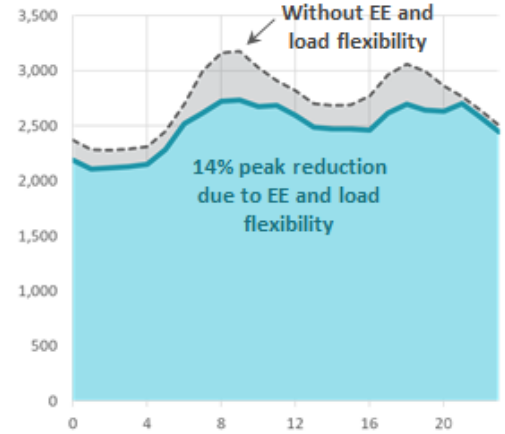
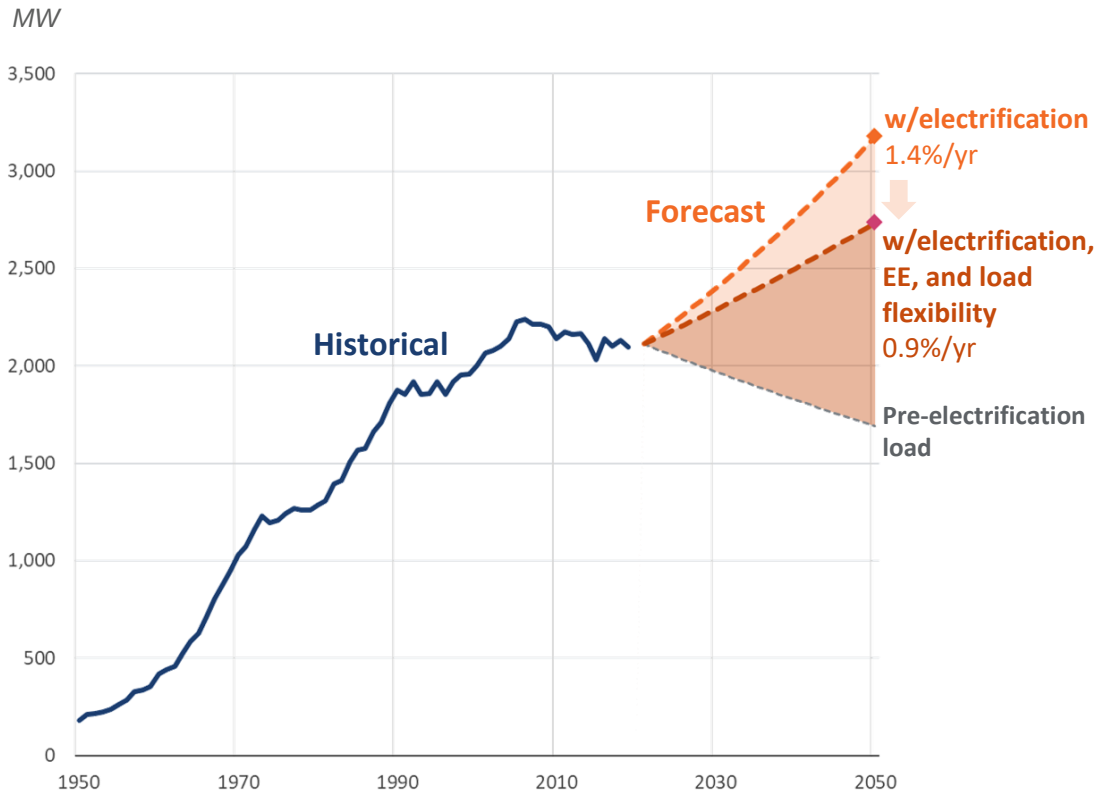


5 Mitigated 2050 Pepco DC load on peak day



Note: Load impacts are shown for one illustrative portfolio. EE and load flexibility options could be pursued in different combinations, with varying operational strategies and levels of enrollment.

Pepco DC's system peak demand with electrification, EE, and load flexibility



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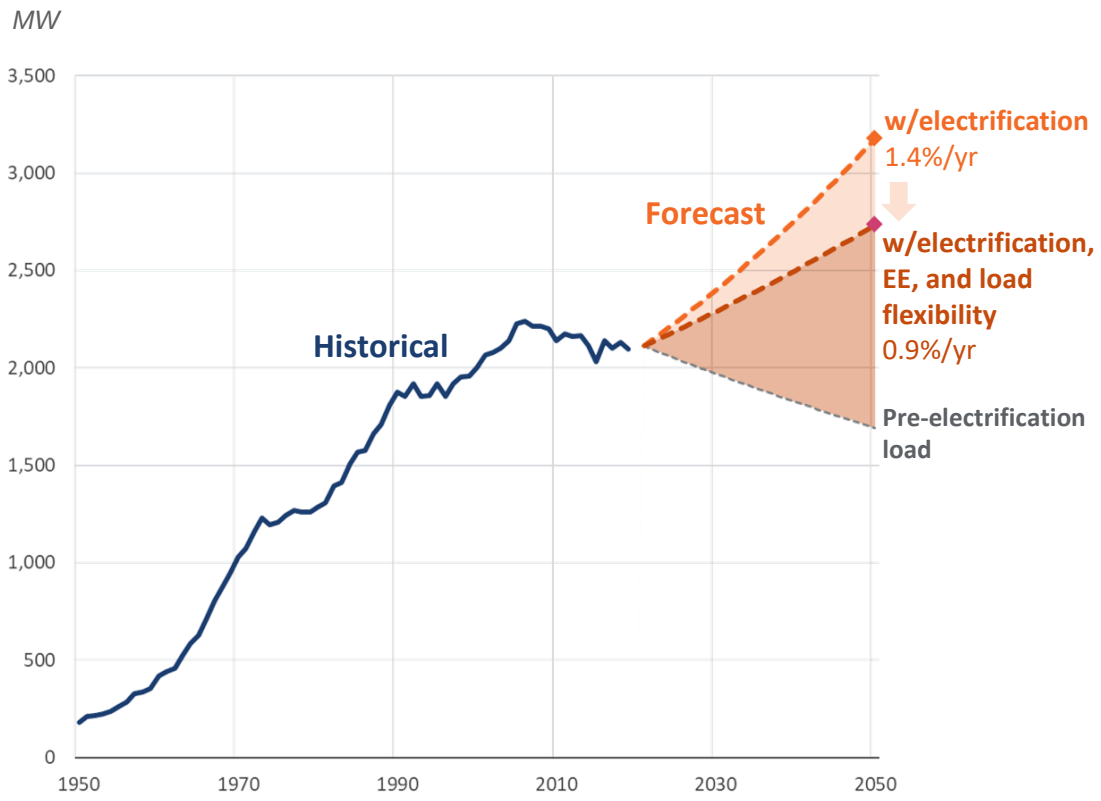

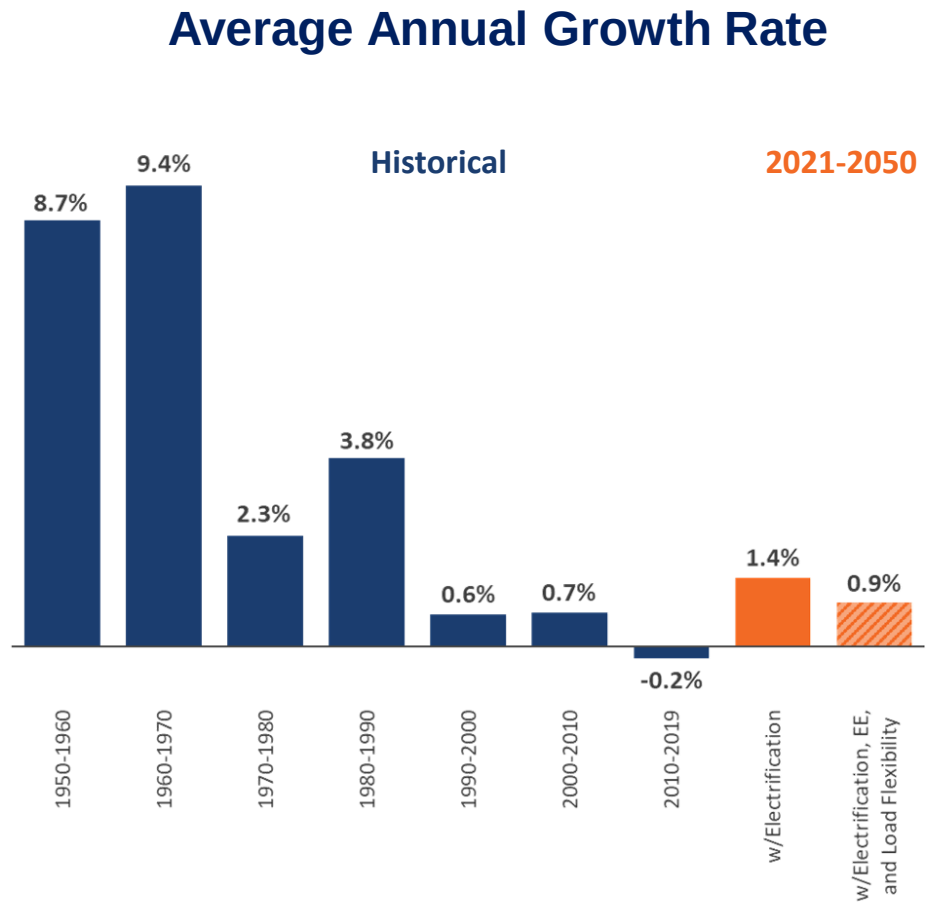

Takeaways for the Pacific Northwest

Every utility is different – tailored analysis and planning are needed

- For winter peaking utilities with growing baseline load, there is less “room to grow”; electrification-driven load growth could be faster and larger than we found for Pepco DC
- However, utilities with significant existing electric resistance heating penetration will experience an efficiency boost when those systems are converted to heat pumps

A long planning horizon helps

- Multi-decade decarbonization goals allow electrification-driven load growth to be addressed at a manageable pace
- However, planning and investment needs to start soon (e.g., Pepco’s 2022 “Climate Solutions Plan”)

EE and load flexibility will be critical for regulatory approval of utility decarbonization plans

- EE and load flexibility enable electrification to happen reliably and cost-effectively
- They also provide direct decarbonization benefits
- In this sense, they will be a necessary component of utility electrification and decarbonization investment plans