

Planning for Electric Vehicles

May/24/2021



WA E2SHB 1287 Clean Cars 2030

- Establish a goal that passenger and light duty vehicles model year 2030 and later be Electric Vehicles (EVs)
- Applied to both vehicle sales and registration within Washington State
- Legislation “unexpectedly” vetoed by Governor due to the conditional road usage charge – poisoned pill
- Intent and future direction is clear
- EVs is a substantially expanded topic in the District’s 2021 Planning Study Update



Primary Technical Sources

- E3 “Economic & Grid Impacts of Plug-In Electric Vehicle Adoption in Washington & Oregon”, 2017
- EPRI “Electric Vehicle Driving, Charging, and Load Shape Analysis”, 2018
- Avista Corporation “Electric Vehicle Supply Equipment Pilot Final Report”, 2019
- These Studies were not available when the District evaluated potential EV impacts 4 years ago

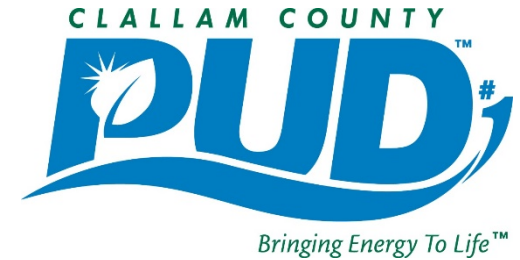


PUD Assumptions

- 30,000 households with vehicle(s)
- Local demographics and driving characteristics
- Eventual 18,500 Personal Electric Vehicles (PEV) miles driven per household consisting of all PEVs
 - Includes seasonal tourist adder to represent area visitors, seasonal residents and elevated seasonal driving more than what is typical in most areas
- 33 kWh average per 100 miles driven
 - Includes SUVs and light trucks and some high HP cars
- Seasonal variations based on existing traffic



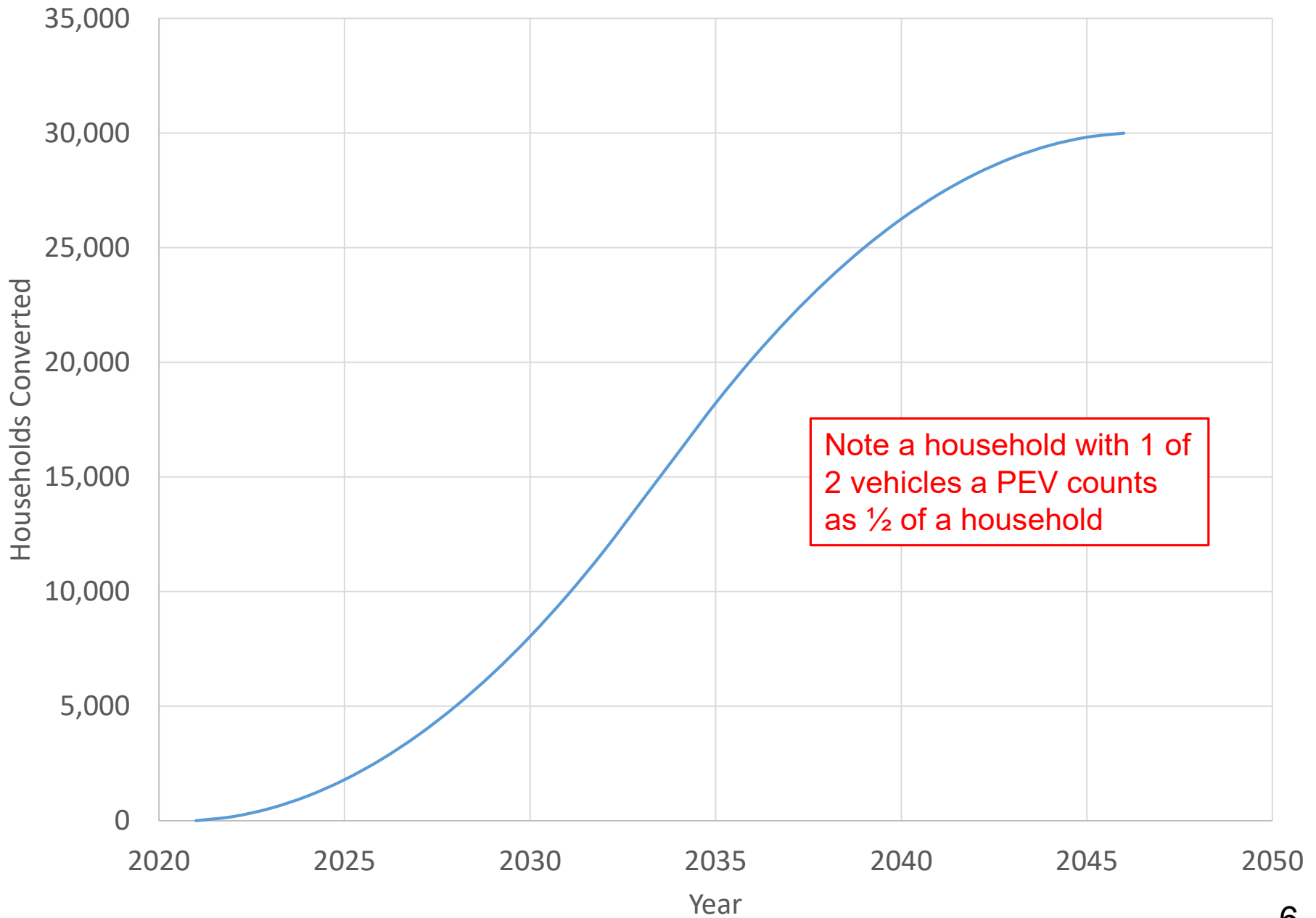
PUD Assumptions



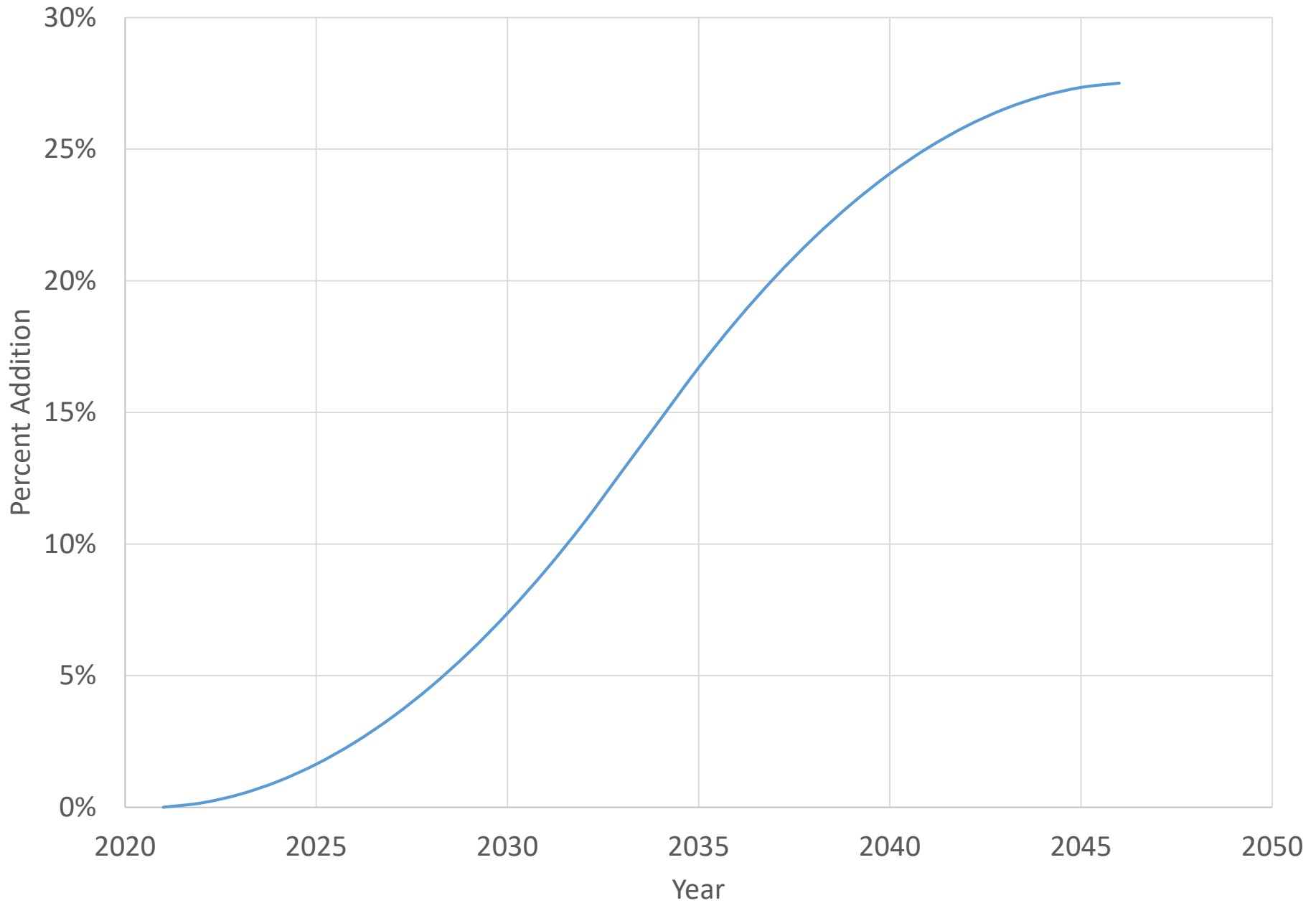
- No future expansive mass transportation network typically available to urban areas
- General conformance to the E3 study assumptions, but tailored to local characteristics and conditions
- No significant TOU or other behavioral load shaping
- Vehicle electrification extended over a 25 year interval
 - Recognizes limitations in manufacturing and raw materials
 - Consistent with industry projections for fastest feasible transition to EVs
 - Considerably slower than what is implied by recent proposed WA State legislation



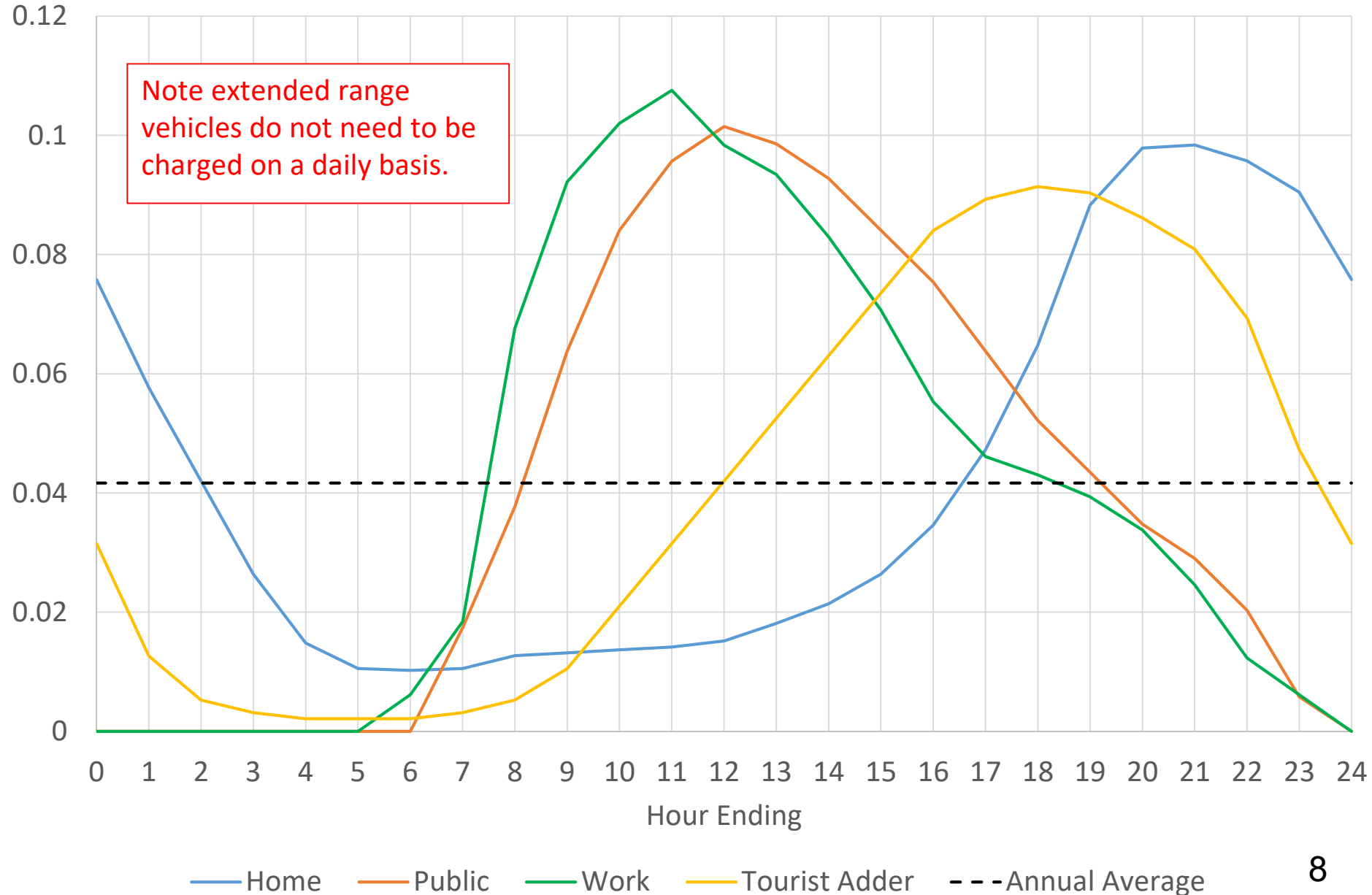
Effective Households Adopting PEVs



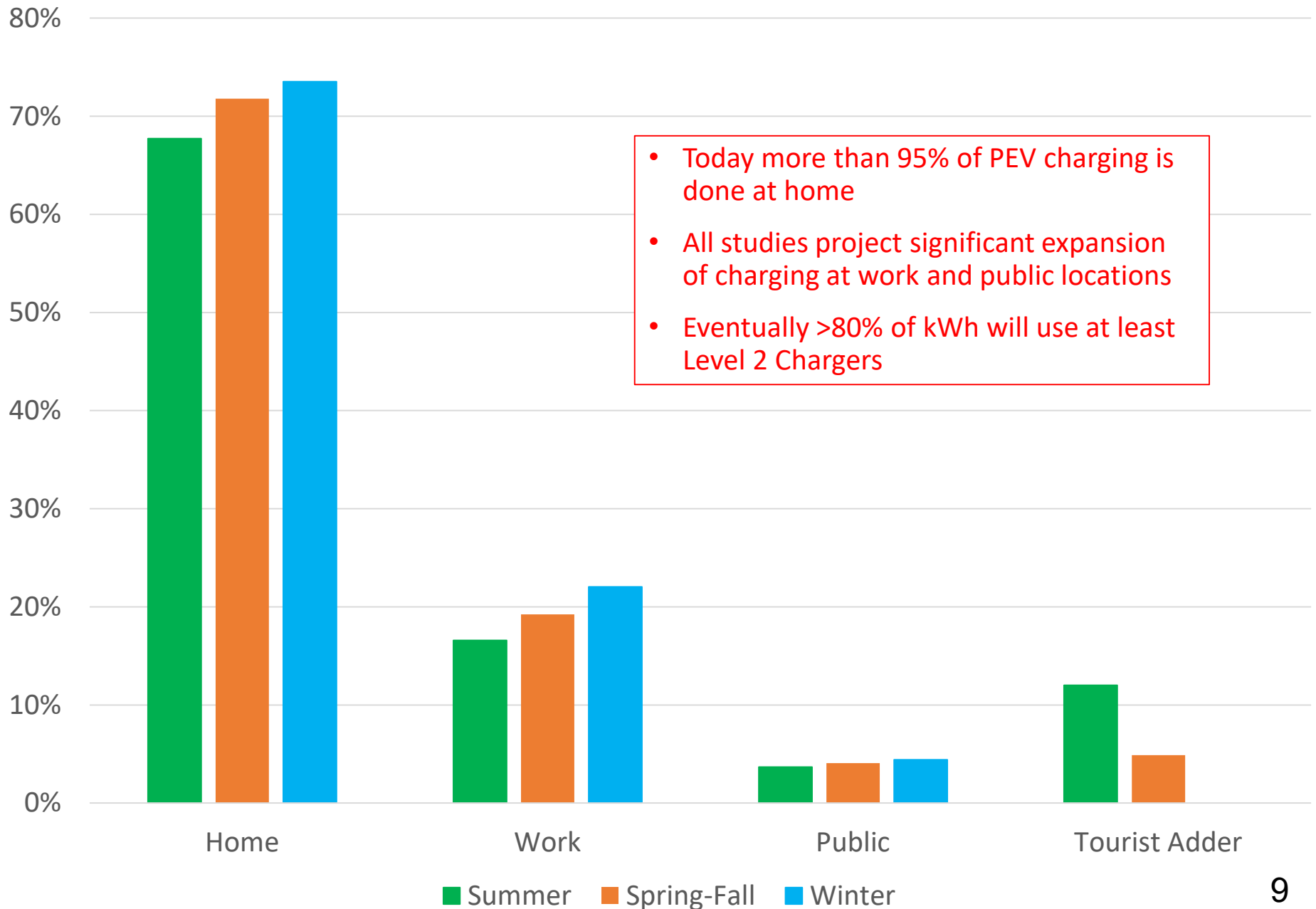
System KWH Load Addition Due to PEVs



PEV Unit Charging Curves By Type over Day Interval for Average Weekday

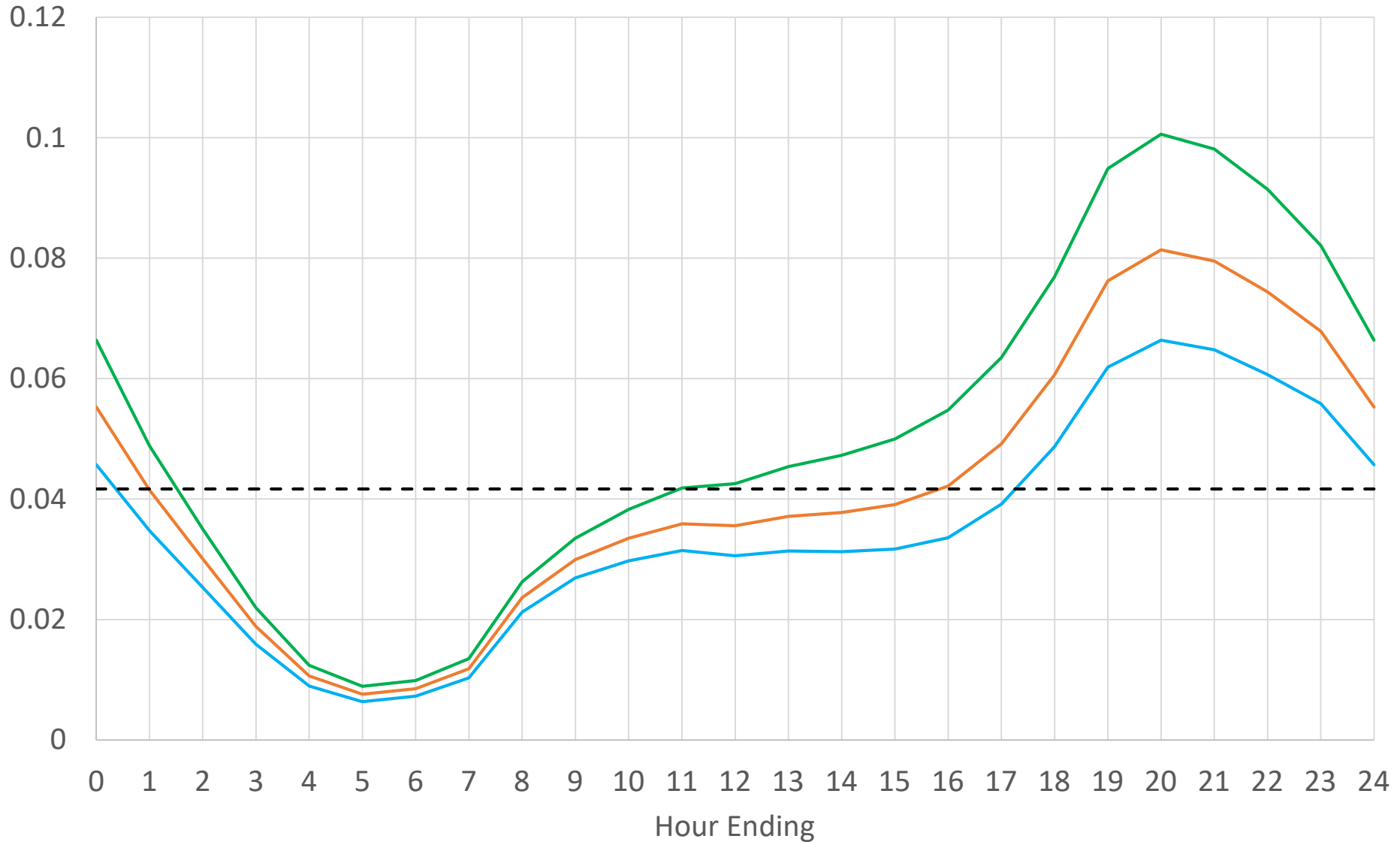


Eventual PEV Charging Proportion by Season



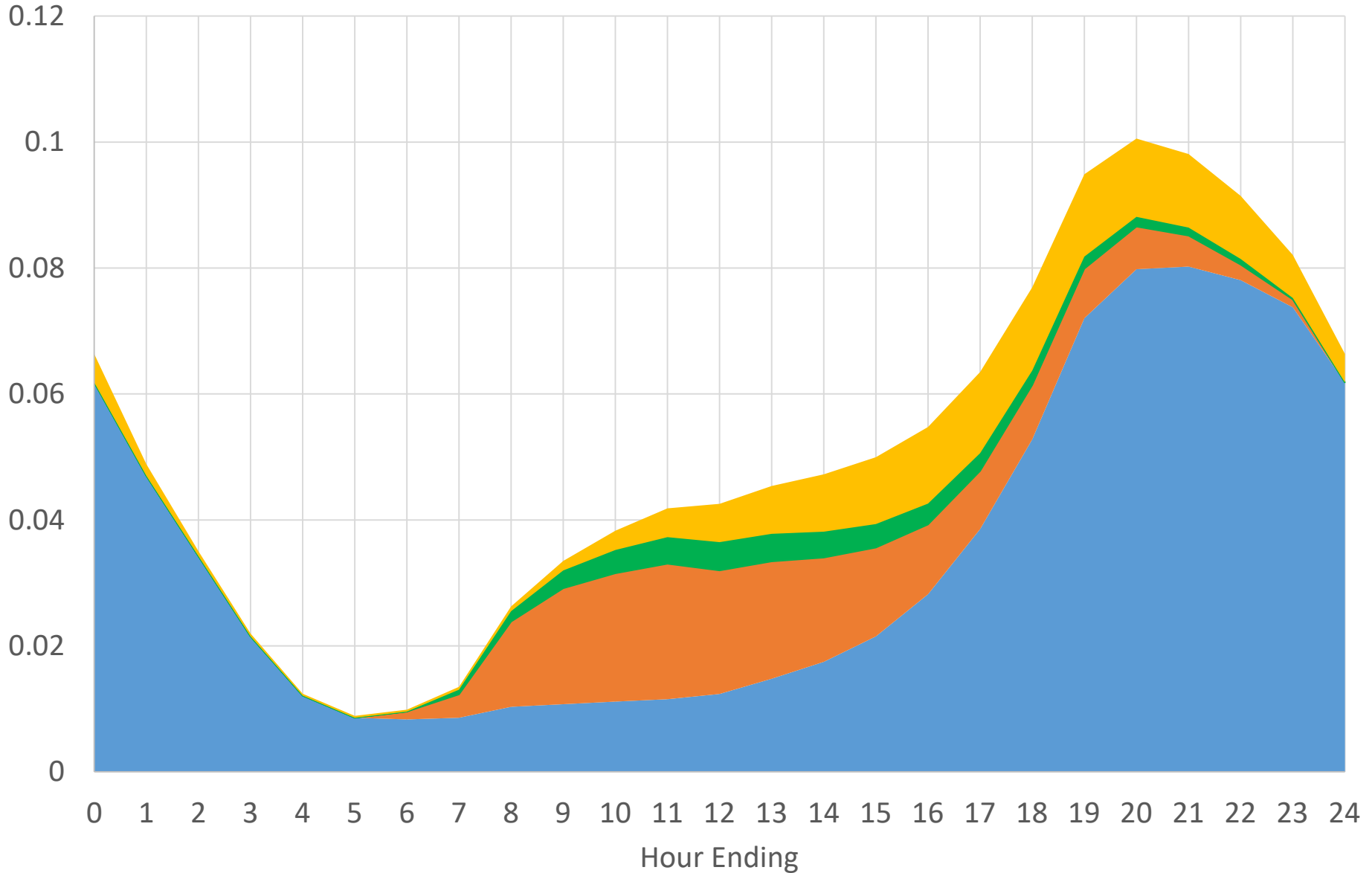
Seasonal Per PEV Unit Weekday Charging Curve

Annual Average = 1/24 or 0.041667



— Summer — Spring-Fall — Winter - - - Annual Average

Eventual Summer Charging Profile

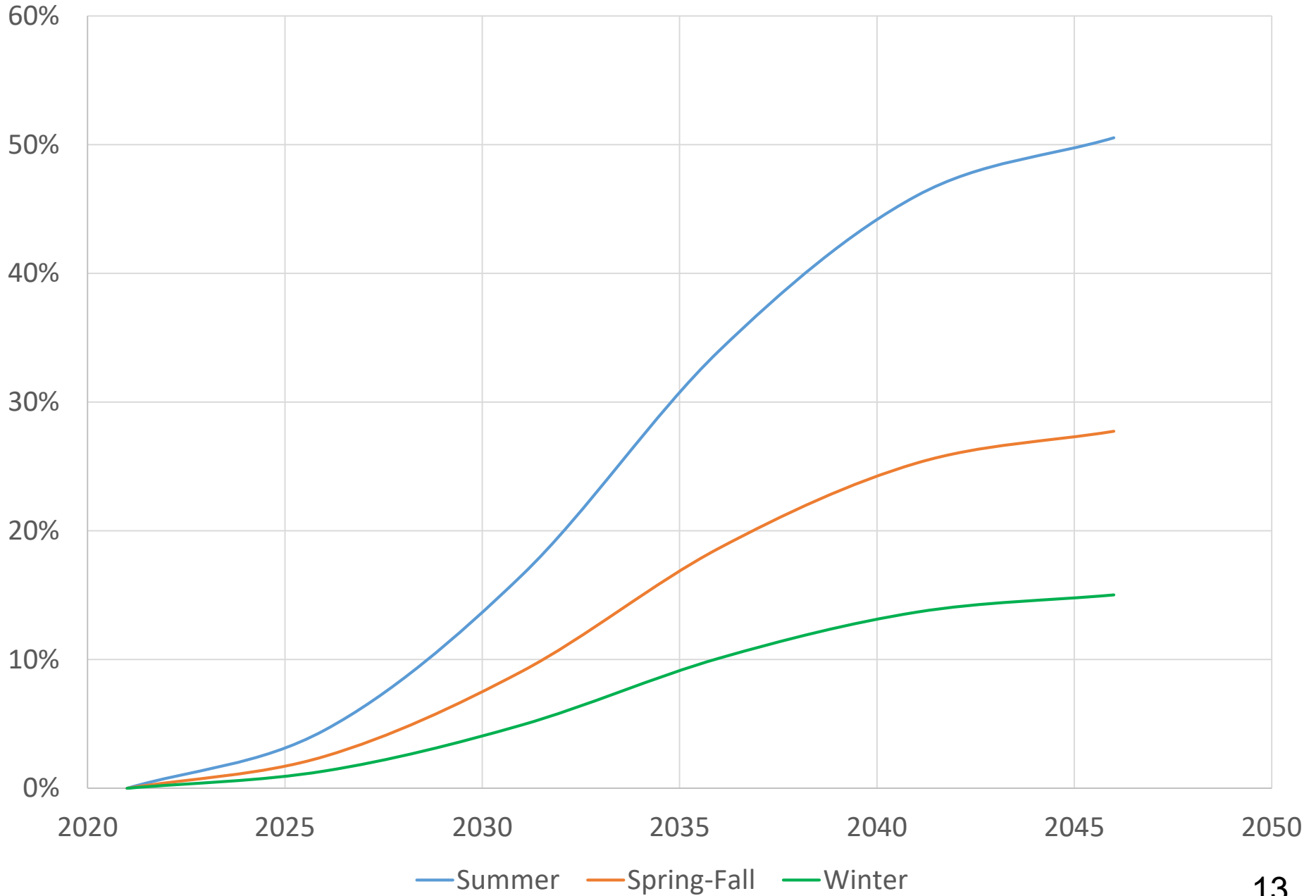


■ Home ■ Work ■ Public ■ Tourist Adder

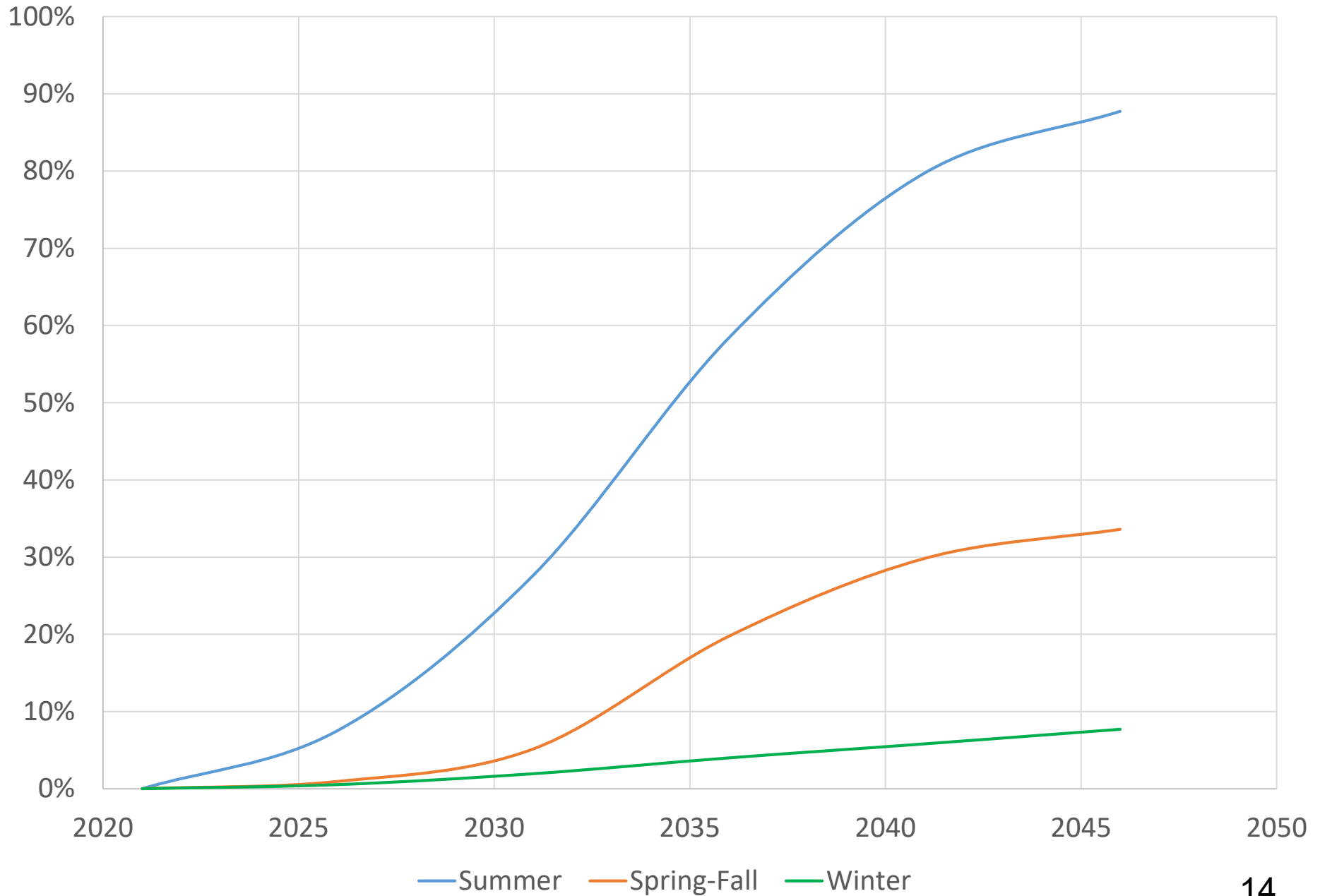
Summary of Analysis



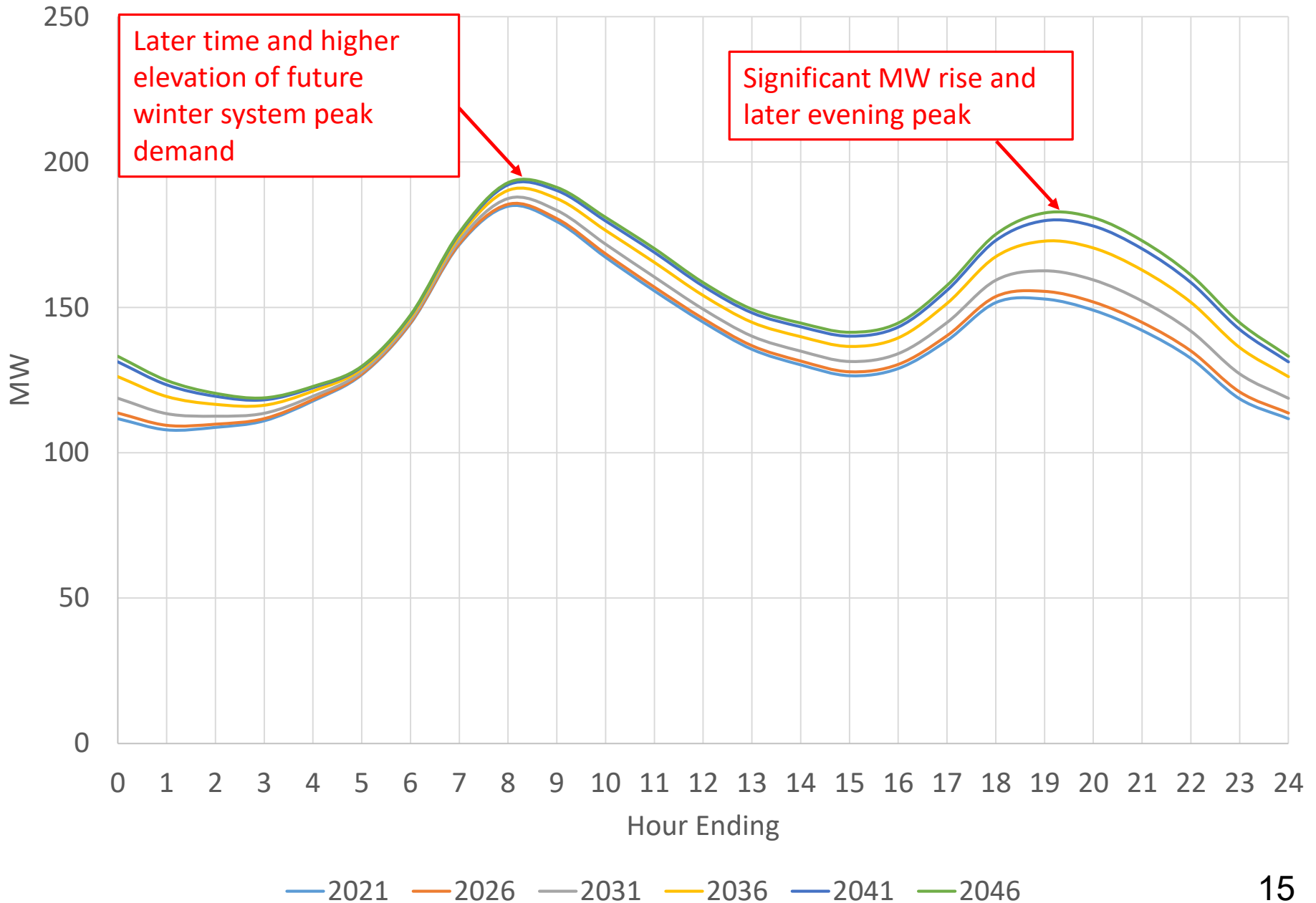
Seasonal kWh Increase due to PEVs



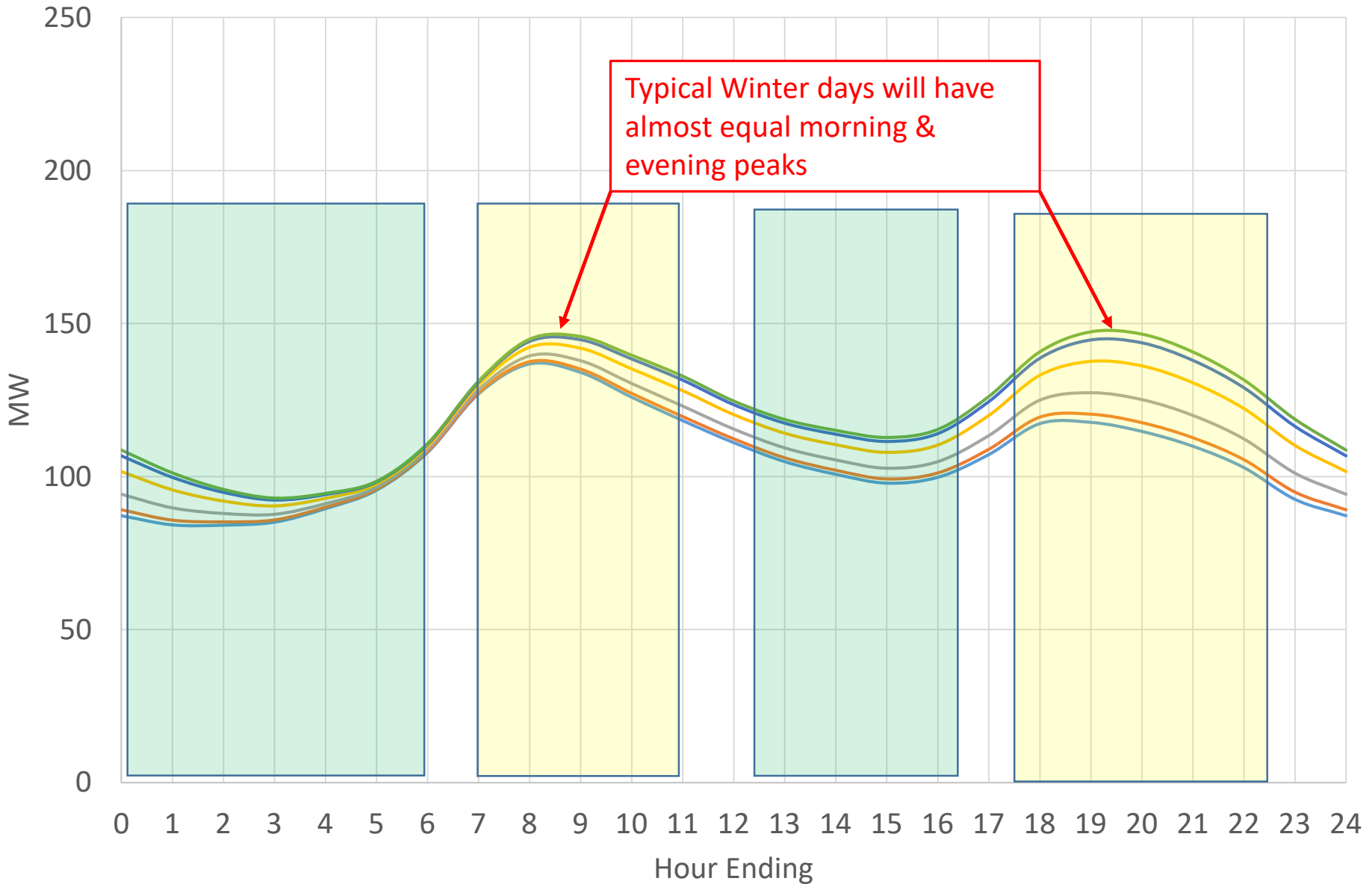
Seasonal KW Demand Increase due to PEVs



Annual System Peak Load with PEV Addition

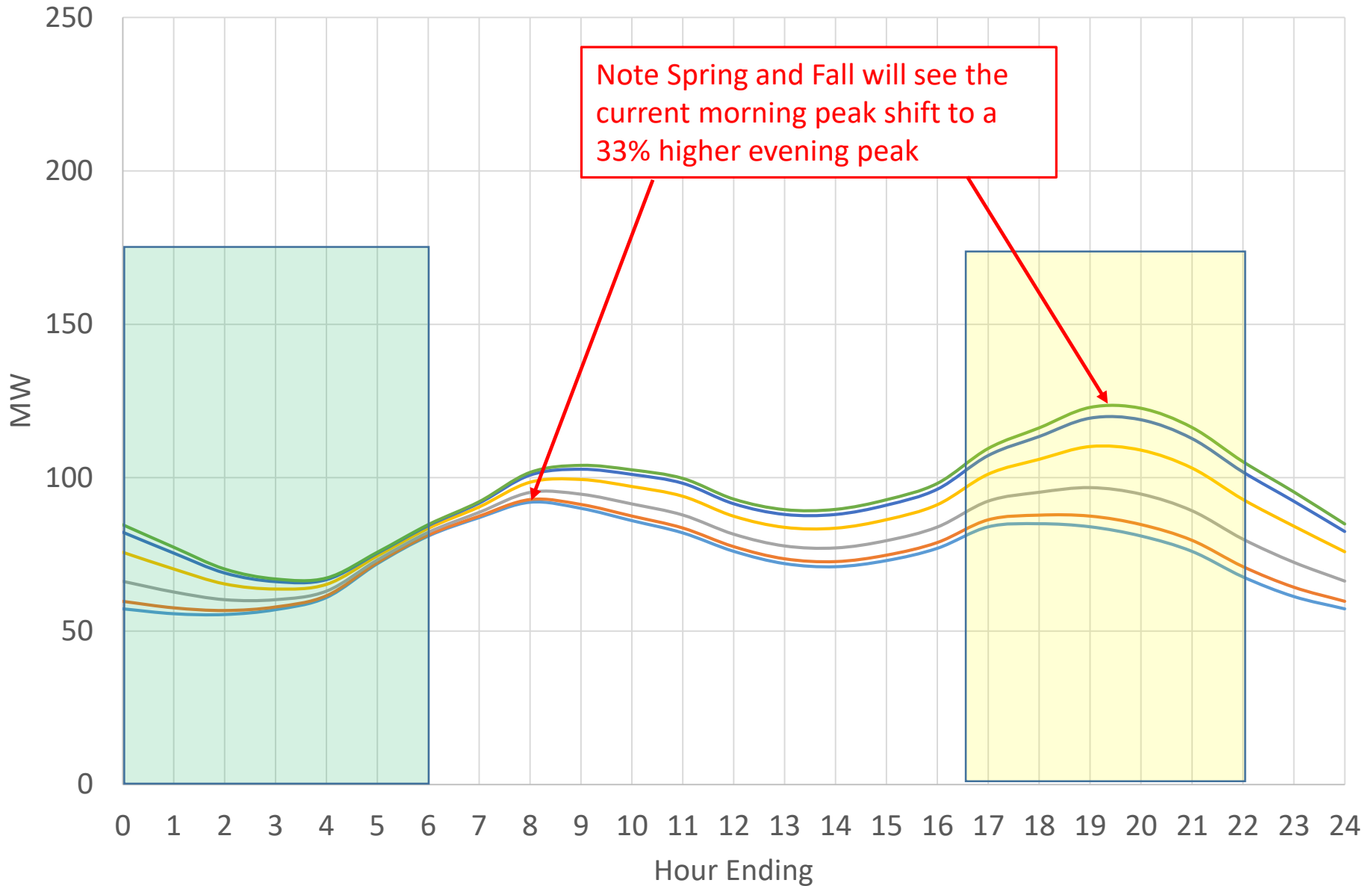


Average Winter Load with PEV Addition



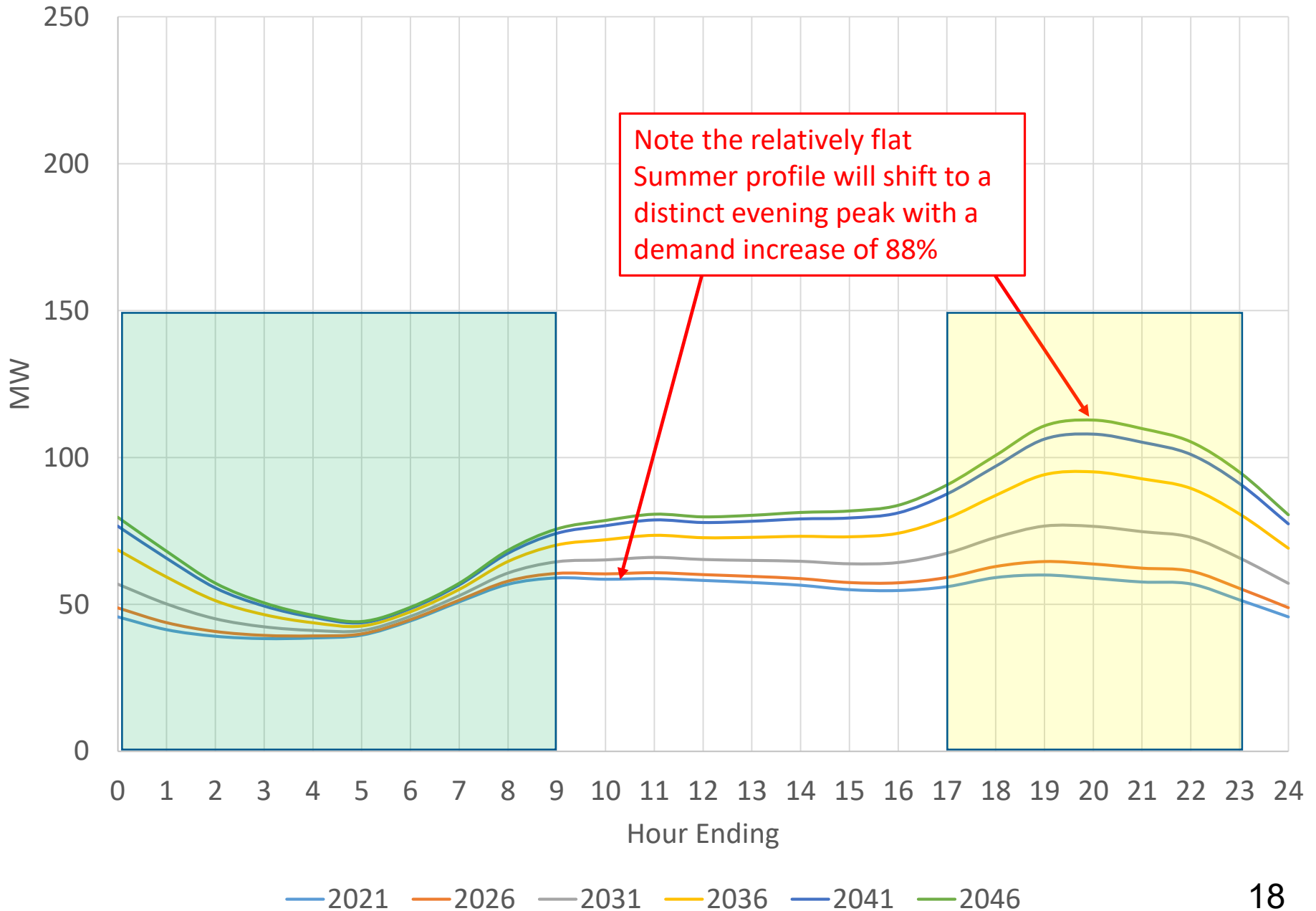
— 2021 — 2026 — 2031 — 2036 — 2041 — 2046

April or October Load With PEV Addition



— 2021 — 2026 — 2031 — 2036 — 2041 — 2046

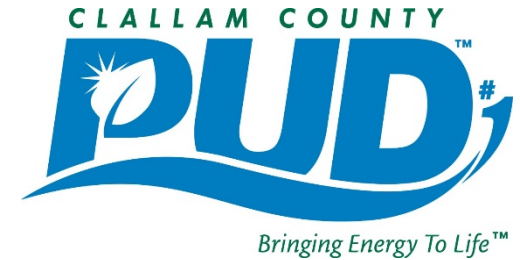
Summer Load With PEV Addition



Observations



Observations



- As a current winter morning peaking utility, Clallam is comparatively well positioned to add significant PEV load
 - Current Summer peaking utilities will have extraordinary challenges and costly new infrastructure requirements
 - All electric utilities will see large concurrent load additions.
- Eventually Clallam will become evening peaking for up to 9 months a year (currently 1 or 2 months per year)
- Eventual winter peak demand and energy additions for Clallam are on the order of 8% and 15% respectively
- Annual kWh supply and sales increase of about 28%

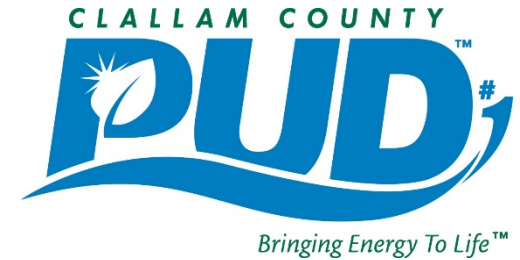


Observations

- Industry Power and Adequacy Studies rely on submitted IRPs and RPs (lagging analysis)
- Limited horizon, IRPs look 10 years into the future
 - Do not normally consider legislated carbon mandates beyond 10 years
 - Do not yet consider load growth consistent with substantial vehicle electrification!!!
- Resource adequacy will require generation additions to power the eventual growth in EVs in our service territory
 - Perhaps 25-30% without effective TOU rates or controls?
 - Perhaps 15-20% with effective TOU rates and controls?
 - Value of local distribution storage increases
- AMI can be leveraged and facilitate TOU rates to mitigate associated distribution infrastructure costs



Observations



- Our summer load, now a relatively minor factor with respect to planning, will become critical
 - Very large load additions to some distribution transformers
 - Late Summer adequacy concerns as our elevated local evening peak will be coincidental to that of the Western Interconnect
- CETA compliance may become problematic over the next two decades, even for BPA customers
 - BPA supply can not exceed 20% carbon through 2044 – CETA
 - PEVs expected to add up to a 28% kWh load addition, placing us at risk
 - Substantial integration of new CETA compliant sources necessary
 - Otherwise +2% annual compounded retail sales rate impact
 - Post 2044 zero carbon CETA mandate much more challenging



Transmission with large PEV load

- Clallam PUD transmission system is adequate for any PEV scenario
- As Clallam monthly peaks transition to evenings, we will become subject to additional external transmission constraints
- Higher BPA transmission charges year round

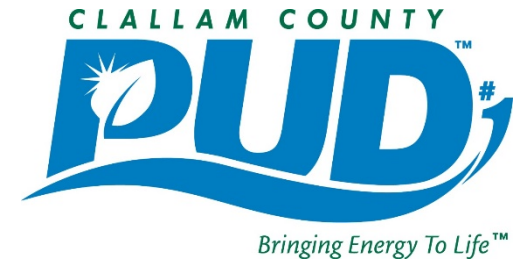


Distribution Substations with large PEV load

- Several substation transformers and associated voltage regulators will require capacity upgrades
- A new substation south of Sequim necessary
- Reduction in substation reserve margins and adverse impact on loss of substation contingencies
- Substation UG cable getaway capacity restrictions
 - Roughly a dozen station getaway cables will need capacity upgrades or segmentation
- System protection and voltage control modifications



Distribution System with large PEV load



- As many as 2,000 distribution transformers may need capacity upgrade to support EV charging
- Several hundred new transformers and services required for charging infrastructure
- Significant infrastructure requirements to support commercial “Fast” or “Super” EV chargers?
 - 8 bay Tesla supercharger has a demand and transformer requirement that is similar to a Walmart Supercenter
- Heavily loaded distribution feeders will require upgrade or division for capacity
- Even some end of line conductor upgrades required for voltage control



Infrastructure Support



- Additional challenges associated with commercial and governmental EV fleets or large vehicle electrification not considered in this analysis
- Long term capital infrastructure activity likely to increase by up to 20% and by as much as \$1,000,000 per year
- At some point, staffing additions likely required to build and support the electric distribution infrastructure required to support EVs
 - +Electric Line Crew?
 - +Substation Technician?
 - +Engineer?
 - +Serviceman helpers?
 - +Power supply analyst?



Questions?

