Maritime Electric Outlook

PEI Electrical Vehicle Association
December 18, 2019

MARITIME ELECTRIC
A FORTIS COMPANY

Maritime Electric Energy Supply Mix

- Participation agreement with NB Power Pt. Lepreau Nuclear Generating Station (15%)
- On-Island wind (~25%)
- MECL on-Island oil-fired units (<1%)
- System purchases from mainland (60%)
    - Estimated CO2 content of 0.3 kg/kWh
- Overall CO2 content of supply is roughly 0.2 kg/kWh
    - Equates to about half that of natural gas combined cycle generation

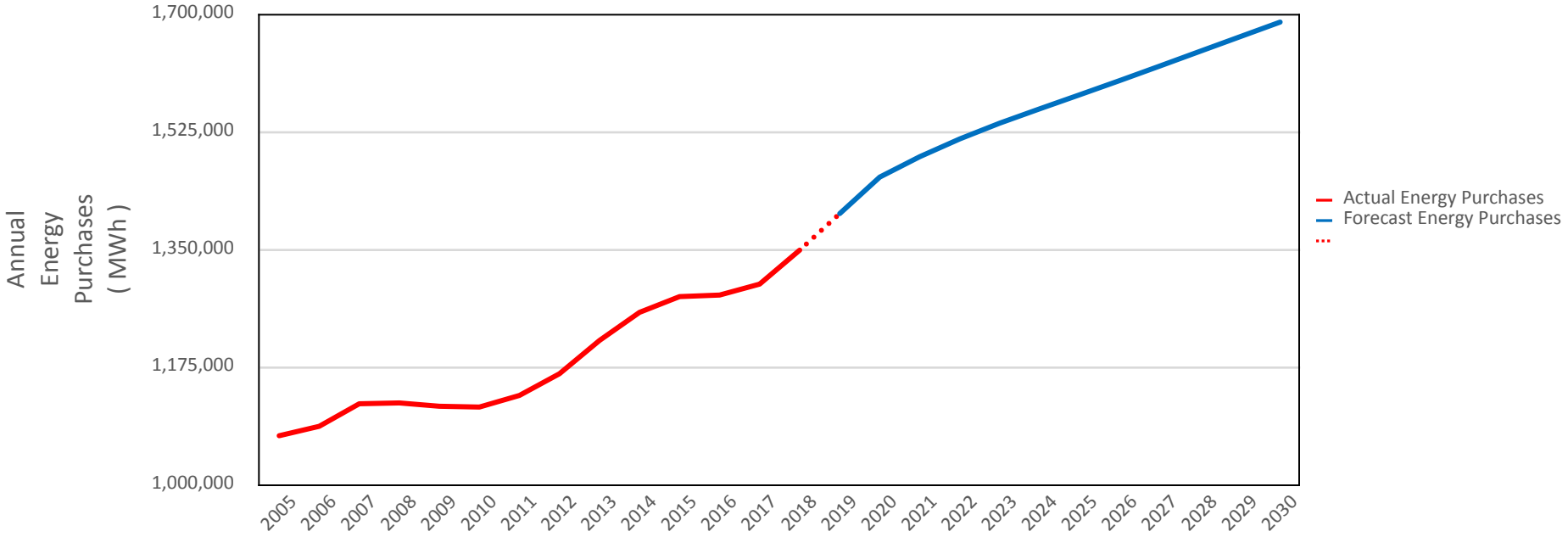
Peak Load and Energy Growth Drivers

- Electrification of space heating has driven majority of load growth this decade
  - Historically primary heating sources were furnace oil (70%), wood (20%), propane (5%), and electric (5%)
  - Electric heating now 20-25%
  - Heat pumps also provide summertime air conditioning load
- LED lighting has reduced load and energy; total conversion not yet complete
- Electrification of transportation is on the horizon
  - Island has roughly 45 EVs and 25 Level 2 EV chargers
  - Province is installing six fast chargers across the Island and recently issued an RFP for six additional level 2 chargers
- MECL working with communities to install public EV charging equipment

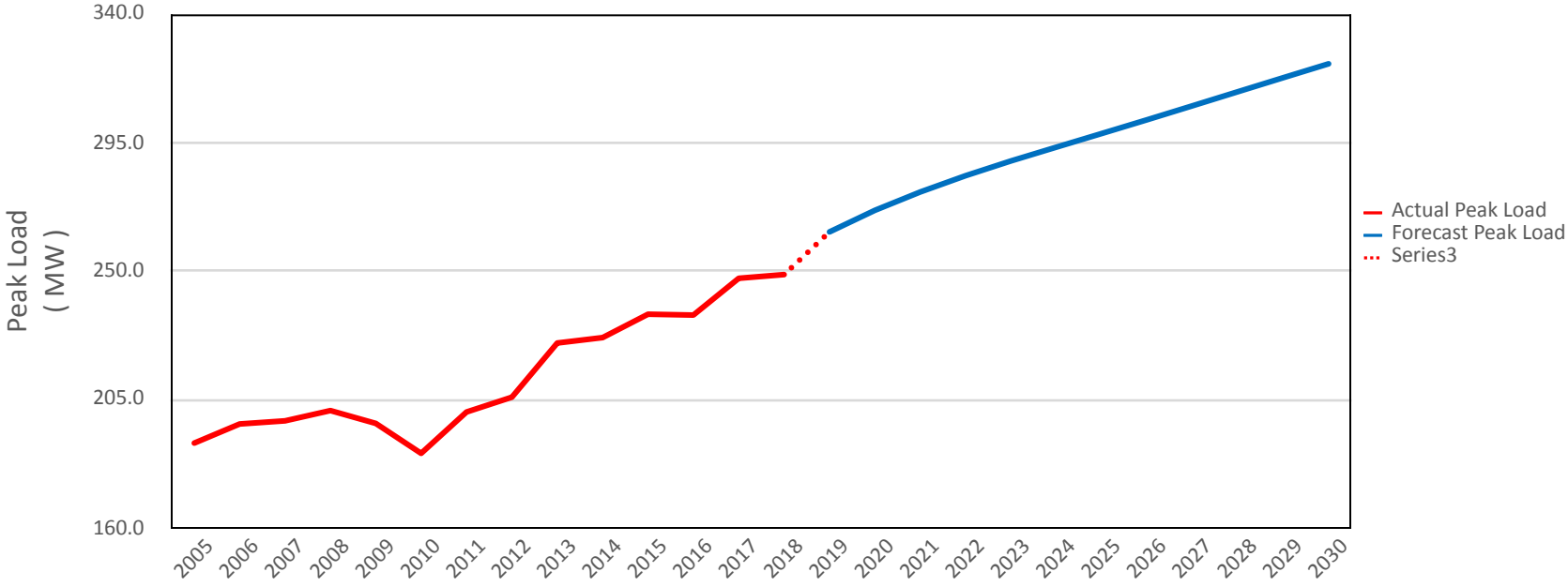
MECL ZEVIP Application

- MECL submitted an application to NRCan for the Zero-Emission Vehicle Infrastructure Program
- Program is aimed at installing Electric Vehicle charging stations in Public Areas and On-Street
- MECL partnered with the Province of PEI, ten communities and two private businesses in submitting the application.
- If successful, this project would see the installation of 50 new level 2 chargers
    - Chargers would be installed at 26 different locations across 10 communities
- Funding for the project is to be:
    - 50% NRCan
    - 25% MECL
    - 12.5% Province of PEI and
    - 12.5 % for prospective communities.

Maritime Electric Annual Energy Forecast



Maritime Electric Annual Peak Load Forecast

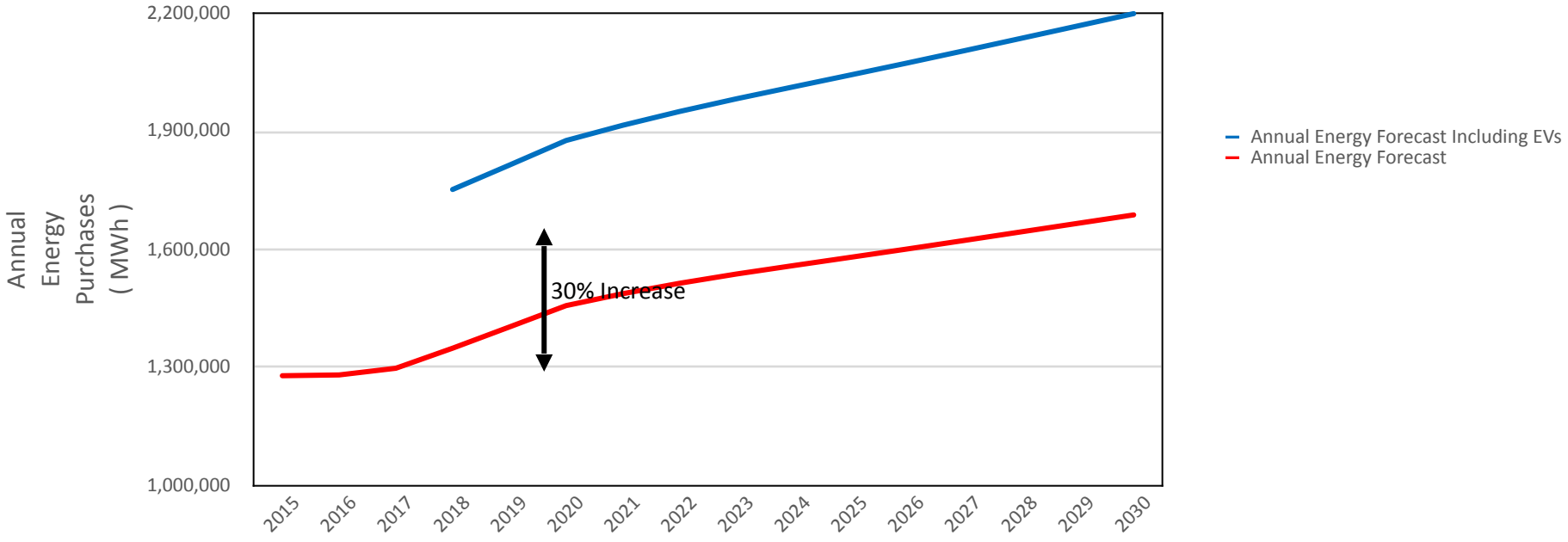


Maritime Electric EV Uptake Projections

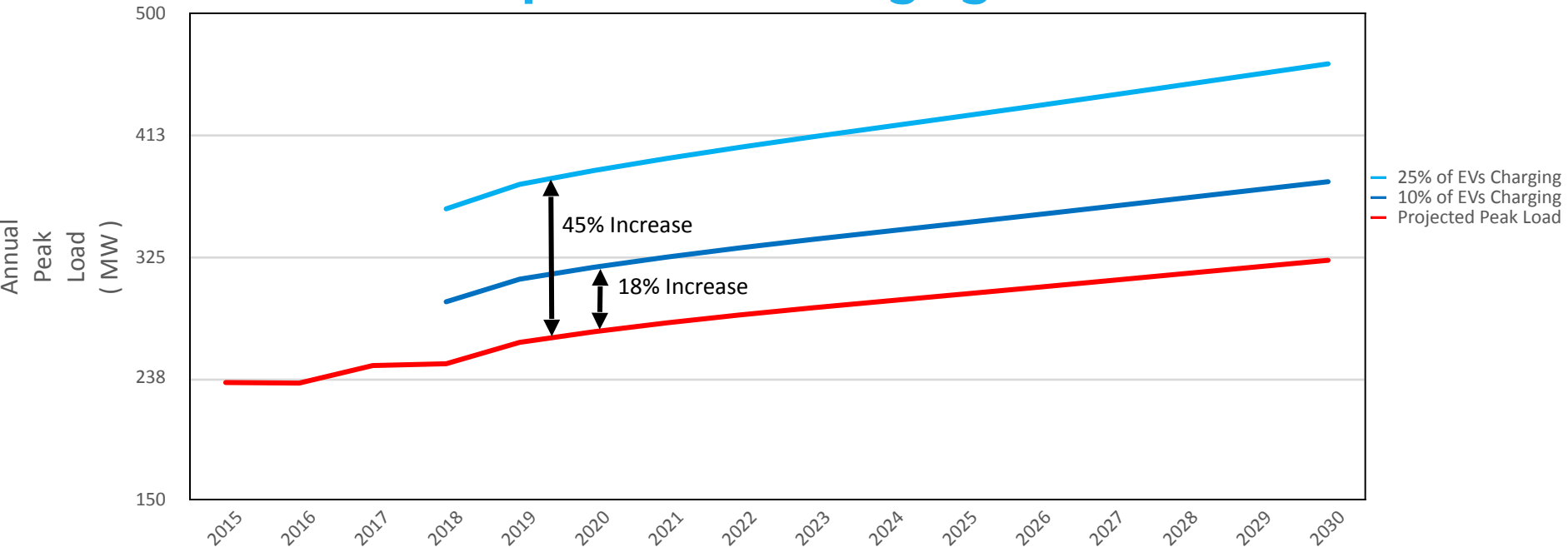
Year	% of New Vehicle Sales	Annual Sales	Annual Energy (MWh)	Max Peak Impact (MW)	25% Charging Peak Impact (MW)	10% Charging Peak Impact (MW)
2020	1.5 %	119	800	1	0	0
2022	1.9 %	152	2,300	3	1	0
2024	4.8 %	404	5,100	6	2	1
2026	6.5 %	564	10,300	12	3	1
2028	10.0 %	902	18,400	22	5	2
2030	15.0 %	1,408	31,300	37	9	4

Based on JP Morgan report "Driving into 2025: The Future of Electric Vehicles", October 2018 and IEA "Global EV Outlook 2019"

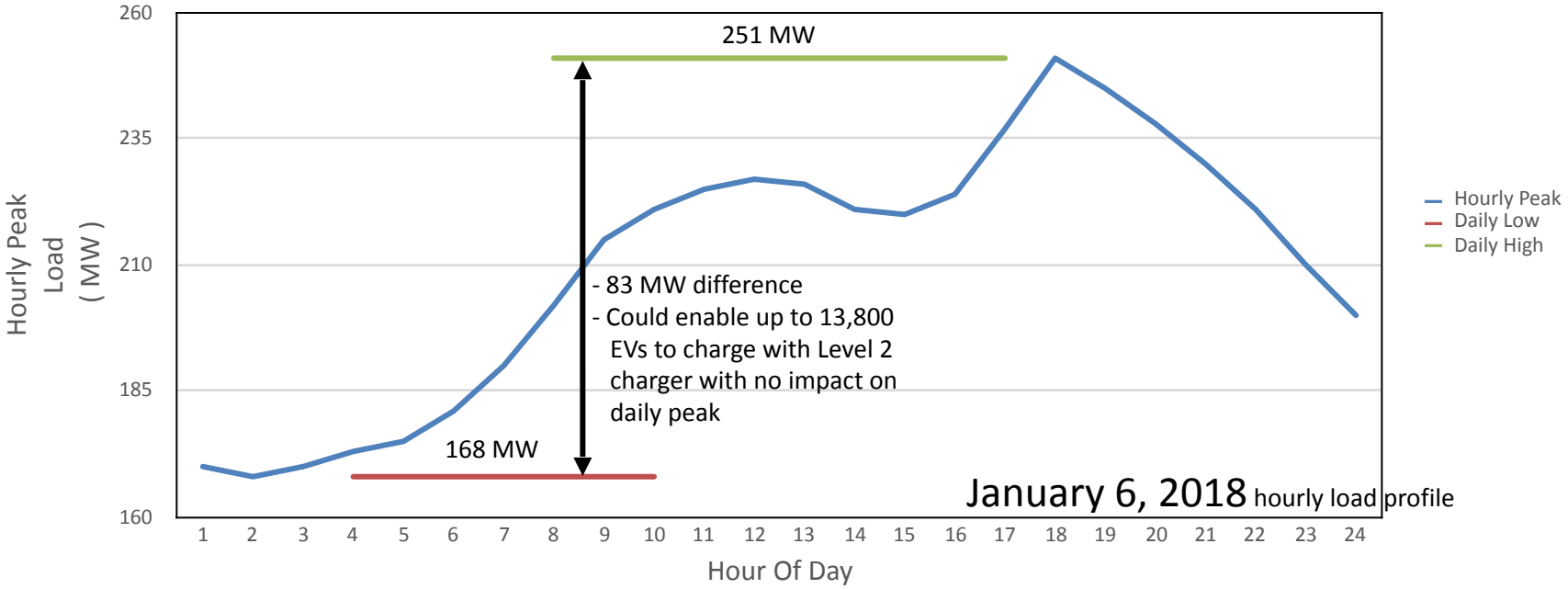
Annual Energy Requirements with 100% EVs



Annual Peak Impact of EV Charging with 100% EVs



EV Charging Opportunity



Options to Accommodate Impact of EV Charging

- Utility control of customer devices to shift load from peak periods
  - Permissive signal (system indicates when charger can charge)
  - Vehicle to Grid – system can input or consume energy from batteries (within constraints)
- Customer control – customers can shift load in response to price signals
- Load shifting – can be either time-based or source-based
  - Time of use sets different prices for peak and off-peak periods
  - Source-based coordinates output from a certain source with usage
    - Is challenging when using intermittent generation such as wind
- Storage – can store on time- or source- basis
- All of these potential solutions require additional ‘smarts’ in the system

Smart Meters

- Smart Meters are required in order to facilitate most methods of influencing vehicle charging
    - Allow two-way communications with customers
    - Facilitate time of use or sourced-based billing
    - Entices load shifting from peak to off-peak periods
    - Produces vast quantities of data that can be analysed for quality, maintenance and rate-making purposes
- Empowers customers to shift load to off-peak periods, giving more customer control
- Aiming for the 2025 timeframe, aligning with projected increase in EV uptake

Additional Challenges with Transportation Electrification

- Possibility of significant load growth in clusters, which could overload equipment
  - The infrastructure has to be in place to meet customer demands
  - Each new EV has a similar impact on peak load as a house
  - 1 to 2 new EV's simultaneously charging could overload an existing pole-top transformer
- If we know where the EV's are being added we can upgrade the necessary equipment before the overload causes an outage
  - This also allows MECL to relocate the undersized equipment to serve other customers, reducing costs for all customers

Electric Vehicle Outlook

- Electric vehicles are coming and MECL must be in a position to meet the requirements of customers
    - Significant increase in energy usage (30% increase with 100% EV conversion)
    - Effect on system peak will be even greater unless we can influence charging habits to occur when usage is reduced (overnight)
        - Time of use rates or other price signals will be required to influence load
        - Smart meters are required to enable this
- Infrastructure upgrades will also be necessary
    - Localized equipment overloading will occur unless MECL knows where EV's are located

Questions?