

## BPU EV Working Group Preview

November 27, 2017

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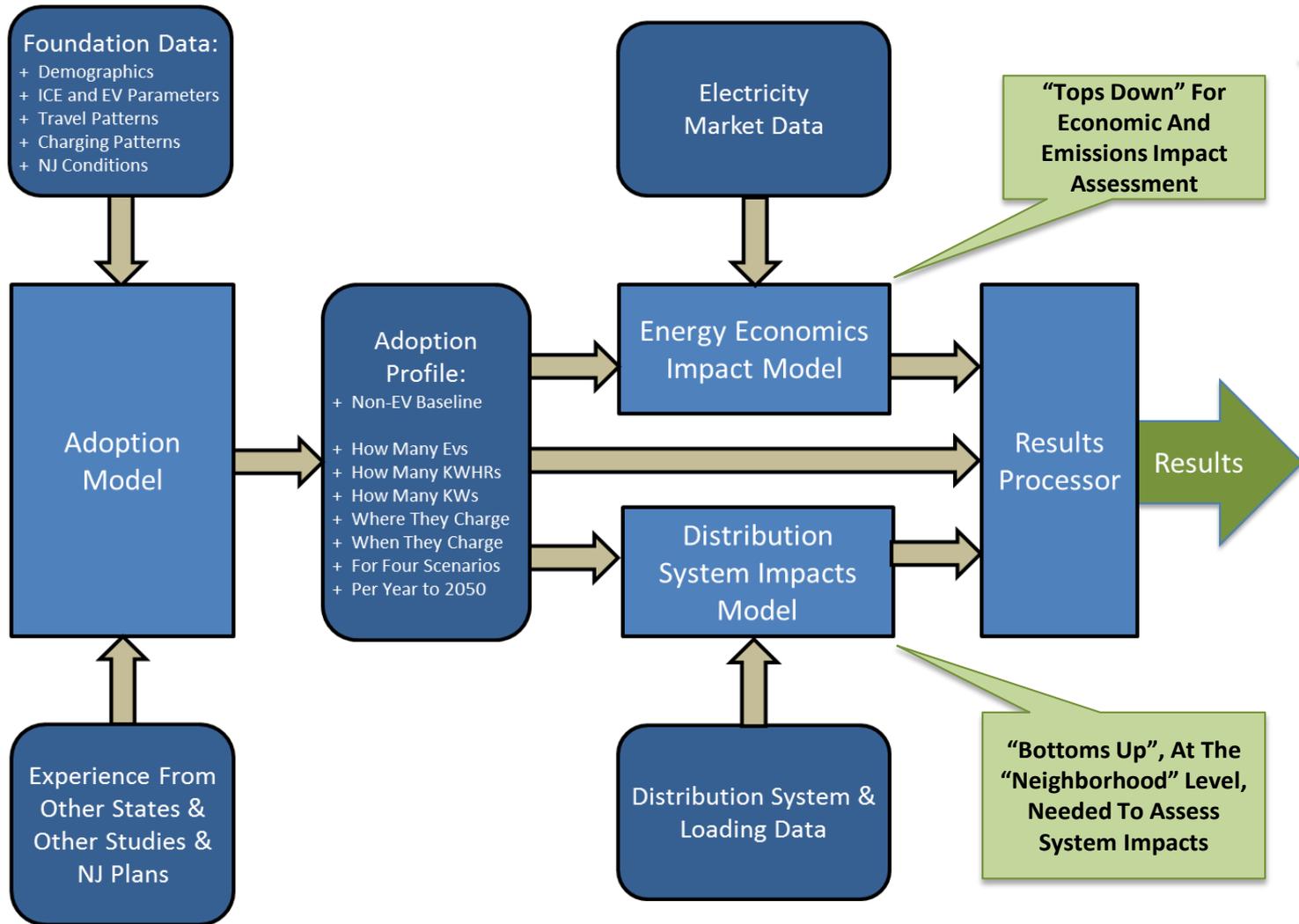
Vice President  
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- **Goals, Scope, and Methodology**
- **The Adoption Scenarios**
- **Key Findings**
  - **Current New Jersey Market Conditions**
  - **Charging Segments**
  - **Economic Impacts**
  - **Emission Impacts**
  - **Utility and Infrastructure Considerations**
- **Next Steps**

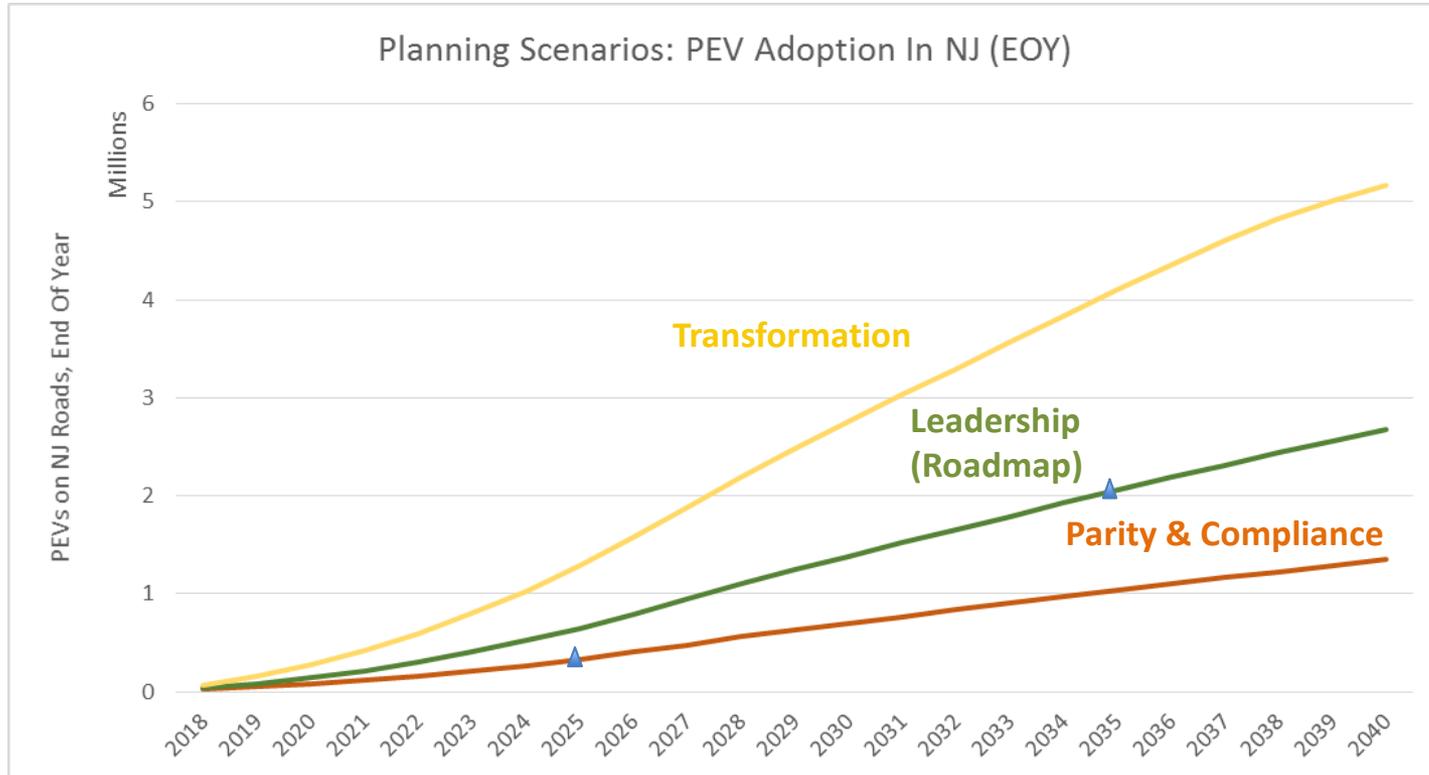
- **Key Questions:**
  - Where is the NJ EV market today?
  - What are the opportunities for growth?
  - What are the costs and benefits of expanded EV adoption?
  - What are the implications for infrastructure and utilities?
  
- **Scope**
  - Focus on light duty vehicles
  - Consider various scenarios from 2018-2050
  - Evaluate economic impacts
    - ✓ Impacts on electricity prices
    - ✓ Impacts on EV driver operating costs
    - ✓ Impacts on Social Cost Of Carbon
    - ✓ Evaluate costs from both market development and potential upgrades
  - Evaluate environmental impacts
    - ✓ CO2 emissions
    - ✓ Nox emissions
    - ✓ Two different emission accounting methods
  - Specifically consider “natural” and “managed” vehicle charge scheduling
  
- **Next Steps**

# The Impact Model



## This Study Is Based On:

- New Jersey Conditions
- Charging Data From Industry
- Detailed Dispatch Simulations
- Detailed Distribution System Data
- Analysis Of Utility Tariffs
- Synthesis of Numerous Studies
- Calibration For New Vehicle Characteristics

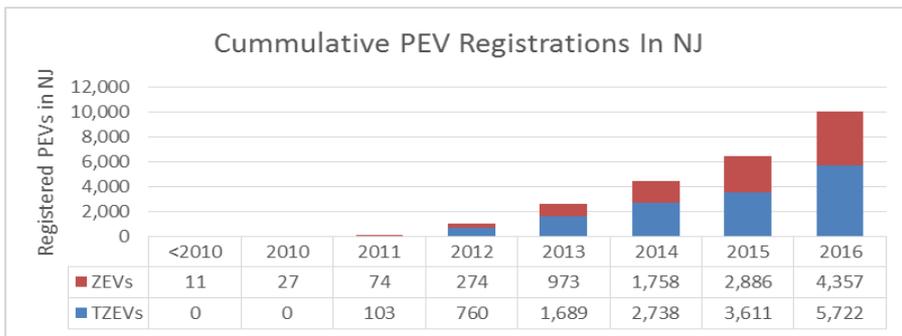
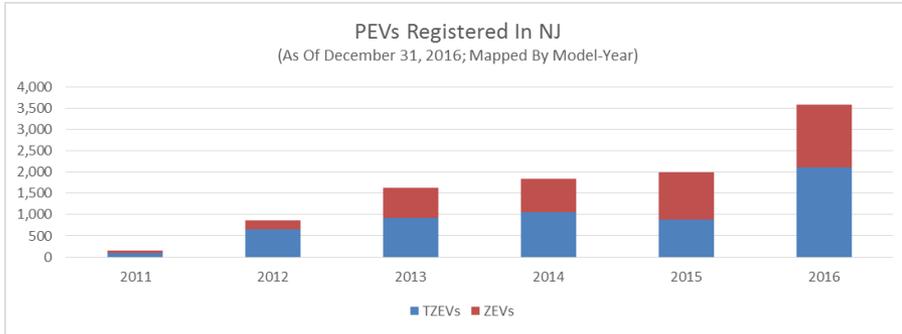


▲ = ChargeVC Roadmap Goals

Under Scenario Two (Leadership) – Approximately 31.5% of Fleet Is A Plug-In By 2035. Global Leadership Benchmarks Are Fleet 30% Penetration By 2030 (mostly in Europe).

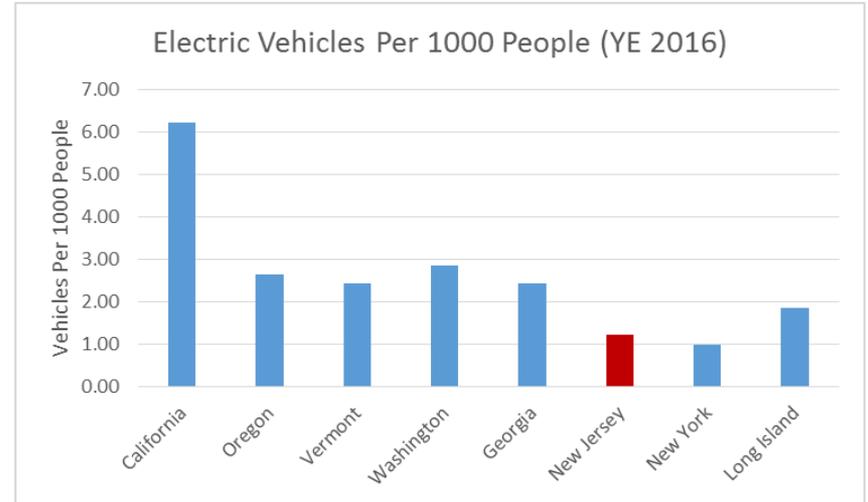
# Findings: Current NJ Market Conditions

PEV Sales Have Accelerated In NJ Over The Last Year, And Now Exceed National Growth (79% in NJ 2016 over 2015, vs ~30% YTD 2017 Nationally)



Source: Registered PEVs in NJ, as of Dec 31, 2016, provided by NJ DEP in July 2017  
Analysis by Mark Warner, ChargeVC

New Jersey Lags Other Adoption-Leaders By Almost A Factor Of Two, Which Demonstrates “Untapped Potential” For Increased PEV Penetration.



New Jersey Also Lags These EV Market Leaders In Public Charging Plug Density, By About A Factor Of 5 (~150 plugs/1000 PEVs, vs 38 plugs/1000 PEVs for NJ).

# Findings: Charging Segmentation

## Residential Chargers

## Semi-Public Chargers

## Public Chargers

### Private Home Chargers



### Workplace Chargers



### Community Chargers



### Multi-Family (& hotels)



### Fleet Chargers



### Corridor Chargers



Convenience Charging, Slower OK

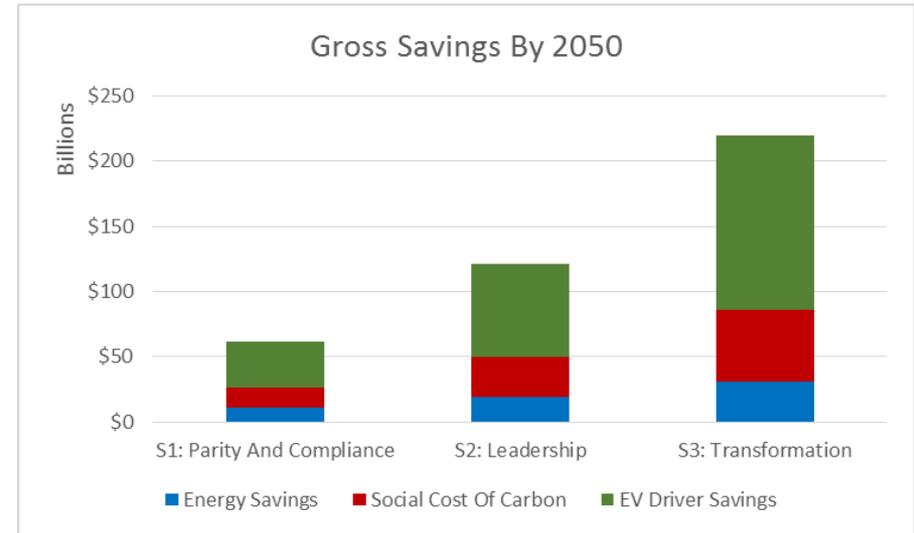
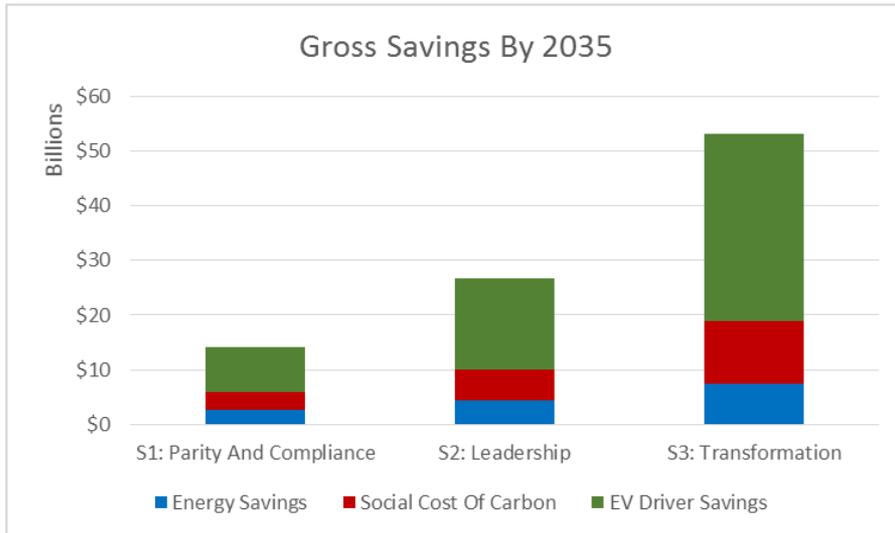
Must Do Charging, Very Fast

Long Dwell Time  
(Authorized Users)

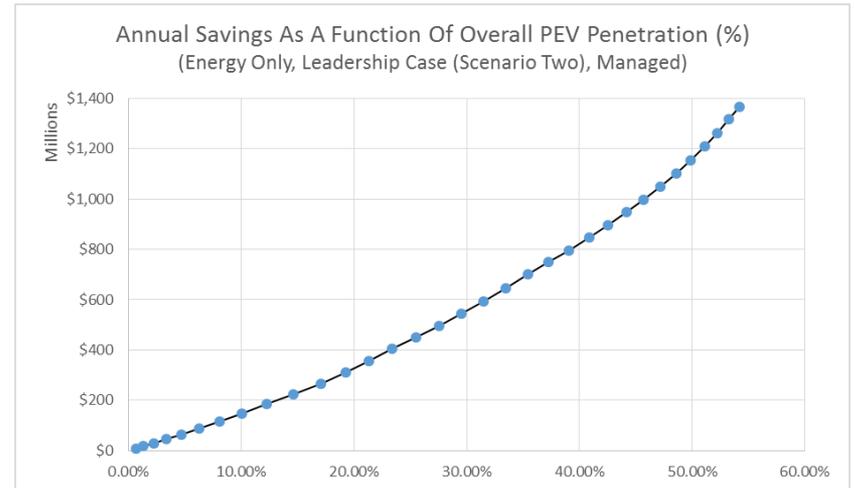
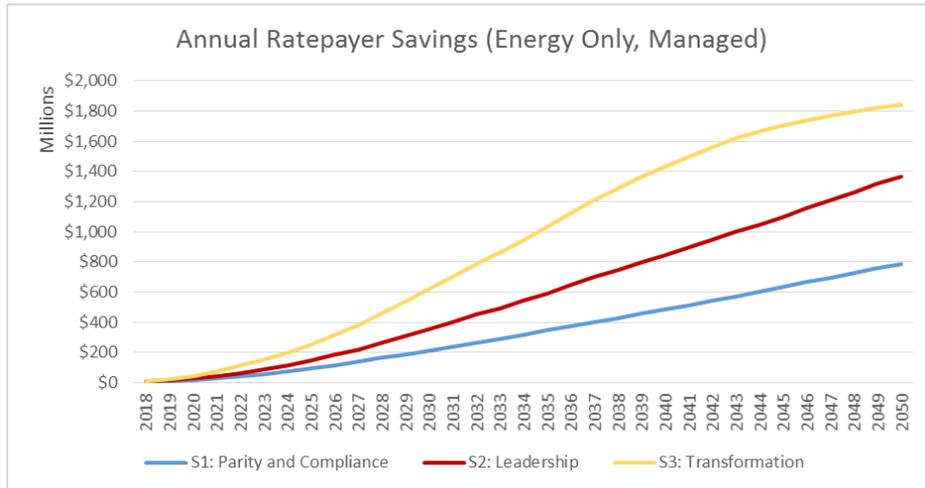
Short Dwell Time  
(Public Users)

- **Key Economic Impact Dynamics**

- Energy Cost Savings (affects all rate payers)
  - Wholesale energy costs go down as a greater fraction of MWHs are in cheaper off-peak times
  - Fixed costs (capacity, transmission, distribution) dilute as MWHR volume increases
  - Energy cost impacts could increase substantially if V2G capabilities used to shave peak load
  - Actual impact on rates will depend on numerous other factors (contracts, tariff design, etc)
- Social Cost Of Carbon Savings Scale With Reduced CO2 emissions (affects society overall)
  - Based on federal SCOC factors applied against CO2 emissions only
- Operating Expense Reductions For PEV Drivers (maintenance and fueling)
  - At today's prices, 4.49 cents/mile for electricity (BEV), vs 10.67 cents/mile for gasoline

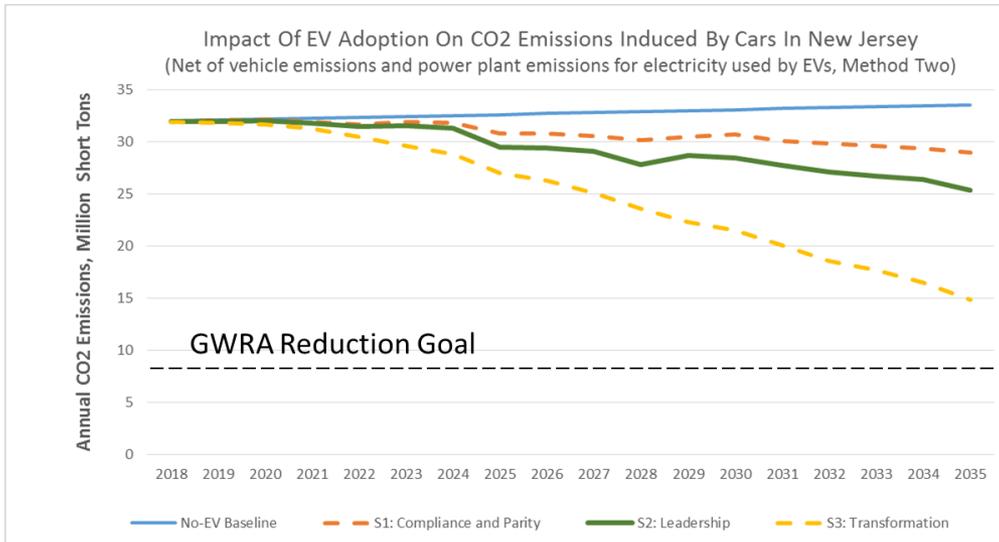
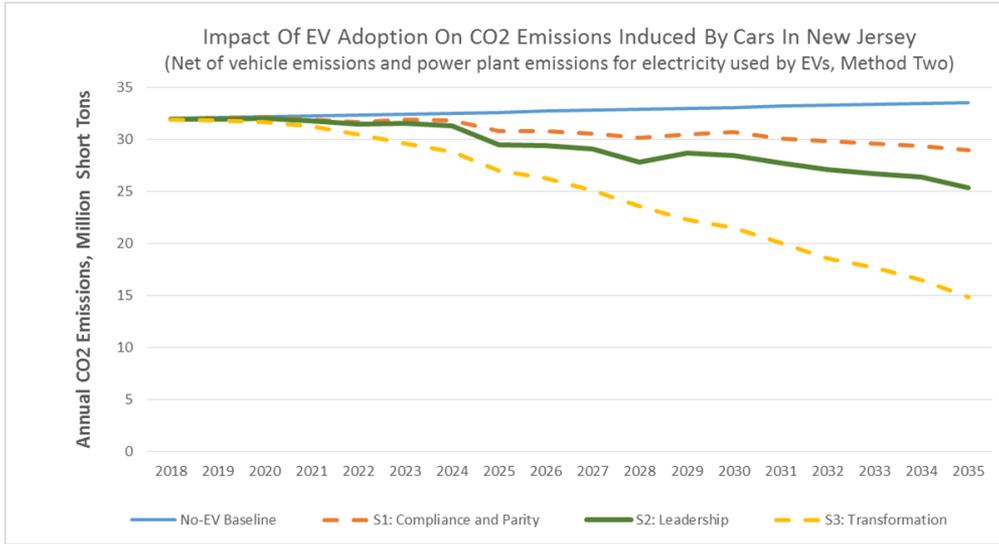


- **Ratepayer Savings Are Substantial, Even When Considering Only Energy Impacts**
- **Benefits Scale Strongly With PEV Adoption Level**
- **Managed Charging Increases Economic Benefit Over Natural Charging**
- **These Impacts Are Realized By All Ratepayers**



- **Economics Are Still NET POSITIVE After Accounting For Estimated Costs**
  - Roadmap Costs (\$550M)
    - Vehicle purchase rebate (\$300M)
    - DCFC Network (\$100M)
    - Other L2 Programs (\$150M)
  - System Impact Costs (upgrade all 1-Ph xFrmrs, \$2.2B)
    - Note: system reinforcement can potentially deliver benefits beyond handling EV-load
- Energy Only Net Savings (Scenario Two, Managed) Through 2035:
  - \$4.34B Nominal Sum, \$1.96B NPV
  - These benefits apply to ALL Ratepayers and continue to increase through 2050
- Net Benefit Increases If Non-Energy Economic Benefits Included

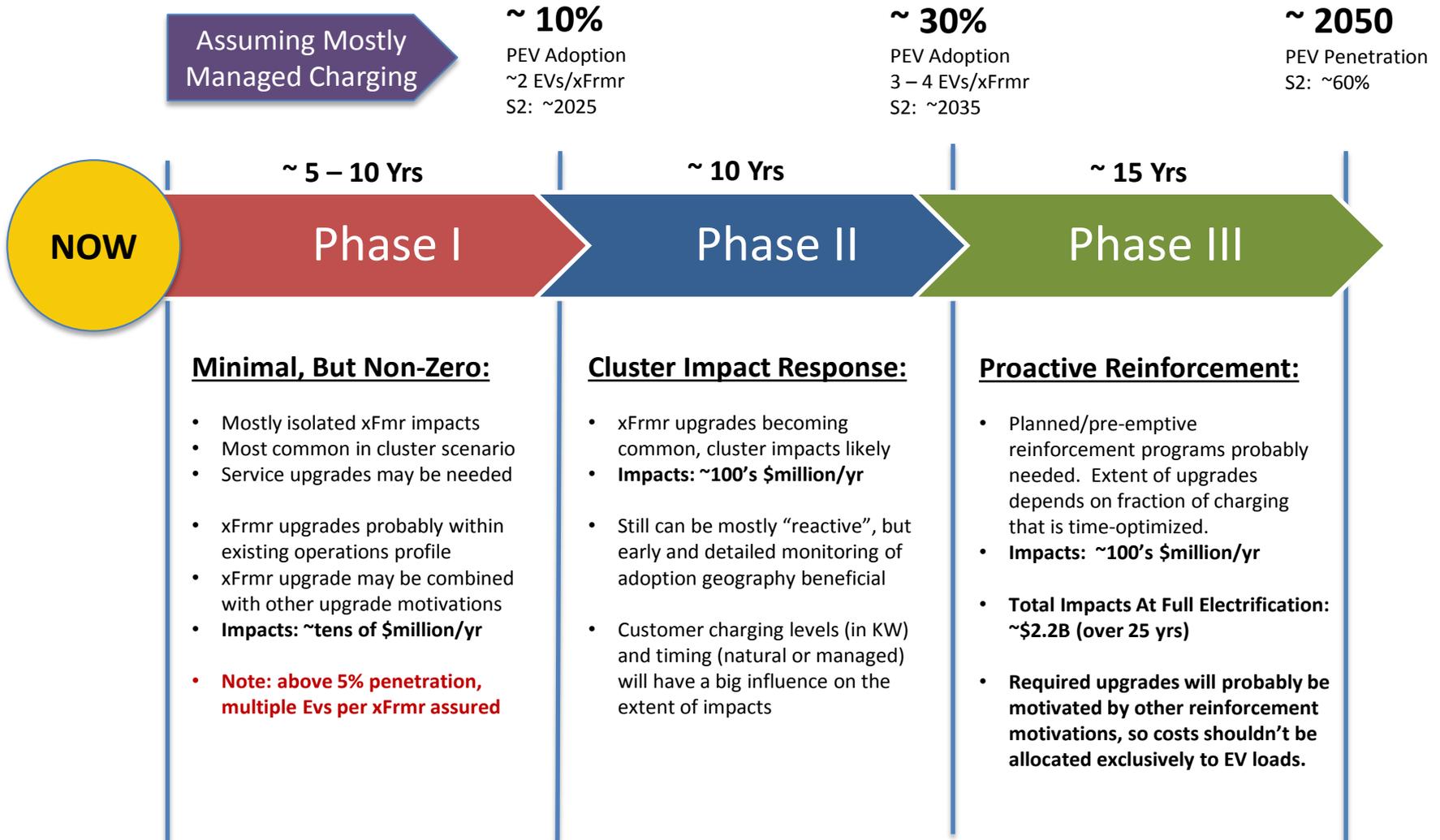
# Findings: CO2 Impacts (transportation only)



## Significant Reductions In Net CO2 Emissions

- No significant difference between managed or natural charging schedule results
- Method Two shows slightly higher beneficial impact
- By 2040, For Roadmap Case (S2, M2):
  - CO2 reduced by 33% wrt baseline in 2040
  - CO2 reduced by 29% wrt baseline in 2018
- For GWRA Goals:
  - Gas CO2 emissions must reduce to 8.4M tons
  - By 2050 (using method two):
    - S1: 28.1 M tons
    - S2: 21.7 M tons
    - S3: 10.3 M tons
    - These results assume BAU generation
  - **Transition to Scenario Three AND further Grid De-Carbonization Needed To Achieve Full GWRA Goals**

# Findings: Infrastructure Impacts



- **Completing Member Review And Internal QA On Study Report**
- **Currently Expecting To Publish Full Report In Mid-December**
- **Follow-Up Activity To Advocate For The Roadmap Program, And Support Members That Are Developing Associated Programs**
- **Numerous Areas For Follow-Up Research Under Discussion**