Study Results Preview
December 14, 2017

Mark Warner
Vice President
Advanced Energy Solutions
Gabel Associates
Study Goals And Scope

• The “NJ EV Market Study” Provides A Foundation For The ChargEVC Roadmap

• 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
  ➢ Explored EV implications through the lens of energy market impacts
  ➢ Detailed Market Simulation Model Based On NJ Parameters
  ➢ Evaluate economic impacts
  ➢ Evaluate environmental impacts
  ➢ Specifically consider “natural” and “managed” vehicle charge scheduling
New Jersey Lags Other Adoption-Leaders By Almost A Factor Of Two
Findings: Highlights

Finding Highlights:

• Untapped Opportunity, Potential For Growth In New Jersey
  ➢ New Jersey could increase its EV adoption by a factor of TWO to FOUR

• Full Economic Benefits Portfolio
  ➢ EV adoption changes grid loading, resulting in significant economic benefits for ALL RATEPAYERS
  ➢ Energy cost efficiencies will deliver as much as $4.3B by 2035 under “Scenario Two”, increasing to $19.4B by 2050
  ➢ At current prices, it costs 10.67 cents/mile to fuel with gasoline, 4.49 cents/mile to “fuel” with electricity
  ➢ New Jersey drivers will save an estimated $16.7B on vehicle operating expense through 2035 (Scenario Two)
  ➢ The “Social Cost Of Carbon”, using federal metrics, represents $5.6B of additional savings through 2035 (Scenario Two)
  ➢ NET Benefits, after accounting for estimated costs, are also strongly positive (>2B by 2035, Scenario Two, Managed)

• Environmental Benefits
  ➢ Every electrically fueled mile is 69% - 79% cleaner than an average gasoline fueled mile
  ➢ Both CO2 and NOx are reduced dramatically with increased EV use, necessary to achieving state goals (GWRA, NOx)
  ➢ Improvements in air quality directly affect public health, especially in the urban core and along high-travel corridors

• Significant Implications For Infrastructure And Utilities
  ➢ Utility will realize increased revenues, cost efficiencies, and strategic opportunities for load shaping
  ➢ Past 5-10% penetration, grid reinforcement will be necessary, supports other modernization efforts
Findings: Gross Economic Impact

EV Benefits Continue To Grow With Adoption, 2050 Benefits 4X 2035 Benefits

- Most of the energy cost efficiencies are delivered through reduced wholesale energy prices, and scale strongly with EV penetration.
Findings: CO2 Impacts
(transportation only)

- Scenario Two Reduces CO2 emissions 24.4% by 2035, a reduction of 40.1% by 2050

- For GWRA Goals:
  - Gas CO2 emissions must reduce to 8.4M tons
  - By 2050:
    - S1: 28.1 M tons
    - S2: 21.7 M tons
    - S3: 10.3 M tons
    - These results assume “business as usual” generation

Reductions Are Greater If The Grid Is Further Carbonized, And A Cleaner Grid, Are BOTH Required To
Findings: Infrastructure Impacts

- **PEV Adoption**
  - **S2: ~2035**
  - **S2: ~2025**

- **PEV Penetration**
  - **~ 10%**
  - **~ 30%**
  - **~ 2050**

**Assuming Mostly Managed Charging**

- **NOW**
  - **~ 5 - 10 Yrs**
  - **Phase I**
    - **Minimal, But Non-Zero:**
      - Mostly isolated xFmr impacts
      - Service upgrades may be needed
      - xFmr upgrades probably within existing operations profile
      - **Note:** above 5% penetration, multiple Evs per xFmr assured
      - MANAGED CHARGING makes a big difference on when, and to what extent, impacts emerge

- **~ 10 Yrs**
  - **Phase II**
    - **Reinforcement Response:**
      - xFmr upgrades becoming common, cluster impacts likely
      - Initially mostly reactive, but transition to more proactive reinforcement.
      - **Grid will need to be fully reinforced by 30% penetration.**

- **~ 15 Yrs**
  - **Phase III**
    - **Grid Optimization:**
      - EV loading now a significant fraction of consumption (20-30%). Can be used to optimize load shape.
      - Necessary grid reinforcements may be motivated by other factors (aging, loading, etc), and can be synergistic with other upgrades.

**Widespread EV Adoption, Combined With Smart Grid Integration, Are An Unprecedented Opportunity For Modernization And Load Optimization.**