Presentation to the LIPA Board of Trustees

Electric Vehicles: Study Results And Utility 2.0 Program Enhancements

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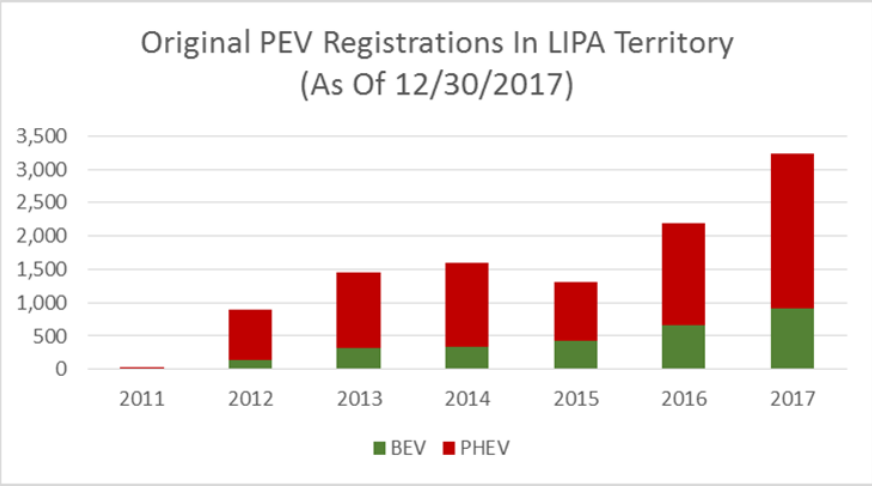
Introduction and Agenda

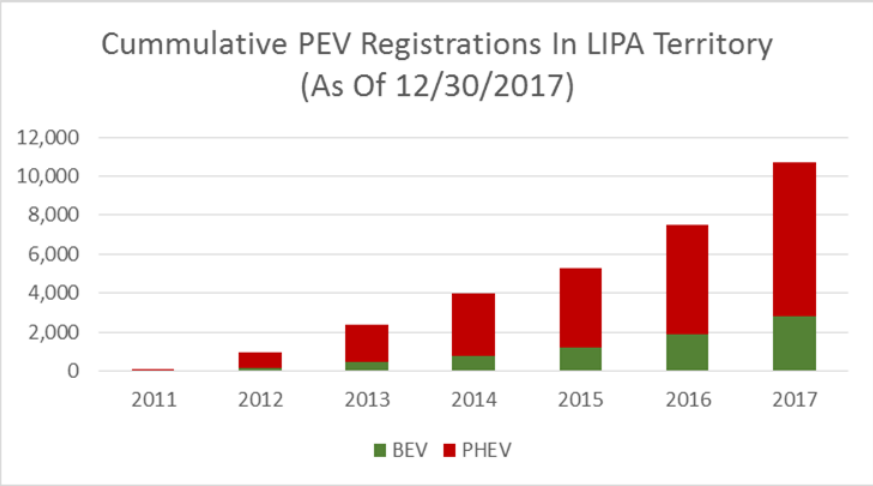
- **Planning Objective:** Explore opportunities for EV market development, quantify benefits and costs for LIPA customers, and identify options for utility engagement.

- **Review Of Key Study Findings**
  - Long Island Market: Current Conditions
  - EV adoption Scenarios
  - Benefits: Economics and Emissions
  - Distribution System Impacts
  - Potential Costs and NET Benefit analysis
  - Utility Implications Over Time

- **Utility Engagement:**
  - Utility Role Vs. Actions By Others
  - Proposed Program Plans (as part of Utility 2.0)

Key Findings: Long Island Market Conditions





- LIPA Residents Buy About 22% Of The Cars In NY State, But 30%-35% Of The Plug-In Electric Vehicle (PEVs) over the last 3 years

- NY Roadmap Goals For Long Island By 2025:
  - 120K PEVs (scaled by population), OR
  - 176K (scaled by vehicle ownership)

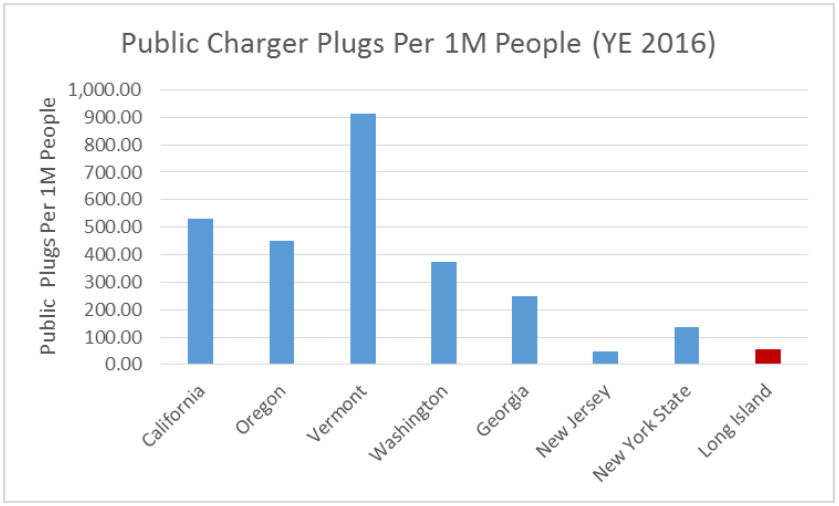
These Adoption Levels Are Achievable If The Growth Evident The Last Two Years Is Sustained, Resulting In ~20K PEVs Sold In 2025.

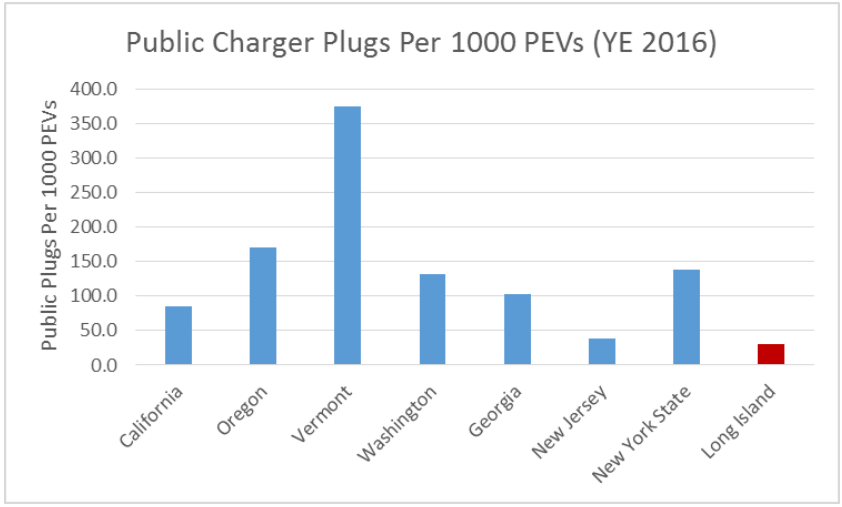
- Based on benchmarking with other leading states, there is probably untapped potential for accelerated EV growth on Long Island

Key Findings: Long Island Market Conditions

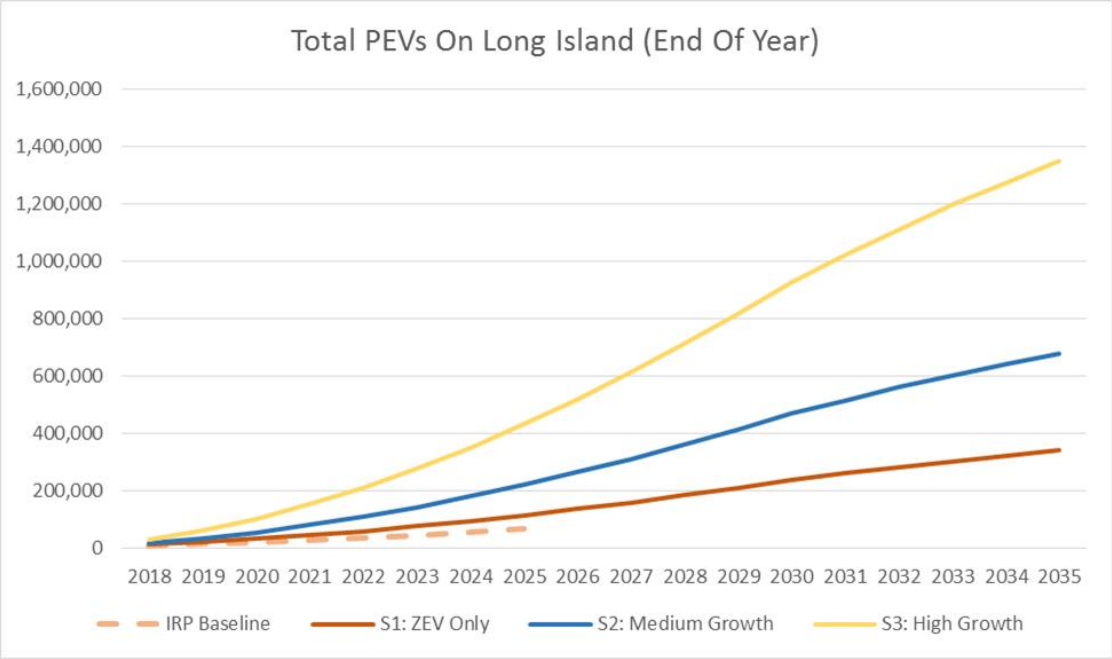
Infrastructure deployment particularly weak on Long Island compared with market leaders

< A Strong Opportunity For Market Development And Utility Engagement >





Key Findings: Long Island Adoption Scenarios



High Growth: Not Yet Within Reach

Medium Growth: Aggressive, But Achievable With Market Development Investment. Parity With Market Leaders.

ZEV Growth: Consistent With Historical Trend, State Goals, Already Close To Achieving.

	2025			2035		
Market Summary	**Scenario One**	**Scenario Two**	**Scenario Three**	**Scenario One**	**Scenario Two**	**Scenario Three**
Number New PEVs Sold	20,140	40,280	80,560	33,396	66,792	133,583
Percent Of New Sales That Are PEV	11.33%	22.67%	45.33%	23.00%	46.00%	92.00%
Number Of PEV Vehicles In Fleet (End Of Year)	116,377	222,184	433,798	341,993	680,301	1,350,033
Percent Of Fleet That Are PEVs (End Of Year)	5.37%	10.25%	20.02%	15.83%	31.48%	62.47%
Percent Of Miles That Are Electrically Fueled	4.44%	8.46%	16.49%	15.31%	30.42%	60.37%

Key Findings: Benefits

NET Savings: $2.9 B (NPV)

(Societal Cost Test, Thru 2035)

	EV Owner	Utility Customer	Society At Large	
				
Vehicle "Fuel" Savings (fueling costs cut drop (7.7 vs 11.2 cpm))	✓		✓	$1.5 B
Lower Electricity Costs (dilution and other effects)	✓	✓	✓	$587 M
Reduced Air Pollution (electrically fueled miles ~82% cleaner)	✓	✓	✓	$710 M

(PV, Thru 2035)

Benefits Increase Strongly With Adoption, Faster EV Growth Means Bigger/Faster Benefits

Key Findings: Distribution System Impacts

Impacts Are Manageable Short Term, But Impacts On Distribution Assets Will Eventually Emerge, And Grow Quickly, At Even Modest Levels Of Adoption:

- Each EV adopted increases residential consumption (kwhrs) by ~25% (average consumer)
- With two cars in many homes, full electrification has the same impact as increasing the number of homes on the distribution system by over 50% (on energy)

- Base case (7 homes, 35.7KVA), **max of 2 EVs (14% penetration) natural, or 9 EVs (64%) managed charging**

- **Key Threshold: when the number of EVs exceeds the number of secondary transformers (~6% PEV adoption), simultaneous charging sessions per transformer become likely, upgrades necessary**
- **AMI meters will help determine when to replace service transformers**

Key Conclusion: Managed Charging Is Highly Beneficial: Helps Defer and Reduce Grid Impacts (by ~ 4X), Increases RatePayer Electricity Cost Savings ~30%. And This Is A Unique And Reasonable Area For Utility Engagement.

Key Findings: Timing Of System Impacts

Assuming Mostly Managed Charging

~ 10%
PEV Adoption
S2: ~2025

~ 30%
PEV Adoption
S2: ~2035

~ 2050
PEV Penetration
S2: ~60%

NOW

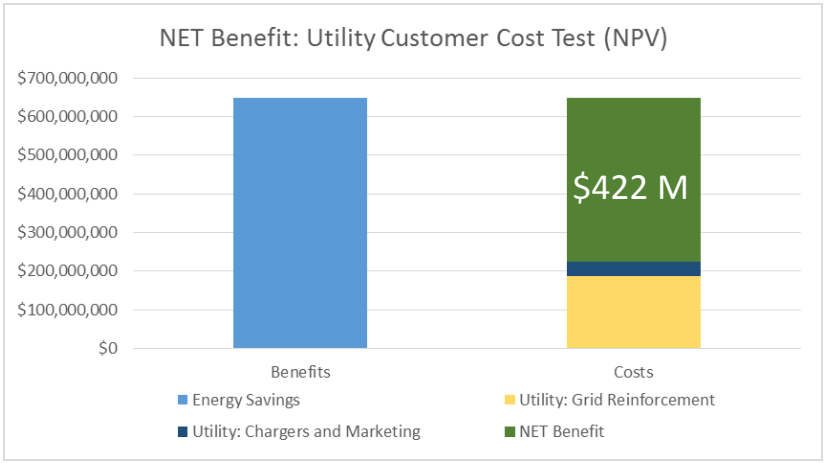
	~ 5 – 10 Yrs	~ 10 Yrs	~ 15 Yrs
	Phase I	**Phase II**	**Phase III**
	Minimal, But Non-Zero:	**Reinforcement Response:**	**Grid Optimization:**
	• Mostly isolated xFmr impacts • Service upgrades may be needed	• xFrmr upgrades becoming common, cluster impacts likely	• EV loading now a significant fraction of consumption (20-30%). Can be used to optimize load shape.
	• xFrmr upgrades probably within existing operations profile	• Initially mostly reactive, but transition to more proactive reinforcement. Tranformer upgrades likely $20-$30M/yr	• **Necessary grid reinforcements may be motivated by other factors (aging, loading, etc), and can be synergistic with other upgrades.**
	• **MANAGED CHARGING makes a big difference on when, and to what extent, impacts emerge**	• **Grid will need to be fully reinforced by ~30% penetration.**	

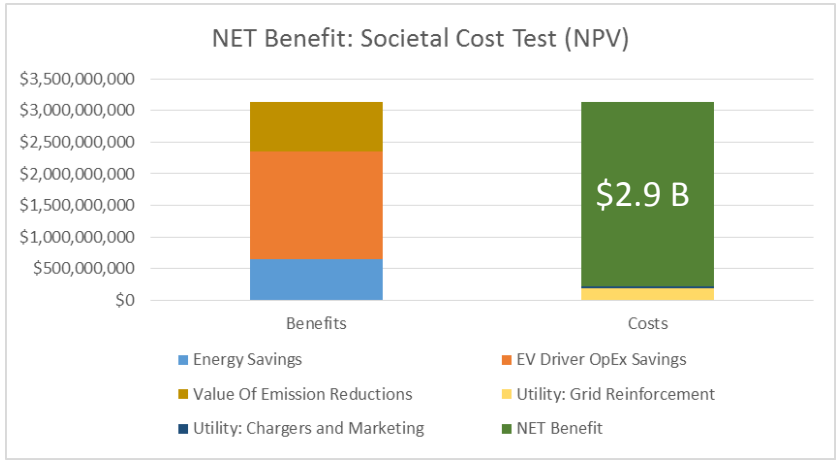
Widespread EV Adoption, Combined With Smart Grid Integration, Are An Unprecedented Opportunity For Modernization And Load Optimization.

Key Findings: NET Economic Impact

- **Two NET Benefit Tests (2018 – 2035)**
  - **Utility Customer Impact Test:** Utility investments balanced against savings that accrue to ratepayers through rates
  - **Societal Benefit Test:** Broader consideration of benefits, including savings for EV drivers and environmental value

- **Cost Assumptions (more details to follow):**
  - Proposed $25M market development program, plus an additional $25M placeholder assumed in following years
  - Grid reinforcement investments, focused on single phase transformers ($354M sum, $189M PV, 2023-2035)





Note: NET results for Scenario Two, Managed Charging, 2018 – 2035
Note: Societal benefit test doesn't consider other costs that might apply (non-utility charging infrastructure costs, vehicle purchase premiums, costs of other state programs (rebates, etc))

Key Findings: Summary Of Results

- New vehicles make mainstream adoption possible, PEV market beginning to grow, primary barriers to expanded growth include **charging infrastructure, affordability, and consumer awareness**
- PEV sales on Long Island are strong, but there is probably "untapped potential" for higher growth in NY (and long island) if adoption barriers addressed

- Basic ZEV-compliance assumptions already built into the IRP, requires very modest utility involvement short term
- If more aggressive EV-growth desired, the "leadership path" is possible with market development investments by the utility and others
- **Opportunity for strong utility role in market development, especially for charging infrastructure, but also depends on significant action by others**

- Vehicle electrification increases utility revenue, could save rate payers money, reduces operating expense for EV drivers, and reduces emissions
- Vehicle electrification highly strategic for utilities: increased volume and revenue, load optimization, potentially new roles for the public utility
- **There are NET economic benefits for proposed programs, benefits exceed proposed costs**

- Minimal system impacts short term, but loading conditions will emerge relatively quickly once multiple EVs per local transformer become common (~6% adoption), sub-station impacts longer term
- **Managed charging programs can have a large impact on reducing and deferring load impacts**

Expanded EV Program In Utility 2.0

- **Key Objectives For Utility Engagement:**
  - Ensure responsible grid integration, address key consumer adoption barriers
  - Serve unmet needs the competitive market can't (or won't)
  - Focus on offerings where utility is uniquely able to add value

- **NY State Programs Already In Place:**
  - ZEV opt-in, state goals (for vehicles and infrastructure)
  - Vehicle purchase rebate
  - Infrastructure: various incentives from NYSERDA and NYPA
    - ✓ Including strong focus on public DC Fast Charging

- **Priority Program Areas For PSEG-LI (Utility 2.0 filing): $25M 2018 - 2022**

Ensure These Programs Compliment Other State Programs

  - Routine Charging: Residential Smart Charging (managed charging program)
  - Routine Charging: Workplace Charging (may expand to mixed-use as market needs dictate)
  - Range Anxiety: Public DC Fast Charging –
    - ✓ A rate solution that compliments NYPA/NYSERDA programs
    - ✓ Off-bill Incentive: "Set Point" design address low utilization phase and demand charges
    - ✓ Prioritization framework to deploy incentive so that policy goals are achieved
  - Lead by example: PSEG-LI fleet vehicle purchase
  - Consumer awareness building (marketing, outreach, partnerships, etc)