

# Update On SCE Electric Transportation for IEPR Workshop on Transportation Demand

**ADVANCED  
TECHNOLOGY**  
Transmission & Distribution Business Unit



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# EVTC- Auto Grade Batteries In Stationary Applications RD&D



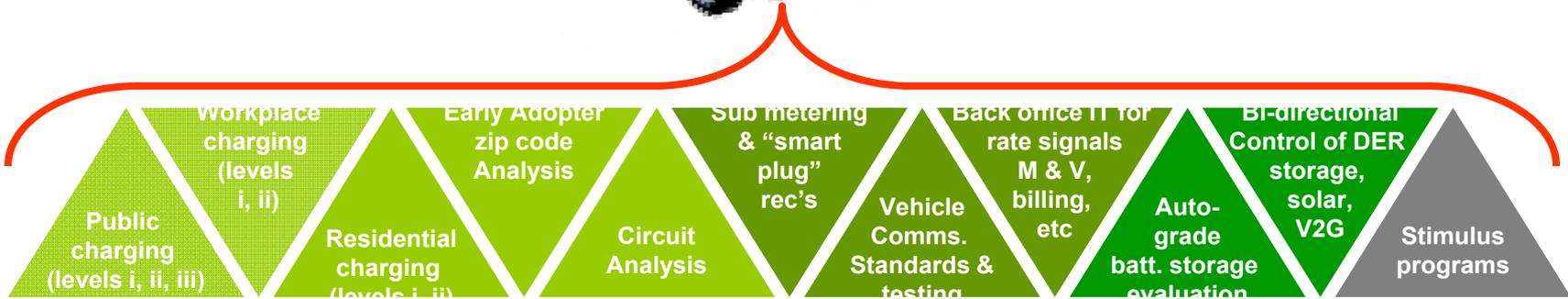
**Long-Term V2H & V2G  
Opportunities through  
Plug-in Electric  
Vehicles**



**Home Energy or  
Community  
Storage up to  
50kWh**

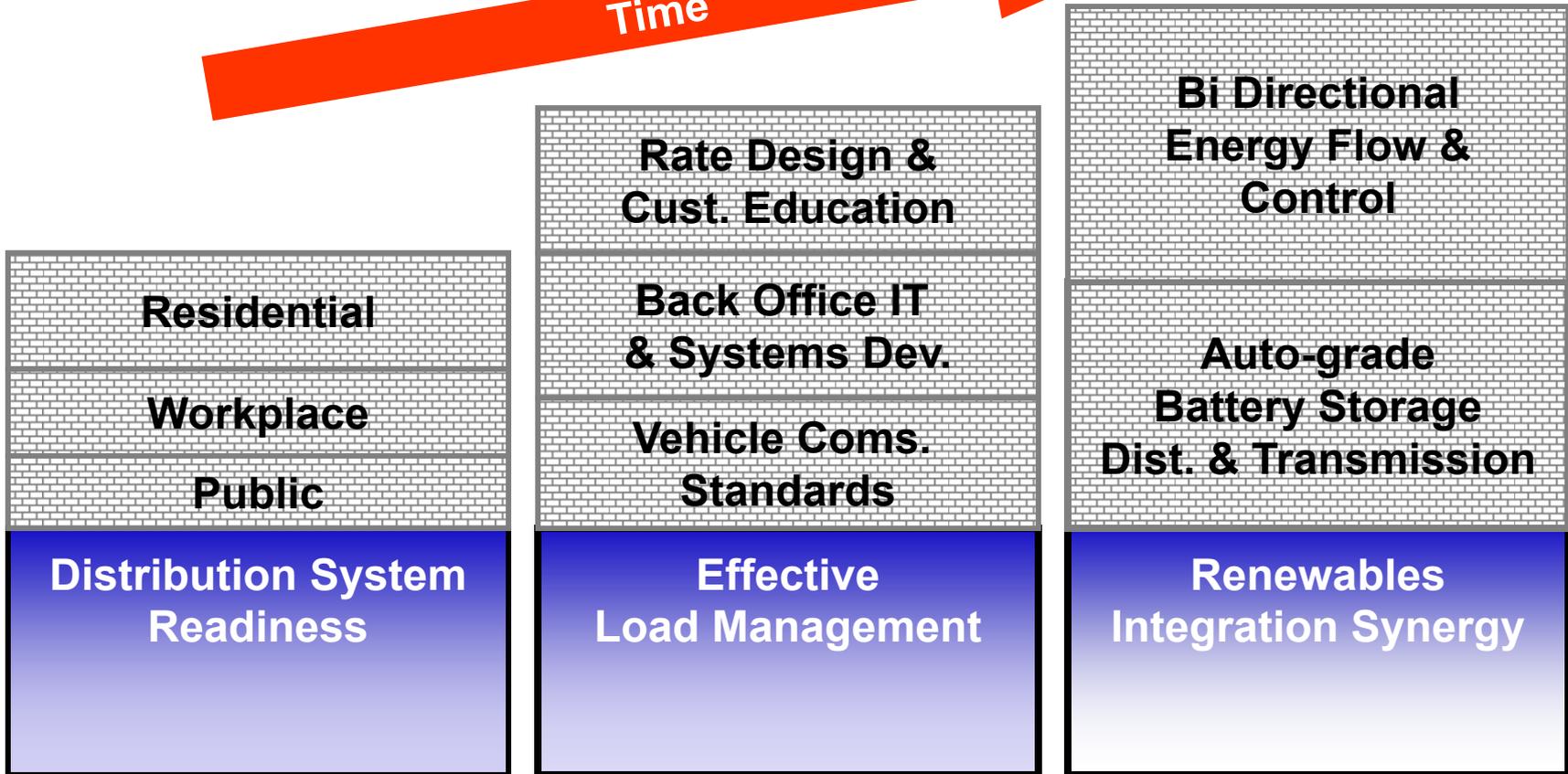


**Larger Central Plant  
Storage > 1 MW**



**SCE's ET Market Penetration Study - volume scenarios, load implications, environmental benefits)**

# The Grid will become smarter



# Summary:

- New ET load off- peak with appropriate rates, control technology & DR programs will help improve the electric system **efficiency** by spreading fixed energy costs over more energy use.
- System **stability** may also be enhanced through communications and control technologies “shaping” ET load to **renewables integration** needs. In addition, “storage capabilities” from both the vehicle and stationary applications will enhance **renewables dispatchability**.
- Storage presents significant potential as utilities comply with future RPS requirements. Effective “control” of **bi-directional energy flow** (solar and mobile/stationary battery storage) presents significant challenges in the near term from an infrastructure and IT perspective.

# ET Deployment Principles

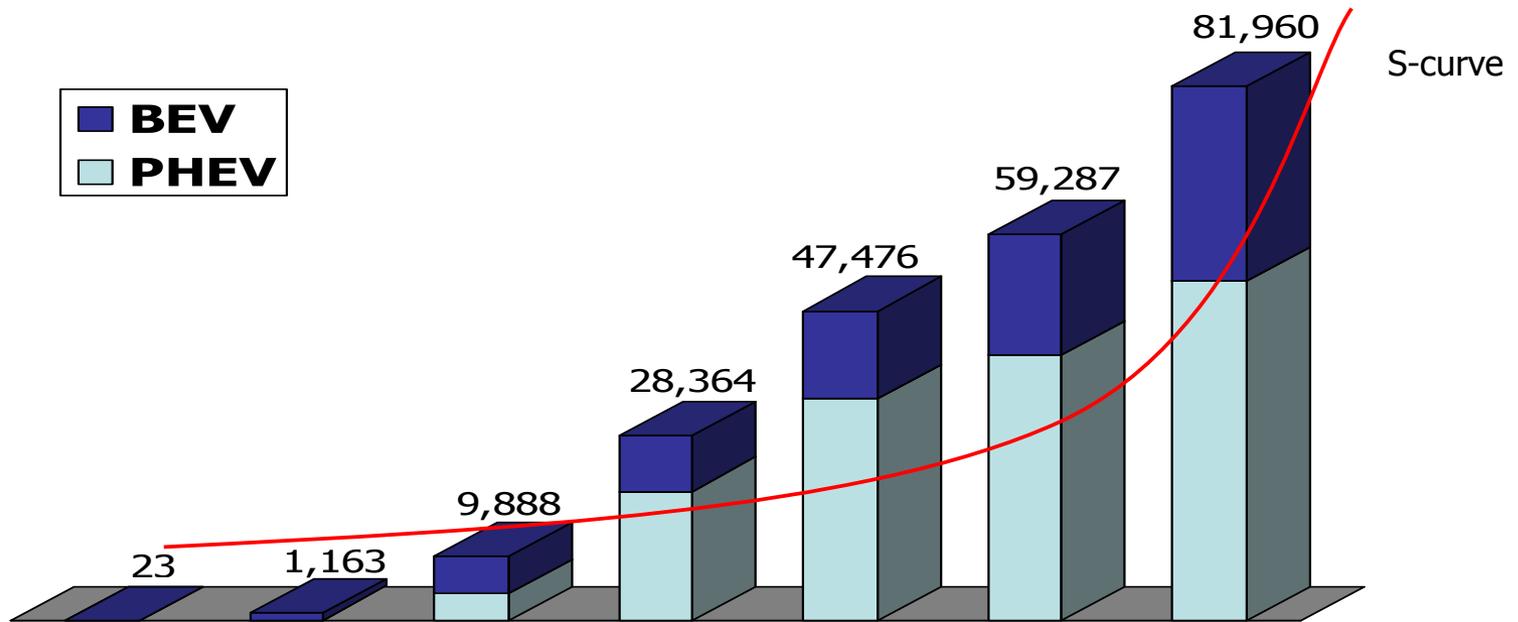
- An orderly, timely, and seamless transition for California consumers from reliance solely on fossil fuel to reliance on a combination of electric fuel and fossil fuel systems
- Maintaining safe, reliable, and environmentally responsible electric service with the increasing presence of ET
- Identification and allocation of costs and benefits associated with increasing ET market penetration and the development of appropriate and reasonable electric rates and incentives for ET
- Implementing effective customer education and outreach programs for the broad automotive industry ET market launch

# A Sense of Urgency

- PHEV and BEV market penetration is happening – NOW!
  - Technological innovation, especially in the field of batteries
  - State and Federal legislation
  - Environmental concerns
  - National security issues
  - Consumer demand
  - Competition between manufacturers
- The influx of PHEVs and BEVs, collectively called plug-in electric vehicles (PEVs), will require significant infrastructure and procedural preparations for California.
- Accurate forecasts of the number of PEVs in the state are critical to strategic preparations for the greater use and prevalence of PEVs

# PEVs in SCE's Service Territory

PEVs begin to impact SCE in 2011. Impacts will first be seen in neighborhood pockets or at businesses with large PEV fleets.



	2009	2010	2011	2012	2013	2014	2015	Total
BEV	0	1,050	5,730	8,515	13,350	18,614	29,947	77,206
PHEV	23	113	4,158	19,849	34,126	40,673	52,013	160,955
% of Total Vehicles in SCE	0.01%	0.01%	0.13%	0.59%	1.13%	1.79%	2.66%	

# SCE's PEVs Market Penetration Assessment - 2020

Total PEV penetrations may reach as high as 16% of total vehicles in SCE's service territory by 2020.

	Technology Split	PEVs Assumption in SCE Service Territory	Estimated PEV Penetrations
<b>High Case</b>	PHEV: 83% BEV: 17%	16% of total vehicle fleet	PHEV: 1.33 Million Vehicles BEV: .27 Million Vehicles <b>Total: 1.6 Million Vehicles</b>
<b>Medium Case</b>	PHEV: 77% BEV: 23%	10% of total vehicle fleet	PHEV: .77 Million Vehicles BEV: .23 Million Vehicles <b>Total: 1.0 Million Vehicles</b>
<b>Low Case</b>	PHEV: 51% BEV: 49%	4% of total vehicle fleet	PHEV: .21 Million Vehicles BEV: .19 Million Vehicles <b>Total: 0.4 Million Vehicles</b>

# SCE Territory: Summary of Emissions Displacement Impacts

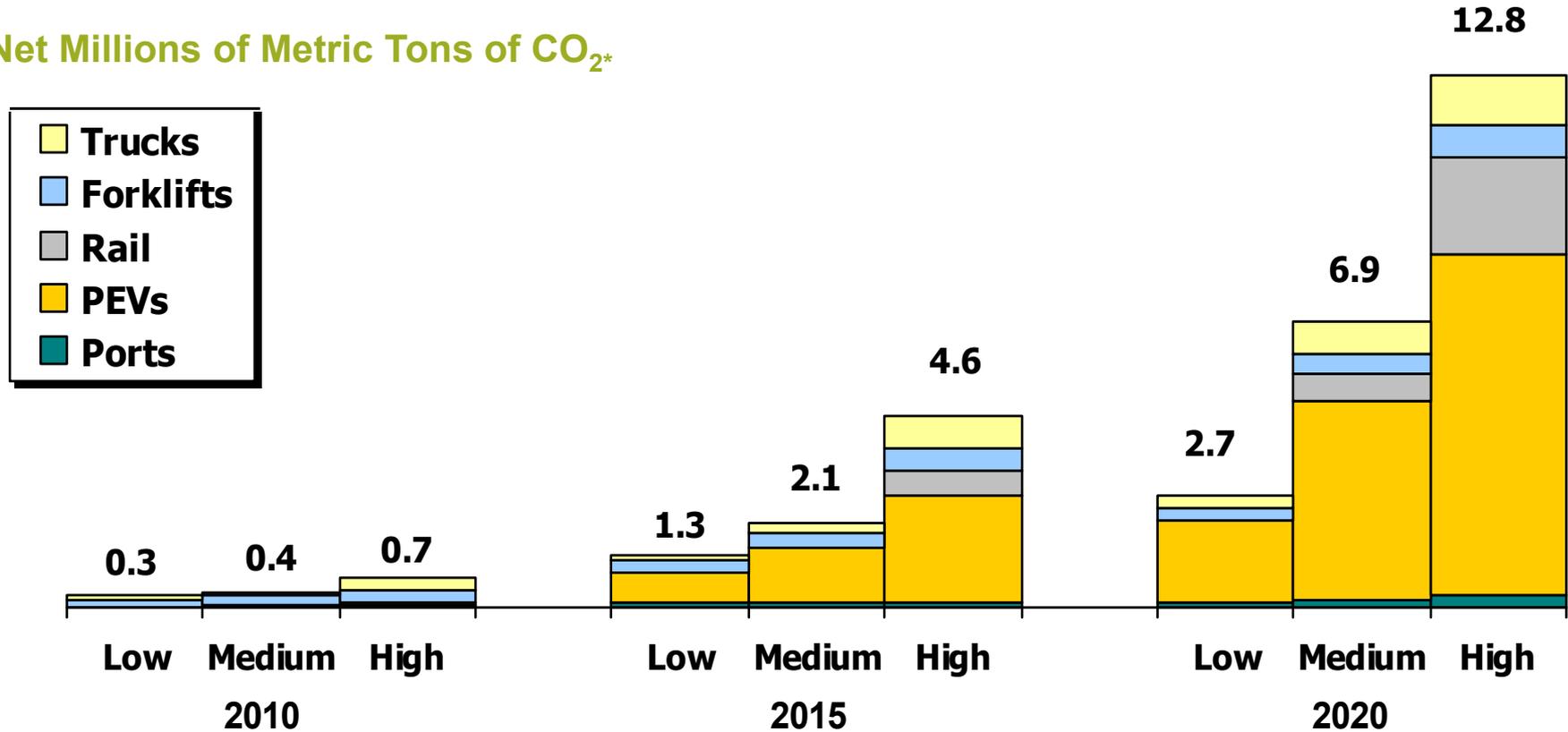
- By 2020, high levels of ET in SCE service territory could achieve significant CO<sub>2</sub> emission reduction. The magnitude of this reduction could be much higher than the potential reduction resulting from an increased Renewable Portfolio Standard. The savings are primarily from PEVs.
- However, this overall societal benefit of emission reduction due to electrification will increase SCE's emissions. The increase equates to about 30% of total societal CO<sub>2</sub> reductions.
- PM10 reductions are primarily due to port electrification and – in later years – rail expansion and electrification.
- In earlier years, Ports and Forklifts account for the greatest NOx reductions, transitioning to PEVs and Rail in 2015 & 2020.

Note: Conclusions are based on an analysis of SCE service territory. Results appear to be scalable to all of California.

# Emission Analysis: Annual Societal Displaced CO<sub>2</sub>

SCE could achieve up to 12.8 MMT of CO<sub>2</sub> savings, primarily from PEVs.

Net Millions of Metric Tons of CO<sub>2</sub>\*



Note: SCE's 2008 annual CO<sub>2</sub> emission = ~ 25 MMT

# Summary of SCE Load Impacts

- ET energy usage may reach as high as 11% of SCE's total load by 2020
- By 2020, Plug-in Electric Vehicles (PEVs) will account for a majority of ET energy usage
- PEV charging without utility involvement may shift SCE's peak hour to 19:00 and increases its peak load by several thousand megawatts
- Assuming perfect load management, SCE could shift charging to off-peak hours, essentially flattening load across the day
- Perfect load management could increase SCE's load factor by as much as 5%

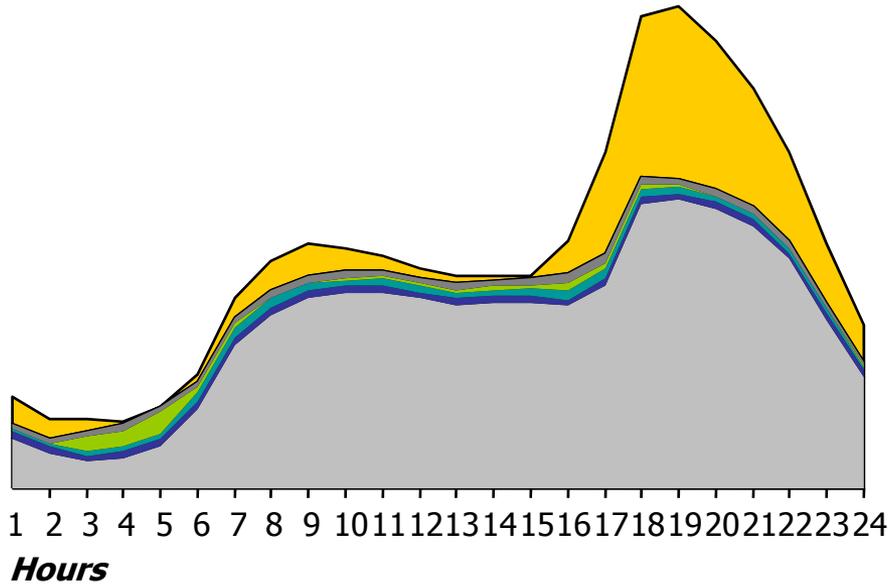
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# 2020 Load Impact Comparisons

Without Load Management

## 2020 Winter Load Impact

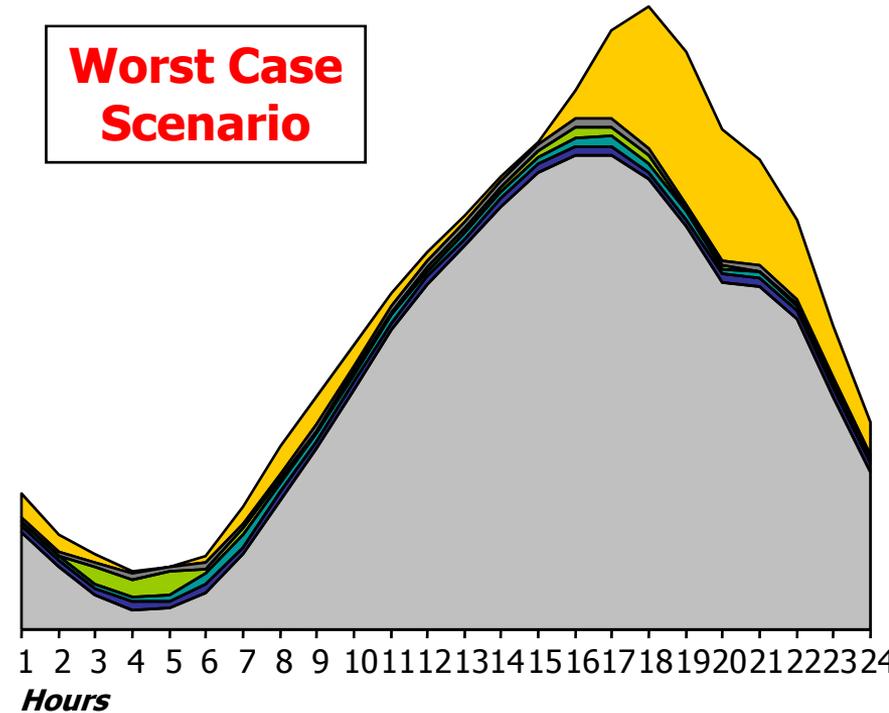
**Worst Case Scenario**



In winter months, PEV charging is coincident with SCE's peak, causing a compounded load impact.

## 2020 Summer Load Impact

**Worst Case Scenario**



In summer months, PEV charging shifts SCE's peak hour to 19:00 while increasing its load significantly.

Initial Load Forecast
  Ports
  Rail
  Trucks
  Forklifts
  PEVs

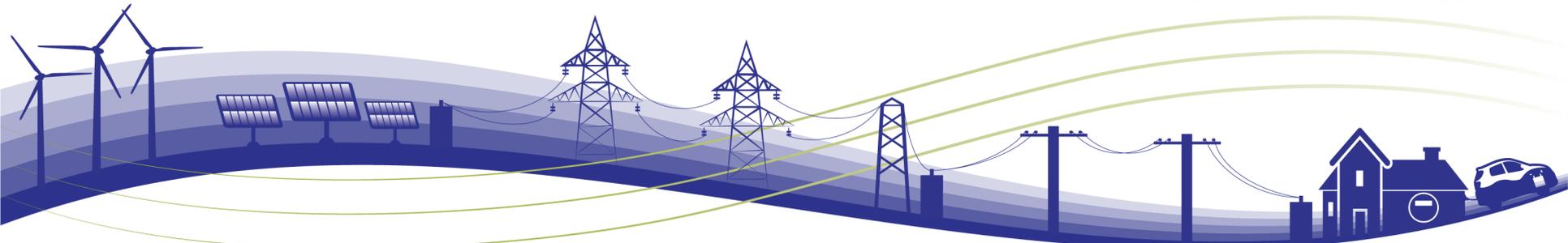
# SCE - Getting Market Ready

- **In depth analysis of market penetration potential in our territories**
- **Participation with early market entrants to gain customer and internal process experience**
- **Executing distribution infrastructure readiness audits which when combined with market penetration analysis can define near and mid term needs**
- **Review of current internal processes and customer education and out reach to develop a plan of action for 2010 education and 2011 market launch**
- **Analyzing vehicles in development to understand charge system needs**
- **Supporting the development of national codes and standards for open source safe reliable vehicle to grid connectivity**
- **Meeting with infrastructure suppliers to review charge system developments and needs versus vehicle production announcements**
- **Developing a description of a public and private charge port infrastructure system to enable near and long term planning**
- **Participating in federal and state policy actions to ensure rate payer value**

# Utility / Stakeholder Collaboration

**Utilities (SCE and municipal utilities) and government agencies will need to work together in order to overcome roadblocks/challenges that may prevent PEV market penetration**

- One Vision: Electric Transportation
  - Seamless transition from fossil fuel to electricity
  - Enhanced consumer experience
  - Grid reliability and enhancement
  - Optimal utilization of generation resources
  - Accurate valuation of GHG and Air Pollution Emissions Reductions
  - Cheaper and Sustainable Transportation
- Enabling Market Growth
  - Regional charging infrastructure planning, funding and deployment
  - Consumer education and outreach
  - Local governments' partnerships and leverage (AB 2766)
  - Streamlined permitting processes
  - Public Safety Education and protocol



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**Thank you**

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