Electric Transportation and Smart Grid
Lake Arrowhead UCLA Conference

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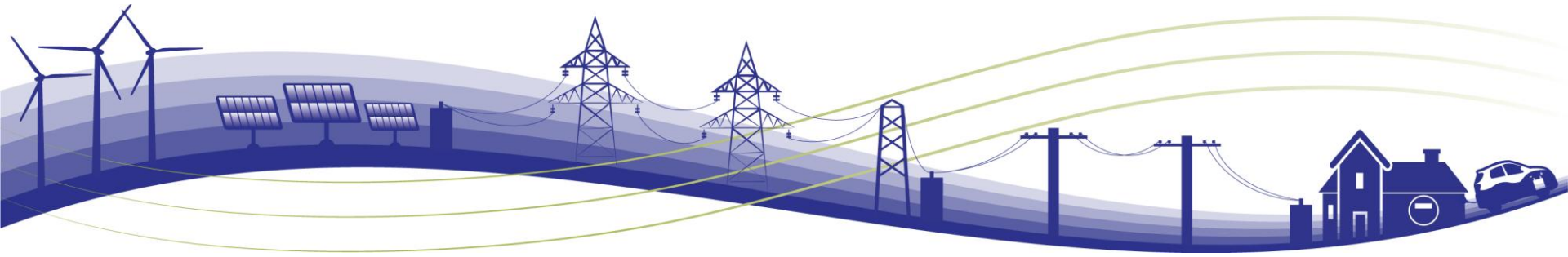

Felix Oduyemi
Senior Program Manager
Policy, Strategy, and Infrastructure
October 18, 2009

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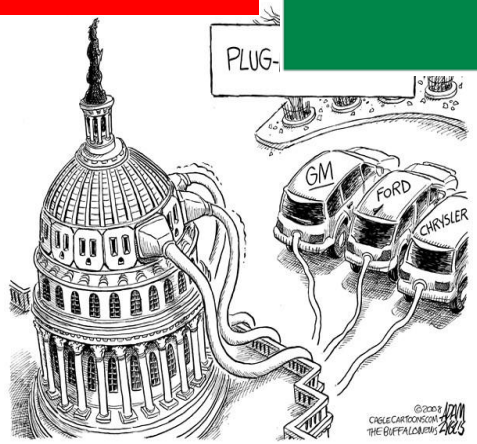
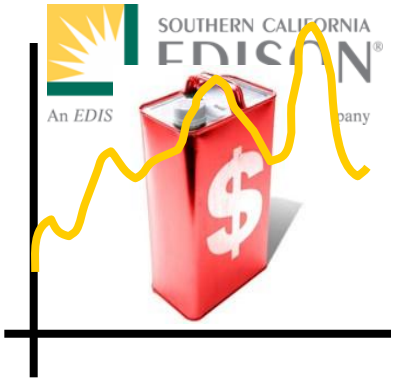
A Perfect Storm…

"We will harness the sun and the winds and the soil to fuel our cars and run our factories."

President Obama, Inaugural speech

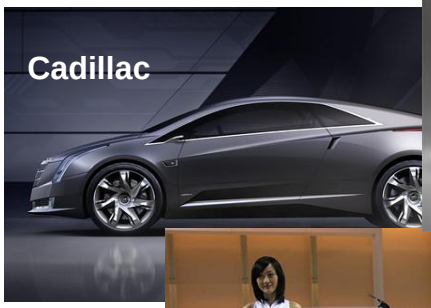


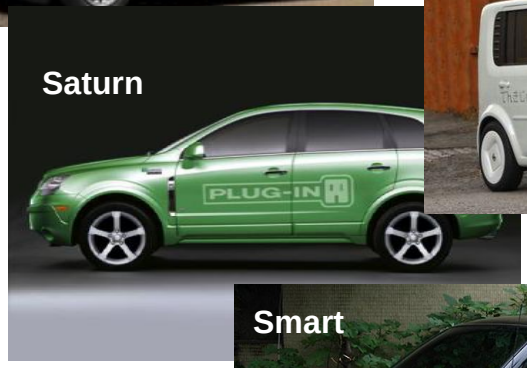


President Obama Directs EPA To Reconsider California's AB 1493 waiver request

PLUG IN AMERICA

FERC Chairman Wellinghoff's priorities- opening electric markets to renewables, promoting energy efficiency and plug-in hybrid cars, promoting efficiency in energy infrastructure and system integration





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

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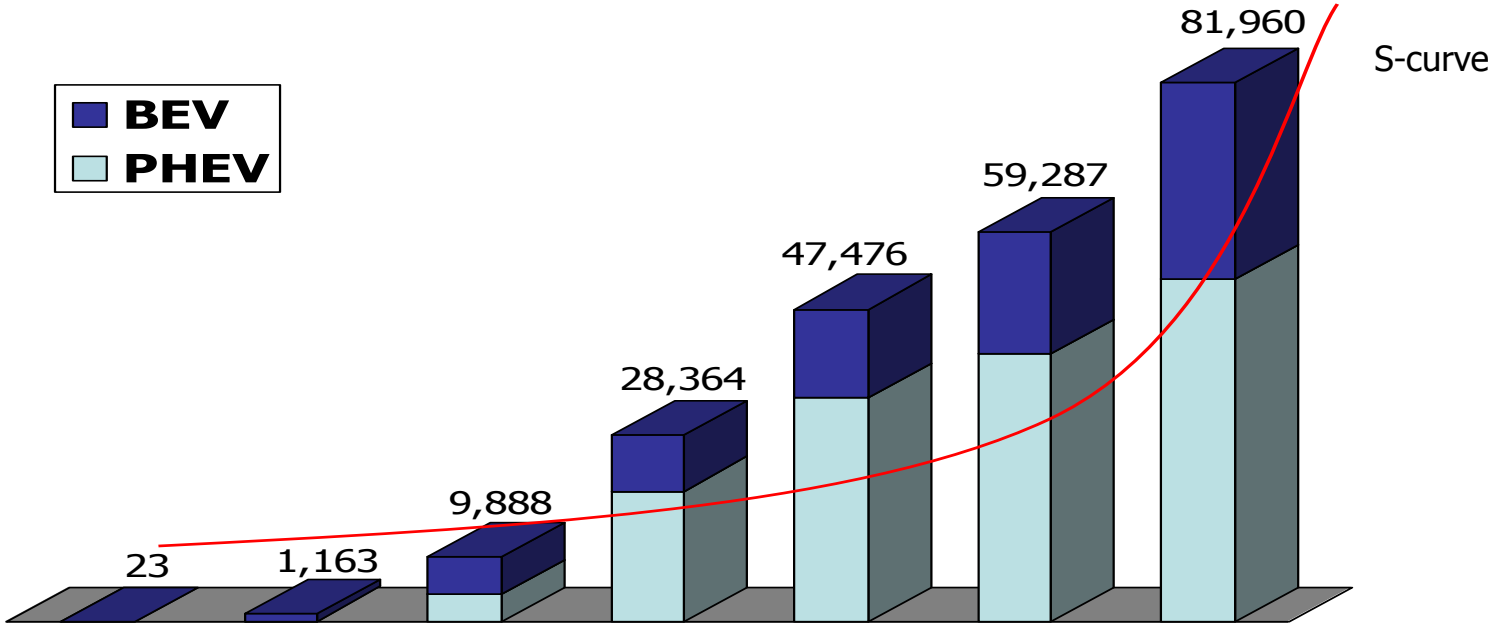
PEVs begin to impact SCE in 2011. Impacts will first be seen in neighborhood pockets or at businesses with large PEV fleets.



	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%	

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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

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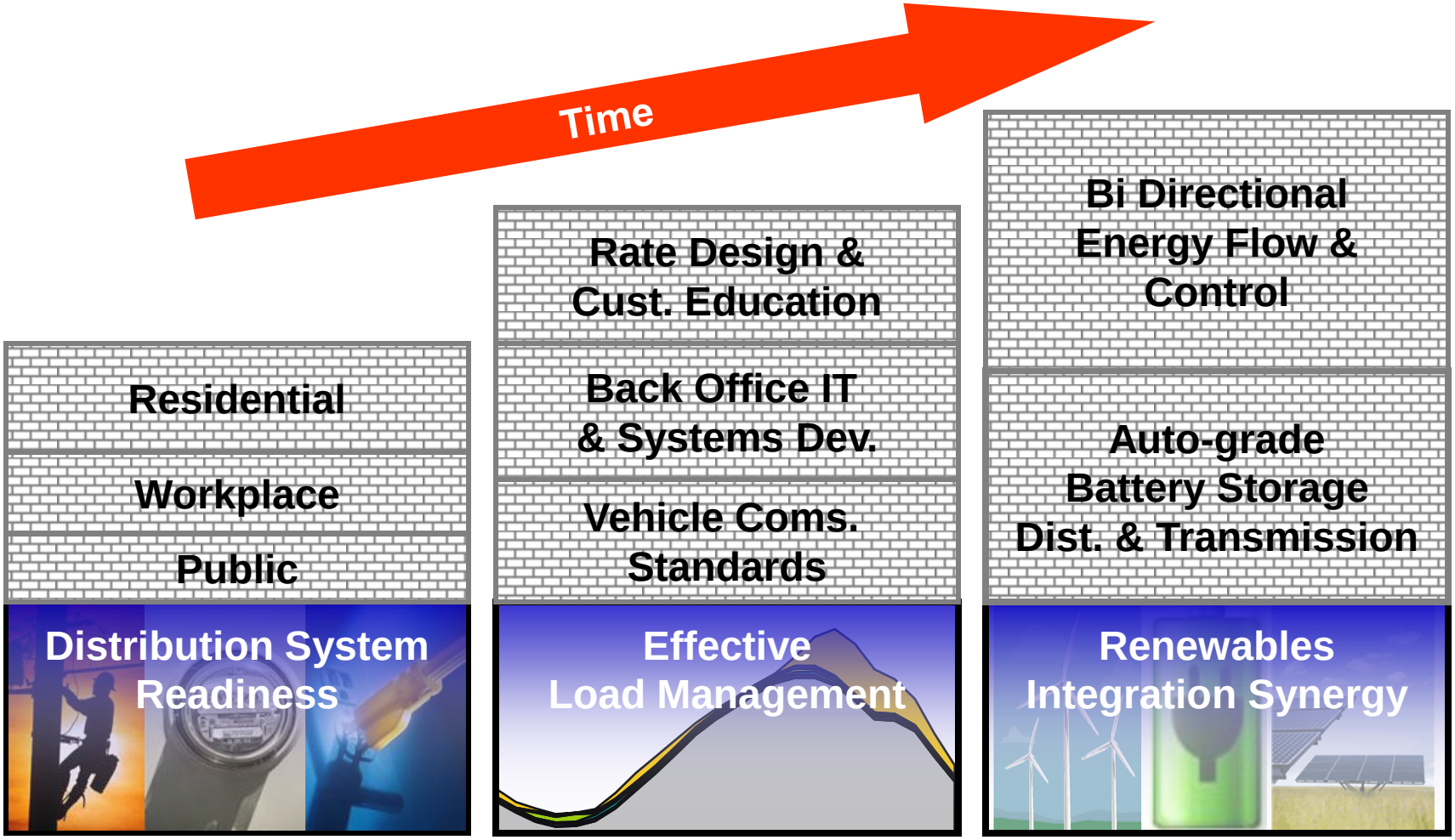
Benefits of electric Transportation

- **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 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.**

The Grid will become smarter



SCE's PEVs Market Penetration Assessment - 2020

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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
High Case	**PHEV: 83%** **BEV: 17%**	**16%** of total vehicle fleet	PHEV: 1.33 Million Vehicles BEV: .27 Million Vehicles **Total: 1.6 Million Vehicles**
Medium Case	**PHEV: 77%** **BEV: 23%**	**10%** of total vehicle fleet	PHEV: .77 Million Vehicles BEV: .23 Million Vehicles **Total: 1.0 Million Vehicles**
Low Case	**PHEV: 51%** **BEV: 49%**	**4%** of total vehicle fleet	PHEV: .21 Million Vehicles BEV: .19 Million Vehicles **Total: 0.4 Million Vehicles**

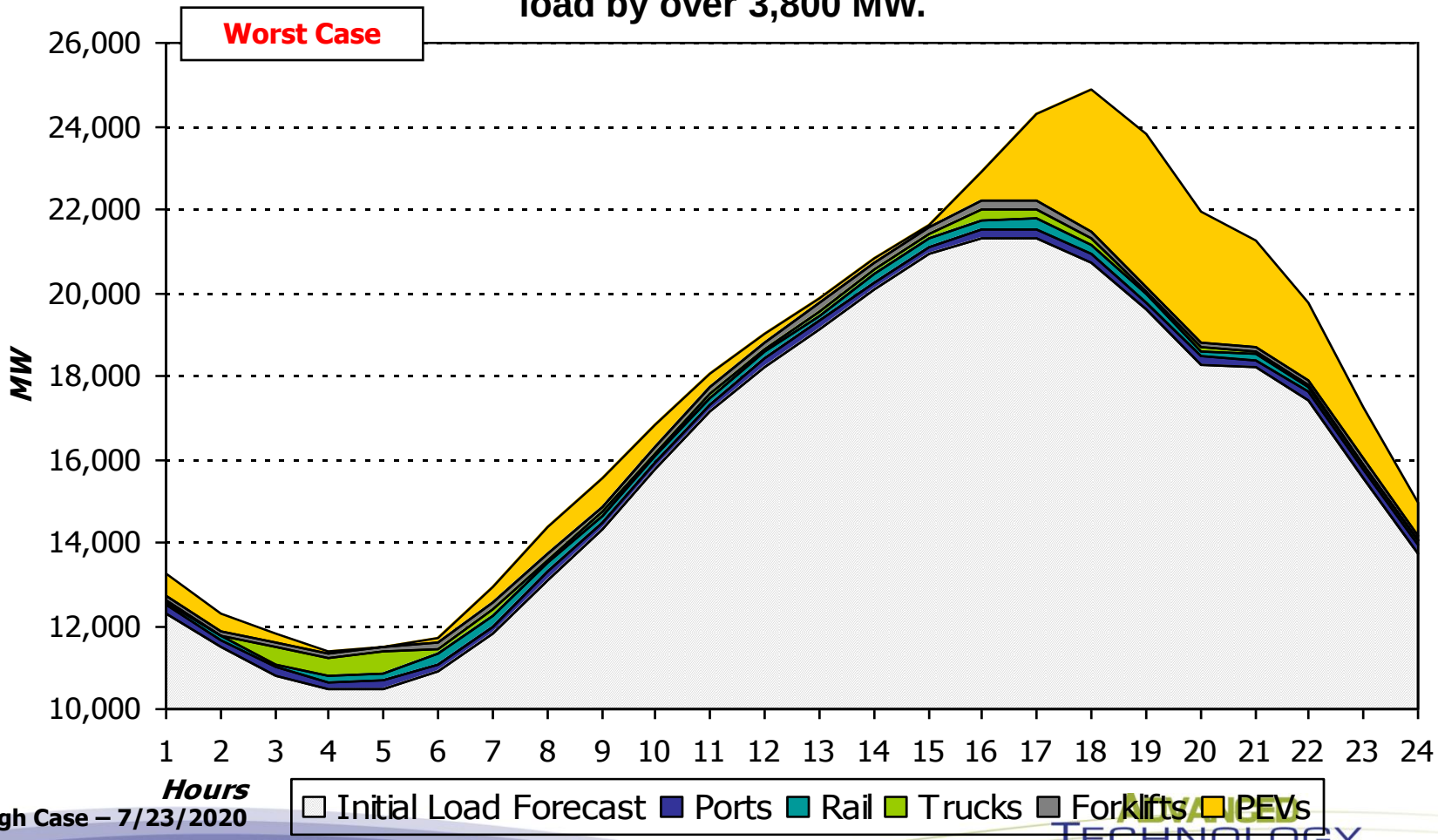
Summary of SCE Load Impacts

- 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%

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

SCE ET Mainstreaming Project- 2020 Summer Load Impact w/ No Utility Involvement*

In summer months, PEV charging shifts SCE's peak hour to 19:00 while increasing its load by over 3,800 MW.



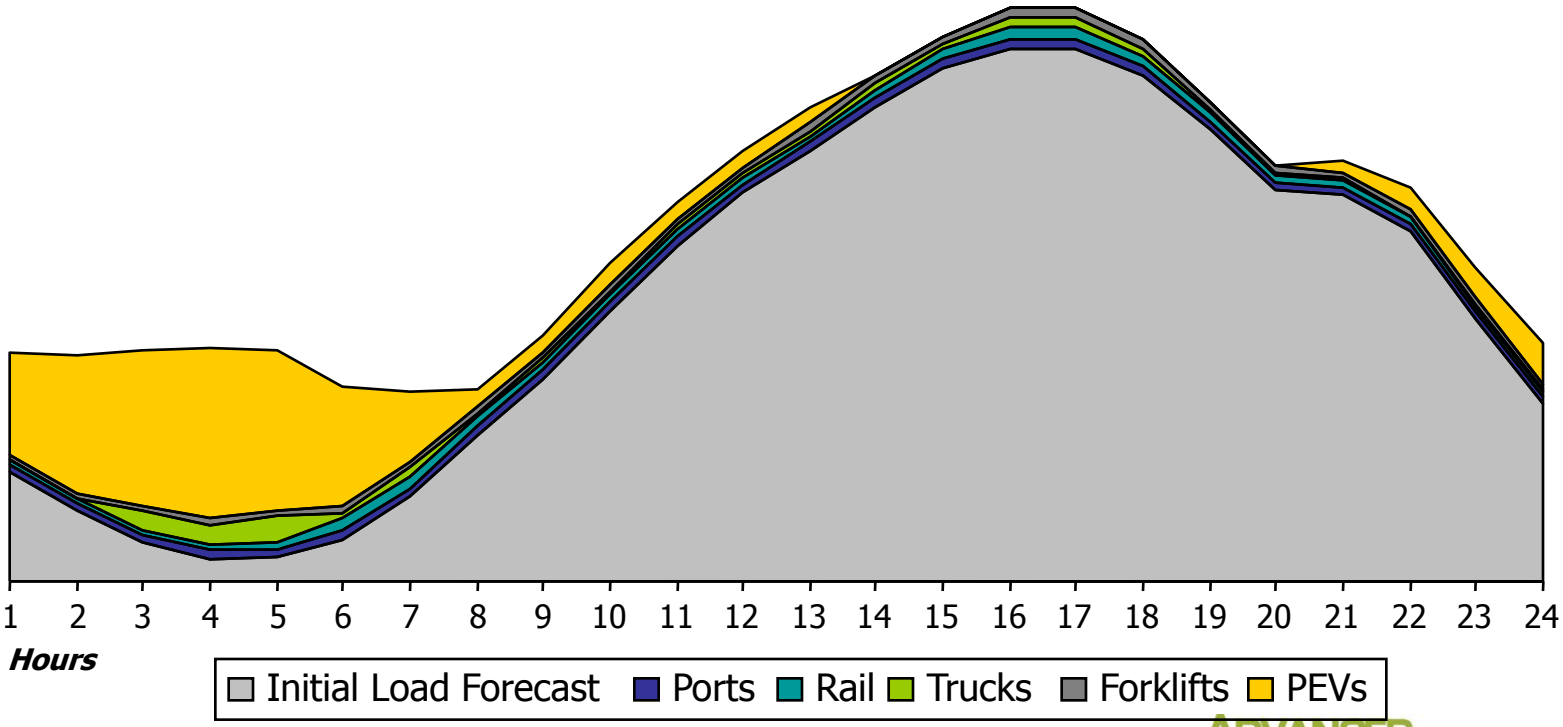
* High Case – 7/23/2020

Assuming perfect load management, SCE could shift charging to off-peak hours, improving SCE's load factor by up to 5%.

Load Management

2020 SUMMER LOAD IMPACT – WITH LOAD MANAGEMENT

Best Case Scenario



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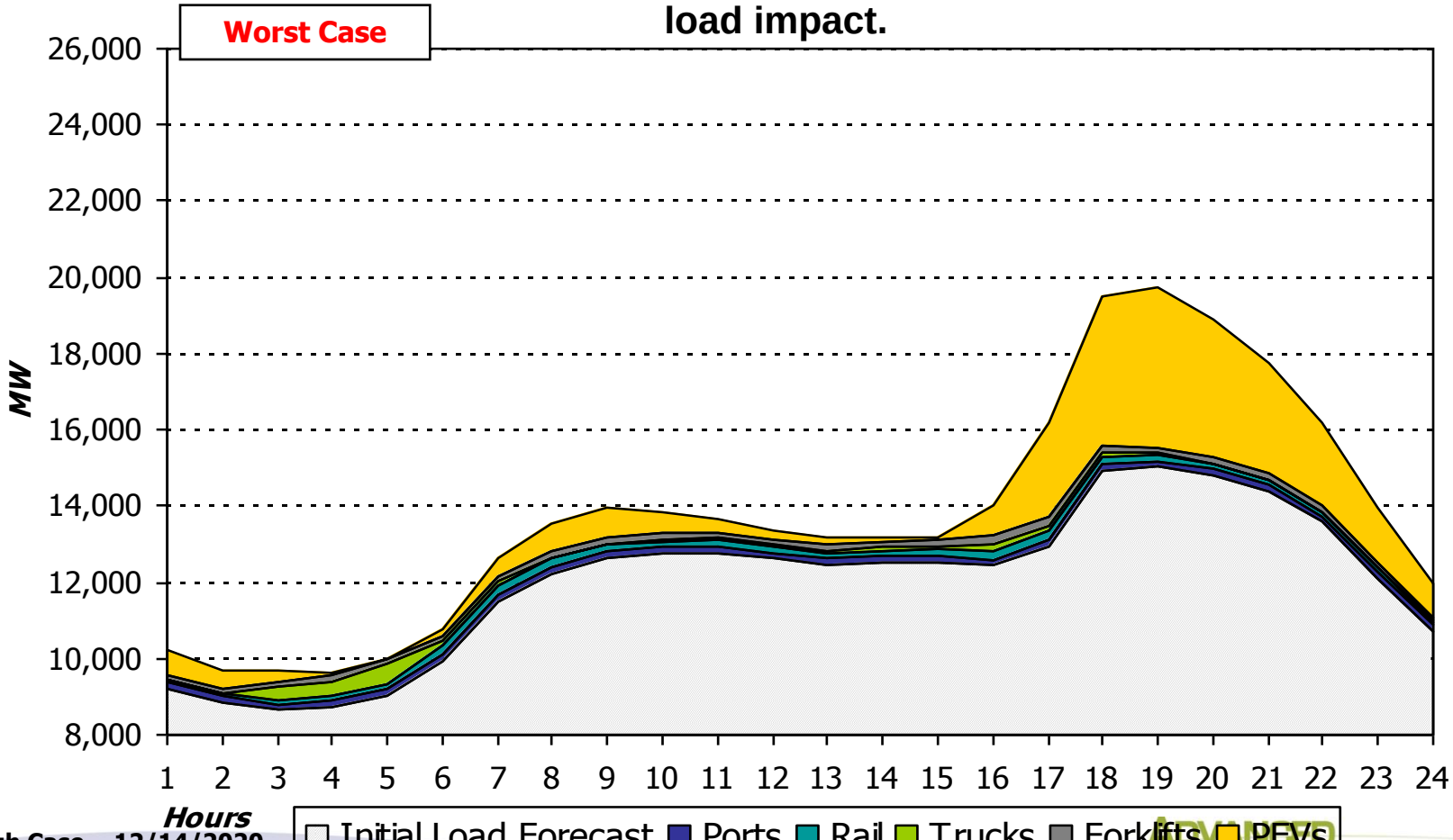
SCE ET Mainstreaming Project- 2020 Winter Load Impact w/ No Utility Involvement*

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



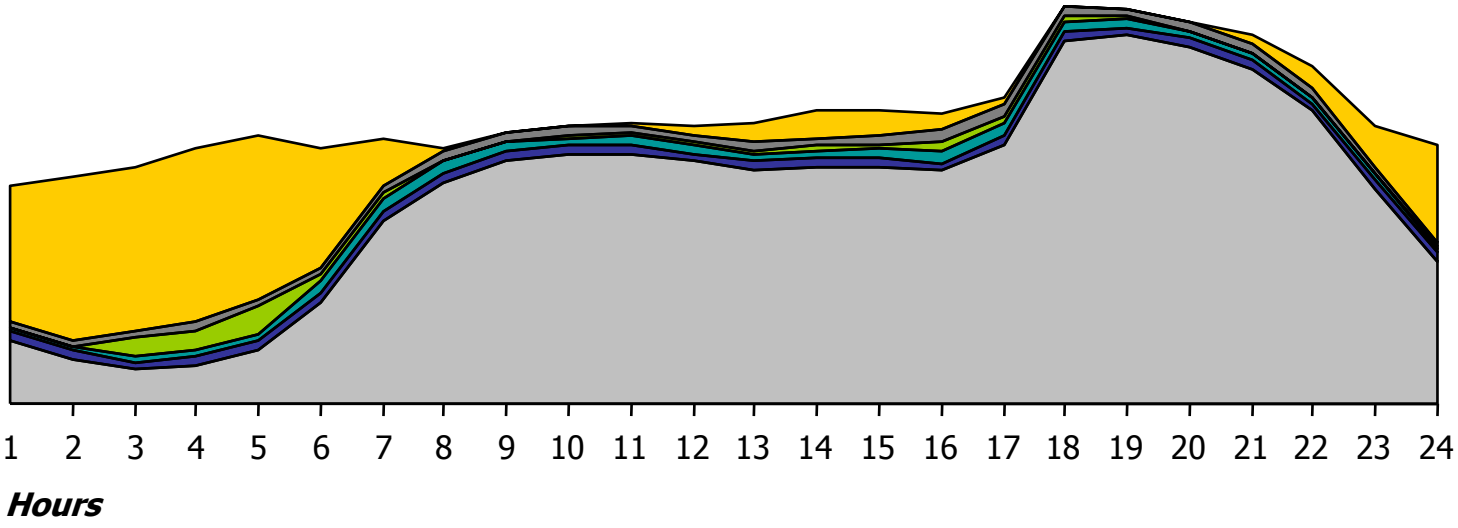
*** High Case – 12/14/2020**

Assuming perfect load management, SCE could shift charging to off-peak hours, essentially flattening load across the entire day.

Load Management

2020 WINTER LOAD IMPACT – WITH LOAD MANAGEMENT

Best Case Scenario



SCE Territory: Summary of Emissions Displacement Impacts

- By 2020, high levels of ET in SCE service territory could achieve significant CO_2 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_2 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_2

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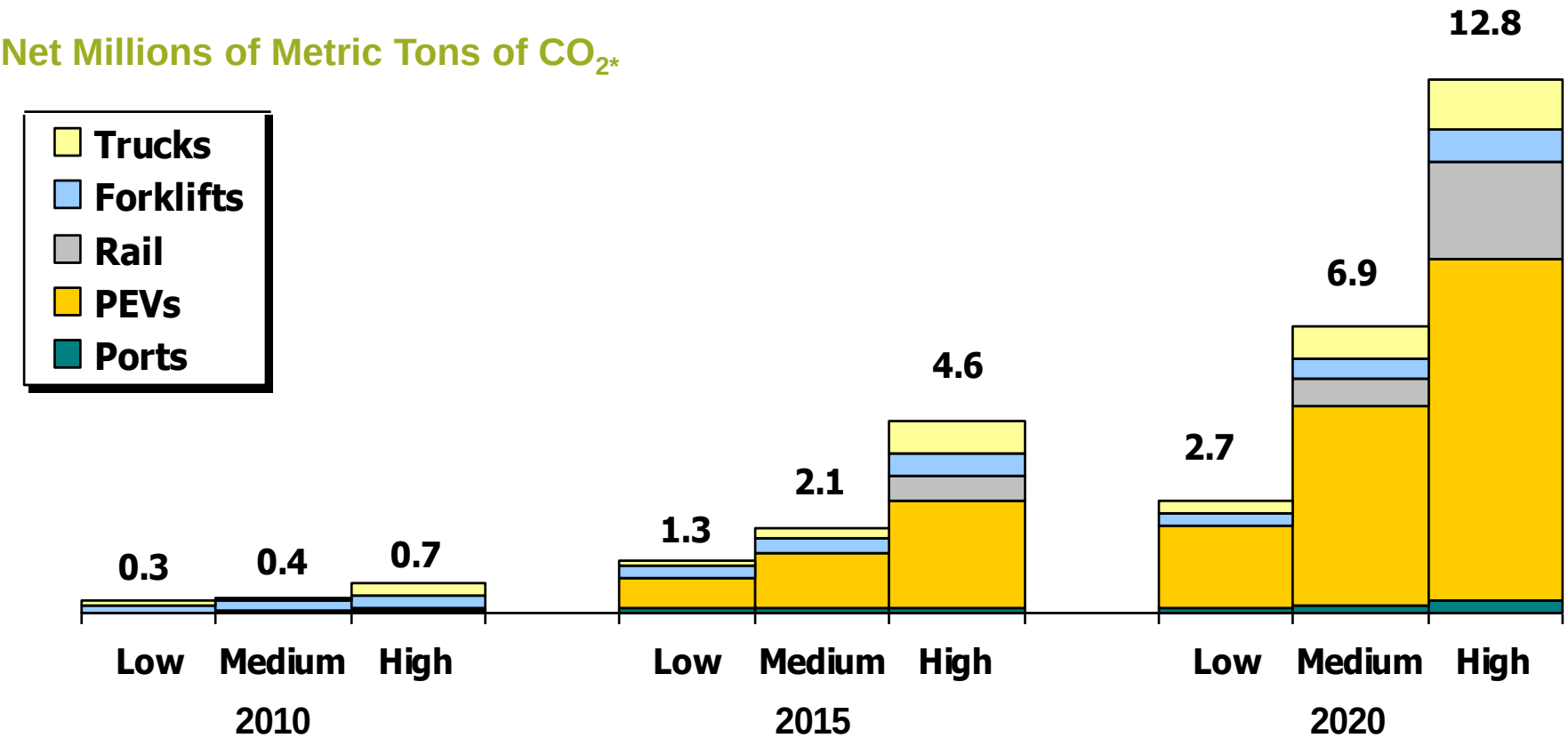
SCE could achieve up to 12.8 MMT of CO2 savings, primarily from PEVs.

Net Millions of Metric Tons of CO_{2*}



Note: SCE's 2008 annual CO_2 emission = ~ 25 MMT

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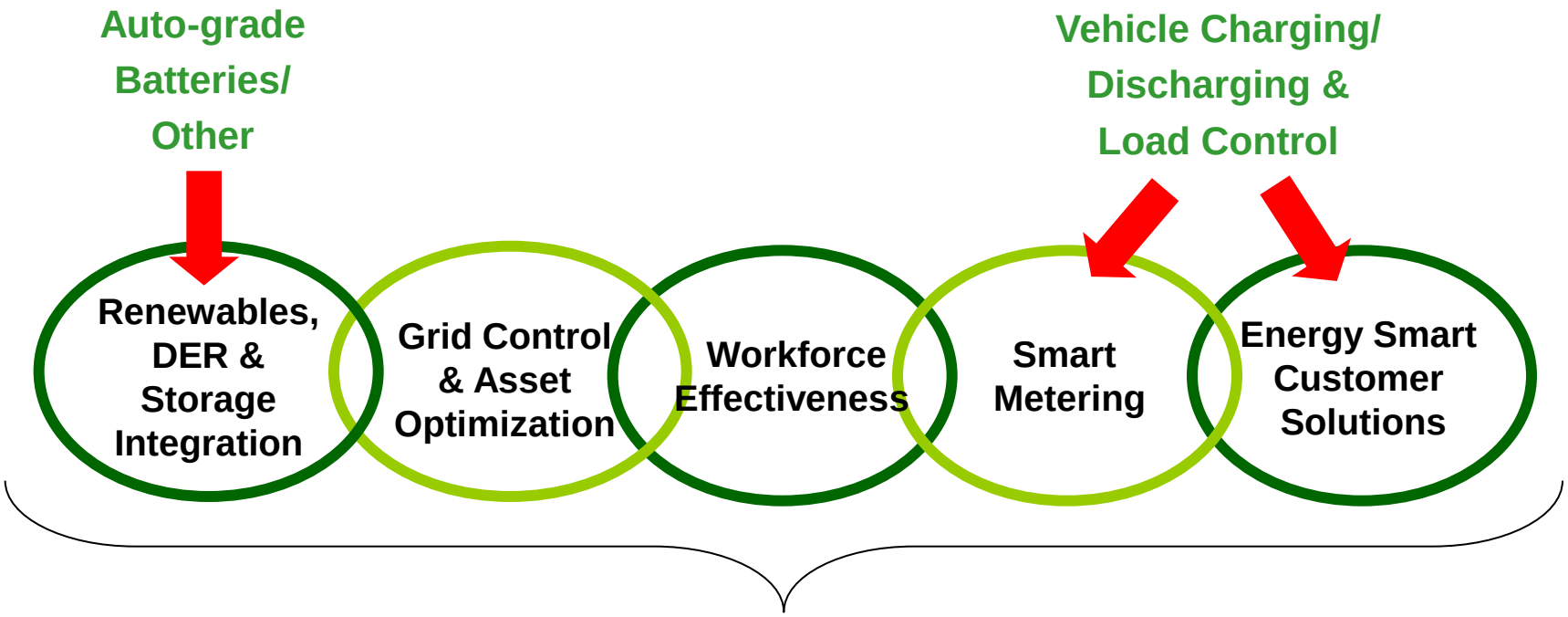
SCE - Getting Market Ready

- 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

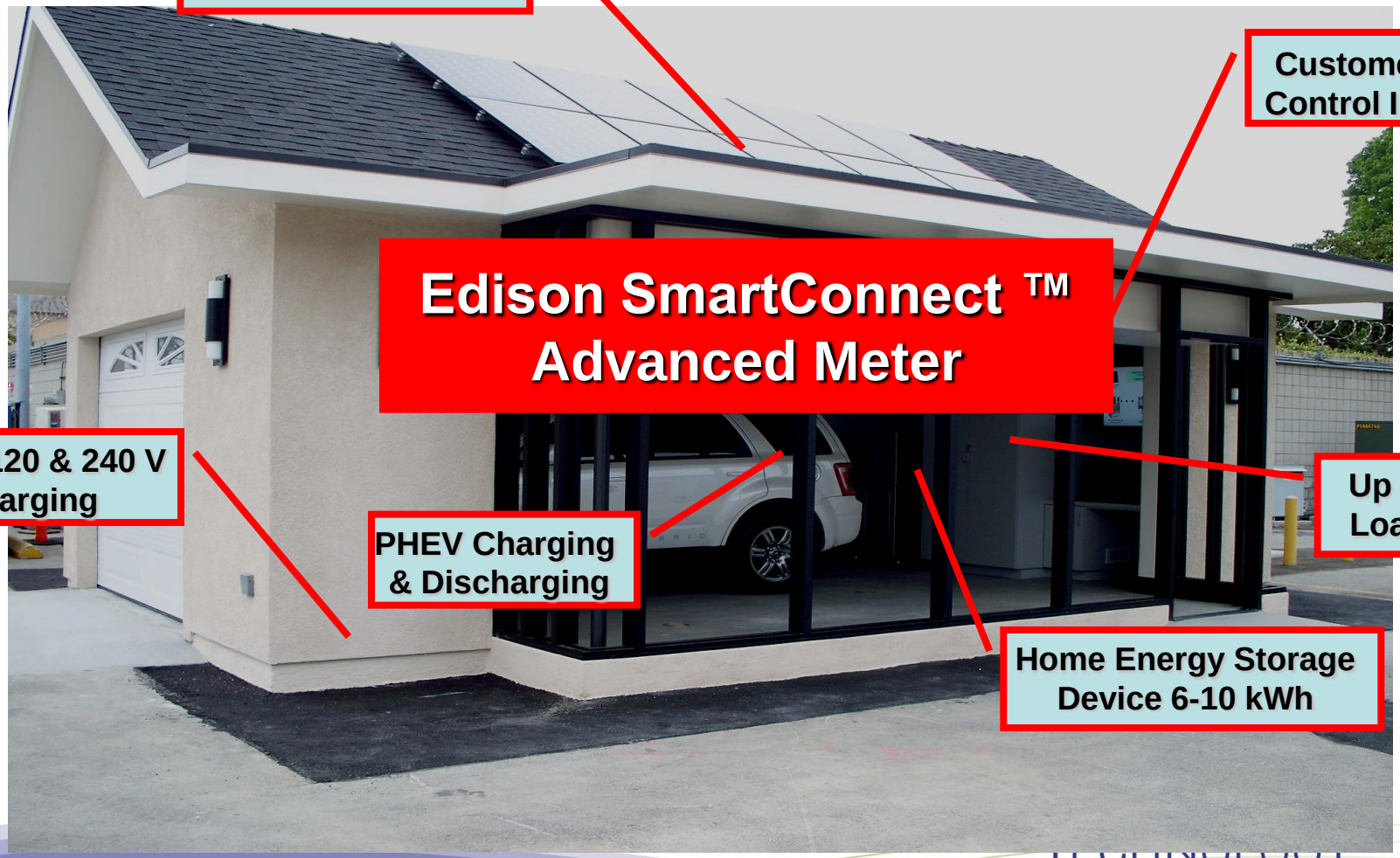
Integrating ET In To SCE SmartGrid Strategy

Five key themes:



Improving reliability, safety, and cost effectiveness while delivering more customized solutions and environmentally-friendly energy supply to meet customer energy management needs

EVTC- "Garage of The Future" Systems Study (Technology and Applications Integration) RD&D



A BIG DAY IN EDISON'S 120 YEAR HISTORY

Obama visits Edison's EVTC- on First Trip to California as President

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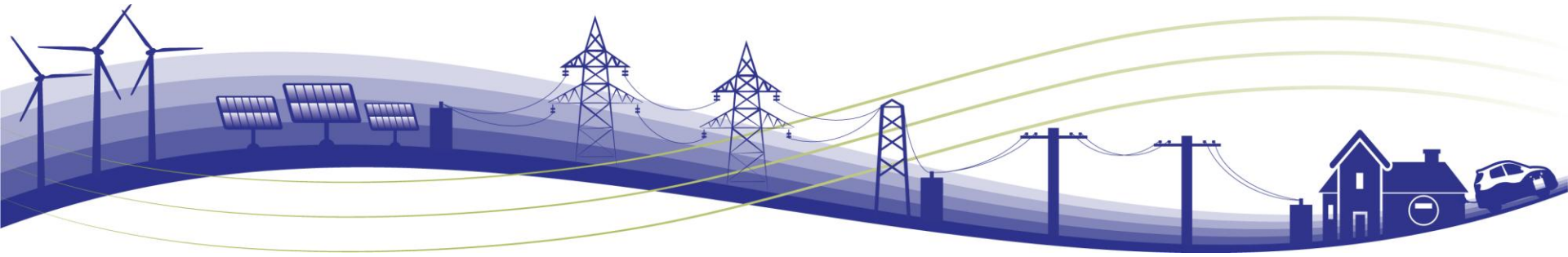

Thank you

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