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## ***WIRES conference***

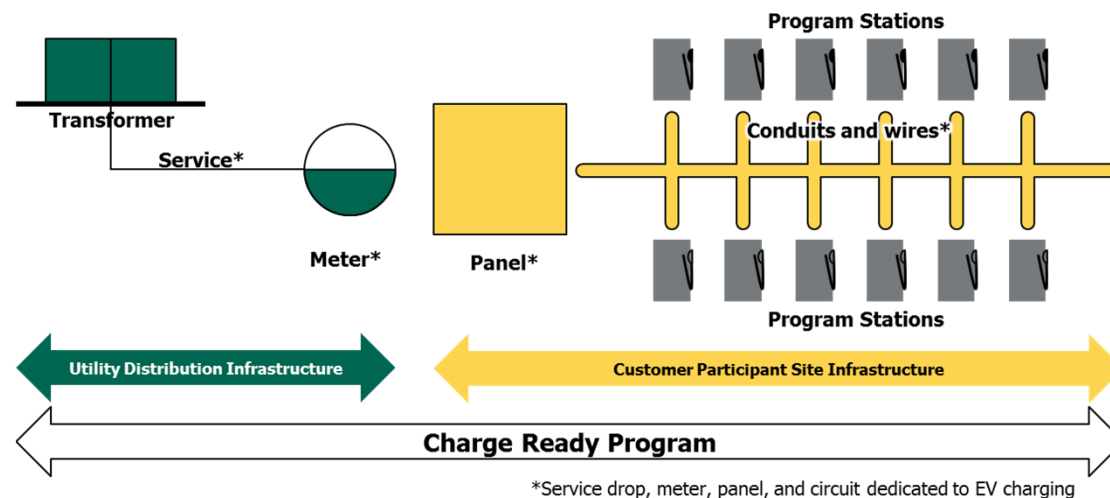
***Grid Planning and Operational Challenges Arising  
from the Electrification of the Transportation Sector***

Dean Taylor, Principal Advisor

January 21, 2016

## SCE has received approval for the 1<sup>st</sup> phase of its 5-year Charge Ready program

- SCE has developed a **five-year \$355M** program to:
  - Install and pay for electric infrastructure to serve up to **30,000 EV charging stations** at **long dwell-time locations** in SCE's territory
  - Provide a rebate to cover some of the base cost of approved charging stations and their installation
- **Phase 1 is a \$22M pilot** to validate market demand and cost assumptions, **approved by CPUC on 1/14/16**
- Participating customers may select charging stations among **broad offering** of products (all Level 2 stations must be DR-capable)
- Participating customers will **operate** charging stations at **their discretion** directly or through EV service providers



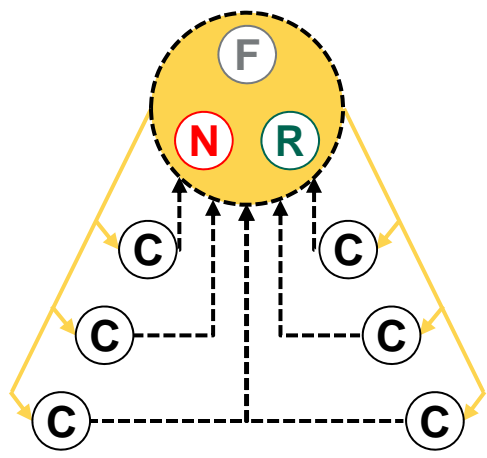
## SCE's Other Transportation Electrification programs

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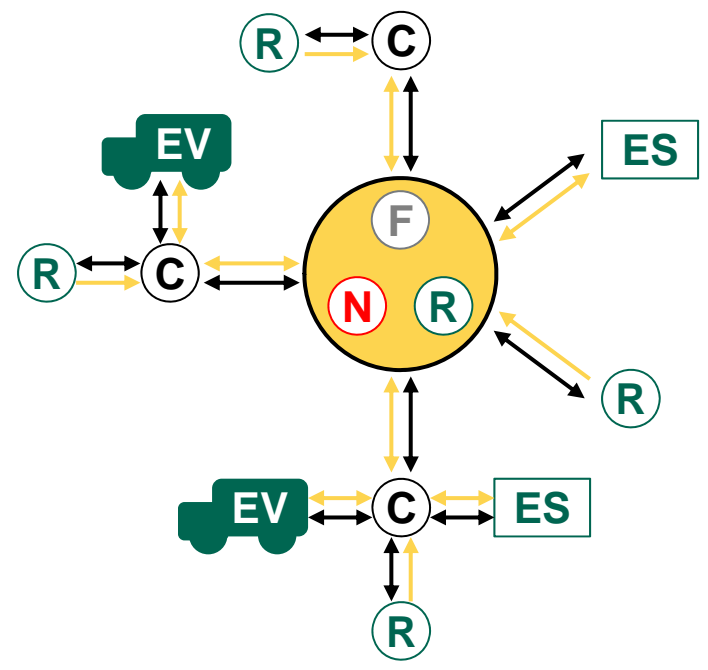
- Broad EV **market education** and TE advisory services programs
- **Five rates** designed with EVs in mind
- New **incentive** programs in development (Low Carbon Fuel Standard funded)
- Several **pilot** programs:
  - Vehicle-to-Grid at LA Air Force Base
  - Submetering of EVs
  - SCE workplace charging
  - Irvine Smart Grid
- By 2017, the **capacity of 4,500 distribution circuits will be posted** online
- \$58 million in utility infrastructure to serve **goods movement electrification at Port** of Long Beach
- On-going assessments on **high speed rail**, light rail, and proposals for electric overhead-wire heavy duty trucks on I-710

# EVs could become an integrated grid asset and significantly improve system management

Centralized and Unidirectional Grid



Decentralized, Bi-directional Grid Supported by a Central System



**Legend:** (F) Fossil Fuels  
(N) Nuclear  
(R) Renewables

(C) Customer  
→ Energy Flow  
⇌ Information Flow

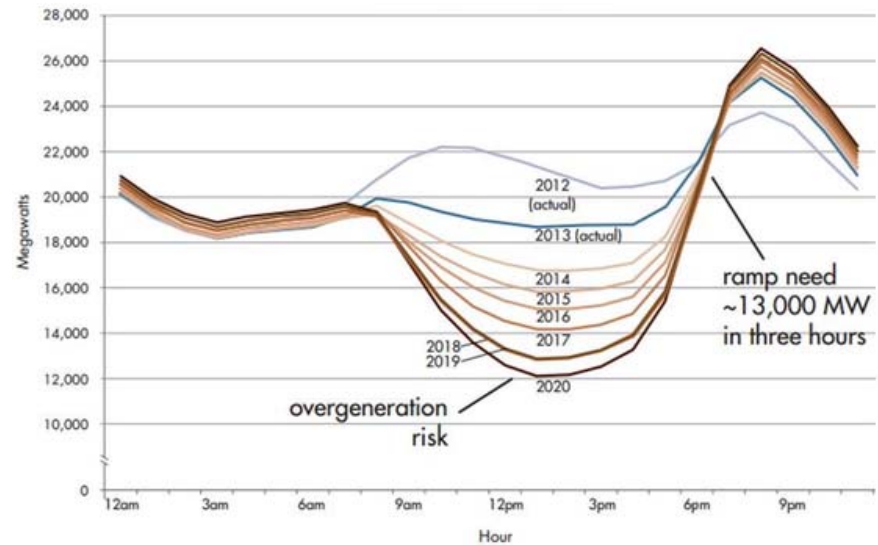
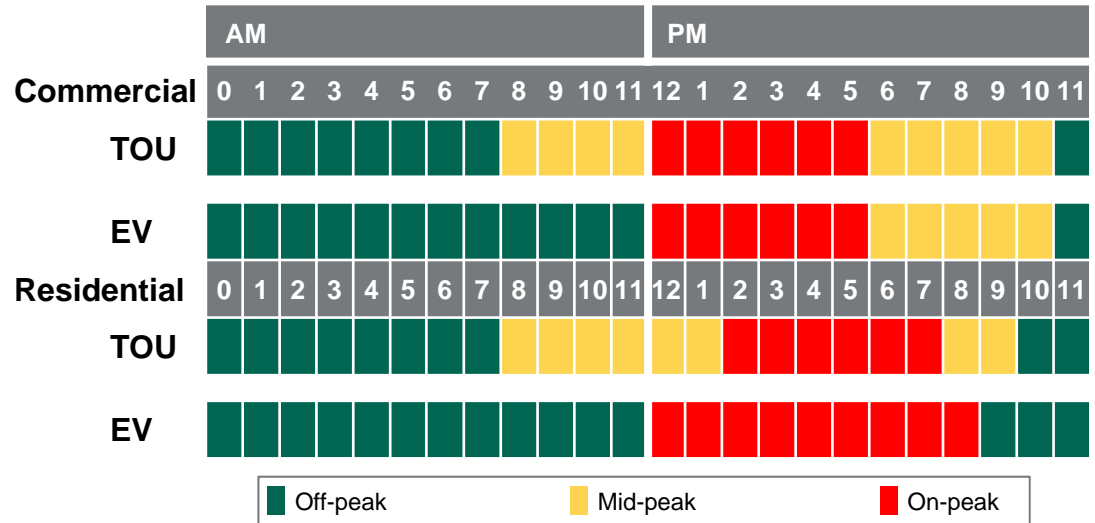
(EV) Electric Vehicle  
(ES) Energy Storage

# The need to manage EV charging is expected to change over time

**Near to mid-term:** Need to send price signals to avoid on-peak charging and incentivize mid-peak and off-peak charging



**Longer Term:** Leverage EVs to absorb over-generation from renewables and smooth ramp-up. This will require defining new peak periods



## Lessons Learned and Trends

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- Strong influence of federal and state **policies toward decarbonization**
- **Little to no grid impacts** (local distribution only, handled through new standards and just-in-time upgrades, most not EV specific)
- **Gaps** in deployment of charging infrastructure include multi-unit dwellings, workplaces, and disadvantaged communities
- Most EV charging is done **at home**
- **Away-from-home charging** trend is not yet clear
  - Emerging **high-range** PHEVs and BEVs may need away-from-home charging **less often**, but could require **faster** charging
- **EVs and storage** will be **game changers**
- **Nationwide interest** in electrification (transportation and industrial)
- **Trend toward expanded role for the utility** on electrification
  - Help enable charging stations
  - More education and outreach