Significant progress is needed across all four pillars, with fastest ramp-up between today and 2030.
PEV Grid Integration: Issues

- Do we need new power plants or transmission lines to support PEV charging?
- What are the opportunities to exploit the latent flexibility in PEV charging load to balance out fluctuations in renewable energy generation?
- Will EV charging overload local distribution circuits?
  - New upgrades needed?
  - Safety/Reliability affected?
- Can PEV charging be timed to coincide with rooftop solar generation?
Technologies and policies are developing to support vehicle-grid integration (VGI)

V2G capability allows PEV to discharge to grid, receive payment for services

V2H/V2B/V2X capability can enhance PEV value proposition

'Smart' charging (or 'V1G') through targeted utility tariffs or communication from grid operator to aggregator / vehicle
**Smart Charging Approaches: V1G**

**Price signals:**
- Time of use (TOU) rates vary on a fixed schedule and are higher during periods of peak demand on the bulk power system.
- Dynamic rates vary from hour to hour with conditions on the bulk system or local grid.

**Managed charging:**
- The utility or a third party directly controls when or at what rate a vehicle charges.
- Customer is paid for performance and can over-ride if necessary.

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WASHINGTON DC (No Time Varying Rates)  
SAN DIEGO (TOU Rates)
Goal: Demonstrate customers’ willingness to adjust timing and location of EV charging in response to dynamic price signals

- Support integration of solar power
- Alleviate congestion on local distribution circuits

Day-ahead Vehicle Grid Integration rate varies with time and location to reflect bulk and local conditions
Incentive program partnership between ConEdison and FleetCarma

- $150 sign-up bonus for installing FleetCarma tracker
- $5/month for charging anywhere in ConEd service territory
- $0.10/kWh incentive for charging off-peak (12AM-8AM, 365)
- $20/month in summer for completely avoiding charging during peak summer hours (2PM-6PM, June-September)

Uses vehicle telematics, but mediated by FleetCarma device
Regulators have approved a variety of roles for utilities in providing charging services.

- Commissions have approved or required a variety of roles for regulated utilities in providing EV charging services.
- These are the most common models:

**Utility (State)**
- Ameren (MO), KCP&L (MO/KS)
- SCE (CA), Eversource (MA), AEP Ohio
- PGE (OR) buses
- HECO (HI), SDG&E (CA), Avista (WA)

### Charging Infrastructure

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<tr>
<th>Service Connection</th>
<th>Supply Infrastructure</th>
<th>Charger Equipment</th>
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- **Business As Usual**
- **“Make Ready”**
- **Charger Only**
- **Full Ownership**
Key issue for regulators: Balance goal of accelerating EV adoption with desire to promote competition and innovation in the emerging market for EV charging services.
THANK YOU

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