RE AND EV INTEGRATION WITH DISTRIBUTION GRID

Title of the Presentation

Presented by

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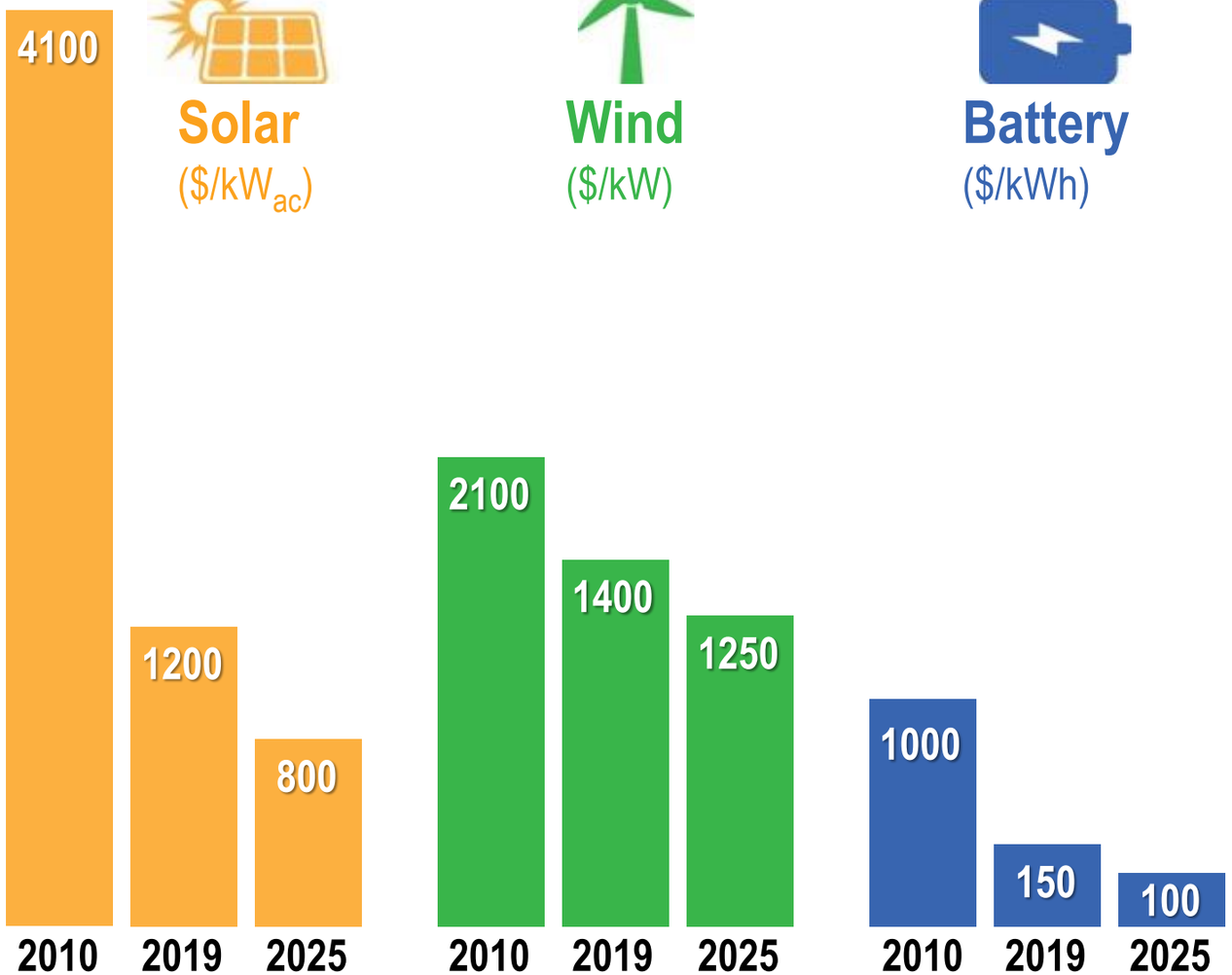
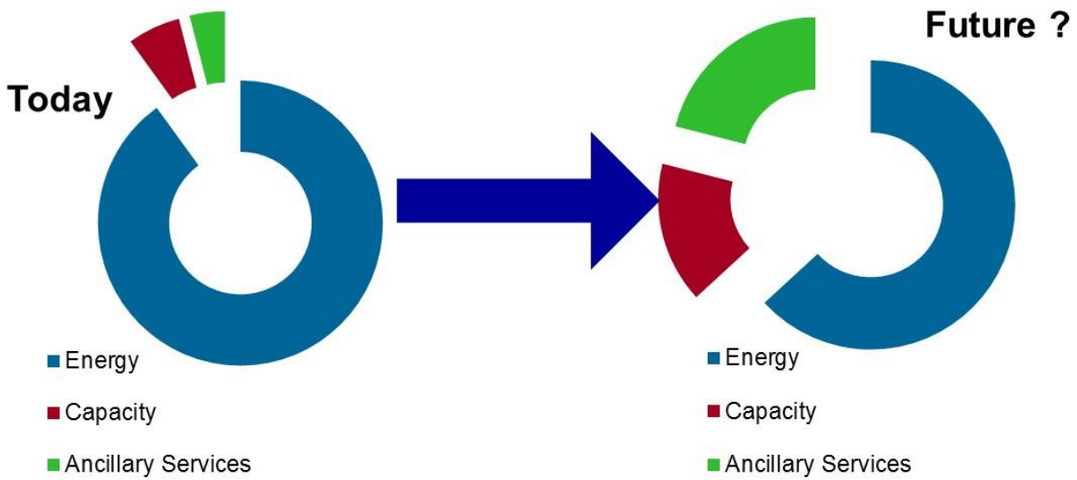
Costs drive growing deployment

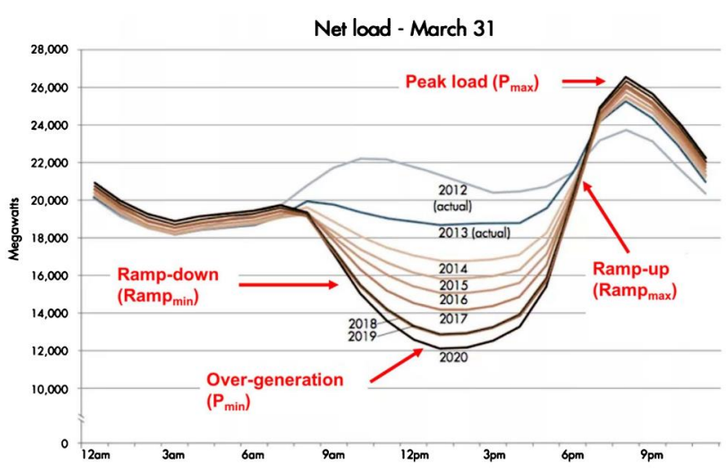


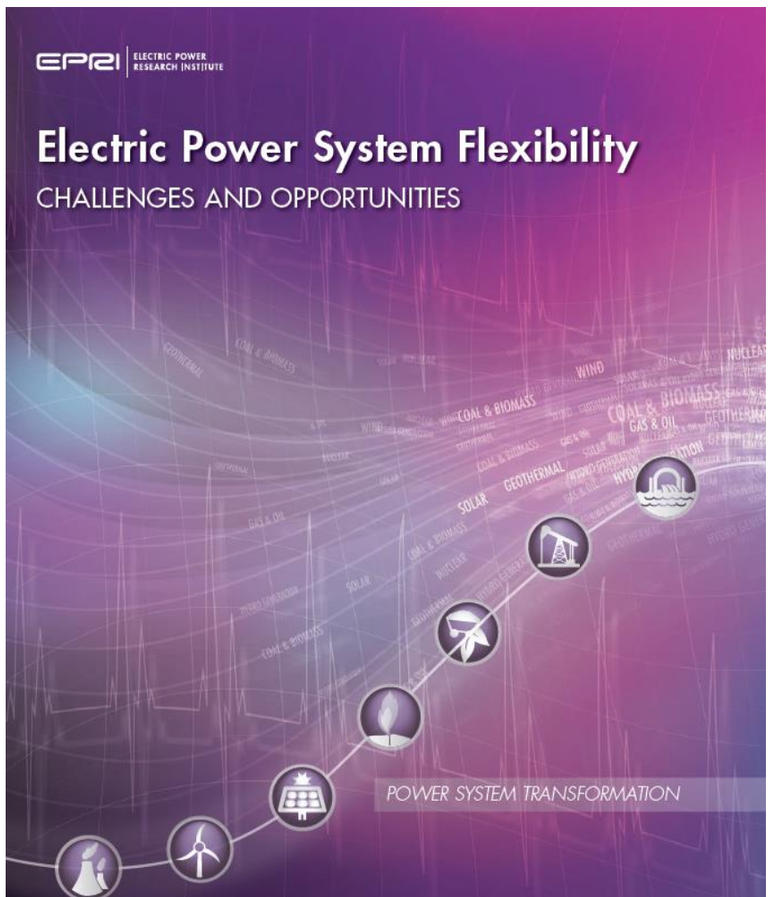
- Universal Solar PV: ~$0.02/kWh in high solar region but still almost half the cost of rooftop solar
- Wind LCOE: ~ $0.03/kWh in high wind region
- Electric vehicle (~300miles): ~$7,000 decrease
- Commercial building batteries: 2-year payback
- Solar/wind + 4-6 hour storage cost = natural gas power plant

Grid & Policy Innovation Unlocks Potential

Renewable penetration creates need for flexibility







EV Deployment can be part of the flexibility solution

Smart and Fast Charging of EV

Enabling Higher Penetration of EV/Solar/DER

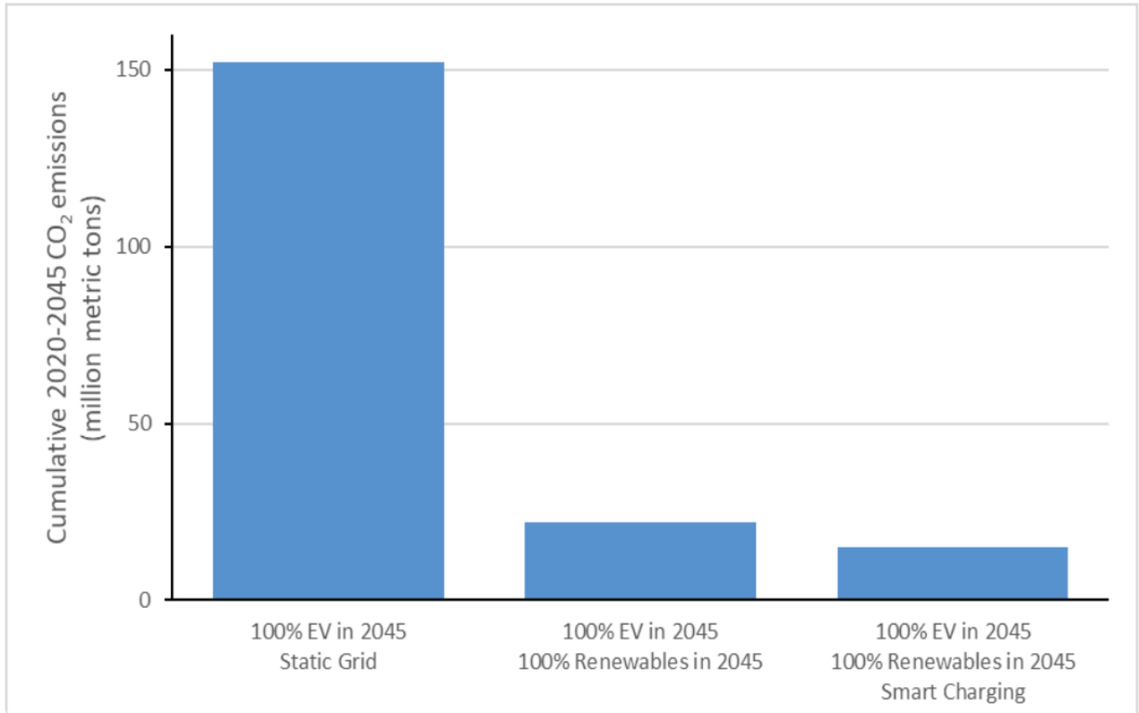
Grid-Integrated Energy Storage

Vehicle-to-Grid System Resource

Connected, Smart, Demand-Responsive Load

California Example (UC Davis study)

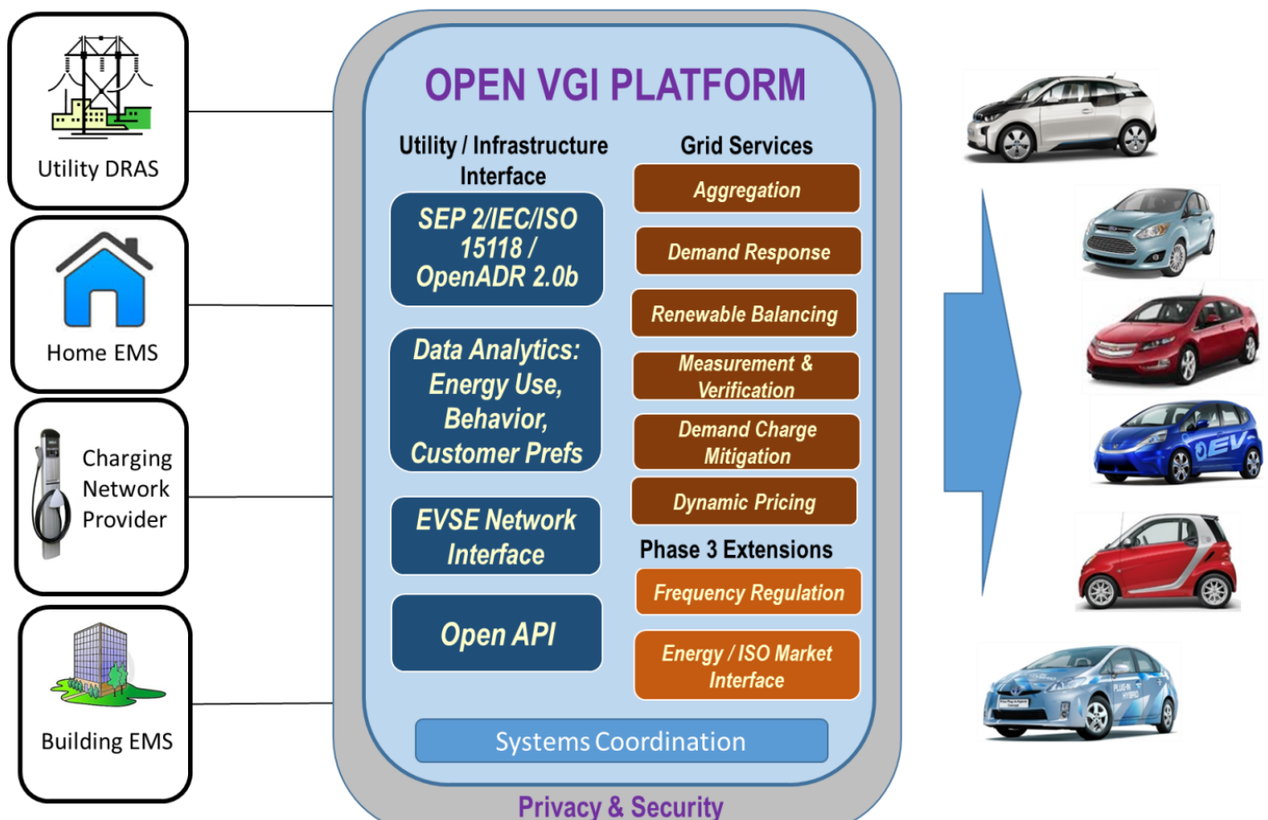
- Smart electric vehicle charging can maximize emissions reductions.
- Smart charging can reduce curtailment of renewable energy.
- Smart charging reduces the need for excess renewable energy and energy storage capacity to compensate for the intermittency of solar and wind.
- California smart charging can save nearly $30 billion in grid infrastructure costs over the period until 2045



https://escholarship.org/uc/item/5rf8b4hz

Open Platform for smart charging integration

Architectural Overview



OVGIP Use Cases

1 Automated Utility Electricity Rate Tariff Processing

2 Aggregation: Locational DR; Balancing Resource

3 Interface w/ Home Energy Management System (EMS)

4 Interface w/ Building EMS

5 Dynamic Pricing Signal Events

6 Interface with EVSE Network Provider

7 Optimized Load Management (ISO/IEC 15118)

8 Vehicle Roaming

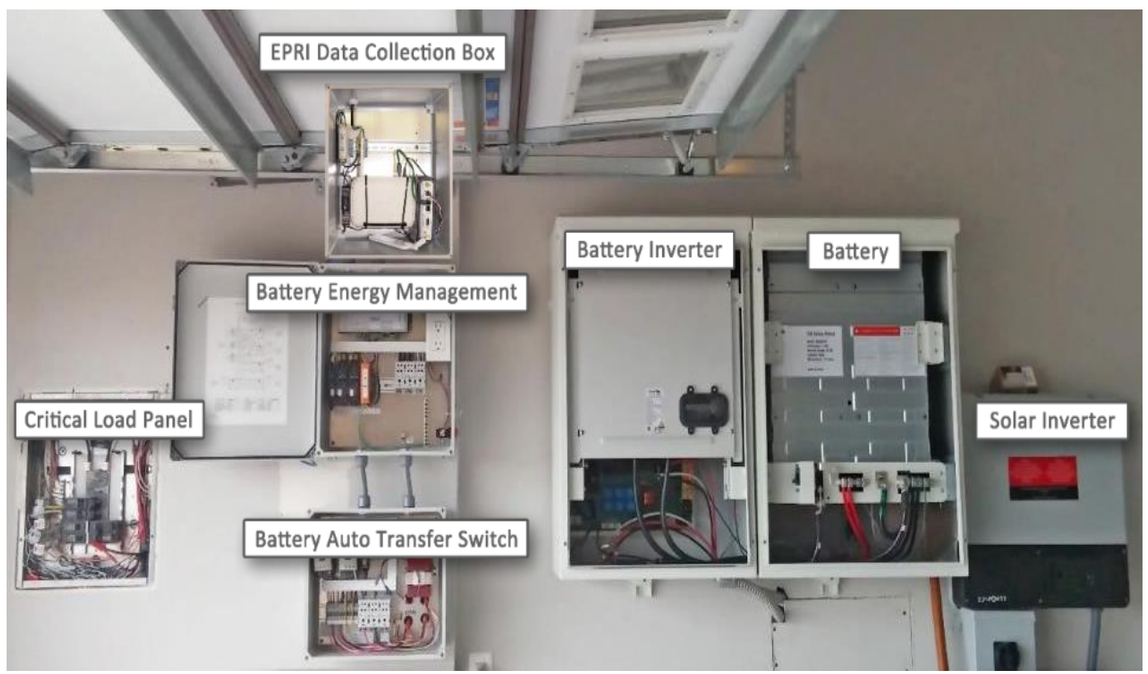
9 EVSE Networking Functionality

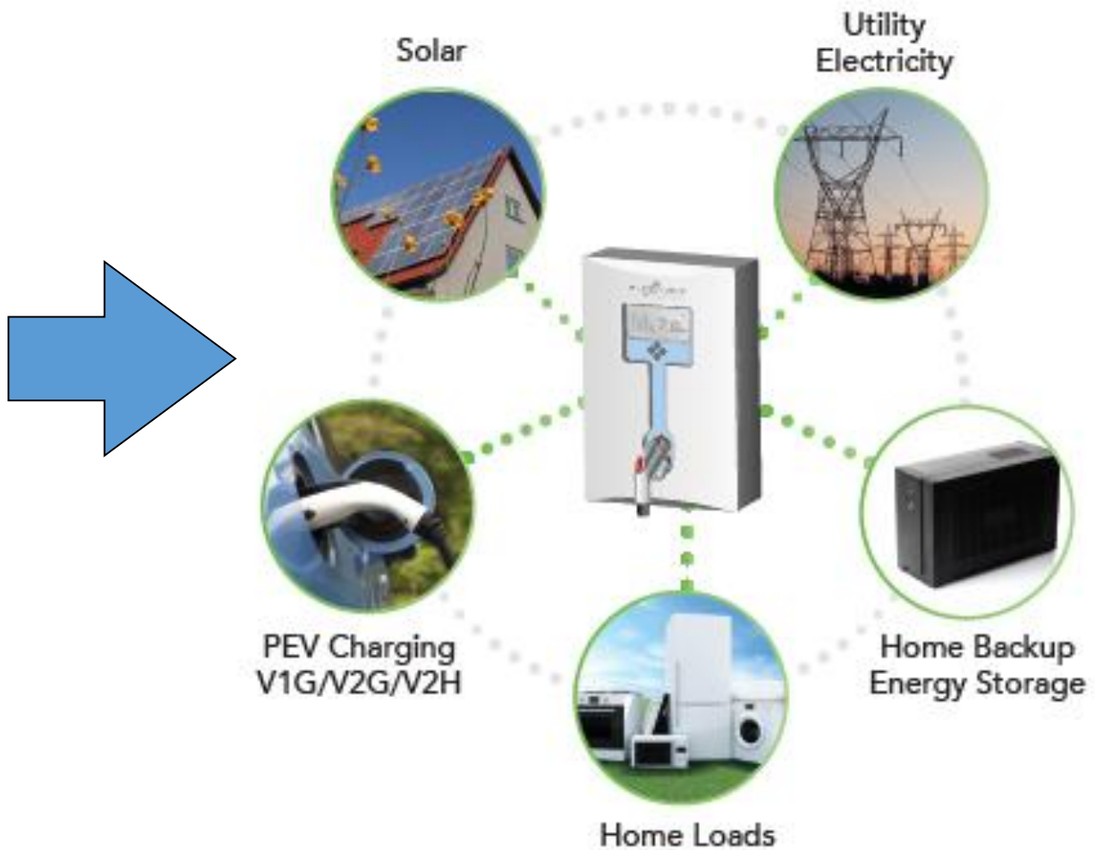
10 Metering and Data Exchange

11 Customer Enrollment / Administration

Resilience may be the wild card value stream

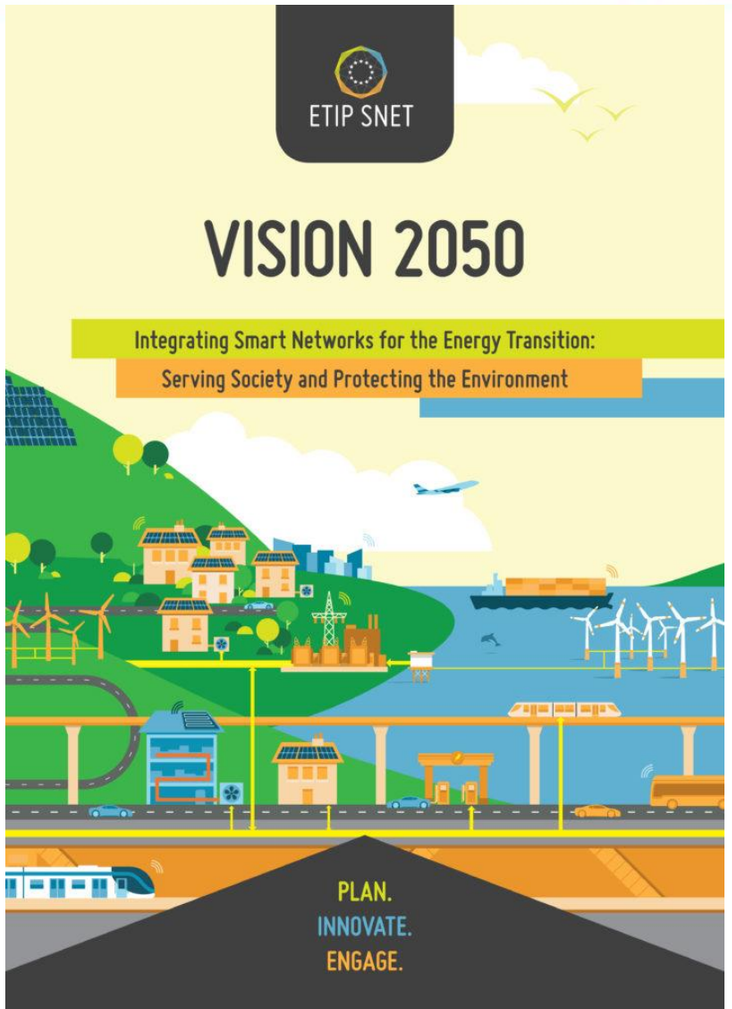
Smart Power Integrated Node (SPIN)





Summary - Challenges we have to address

1. **Architecture** for integration of resources at the customer and community levels
2. Shared **communication infrastructure** with **cyber security**
3. **Market and regulatory constructs** for flexibility and capacity
4. **Models and Tools for Planning** – Customers, Distributed Controls, Non Wires Alternatives
5. Integration of Distributed Energy Resource Management Systems **(DERMS)** with Distribution Operations
6. **Platforms** that integrate customer resources with distribution planning and real time operations
7. **TSO/DSO Coordination** – both planning and operations




Together…Shaping the Future of Electricity

Thank You

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