Southern California Edison EPIC Overview

i-PCGRID Conference

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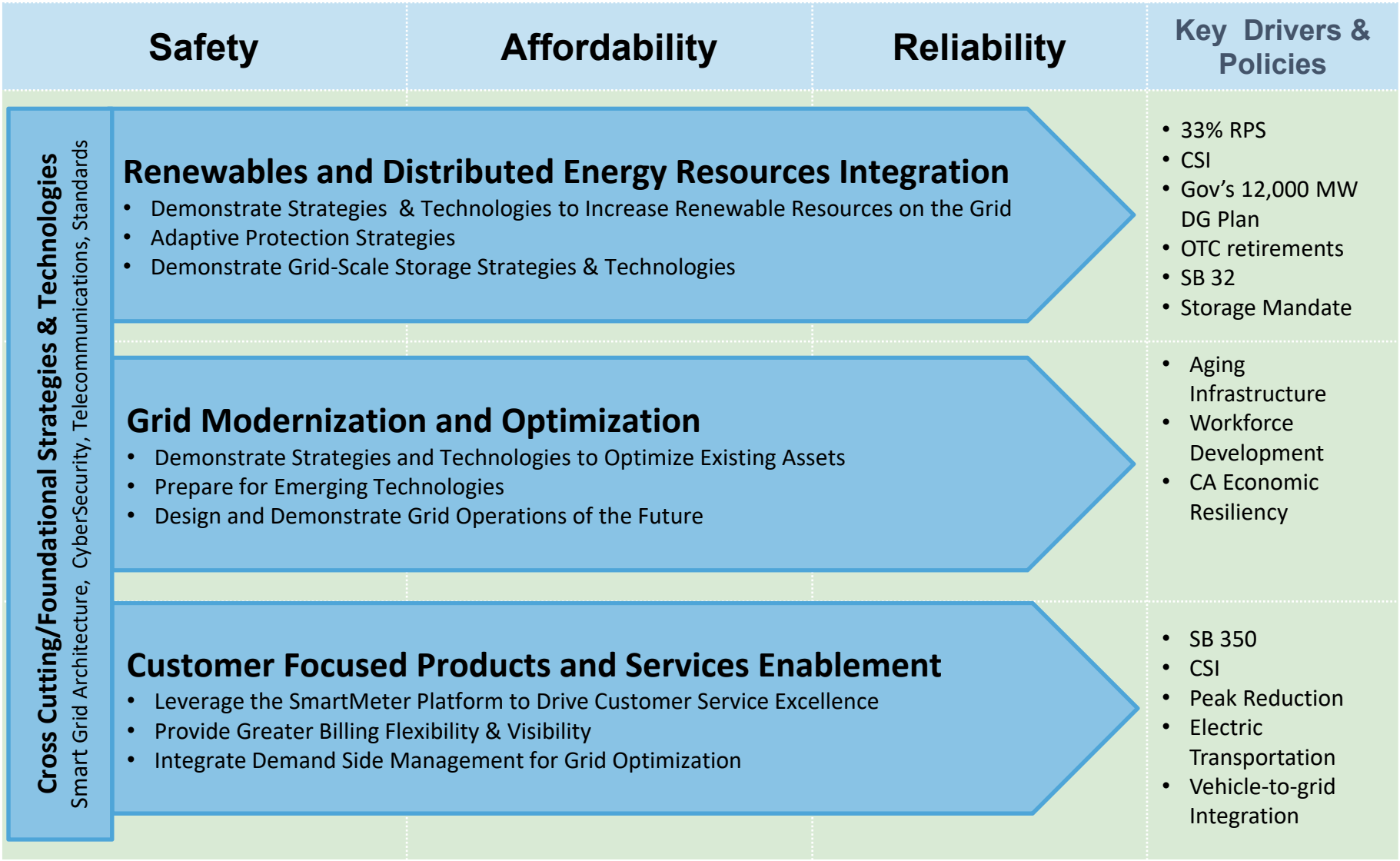
Summary of the EPIC Program

Funding & Admin.	▪ **$162M/annually in ratepayer funding (2012-2020)** ▪ **CEC administers 80% of the authorized budget; IOUs administer 20%**
Investment Areas	▪ **Applied Research: $55M/annually (CEC only)** ▪ **Technology Demonstration & Deployment** – **CEC $45M, PG&E $15M, SCE $12M, SDG&E $3M (/annually)** ▪ **Market Facilitation: $15M/annually (CEC only)**
Electricity System Value Chain	▪ **Grid Ops / Mkt. Design** ▪ **Generation** ▪ **Transmission**

Select EPIC Requirements

- **Workshops & Symposiums:** EPIC Administrators hold workshops twice a year.
  - Solicit feedback from stakeholders on technology gaps
- **EPIC Annual Report & Project Final Reports: A**nnual reports on the implementation of the Portfolio are submitted February 28.
  - Project Final Reports are included in the Annual Report
  - Annual Report is public and posted by the CPUC and the Utilities on respective websites
- **Project Specific Approvals:** EPIC Administrators are only able to fund projects that have been approved by the CPUC

Investor Owned Utility EPIC Framework



Program Objective

- Evaluate pre-commercial technology and demonstrate its integration to advance the grid and support California energy policy goals.
- EPIC Portfolio aligns with the Joint IOU Framework and demonstrates emerging technologies to:
  - Incorporate additional clean energy into the grid;
  - Strengthen and modernize the grid to become more resilient and reliable;
  - Enable customer choices for electric products & services;
  - Evaluate cross-cutting foundational technologies & strategies.

EPIC I: Key Lessons Learned

Substation Automation (SA-3), Phase 1

Industry Lessons Learned

- SA3 successfully demonstrated that an HMI can be fully configured in minutes, instead of several weeks
- Needed more consistent vendor adoption of IEC 61850
- Cyber security standards are still emerging
- IEC61850 does not cover all required features and SCE had to go beyond the existing standards

Learnings for future Demonstrations

- Increasing System Intelligence and Situation Awareness Capabilities
  - Demonstrating an intelligent alarming system that identifies the problem's cause and subsequently presents EMS operators with relevant information needed to make informed decisions.
  - The tool will identify and demonstrate an intelligent algorithm that goes beyond simple alarm prioritization and can reliably pinpoint the event triggering the alarms.

EPIC I: Key Lessons Learned (continued)

Integrated Grid Project, Phase 1

Industry Lessons Learned

- IEEE 2030.5 standard in early stages of deployment and few aggregators have it.
- Lab testing with a real-time simulation approach allows examination of a broad range of conditions before field deployment.
- Edge computing capability in the FAN field device is vital to allowing network adaptability.
- When integrating cybersecurity measures, examine all systems for continued proper operation.
- Recruiting customers for the demo requires establishing value for their efforts/equipment use.

Learnings for future Demonstrations

- The IGP controls need to be demonstrated in the field with distribution circuit resources (e.g. capacitor controllers, remote control switches with monitoring, DER resources)

EPIC II: Key Lessons Learned

Advanced Metering Capabilities

Industry Lessons Learned

- Missing data. ~30% of the cases, the meter had an outage, although no outage events were recorded in the database for the meter.
  - This problem was solved by a secondary validation of status flags associated with each consumption interval of mismatched meters only.
- Data quality. Some transformers were not in the database, making it impossible to identify the correct mapping. In other cases, the transformer was in the database, but there were no meters associated and thus no assumed transformer voltage.
  - This problem was solved through changes in processes for installing new or replacement transformers.

Learnings for future Demonstrations

- Project's solutions successfully demonstrated that they could improve transformer-to-meter and phase-to-meter connectivity records. SCE plans to implement the vendor's solutions in the production environment for use by Grid Operations and Field Engineering staff.