Electric Program Investment Charge

EPIC Administrators Webinar

December 18, 2013

Agenda

• **Background**	Cem Turhal. Energy Division. CPUC
• **IOU Introduction**	Ferhaan Jawed, Pacific Gas and Electric
• **SCE Illustrative Programs**	Percy Haralson, Southern California Edison
• **PG&E Illustrative Programs**	Suna Taymaz, Pacific Gas and Electric
• **SDG&E Illustrative programs**	Frank Goodman, San Diego Gas & Electric
• **Questions and Answers**	
• **CEC Illustrative programs**	Erik Stokes, RD&D, Energy Commission
• **Wrap Up**	CEC
• **Questions and Answers**	

Electric Program Investment Charge

Cem Turhal

California Public Utilities Commission

Energy Division

December 18,2013

EPIC Program- Background

- The Electric Program Investment Charge (EPIC) is designed to assist the development of non-commercialized new and emerging clean energy technologies in California, while providing assistance to commercially viable projects. EPIC consists of three program areas funded at a total of $162 million/year: (1) Applied research and development ($55 million/year); (2) Technology demonstration and deployment ($75 million/year), and; (3) Market facilitation, consisting of market research, regulatory permitting and streamlining, and workforce development activities ($15 million/year). EPIC activities must be designed to produce electricity ratepayer benefits.

EPIC Program- Funding Areas

Funding Element	CEC	Utilities	CPUC	Total ($ Millions)
Applied Research	$55.0	-	-	$55.0
Technology Demonstration and Deployment	$45.0*	$30.0	-	$75.0
Market Facilitation	$15.0	-	-	$15.0
Program Administration	$12.8	$3.4	-	$16.2
Program Oversight	-	-	$0.8	$0.8
Total ($ Millions)	$127.8	$33.4	$0.8	$162.0

* A minimum of 20% of the CEC's funding for technology demonstration and deployment must be used for bioenergy projects

EPIC Program- Funding by each PA

Program Administrators 2012-2014 Triennial Investment Plan Program Budget Allocations (in $ Millions)				
Program Administrator	**2012**	**2013**	**2014**	**Total**
CEC	113.1	127.8	127.8	368.7
PG&E	15.1	17.1	17.1	49.3
SCE	12.2	14.1	14.1	40.4
SDG&E	2.6	3.0	3.0	8.6
Total	143.0	162.0	162.0	467.0

EPIC Program is now Live

- On November 1, 2012, each of the Program Administrators submitted their respective initial triennial investment plans to the CPUC for consideration
- Each plan has been voted out by the Commission on the November 14, 2013 CPUC meeting.
- The Program Administrators award contracts and/or grants to successful bidders and report the award recipients in their annual report filing, due in February of each year.
- The CPUC will continue to oversee the implementation of the EPIC program and will begin the deliberation process for the second triennial investment cycle early 2014 once the program administrators file their second round of investment plan applications with the CPUC.

Next Steps- EPIC Program

- Program Administrators will begin the development of their second triennial investment plan applications starting on January, 2014 and submit their proposals to the CPUC on May 1, 2014.
- The CPUC will begin its deliberation process for the second triennial investment cycle through November, 2014.

EPIC Program- Schedule

	Investment Plan 1	Investment Plan 2	Investment Plan 3
Funding Period	2012 - 2014	2015 - 2017	2018 - 2020
Investment Plan Development	July – October 2012	January – March 2014	January – March 2017
Proposed Plan Submitted to CPUC	November 1, 2012	May 1, 2014	May 1, 2017
CPUC deliberations	November 2012 – November 2013	May – November 2014	May – November 2017
CPUC Decision	November 2013	December 2014	December 2017

EPIC Program- Reporting and Ongoing Oversight

- Program Administrators shall file reports annually starting on February 28, 2014 to February 28, 2020.

- CPUC will hire an Independent Evaluator to review the EPIC program by 2016.

How can you get involved?

Visit the CPUC Proceeding Webpage:

http://delaps1.cpuc.ca.gov/CPUCProceedingLookup/f?p=401:1:0

The EPIC Proceeding number is A1211001.

Feel free to subscribe to the EPIC service list to receive news about new filings.

You will be able to see the investment plans, comments, reply comments, rulings and any decisions the ALJ issues with regards to EPIC on this page.

CEC EPIC Webpage: http://www.energy.ca.gov/research/epic/

CPUC EPIC Webpage: Currently under development.

The **IOU Webpages** are currently being developed, and will be on the CPUC EPIC website upon completion.

Contact the Program Administrators Directly

CPUC Staff Contacts

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Electric Program Investment Charge

SCE – PG&E – SDG&E Technology Demonstration & Deployment Programs

Summary of EPIC Decision

Funding & Admin.

- Approx. $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
- Distribution
- Demand-Side Mgmt

IOUs are Limited to Funding Technology Demonstration & Deployment Programs

Technology Demonstration and Deployment - The installation and operation of pre-commercial technologies or strategies at a scale sufficiently large and in conditions sufficiently reflective of anticipated actual operating environments to enable appraisal of the operational and performance characteristics and the financial risks

IOU Working EPIC Program Framework

EPIC Technology Demonstration and Deployment Priority Utility Objectives

Demonstrate System and Public Safety Health/Environmental Impact, Hazard Mitigation, System Integrity	**Demonstrate Reliability** Reliability Improvement, Maintaining Reliability in the face of Grid changes	**Affordable Environmental & Energy Policy Attainment** AB32, RPS, Energy Efficiency, Distr. Gen/Renewables & Integration (Distributed & Large Scale)	**Key "Megatrend" Drivers & Policy Objectives**

Cross Cutting/ Foundational Strategies & Technologies
Smart Grid Architecture, CyberSecurity, Telecommunications, Standards

Renewables and Distributed Energy Resources Integration

- Integrate Distributed Energy Resources, Generation and Storage Safely and Reliably
- Demonstrate Adaptive Protection Strategies
- Generation Transparency and Flexibility

- 33% RPS
- CSI
- Gov's 12,000 MW DG Plan
- OTC retirements
- AB32
- Energy Storage OIR

Grid Modernization and Optimization

- Demonstrate Strategies and Technologies to Optimize Existing Assets
- Prepare for Emerging Technologies
- Design and Demonstrate Grid Operations of the Future

- SB17
- Aging Infrastructure
- Workforce Development
- California Economic Resiliency

Customer Focused Products and Services Enablement

- Leverage the SmartMeter Platform to drive Customer Service Excellence
- Integrate Demand Side Management to Optimize the Grid
- Respond to Emerging Grid Integration Issues

- ZNE
- CSI
- Net Energy Metering
- Peak Reduction
- EE Strategic Plan

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company

SCE

Presented by

Percy Haralson

Principal Manager, Advanced Technology

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SCE Proposed Projects

Energy Resources Integration

- *Distribution Planning & Analysis*
- *Wide Area Voltage & VAR Control*
- *Renewables Integration Utilizing Distributed Energy Storage, Distribution System*

Grid Modernization and Optimization

- *Real-Time Digital Simulator Mobile Testing Solution*
- *Superconducting Transformer*
- *Next Generation Distribution Automation*
- *Portable End-to-End Test System*
- *Substation Automation – Phase III*

Customer Focused Products and Services

- *Transformer Load Management Analysis*
- *Beyond The Meter – Customer Device Communication, Unification & Demonstration*
- *Regulatory Mandates Submetering*

Cross-Cutting/Foundational Strategies & Technologies

- *Deep Grid Coordination*
- *State Estimation Using Phasor Measurement Technologies*
- *Wide Area Reliability Management & Control*

Superconducting Transformer

Concern, Problem, or Gap to be Addressed –

- Demonstrate superior operational efficiency relative to standard power transformers
- Demonstrate reduction of fault current magnitude with built-in Fault Current Limiting capability
- Validate anticipated reduction in total cost of ownership for utility transformers

Technology or Strategy to be Demonstrated –

- Install and operate the first-of-its-kind Superconducting Transformer (SCX) and measure the operational efficiency gains afforded by superconducting technology. “With superconductors, losses due to the Joule effect become essentially zero, thereby creating the potential for dramatic reduction in overall losses. Even with the added cost of making them cold enough for superconducting, transformers in the 10 MW and higher range are projected to be substantially more efficient and less expensive than their conventional counterparts. “ (IEC - Efficient electrical energy transmission & distribution)
- SCX has fault current limiting (FCL) capability and the potential to be a practical solution to high short circuit duty issues for the industry. Reduced fault duty results in less equipment stress, improved power quality for neighboring customers, and less severe energy release at fault locations.
- SCX uses liquid nitrogen (LN2) instead of oil. Since LN2 is not flammable, this is a safety plus.

EPIC Primary or Secondary Principles Met

- Increased reliability
- Improved power system performance and lower operating costs
- Increased safety
- Efficient use of ratepayer monies

Advanced Voltage & VAR Control of SCE Transmission

Concern, Problem, or Gap to be Addressed –

- Demonstrate efficient voltage regulation of different voltage levels at Devers substation while minimizing the number of switching actions.
- Monitor and eliminate circular VAR flows among multiple parallel transformer banks at the substation.
- Provide early detection of unusual operating conditions related to highly stressed system scenarios that are seen from significantly different system responses after routine switching events.

Technology or Strategy to be Demonstrated –

- Increase renewables integration by improving VAR reserves via coordinating switching of continuous and discrete VAR control devices, improve system operational reliability by continuously monitoring system proximity to voltage instability from intermittent renewables as seen by substation measurements, and also improve longevity of expensive discrete control devices, such as transformer banks load tap changer (LTC) by reducing switching actions.

EPIC Primary or Secondary Principles Met

- Increased reliability
- Improved power system performance and lower operating costs
- Increased safety
- Efficient use of ratepayer monies

Substation Automation-3 Phase III

Concern, Problem, or Gap to be Addressed –

- Need to integrate centrally managed critical cyber security systems (CCS) to comply with NERC CIP requirements for transmission substations (bulk electric stations).
- Protect investments in SAS and SA-2 systems by integrating cost-effective SA-3 capabilities within existing legacy systems. [hybrid]
- Existing event notification system for substation operators provides nominal information that makes it difficult to pinpoint the event triggering the alarms – an intelligent algorithm is necessary to identify the source of the problem and provide only the relevant information necessary to make decisions.
- Desire to improve the efficiency and effectiveness of factory acceptance testing (FAT) and site acceptance testing (SAT) processes.

Technology or Strategy to be Demonstrated –

- This project is intended to apply the findings from the Substation Automation Three (SA-3) Phase II (Irvine Smart Grid Demonstration) project to develop real solutions to automation problems faced by SCE today (bullets one and two above). The project will develop two standards based automation solutions (sub-projects) for bulk and hybrid systems, as well as develop two automation tools (bullets three and four above).

EPIC Primary or Secondary Principles Met

- ✓ Increased reliability
- ✓ Improved power system performance and lower operating costs
- ✓ Increased safety
- ✓ Efficient use of ratepayer monies

Pacific Gas and Electric Company®

PG&E

Presented by

Suna Taymaz

Sr. Manager, Smart Grid and R&D PMO

Pacific Gas and Electric Company®

PG&E Projects

Energy Resources Integration

- *Energy Storage for Market Operations*
- *Energy Storage for Distribution Operations*
- *Mobile and Stationary Energy Storage Synergies*
- *New Resource Forecast Methods to Better predict Variable Resource Output***

Grid Modernization and Optimization

- *Discrete Reactors*
- *Grid Ops of the Future*
- *Distribution System Safety and Reliability Through New Data Analytics Techniques (System Tool for Asset Risk)*
- *Close Proximity Switching*
- *DSM for T&D Cost Reduction*
- *Network Condition-Based Maintenance*
- *"Next Generation" SmartMeter Telecom Network Functionalities*

Customer Focused Products and Services

- *Vehicle-to-Grid*
- *Appliance-Level Load Disaggregation*
- *EV Submetering*
- *PV Submetering*
- *Enhanced Data Techniques and Capabilities via the SmartMeter Platform*
- *DC Fast Charging Mapping*
- *Automatic Identification of Distributed PV Resources*

**Evaluating project scope

System Tool for Asset Risk (STAR)
Highlighted Benefits: Safety and Reliability

Concern, Problem, or Gap to be Addressed –

- Utilize data analytics advances to improve grid safety and reliability
- Demonstrate that the ever-increasing amounts of data can be mined and combined efficiently and cost-effectively in targeted use cases such as risk-based asset management and enhanced safety hazard mitigation

Technology or Strategy to be Demonstrated –

- "Big Data" is an emerging opportunity area for utilities. Common Internet Technologies (Data "mash-ups", visual recognition, instant ad-hoc search) have significant utility use-cases
- This initiative will develop a risk-based solution to refine investment plan strategies based on STAR-prioritized risks
- Leverage a variety of asset-based health attributes including asset condition, operating history, and geospatial attributes including geography, weather, etc. to calculate a relative risk score
- Demonstrate innovative technologies related to advanced data analytics and visualization as described in the EPIC plan
- **Example:** The STAR tool could provide insights to help mitigate system and public safety risk by prioritizing assets with higher failure likelihood and higher failure consequence (e.g. "risk")

EPIC Primary or Secondary Principles Met

- Increased Reliability
- Increased Safety
- Societal Benefits
- Efficient Use of Ratepayer Monies

Appliance-level Load Disaggregation
Highlighted Benefit: Lower Costs

Concern, Problem, or Gap to be Addressed –

- Utilize SmartMeter data to analyze energy usage and deliver to customers the specific cost for running each of their major appliances
- Research conducted in 2012 showed that itemized billing ranked highest among the energy management tools.
    - 71 percent of residential customers rated itemized billing as the most valuable potential energy management tool

Technology or Strategy to be Demonstrated –

- Currently, it is challenging for customers to determine how their monthly energy bills reflect actual in-home usage and therefore the necessary actions and behavioral changes to reduce their energy bill.
- Pilot will evaluate itemized bill data solutions and will determine necessary features and enhancements to existing billing presentations based on customer research.
- Example: Customers will be able to access a dashboard to see exactly how specific appliances affect their personal energy usage such as: Energy itemization of each major appliance, monthly usage projections, personalized energy saving tips, and real-time energy demand.

EPIC Primary or Secondary Principles Met

- ✓ Lower Costs
- ✓ Societal benefits
- ✓ Loading Order
- ✓ Efficient use of ratepayer monies

SDG&E

Presented by

Dr. Frank R. Goodman, Jr.

Team Lead, Power System Technology, Integration, and Customer Systems

Technology Innovation & Development Department

SDG&E Projects

Grid Modernization and Optimization

Advanced distribution automation demonstration programs

- ***Smart distribution circuit***
- ***DER grid support functions***
- ***Distributed control****
- ***Smart grid architecture*****
- ***Visualization and situational awareness system*****

Customer Focused Products and Services

EV Submetering Pilots, as approved in D.13-11-002***

While the EV Submetering Pilots were not originally proposed in SDG&E's EPIC Application, D.13-11-025 (EPIC decision) encourages SDG&E to use EPIC funds for the Pilots

*On hold, pending finalization of funding requirements for EV submetering
**Cancelled or deferred to fund EV submetering
*** SDG&E's plans to use EPIC funds for the EV Submetering Pilots are tentative, pending final approval

Smart Distribution Circuit Demonstration

Concern, Problem, or Gap to be Addressed –

- Identify preferred circuit components and circuit designs for a more fully automated distribution system
- Determine best circuit designs for networking with advanced distribution control infrastructure
- Achieve lower electrical losses, better operational performance, higher reliability, and improved power quality

Technology or Strategy to be Demonstrated –

- Perform pilot demonstrations of smart distribution circuit features and associated simulation work to identify best practices for integrating new and existing distribution equipment in these circuits
- Provide information to support a decision basis regarding which circuit features should be pursued in commercial deployment programs

EPIC Primary or Secondary Principles Met

- Increased reliability
- Improved power system performance and lower operating costs
- Increased safety
- Efficient use of ratepayer monies
- GHG emissions reduction and other societal benefits
- Economic development

Grid Support Functions of Distributed Energy Resources (DER)

Concern, Problem, or Gap to be Addressed –

- In addition to their use in energy supply, DER could potentially be used to provide non-traditional functions, such as Volt/V AR regulation, fast-response peaking or emergency power, peak shaving, and distribution system status validation at a DER location
- The technical and economic requirements and the strength of the business case for these grid support functions are not yet known and will be assessed via pilot demonstrations

Technology or Strategy to be Demonstrated –

- Assess the viability of specific DER functions via laboratory and field demonstration work
- Contribute knowledge to support a decision basis regarding which, if any, grid support functions and application situations should be pursued in commercial deployment programs
- Clarify what technology and which standards (existing or yet to be developed) are requisite to successful use of DER for grid support functions
- Clarify the cost/benefit proposition of grid support functions

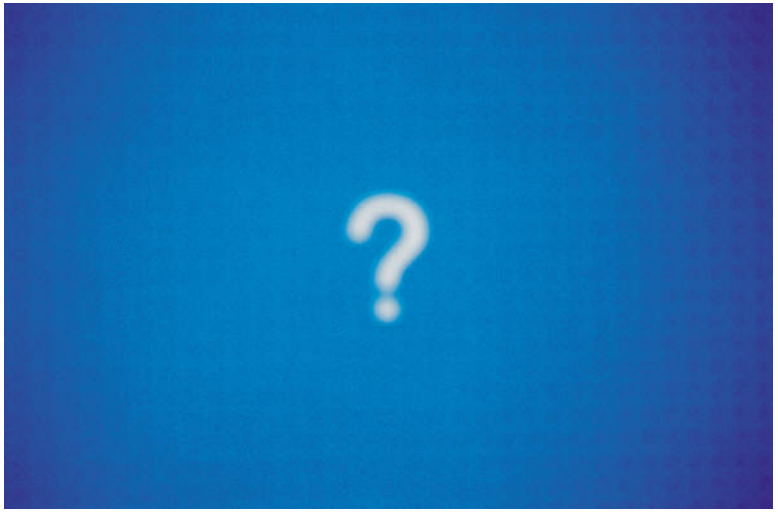
EPIC Primary or Secondary Principles Met

- ✓ Increased reliability
- ✓ Improved power system performance and lower operating costs
- ✓ Increased safety
- ✓ Efficient use of ratepayer monies
- ✓ GHG emissions reduction and other societal benefits
- ✓ Economic development

IOUs: Next Steps

Tentative Timeline	
Execute 1st Triennial EPIC Investment Plan including project-specific solicitations	• Ongoing through 2014
1st Triennial EPIC Investment Plan Annual Report	• February 28, 2014
Stakeholder Workshop: Present draft of 2nd Triennial EPIC Investment Plan (2015-2017)	• March 2014
File 2nd Triennial EPIC Investment Plan	• May 1, 2014

Questions



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