BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Application of San Diego Gas & Electric Company
(U 902-E) for Approval of Electric Program Investment
Charge Triennial Plan for Years 2012-2014

APPLICATION OF SAN DIEGO GAS & ELECTRIC COMPANY (U 902-E) FOR APPROVAL OF ELECTRIC PROGRAM INVESTMENT CHARGE TRIENNIAL PLAN FOR YEARS 2012-2014

Emma D. Salustro
101 Ash Street, HQ12
San Diego, California 92101-3017
Telephone: (619) 696-4328
Facsimile: (619) 699-5027
Email: esalustro@semprautilities.com

Attorney for:
SAN DIEGO GAS & ELECTRIC COMPANY

November 1, 2012

271045

TABLE OF CONTENTS

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Application of San Diego Gas & Electric Company (U 902-E) for Approval of Electric Program Investment Charge Triennial Plan for Years 2012-2014

APPLICATION OF SAN DIEGO GAS & ELECTRIC COMPANY (U 902-E) FOR APPROVAL OF APPROVAL OF ELECTRIC PROGRAM INVESTMENT CHARGE TRIENNIAL PLAN FOR YEARS 2012-2014

I. INTRODUCTION

In compliance with California Public Utilities Commission ("Commission") Decisions ("D.") 12-05-037 and 11-12-035, and pursuant to the Commission's Rules of Practice and Procedure, San Diego Gas & Electric Company ("SDG&E") hereby submits this application ("Application") to submit its First Triennial Electric Program Investment Charges ("EPIC") Investment Plan ("EPIC Plan") to the Commission.

II. BACKGROUND

On May 31, 2012, the Commission issued D.12-05-037, which established the purposes and governance structure for EPIC. EPIC was previously established by the Commission in D.11-12-035 to "provide public interest investments in applied research and development, technology demonstration and deployment, market support, and market facilitation of clean energy technologies and approaches for the benefit of electric ratepayers" of SDG&E, Pacific Gas and Electric ("PG&E") and Southern California Edison ("SCE") (collectively, the "IOU Administrators").[1]

[1] D.12-05-037 at 2.

EPIC is designed to "be the primary vehicle for utility electric [research development & deployment ("RD&D")] proposals other than proposals submitted by the utilities for demand response and electric efficiency RD&D projects."[2] The IOU Administrators may only administer projects funded by EPIC in the area of technology development and deployment ("TD&D").[3]

A. General Requirements

D.12-05-037 requires that the "coordinated"[4] EPIC plans submitted on November 1, 2012 by the four EPIC Administrators – the three IOUs and the California Energy Commission ("CEC") – meet the following common requirements:

- Any projects funded through EPIC must, first and foremost, demonstrate "the potential to produce electricity ratepayer benefits, defined as promoting greater reliability, lower costs, and increased safety."[5]
- EPIC expenditures are to be guided by the complementary principles of providing societal benefits, assisting with the reduction of greenhouse gas ("GHG") emissions in the electricity sector at the lowest possible cost, supporting the Loading Order,[6] and contributing to goals related to low-emission vehicles and transportation, economic development, and efficient use of ratepayer monies.

---

[2] *Id.* at COL 15.

[3] *Id.* at FOF 8.

[4] *Id.* at FOF 9.

[5] *Id.* at FOF 1.

[6] Since 2003, Commission-regulated utilities have had to procure resources to serve demand according to the "Loading Order", which is:

(1) Energy Efficiency & Conservation
(2) Demand Response
(3) Renewable Resources & Clean Distributed Generation, and
(4) Clean Conventional (Fossil) Generation, if necessary.

CPUC, *Energy Action Plan*, adopted April 18, 2003, available at http://docs.cpuc.ca.gov/published/report/28715.htm.

- EPIC expenditures must follow the statutory guidance provided by sections 740.1 and 8360 of the California Public Utility Code;[7]
- EPIC Plans must be mapped to the electric utility value chain identified in D.12-05-037; and
- EPIC funds may not be used to fund duplicative activities.[8]

In addition, the Decision articulates specific information that the EPIC plans must include, such as the responses to any stakeholder comments and intended intellectual property "(IP")methodologies.

III. SUMMARY OF THE APPLICATION

As described in more detail in Attachment A to this Application,[9] the SDG&E EPIC Plan represented in this Application is fully consistent and responsive to the requirements of D.12-05-037. The Commission's directives, as well as SDG&E's demonstrated vision for EPIC-funded TD&D programs, warrant the Commission's approval of the EPIC Plan. The EPIC Plan advances SDG&E's vision for a "smarter" smart grid while providing benefits to electric utility ratepayers, aligning with State energy policies and statutes, and delivering societal and economic benefits that exceed program costs.

IV. SUMMARY OF THE SDG&E EPIC PLAN

SDG&E's EPIC Plan is composed of five distinct, yet related, TD&D programs that demonstrate function and utility beyond existing smart grid deployments, specifically:

---

[7] D.12-05-037 at 18, COL 1, OP 12(e). All statutory citations herein are to the California Public Utility Code, unless otherwise stated.

[8] *Id*. at 40, FOF 9. As a result, the Commission directs the EPIC Administrators to collaborate to "to ensure there is no duplication of effort".

[9] While SDG&E is not offering any testimony in support of its EPIC Plan in this Application, it will make qualified witnesses available at the Commission's request.

(1) Smart Grid Architecture Demonstrations: will consist of pilot demonstrations of key candidate prototype components of the SDG&E smart grid architecture to determine their suitability for adoption in the architecture. The demonstration results will be used by the SDG&E interdepartmental smart grid architecture team to aid in selection of architecture components for adoption in the architecture and to support the implementation phase for adopted components.

(2) Visualization and Situational Awareness Demonstrations: will demonstrate options for the SDG&E smart grid's visualization and situational awareness system, which system operators need to efficiently process the high volume of data coming from sensors and smart devices in the grid and strategically use the data to improve operations and reliability. The findings and resulting system may help mitigate possible risks associated with overwhelming system operators with too much data.

(3) Distributed Control for Smart Grids: will demonstrate a prototype distributed system controller that may manage and dispatch higher penetrations of smart devices in the grid by using local control of circuits as part of a hierarchical control strategy under the distribution management system. This program will help SDG&E make strategic choices concerning distributed control systems.

(4) Demonstration of Grid Support Functions of Distributed Energy Resources ("DER"): will demonstrate grid support functions of DER (sometimes called ancillary services), which can improve distribution system operations. The demonstrations will quantify the value of specific grid support functions in specific application situations and provide a basis for SDG&E to determine which functions it wants to pursue commercially in the development of its smart grid.

(5) Smart Distribution Circuit Demonstrations: will demonstrate smart distribution circuit designs to establish the best design practices for integration of many types of emerging smart, controllable devices, existing equipment, and advanced protection systems. It will provide a basis for SDG&E to strategically and efficiently integrate new devices in a consistent manner throughout SDG&E's distribution circuits.

The five EPIC programs are described in detail in Attachment A.

All five programs are smart grid integration system demonstration programs. The programs are designed to fill industry gaps by helping advance the smart grid from a mass of autonomous smart devices to an integrated networked system of devices and subsystems.

SDG&E is not aware of any other research and development programs that are duplicative of its five EPIC programs.

V. SDG&E'S EPIC PLAN SHOULD BE APPROVED AS REASONABLE, APPROPRIATE, AND IN THE BEST INTEREST OF RATEPAYERS

In D.12-05-037, the Commission mandates that any program funded through EPIC must, first and foremost, be able to demonstrate its "potential to produce electricity ratepayer benefits, defined as promoting greater reliability, lower costs, and increased safety."[10] In addition, it must use various complementary and statutory principles to guide the Plan development and ensure the result is "just and reasonable to ratepayers."[11] As described in more detail in the Attachment A to this Application, the SDG&E EPIC Plan is fully consistent with and responsive to the requirements outlined in D.12-05-037. The SDG&E EPIC Plan has the potential to provide ratepayers with greater reliability, lower costs, and increased safety by helping the smart grid become "smarter" through smart device integration in a networked communication and control infrastructure.[12] In addition, the EPIC Plan aligns with the complementary principles outlined in D.12-05-037, such as the efficient use of ratepayer monies and support for GHG emission reduction policies.[13] It also it meets the statutory criteria outlined in sections 740.1 and 8360.[14] All five programs map to the applicable sections of the electric utility value chain.[15] Finally, the SDG&E EPIC Plan will deliver societal and economic benefits that exceed program costs.[16]

---

[10] D.12-05-037 at FOF 1.

[11] *Id.* at 20 & OP 2.

[12] Attachment A, SDG&E EPIC Plan, at Sections 5.2 & 8.1.

[13] *Id.* at Section 8.2.

[14] *Id.* at Sections 8.3 & 8.4.

[15] *Id.* at Section 8.5. The only section of the utility value chain that SDG&E's EPIC Plan does not map to is "Generation" because the IOU Administrators are prohibited from funding generation programs through EPIC. D.12-05-037 at OP 13.

[16] Attachment A, SDG&E EPIC Plan at Section 8.6.

VI. SDG&E'S EPIC PLAN FULFILLS THE COLLABORATION AND CONSULTATION REQUIREMENTS OF D.12-05-037

D.12-05-037 encourages the four EPIC Administrators to "offer a coordinated approach to clean energy RD&D"[17] through their triennial EPIC plans "to ensure there is no duplication of effort."[18] D.12-05-037 also requires that the EPIC Administrators consult with stakeholders at specific times during the scoping and plan development process. SDG&E has fulfilled both of these requirements. To continue such collaboration in the future, however, SDG&E seeks clarity from the Commission concerning joint EPIC Administrator activities.

A. In Accordance with D.12-05-037, SDG&E Has Collaborated With Other EPIC Program Administrators to the Fullest Extent Possible Under the Law

SDG&E has fulfilled the requirements of D.12-05-037 to coordinate with the other EPIC Administrators through reasonable and constant collaboration throughout the plan development process.

Starting in June 2012, SDG&E and the other IOU EPIC Administrators began meeting semiweekly, usually via telephone. As a result of these meetings, the IOU Administrators developed the Working IOU EPIC Framework ("Working Framework"), which is designed to narrow the IOUs' priorities in EPIC.[19] The IOU EPIC Administrators presented the Working Framework several times to both the CEC and Commission Staff, and incorporated the parties' suggestions and comments into the final Working Framework.[20]

Once the Working Framework was finalized in September 2012, the EPIC Administrators began developing their individual EPIC Plans. They continued to meet at least weekly to

---

[17] D.12-05-037 at FOF 9.

[18] *Id.* at 40.

[19] *See* Attachment A, SDG&E EPIC Plan, at Section 3.3 for a detailed explanation of the Working IOU EPIC Framework.

[20] *See id.* at Section 3.5 for specific details about the IOU Administrators' consultations with the CEC and the Commission Staff regarding the Working IOU EPIC Framework

coordinate the individual EPIC plans to prevent duplication and to determine if there were potential collaboration opportunities.[21] The result of this continuous coordination process is reflected in SDG&E's EPIC Plan.

B. The Commission Should Explicitly Authorize Joint IOU Cooperation on TD&D Programs to Further the Goals of EPIC to Address Antitrust Concerns

In D.12-05-037 the Commission ordered the IOU EPIC Administrators to collaborate to further the development of EPIC programs and activities.[22] SDG&E appreciates the Commission's desire to conserve precious EPIC ratepayer funding by encouraging cooperation between the EPIC IOU Administrators. While SDG&E would like to engage in future collaborations with the other IOU Administrators, it is hesitant to do so without explicit Commission authorization.

While the overarching directive to coordinate is clear, it is not apparent which specific activities the Commission is authorizing the IOU Administrators to engage in to further this directive. Antitrust laws could impede the IOU Administrators' ability to continue to comply with these directions unless the Commission specifically grants State Action Immunity for joint utility cooperation. In particular, SDG&E requests the Commission for a finding that explicitly authorizes the IOU Administrators to jointly engage in certain specific activities which they feel are necessary to work collaboratively on EPIC and leverage EPIC funds, as ordered by the Commission.

For example, SDG&E has concerns regarding coordinating joint IOUs' activities or otherwise working cooperatively in order to contract with third party contractors, absent direct

---

[21] *See id* at Section 3 for specific details about the collaboration efforts of SDG&E and the other EPIC Administrators.

[22] D.12-05-037 at FOF 9.

and explicit Commission authorization to do so, as well as continued supervision by the Commission over such activities. Specifically, agreements between competitors, such as the IOU Administrators, concerning core elements of the competitive process, including agreements on price and output, could be viewed as unlawful under the antitrust laws under certain circumstances.[23]

The Commission could address these concerns by providing the IOU Administrators with protection against an antitrust action under the State Action Doctrine defense. The State Action Doctrine exempts certain conduct from antitrust laws where the State has made a decision to displace competition with regulation.[24] The State Action Doctrine defense exists where: (a) the challenged conduct is a result of directions clearly articulated and affirmatively expressed as state policy; and (b) there is continued active supervision of the IOU activities in this regard.[25] Therefore, SDG&E requests that to open the door to future joint IOU Administrator EPIC programs, the Commission should identify EPIC as a state policy goal and specifically direct the IOUs to work collaboratively to achieve the goal.

The Commission has previously granted IOUs the use of the State Action Immunity doctrine in similar situations when the Commission required IOU cooperation, such as in D.12-04-045, which clarified that the Commission's prior decision[26] approving the IOUs' 2012-2014 Direct Response activities "represents a state policy goal" that required that the IOUs "work

---

[23] While joint negotiations about EPIC programs and contracts would not necessarily be deemed unlawful, the IOUs would face significant legal risks without state action immunity.

[24] *Parker v. Brown*, 317 U.S. 341 (1943); *see also City of Lafayette v. Louisiana Power & Light Co.*, 435 U.S. 389, 410 (1978) (Brennan, J.) (explaining that the two standards for antitrust immunity under *Parker v. Brown* are that first, the challenged restraint must be "one clearly articulated and affirmatively expressed as state policy" and second, the policy must be "actively supervised" by the State itself); D.10-06-009 (granting the state action immunity doctrine for IOUs).

[25] D.12-04-045, 2012 Cal. PUC LEXIS 193, *247.

[26] D.09-08-027.

collaboratively to achieve this goal."[27] Similarly in D.10-06-009, the Commission granted the State Action Immunity Defense for the cooperative activities the Commission expected among the IOUs in connection with the Hydrogen Energy California project.[28] SDG&E asks for the same consideration and treatment here. Without the protection of the State Action Immunity Defense, any future cooperative activities among the IOU Administrators could subject the ratepayers to the significant costs of defending an antitrust lawsuit and the potential of treble damages if the lawsuit is successful.[29]

C. In Accordance with D.12-05-037, SDG&E Consulted with Stakeholders and Gave Appropriate Consideration to their Comments

SDG&E's efforts to inform and involve interested stakeholders in its EPIC Plan development has been reasonable and in accordance with D.12-05-037. D.12-05-037 requires that the EPIC Administrators hold scoping workshops in Summer 2012, and propose their EPIC plans to stakeholders in September 2012.[30] SDG&E fully satisfied these requirements by engaging in the mandatory consultations with stakeholders, as well as participating in several additional voluntary consultations.

On August 16 and 17, 2012, SDG&E and the other two IOUs held the required public scoping workshops for the EPIC program.[31] At the workshops, the IOUs discussed their approach to developing the EPIC plans, including key policy drivers and D.12-05-037

---

[27] D.12-04-045, 2012 Cal. PUC LEXIS 193, *246-*247 ("We therefore authorize the Utilities to engage in certain specific activities necessary to collaboratively implement the DR statewide activities as ordered by the Commission.").

[28] D.10-06-009, modifying D.09-12-014 to clarify the scope of cooperative activities by the IOUs in connection with the Hydrogen Energy California project approved in D.09-12-014.

[29] For example, Section 4 of the Clayton Antitrust Act automatically gives a successful antitrust plaintiff "threefold the damages sustained." 15 U.S.C. § 15(a).

[30] D.12-05-037 at 31.

[31] On July 23, 2012, SCE publicly noticed the workshops on behalf of the EPIC IOU Administrators to all members of the R.11-10-003 service list. Additionally, SDG&E contributed extensively to the CEC's public workshops for EPIC on August 2-3 and August 9-10.

requirements. The IOUs also presented the initial draft Working Framework for comment and discussion.[32]

On September 28, 2012, the IOU Administrators presented again to stakeholders via a webinar.[33] As required by D.12-05-037,[34] SDG&E presented its draft EPIC Plan to stakeholders by discussing three of its five proposed EPIC programs in detail during the webinar and posting all five of its proposed EPIC programs on its website for public review.[35]

SDG&E also voluntarily engaged stakeholders and other interested parties in its plan development process on other occasions. For example, in early September, the four EPIC Administrators met with Commission Staff to discuss development efforts to date. Later, in mid-September, the four EPIC Administrators presented the Working Framework to Electric Power Research Institute ("EPRI"), which confirmed that the gaps identified by the Working Framework are indeed existing industry gaps that would be appropriately addressed through EPIC TD&D programs. Finally, in mid-September, SDG&E received additional feedback on its five program proposals from Commission Staff. SDG&E has incorporated the feedback received during each of these meetings into its EPIC Plan.

VII. SDG&E'S PROPOSED INTELLECTUAL PROPERTY METHODOLOGIES FOR EPIC ARE REASONABLE AND CONSISTENT WITH COMMISSION-APPROVED APPROACHES

The main benefit to the electric utility ratepayers and the purpose of SDG&E's EPIC programs will be the technology and system integration demonstrations and the lessons learned

[32] The comments and feedback received by SDG&E, and its response to those comments, are discussed in Attachment A, SDG&E EPIC Plan, at Section 3.5.

[33] On September 14, 2012, Edison provided public notice of the webinar on behalf of the EPIC IOU Administrators to all members of the R.11-10-003 service list.

[34] D.12-05-037 at 31.

[35] SDG&E, EPIC, http://sdge.com/regulatory-filing/3749/electric-program-investment-charge-epic. The comments and feedback received by SDG&E, and its response to those comments, are discussed in Attachment A, SDG&E EPIC Plan, at Section 4.2.

therefrom. These lessons learned will provide electric utility ratepayers with the secondary benefit – lower costs – by allowing SDG&E make more informed decisions concerning its commercial smart grid deployment and development activities. In addition, if the technology demonstrations are successful, tertiary benefits may also accrue to the electric utility ratepayers in the form of IP rights. As required by D.12-05-037, SDG&E will employ various methodologies that benefit electric utility ratepayers to handle any IP that emerges from its EPIC programs.

The two most likely situations to occur dictate slightly different IP approaches.[36] In the first situation, the IP is developed by SDG&E in-house and funded by ratepayers through EPIC. In the second situation, the IP is developed by a third-party contractor and is funded by ratepayers through EPIC. The particular IP methodologies SDG&E would use in the two situations are detailed below.

A. Methodology for IP Developed In-House By SDG&E

For IP developed in-house by SDG&E, SDG&E would first file a patent for the IP with the U.S. Patent and Trademark Office. SDG&E would share any net revenues (i.e., revenues from royalties, license fees, or proceeds from the sale of IP rights) with its ratepayers under the net revenue sharing mechanism formula approved in the most recent SDG&E General Rate Case.

[36] There is a third, less likely situation as well, where IP is jointly developed by SDG&E and a third-party contractor. As discussed in SDG&E's EPIC Plan, SDG&E's approach to this situation will be largely dictated by the contractual terms between SDG&E and the third-party contractor. SDG&E will apply the same sharing mechanism to any EPIC IP revenues it receives in this situation.

The current Commission-approved formula provides ratepayers with 60% of net revenues and shareholders with 40% net revenues (the "60/40" formula).[37]

In the event of a sale or transfer of IP rights, SDG&E would seek to retain a perpetual, non-exclusive unrestricted license to practice the invention at issue for or on behalf of the California ratepayers to the extent permissible under applicable laws, including without limitation, the affiliate transaction rules.[38] That way SDG&E and its ratepayers would not have to pay to use IP of its own invention.

B. Methodology for IP Developed By a Third-Party Contractor

For any IP developed by a third-party contractor but funded by the ratepayers through EPIC, the specific IP methodology details will likely differ based on the particular contractor. SDG&E will again seek to retain a perpetual, non-exclusive unrestricted license to practice the invention at issue for or on behalf of the California ratepayers to the extent permissible under applicable laws, including without limitation, the affiliate transaction rules. That way the ratepayers would not have to pay (via their utility) for IP they funded. In addition, as a condition of the EPIC contract with SDG&E, the third-party contractor would be required to protect SDG&E's and its ratepayers' interests by citing SDG&E's support within the specification of any U.S. patent application for any subject inventions and provide SDG&E with a confirmatory

[37] The 60/40 (ratepayer/shareholder) revenue sharing mechanism for net revenues (future or ongoing royalties from the use of a license, sale of securities) related to ratepayer-funded RD&D programs was most recently approved in D.08-07-046, the decision on the Test Year 2008 General Rate Case for Southern California Gas Company, issued August 1, 2008. SDG&E has requested the same revenue sharing mechanism in its pending GRC. *See* A.10-12-005, Prepared Direct Testimony of Kathleen H. Cordova (SDG&E-15), at 74. If the situation involved the conversion of warrants, the proceeds would be distributed 67% to ratepayers and 33% to shareholders in accordance with the gain-on-sale allocation approach approved by the Commission in D.06-05-041, as modified by D.06-12-043.

[38] In the event of a sale or transfer of IP rights, SDG&E would file an Advice Letter pursuant to GO 96-B, Pub. Util. Code sec. 851 and GO-173.

license for subject inventions.[39] These are the same terms for IP generated by federally-funded efforts by contractors under the federal Bayh-Dole Act.[40]

SDG&E's specific share of any royalties will be dependent on the terms of the contract between SDG&E and the third party contractor. In the event that SDG&E has contracted to receive a portion of any subsequent IP royalties, SDG&E will apply the most recently-approved sharing mechanism formula to its share of any net revenues.

VIII. NO RATE INCREASE IS REQUESTED BECAUSE EPIC FUNDS HAVE ALREADY BEEN AUTHORIZED AND ARE BEING COLLECTED

SDG&E is not requesting approval for a rate increase in this Application because the collection of EPIC funds from electric utility ratepayers was previously authorized in D.11-12-035[41] and D.12-05-037.[42] The IOUs are ordered to collect an interim EPIC surcharge "set at the same levels per kilowatt/hour as the rates for the system benefits charge, after subtracting the portion of the system benefits charge collected for the energy efficiency programs associated with Public Utilities Code Section 399.8".[43] The funds are to be collected by the IOUs from their electric ratepayers in the same proportion that the Public Goods Charge funds were

[39] This approach is akin to the IP methodology adopted in D.08-04-039 (as modified by D.08-04-054) at *72-*84 related to the California Institute for Climate Solutions. It is derived from the Bayh-Dole Act.

[40] Adopted in 1980, the Bayh-Dole Act, officially titled the "University and Small Business Patent Procedures Act," is codified in 35 U.S.C. § 200-212, and implemented by 37 C.F.R. 401 et seq. For example, in section (b) of 37 CFR 401.14 ("Allocation of Principle Rights") states, "With respect to any subject invention in which the *Contractor* retains title, the Federal government shall have a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States the subject invention throughout the world." (emphasis added).

[41] D.11-12-035 at OP 2, 3 (establishing the EPIC surcharge and ordering the electric IOUs to collect EPIC from their ratepayers in the same manner as the expiring system benefits charge associated with Public Utilities Code Section 399.8).

[42] D.12-05-037 at OP 1.

[43] D.11-12-035 at OP 3.

collected: PG&E 50.1%; SDG&E 8.8%; and SCE 41.1%.[44] Therefore, from January 1, 2012 until December 31, 2012, SDG&E is ordered to collect $12.730 million annually.[45]

On December 22, 2011, SDG&E filed a Tier 1 Advice Letter 2321-E seeking authorization to establish the EPIC surcharge and associated EPIC Balancing Account ("EPICBA").[46] On January 1, 2012, SDG&E began collecting EPIC funds from its electric ratepayers through the electric Public Purpose Program ("PPP") bill component.

In accordance with D.12-05-037, the level of EPIC funds collected from electric IOU ratepayers will increase to $162 million annually starting January 1, 2013 through December 31, 2020.[47] Therefore, starting January 1, 2013, SDG&E is ordered to increase its EPIC collections from $12.730 million to $14.256 million annually. On June 22, 2012, SDG&E filed a Tier 1 Advice Letter 2375-E to revise its EPIC Balancing Account to align with SDG&E's 8.8% share of authorized funding beginning January 1, 2013. On October 1, 2012, SDG&E filed Tier 2 Advice Letter 2402-E, which revises SDG&E's electric PPP rates effective January 1, 2013.[48] The Advice Letter included the increase in EPIC collections commencing January 1, 2013.

The electric rate impacts are presented in the tables below.

---

[44] D.12-05-037 at OP 7.

[45] Under the Public Goods Charge, SDG&E collected $6.52 million for renewables and $6.210 for RD&D.

[46] In accordance with D.12-05-037 and Public Resources Code sec. 25711, SDG&E will transfer EPIC funds out of the EPIC balancing account on four specific occasions. First, SDG&E will send an annual check Commission for its administrative oversight of the EPIC program. Second, SDG&E will send a check quarterly to the CEC directly for administrative costs incurred by the CEC during its administration of its EPIC programs. SDG&E has already started making both of these payments to the Commission and the CEC. Third, SDG&E will transfer funds to the CEC for the CEC's program costs "periodically" as the CEC incurs such costs. Because no programs have yet been approved, SDG&E has not yet completed any such transfer. Fourth, SDG&E will record its own EPIC program and administrative costs against the balancing account. Because no programs have yet been approved, SDG&E has not yet recorded any program costs.

[47] D.12-05-037 at OP 1, 7. Collections amounts shall be adjusted on January 1, 2015 and again on January 1, 2018, at the rate of the consumer price index change over the previous three-year period. D.12-05-037 at OP 7.

[48] Ordering Paragraph 2 of D.03-04-027 requires SDG&E to file an advice letter by October 1 each year to revise its electric PPP rates effective January 1 of the following year.

Illustrative Electric Rate Impact
2013

Customer Class	2012[1]	2013	Change	
	¢/KWhr	¢/KWhr	¢/KWhr	%
(a)	(b)	(c)	(d)	(e)
Residential	18.324	18.332	0.008	0.04%
Small Commercial	18.001	18.012	0.011	0.06%
Med&Lg C&I[2]	14.305	14.311	0.006	0.04%
Agriculture	17.509	17.517	0.008	0.05%
Lighting	14.868	14.877	0.009	0.06%
System Total	16.154	16.161	0.007	0.04%

[1] Reflect rates effective September 1, 2012 (AL 2396-E)

[2] C&I stands for Commercial and Industrial

Illustrative Electric Rate Impact
2014

Customer Class	2012[1]	2014	Change	
	¢/KWhr	¢/KWhr	¢/KWhr	%
(a)	(b)	(c)	(d)	(e)
Residential	18.324	18.332	0.008	0.04%
Small Commercial	18.001	18.012	0.011	0.06%
Med&Lg C&I[2]	14.305	14.311	0.006	0.04%
Agriculture	17.509	17.517	0.008	0.05%
Lighting	14.868	14.877	0.009	0.06%
System Total	16.154	16.161	0.007	0.04%

[1] Reflect rates effective September 1, 2012 (AL 2396-E)

[2] C&I stands for Commercial and Industrial

A. SDG&E's Proposed Accounting Treatment for Encumbered, But Unspent, EPIC Funds is Reasonable and Appropriate

Due to the compressed schedule and uncertain program approval date, the programs comprising SDG&E's EPIC Plan cannot necessarily be completed before the first cycle ends. Therefore, these programs, and their necessary expenditures, will likely extend into the second EPIC cycle. SDG&E's EPIC commitments approved as part of this multiyear Plan, but potentially not fulfilled until after the first cycle, will be spent and booked to EPICBA as the expenses are incurred.[49] This approach is reasonable because it provides SDG&E with certainty that it will have sufficient funds to meet its program commitments and fully execute its EPIC programs. In addition, it would be unreasonable to require complex R&D programs, like those contained in SDG&E's EPIC plan, to be completed in what little time remains in the first cycle after Commission approval.

B. SDG&E's Proposed Clarification for Fund Shifting is Reasonable and Appropriate

The Decision states, "If an administrator wishes to shift more than 5% of the budget for a given category of expenditure authorized in an investment plan, or to fund a new category of expenditure[50], the administrator should be required to apply to the Commission to approve such a change."[51] The Decision is silent on the appropriate regulatory mechanism that should be employed if such changes are to be proposed. SDG&E recommends that such revisions be the subject of an advice letter. This process would provide parties with an opportunity to review a

[49] D.12-05-037 only addresses EPIC budget funds that are "unencumbered" at the end of an EPIC cycle as eligible to be rolled-over into the next cycle. It does not address how EPIC funds that are encumbered, but unspent, at the end of an EPIC cycle should be treated by the IOU Administrators.

[50] "Category" is not defined by D.12-05-037. For purposes of this Application and attached EPIC Plan, SDG&E interprets "category" to mean a program proposal.

[51] D.12-05-37 at COL 22.

utility's proposal, submit comments and allow the Commission to respond in a timelier manner that might be experienced with a petition for modification or other regulatory filing.

IX. REQUESTED RELIEF

SDG&E respectfully requests that the Commission issue a decision:

1. Finding SDG&E in compliance with the requirements of D.12-05-037;
2. Finding SDG&E's EPIC Plan reasonable, appropriate and in the best interest of electric utility ratepayers;
3. Finding EPIC represents a State policy goal, and ordering the IOU EPIC Administrators to work collaboratively to achieve the goal, thus providing the IOU EPIC Administrators the protections of the State Action Immunity Doctrine;
4. Finding SDG&E's proposed IP methodology reasonable, appropriate, and in the best interest of electric utility ratepayers;
5. Finding SDG&E's proposed accounting methodology for program costs encumbered but unspent during the first triennial cycle as reasonable and appropriate;
6. Finding SDG&E's proposed use of the advice letter process is a reasonable and appropriate mechanism in which EPIC Administrators shall seek authorization to shift funds or establish a new EPIC program;
7. Rendering other Findings of Fact, Conclusions of Law, and issuing orders consistent with the foregoing requests; and
8. Any other relief as is necessary and proper.

X. STATUTORY AND PROCEDURAL REQUIREMENTS

A. Rule 2.1 (a) – (c)

In accordance with Rule 2.1 (a) – (c) of the Commission's Rules of Practice and Procedure, SDG&E provides the following information.

1. Rule 2.1 (a) - Legal Name

SDG&E is a corporation organized and existing under the laws of the State of California. SDG&E is engaged in the business of providing electric service in a portion of Orange County and electric and gas service in San Diego County. SDG&E's principal place of business is 8330

Century Park Court, San Diego, California 92123. SDG&E's attorney in this matter is Emma D. Salustro.

2. Rule 2.1 (b) - Correspondence

Correspondence or communications regarding this Application should be addressed to:

Joy Yamagata
Regulatory Manager
San Diego Gas & Electric Company
8330 Century Park Court, CP32D
San Diego, California 92123
Telephone: 858-654-1755
Facsimile: (858) 654-1788
JYamagata@semprautilities.com

with copies to:

Emma D. Salustro
Attorney for:
San Diego Gas & Electric Company
101 Ash Street, HQ12
San Diego, CA 92101-3017
Telephone: (619) 696-4328
Facsimile: (619) 699-5027
ESalustro@semprautilities.com

3. Rule 2.1 (c)

a. Proposed Category of Proceeding

SDG&E proposed to categorize this Application as a "quasi-legislative" proceeding within the meaning of Rules 1.3(d) and 7.1.[52]

b. Need for Hearings

SDG&E does not believe that approval of this Application will require hearings. SDG&E has provided ample supporting information, analysis and documentation that provide the Commission with a sufficient record upon which to grant the relief requested. In addition, it has presented interested stakeholders its draft EPIC plan several times during the scoping and development process and incorporated relevant feedback in to the EPIC Plan. SDG&E,

[52] The Commission has found similar proceedings to fall into the quasi-legislative category, such as the consolidated proceedings to approve the IOUs' Smart Grid Deployment Plans. *See, e.g.*, D.11-12-012 (affirming that the proceeding was quasi-legislative because the "proceeding will address the policy of issue of whether the Smart Grid deployment plans comply with the policies established in D.10-06-047.")

nevertheless, sets forth below a schedule that includes hearings, in the event hearings are deemed to be necessary.

c. Issues to be Considered

The issues to be considered are described in this Application and the accompanying SDG&E EPIC Plan.

d. Proposed Schedule

As noted above, SDG&E does not believe hearings will be necessary, but proposes alternate schedules to address either scenario:

PROPOSED SCHEDULE – NO HEARINGS	
ACTION	**DATE**
Application filed	November 1, 2012
Daily Calendar Notice	November 2, 2012
Response/Protests	December 3, 2012
Reply to Response/Protests	December 13, 2012
Prehearing Conference (if necessary)	December 17, 2012
Scoping Memo Issued	December 28, 2012
Intervenor Testimony	January 18, 2013
Rebuttal Testimony	February 8, 2013
Concurrent Opening Briefs	March 1, 2013
Concurrent Reply Briefs	March 22, 2013
Proposed Decision	April 19, 2013
Comments on Proposed Decision	May 9, 2013
Reply Comments on Proposed Decision	May 14, 2013
Commission Approval	May 23, 2013 or June 27, 2013

PROPOSED SCHEDULE –HEARINGS REQUIRED	
ACTION	**DATE**
Application filed	November 1, 2012
Daily Calendar Notice	November 2, 2012
Response/Protests	December 3, 2012
Reply to Response/Protests	December 13, 2012
Prehearing Conference (if necessary)	December 17, 2012
Scoping Memo Issued	December 28, 2012
Intervenor Testimony	January 18, 2013
Rebuttal Testimony	February 8, 2013
Evidentiary Hearings	February 20 & 21, 2013
Concurrent Opening Briefs	March 15, 2013
Concurrent Reply Briefs	April 5 22, 2013
Proposed Decision	May 6, 2013
Comments on Proposed Decision	May 28, 2013
Reply Comments on Proposed Decision	June 3, 2013
Commission Approval	June 27, 2013

B. Rule 2.2 – Articles of Incorporation

A copy of SDG&E's Restated Articles of Incorporation as last amended, presently in effect and certified by the California Secretary of State, was filed with the Commission on August 31, 2009 in connection with SDG&E's Application No. 09-08-019, and is incorporated herein by reference.

XI. SERVICE

In accordance with Ordering Paragraph 11 of D.12-05-037, SDG&E will serve this Application and its attachments on parties to the service list for R.11-10-003 (*Order Instituting Rulemaking on the Commission's own motion to determine the impact on public benefits associated with the expiration of ratepayer charges pursuant to Public Utilities Code Section*

399.8), A.10-12-005 (SDG&E's pending GRC proceeding), A.10-11-015 (SCE's pending GRC proceeding), and A.09-12-020 (PG&E's most recent GRC proceeding). Hard copies will be sent by overnight mail to the Assigned ALJ Fitch in R.11-10-003 and Chief ALJ Karen Clopton.

XII. CONCLUSION

WHEREFORE, SAN DIEGO GAS & ELECTRIC COMPANY requests that the Commission grant SDG&E's Application as described herein.

Respectfully submitted this 1st day of November 2012.

By: /s/ Emma D. Salustro
Emma D. Salustro

Attorney for:
SAN DIEGO GAS & ELECTRIC COMPANY
101 Ash Street, HQ 12
San Diego, CA 92101
Telephone: (619) 696-4328
Facsimile: (619) 699-5027
E-mail: esalustro@semprautilities.com

SAN DIEGO GAS & ELECTRIC COMPANY

By: /s/ James Avery
James Avery
San Diego Gas & Electric Company
Senior Vice President – Power Supply

OFFICER VERIFICATION

OFFICER VERIFICATION

James Avery declares the following:

I am an officer of San Diego Gas & Electric Company and am authorized to make this verification on its behalf. I am informed and believe that the matters stated in the foregoing **APPLICATION OF SAN DIEGO GAS & ELECTRIC COMPANY (U 902-E) FOR APPROVAL OF APPROVAL OF ELECTRIC PROGRAM INVESTMENT CHARGE TRIENNIAL PLAN FOR YEARS 2012-2014** are true to my own knowledge, except as to matters which are therein stated on information and belief, and as to those matters, I believe them to be true.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed on November 1, 2012 at San Diego, California.

By: /s/ James Avery
James Avery
San Diego Gas & Electric Company
Senior Vice President – Power Supply

271045

Attachment A

SDG&E Electric Program Investment Charge
First Triennial Investment Plan
2012 – 2014

November 1, 2012

Table of Contents

1. Executive Summary of SDG&E EPIC Plan

The California Public Utilities Commission ("Commission") established the Electric Program Investment Charge ("EPIC") in Decision ("D.") 11-12-035 to provide public interest investments in research and development of clean energy technologies and approaches for the benefit of California's investor-owned utility ("IOU") electric ratepayers. SDG&E and the other IOUs were instructed to develop plans for the use of EPIC funds between 2012 through 2014.

SDG&E's EPIC Plan is composed of five individual, yet complementary, demonstration programs. The five programs were chosen by SDG&E through a thorough selection process that included Commission-ordered collaboration with the other EPIC Administrators, consultations with stakeholders, an industry gap analysis, internal vetting to ensure alignment with SDG&E's needs and goals, and various steps to prevent duplication with other known demonstration programs.

All five programs are smart grid integration system demonstration programs. Each program has the potential to help advance the SDG&E smart grid from a mass of autonomous smart devices to a networked system of integrated devices and subsystems. In essence, the programs will help modernize SDG&E's smart grid to make it even "smarter."

All five programs have the potential to provide electric utility ratepayers with the Commission-ordered benefits of lower costs, greater reliability and increased safety. In addition, the five programs align with various State energy policies, goals and statutory requirements.

This is the first of three triennial EPIC Plans that SDG&E is required to file with the Commission. SDG&E strives to continue consulting with interested stakeholders and coordinating its program efforts with the other EPIC Administrators, to the extent legally permissible, as it makes findings through these five programs and develops future EPIC Plans.

2. Background

On May 31, 2012, the Commission issued D.12-05-037, which established the purposes and governance structure for the EPIC program. The Commission previously established EPIC in D.11-12-035 to "provide public interest investments in applied research and development, technology demonstration and deployment, market support, and market facilitation, of clean energy technologies and approaches for the benefit of electric ratepayers of Pacific Gas and Electric Company ("PG&E"), San Diego Gas & Electric Company ("SDG&E") and Southern California Edison ("SCE"), the three large investor-owned utilities" (collectively, "the IOU Administrators").[1]

EPIC funding is collected from the ratepayers of the three IOUs through rates. Eighty percent of EPIC funding is administrated by the California Energy Commission ("CEC") and the remaining twenty percent is administrated by the IOUs at the same rate of collection: 50.1% for PG&E, 41.1% for SCE and 8.8% for SDG&E.[2]

The EPIC program is designed to "be the primary vehicle for utility electric [research development & deployment] RD&D proposals other than the proposals submitted by the utilities for demand response and electric efficiency RD&D projects."[3] The IOUs may only administer projects funded by EPIC in the area of Technology Demonstration and Deployment ("TD&D").[4] The Commission strongly encourages the four EPIC Administrators – the three IOU Administrators and the CEC – to coordinate their EPIC expenditures for clean energy research and development ("R&D").[5]

Any projects funded through EPIC must, first and foremost, be able to demonstrate "the potential to produce electricity ratepayer benefits, defined as promoting greater reliability, lower costs, and increased safety."[6] In addition, EPIC expenditures are to be guided by the complementary principles of societal benefits, greenhouse gas ("GHG") emissions reductions in the electricity sector at the lowest possible cost, the Loading Order,[7] low-emission vehicles and transportation, economic development, and efficient

---

[1] D.12-05-037 at 2.
[2] *Id*. at 2-3.
[3] *Id*. at COL 15.
[4] *Id*. at FOF 8.
[5] *Id*. at FOF 9.
[6] *Id*. at FOF 1.
[7] Since 2003, Commission-regulated utilities have had to procure resources to serve demand according to the Loading Order, which is:

(1) Energy Efficiency & Conservation
(2) Demand Response
(3) Renewable Resources & Distributed Generation, and
(4) Clean Conventional (Fossil) Generation, if necessary.

CPUC, *Energy Action Plan*, adopted April 18, 2003, available at http://docs.cpuc.ca.gov/published/report/28715.htm.

use of ratepayer monies. Lastly, EPIC expenditures must follow the statutory guidance provided by Cal. Pub. Util. Code secs. 740.1 and 8360.[8]

It is with these principles in mind – mandatory benefits to ratepayers and alignment with a wide variety of complementary policies and statutes – that SDG&E developed its EPIC Plan.

2.1 IOU-Administered Program Funding Allocation

Commission Decision 12-05-037 allocates EPIC funding as follows:

Funding Element	CEC	IOU	CPUC	Total ($ millions)
Applied Research	55	0	0	55
Technology Demonstration and Deployment	45	30	0	75
Market Facilitation	15	0	0	15
Program Administration	12.8	3.4	0	16.2
Program Oversight	0	0	0.8	0.8
Total ($ millions)	**127.8**	33.4	**0.8**	**162**

Within the IOU category, funds are allocated according to the amount that the respective electric utility ratepayers pay into the EPIC fund, with a resultant allocation of PG&E - 50.1%, SCE- 41.1%, and SDG&E - 8.8%. As a result, SDG&E's EPIC Plan budget allows for $2.64 million annually for TD&D programs and $299,200 for program administration.[9]

3. Initial Scoping and Coordination by IOU EPIC Administrators

Since June 2012, SDG&E, in conjunction with the other IOU Administrators and in parallel with the CEC, worked through a rigorous, multi-step process to develop a common foundation for the various EPIC Plans. The process included surveying the policy and regulatory landscape for primary policy drivers, conducting a preliminary gap analysis, reviewing known R&D programs for possible duplication, and developing a working framework to guide the IOU Administrators' EPIC program selection efforts.

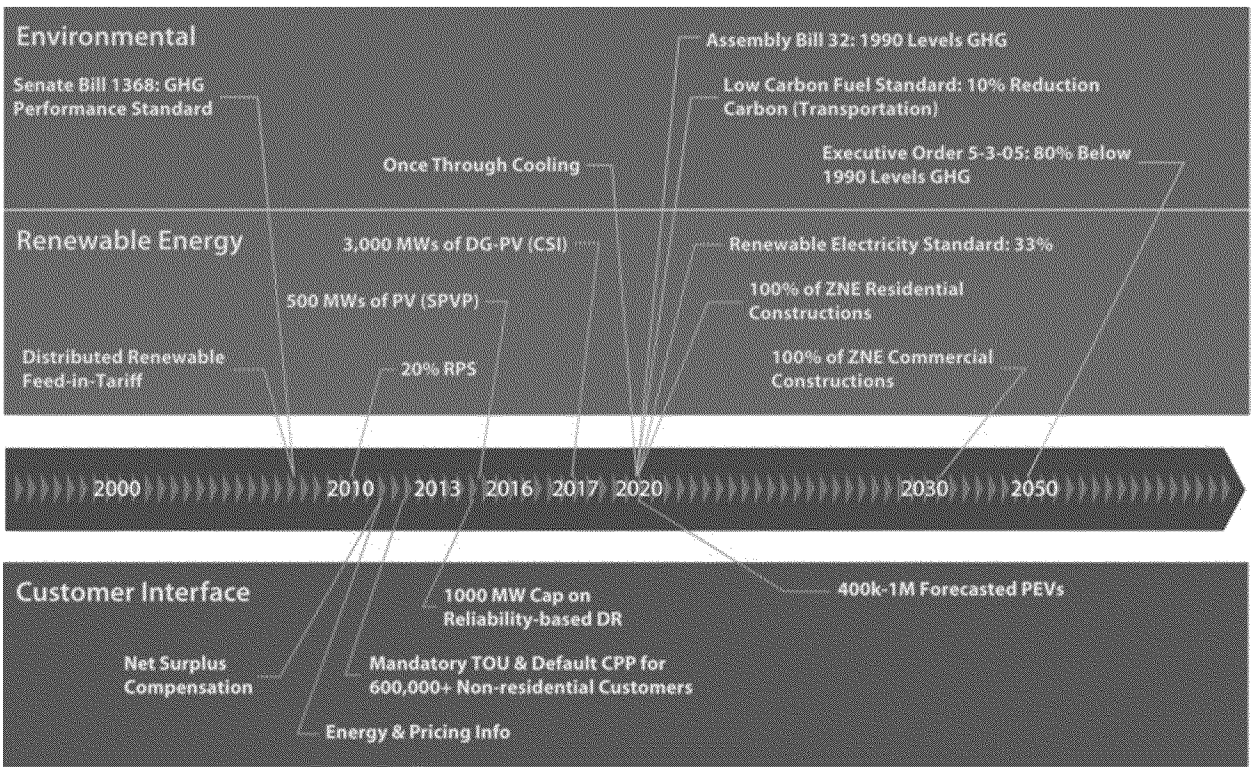
[8] D.12-05-037 at 18, COL 1, OP 12(e). All code citations in this EPIC Plan are to the Public Utility Code unless otherwise noted.

[9] For the purposes of EPIC, "administrative costs" include staffing costs of the administrators, associated general and administrative expenses and overhead, and related contracting costs to: prepare the investment plans, conduct solicitations, select funding recipients, and monitor and oversee the progress of projects and investments. Administrative costs do not include evaluation or measurement costs. Administrative costs are capped at 10% of the EPIC Administrators' overall budgets. D.12-05-037 at 65-66, 100.

Stakeholders were consulted, and their feedback was incorporated, throughout this process.[10]

3.1 Review of the Relevant Regulatory and Legislative Energy Landscape in California

To start narrowing the scope of their EPIC Plans, the IOU Administrators considered the various regulatory and legislative requirements shaping the energy landscape in California. The IOU Administrators determined that the following regulatory and legislative requirements were the primary drivers of California's energy policy landscape:[11]



According to D.12-05-037, EPIC Plans must not only conform to these legal requirements, but they must also further the policy initiatives and goals underlying these requirements. While SDG&E considered all of these legislative and regulatory initiatives as important to potentially address through its EPIC Plan, a few in particular stand out

[10] *See infra* Section 3.5 for additional information about the two IOU Administrator workshops held in August. In addition, SDG&E attended the CEC's two scoping workshops, also held in August. An SDG&E employee presented information about the IOU Administrators' ongoing coordination and plan development efforts at the CEC's two workshops.

[11] *See Southern California Edison Smart Grid Strategy & Roadmap*, at 4, available at http://www.sce.com/NR/rdonlyres/BFA28A07-8643-4670-BD4B-215451A80C05/0/SCE_SmartGrid_Strategy_and_Roadmap.pdf (alternations to the original).

as the most relevant for SDG&E and its ratepayers, specifically SB17,[12] the 33% renewable portfolio standard ("RPS"),[13] the Governor's goal of 12,000 MW of renewable distributed energy resources ("DER") by 2020,[14] and the various policy goals aimed at reducing GHG emissions.[15] Together, these policies contributed significantly to SDG&E's program selection process.

3.2 Informal Survey of Existing TD&D Energy Programs

As part of their scoping process and in accordance with section 740.1(d), the IOU Administrators informally researched other TD&D programs, including California-based programs[16], U.S. Department of Energy-funded projects, and other known efforts in North America and other countries with advanced utility programs, to develop a basic understanding of ongoing electric utility efforts. SDG&E used this information to eliminate potentially duplicative or moot proposals when it was selecting its EPIC programs.[17]

3.3 Development of IOU Working EPIC Framework to Focus EPIC Programs

The IOU Administrators also collaborated to create the IOU Working EPIC Framework ("Working Framework").

[12] SB17, codified at Cal. Pub Util. Code sec. 8360 et seq., requires the Commission to create a smart grid deployment plan by July 1, 2010 and electrical utilities to submit a smart grid deployment plan to the Commission by June 1, 2011. The statute required that standards be adopted for California that complied with standards from the National Institute of Standards and Technology ("NIST"), the Gridwise Architecture Council, the International Electrical and Electronics Engineers, the North America Electric Reliability Cooperation, and FERC. Cal. Pub. Util. Code §8362(a).

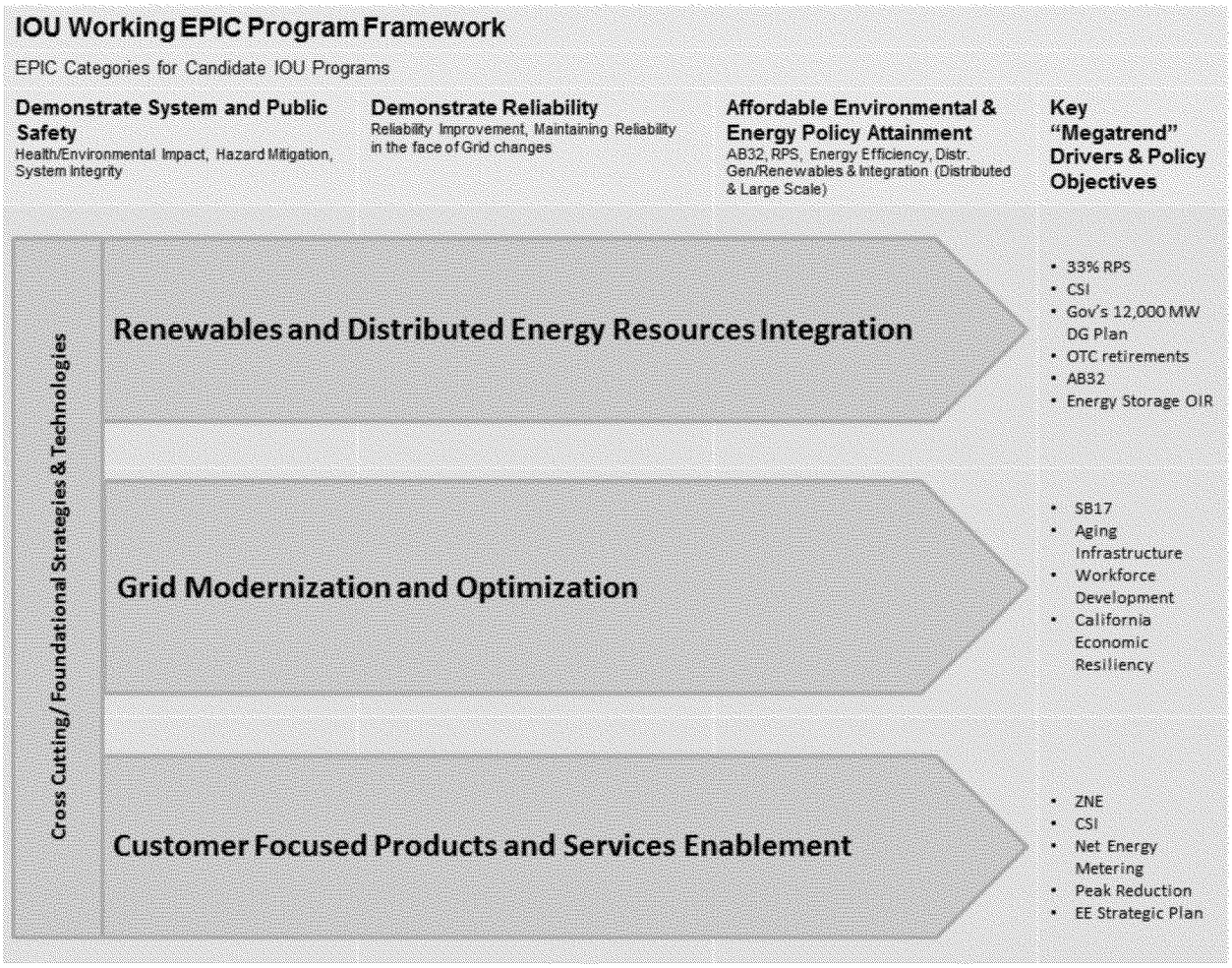
[13] SB1X-2 (2011); Office of the Governor, Executive Order S-21-09, Sept. 15, 2009; Office of the Governor, Executive Order S-14-08, November 17, 2008.

[14] Governor Jerry Brown, *Clean Energy Jobs Plan*, June 2010, available at http://gov.ca.gov/docs/Clean_Energy_Plan.pdf.

[15] See, e.g., AB32.

[16] For example, the California Solar Initiative ("CSI") RD&D Plan suggests that 50-65 percent of CSI RD&D Program funds be dedicated to grid integration projects. CPUC, *The CSI Research, Development, Demonstration and Deployment (RD&D) Plan*, available at http://www.cpuc.ca.gov/PUC/energy/Solar/rdd.htm. The third round CSI RD&D Program grant awards were made in March 2012 and grid integration of high-penetration photovoltaics ("PV") was a primary focus of these awards. *CPUC Approves Third Round of Grants for California Solar Initiative RD&D Program*, Resolution No. E-4470, March 8, 2012, available at http://docs.cpuc.ca.gov/PUBLISHED/NEWS_RELEASE/161190.htm.

[17] *See infra* Section 4 for a detailed description of SDG&E's program selection process.



The Working Framework is not intended to be a legally-binding framework within which the IOU Administrators' EPIC programs are limited, but rather a guiding framework that expresses the interplay of the various pressures on today's energy sector, including regulatory and legislative requirements and their underlying policy goals, section 8360 requirements, the electricity system value chain, and industry gaps.

The Working Framework outlines four possible categories in which the IOU Administrators should focus their EPIC programs:

1. Renewable and Distributed Energy Resource Integration
2. Grid Modernization and Optimization
3. Customer Focused Products and Services Enablement
4. Cross Cutting/Foundational Strategies and Technologies.

These four categories are described below in more detail. All four categories strive to provide electric utility ratepayers the benefits of greater reliability, lower costs, and increased safety, while simultaneously providing benefits related to GHG emissions mitigation, the California Loading Order, low-emission vehicles/transportation issues,

economic development, the efficient use of ratepayer monies, and other general societal benefits.

3.3.1 Renewable and Distributed Energy Resource Integration Category

California's numerous clean energy goals are the primary policy drivers for this category of potential EPIC programs. For example, by 2020, California utilities are required to have 1) reduced carbon dioxide to 1990 levels,[18] 2) purchased or produced enough California-eligible renewable energy to meet 33% of customer needs,[19] 3) retired 16,000 MW of once-through-cooling power plants previously used to provide system inertia and integrate renewable energy,[20] and 4) encouraged the development of infrastructure to enable all new buildings dwellings to operate on a Zero Net Energy ("ZNE") basis.[21] In addition, they are strongly encouraged to interconnect 12,000 MW of locally-produced renewable generation.[22] Achievement of these goals will significantly increase the amount of renewable energy connected to California utility grids at the transmission and distribution levels.

This Working Framework category, *Renewable and Distributed Energy Resource Integration*, encompasses potential EPIC programs designed to help California and its electric utility ratepayers:

- Safely, reliably and affordably attain the State's clean energy policy goals at the least cost/best fit;
- Maintain various required balancing area standards (e.g., frequency, voltage and imbalances) and utility standards (e.g., voltage and harmonics);
- Demonstrate California's leadership in new technologies and grow the State's economy by developing and investing in leading-edge technology companies;
- Develop and maintain a skilled workforce versed in the newest technologies; and
- Strive for minimal rate increases necessary to de-carbonize the utility systems.

SDG&E has chosen not to propose a program that falls primarily in this category. Instead, it has chosen to apply its limited EPIC resources to programs in higher priority Working Framework categories.

3.3.2 Grid Modernization & Optimization Category

Recently, the grid infrastructure has been undergoing significant changes. New methods, integrated systems, and tools are needed to manage and maintain existing

---

[18] Global Warming Solutions Act of 2006 ("AB32"), September 27, 2006.
[19] SB1X-2.
[20] State Water Resources Control Board Resolution No. 2010-0020, effective October 1, 2010, amended by Resolution No. 2011-0033, July 19, 2011.
[21] *California Long Term Energy Efficiency Strategic Plan*, September 2008, available at http://www.cpuc.ca.gov/NR/rdonlyres/D4321448-208C-48F9-9F62-1BBB14A8D717/0/EEStrategicPlan.pdf (the plan strives to achieve this goal by 2020 for residential buildings and 2030 for commercial buildings).
[22] *See Clean Energy Jobs Plan*, *supra* note 14.

grid assets and to enable the "next generation" of assets, which will keep the more complex system operating safely, reliably, and cost-efficiently in the future.

This Working Framework category, *Grid Modernization and Optimization*, encompasses potential EPIC programs designed to help California and its electric utility ratepayers:

- Integrate a multitude of new technologies into the power system so that they operate harmoniously together and provide maximum benefits to ratepayers
- Meet the goals of SB17[23] to modernize electric utility power system; infrastructure;
- Protect against cybersecurity and critical infrastructure threats;
- Safely, reliably and affordably integrate technologies that help to achieve the State's energy goals;
- Demonstrate California's leadership in new technology;
- Develop and maintain a skilled workforce versed in the newest technologies;
- Ensure that ratepayers enjoy a smooth upgrade experience; and
- Ensure that IOUs are making the best technology choices in terms of functionality and economics.

This Working Framework category is the highest priority for SDG&E because its customers are aggressively adopting new energy management products and new utility and customer technologies are rapidly developing. As a result, SDG&E proposes four programs that fall under this category in its EPIC Plan, specifically:

- Visualization and Situational Awareness
- Distributed Control for Smart Grids
- Demonstration of Grid Support Functions of DER
- Smart Distribution Circuit Demonstrations

3.3.3 Customer Products/Services Enablement and Integration Category

Thanks to new State policies and related technologies, California energy customers have numerous opportunities to participate in the energy sector through new technologies such smart meters,[24] electric vehicles ("EV"), photovoltaic systems, demand response and demand management methods, and ZNE homes.[25] As a result, customers have the opportunity to evolve from simply being consumers of electricity to being "prosumers" (producers and consumers) of electricity. With the help of new technologies, prosumers can actively participate by supplying power from their own distributed energy resources to the grid and by using energy management systems to operate their energy devices in an optimal manner.

---

[23] *See* SB17, *supra* note 12.

[24] Recently, more than 10 million smart meters have been installed in California. News Release, *CPUC Acts to Ensure Consumer and Market Benefits from Smart Meters*, October 3, 2012, available at http://www.electricenergyonline.com/?page=show_news&id=166978.

[25] *See California Long Term Energy Efficiency Strategic Plan*, *supra* note 21.

This Working Framework category, *Customer Products/Services Enablement and Integration*, encompasses potential EPIC programs designed to help California and its electric utility ratepayers:

- Implement California's energy policies;
- Develop and maintain a skilled workforce versed in newest technologies;
- Continue to provide reliable power to consumers; and
- Provide customers with opportunities to better manage their own energy costs and to become producers of electricity.

SDG&E is not proposing a program that falls primarily into this Working Framework category.[26] Instead, it has chosen to apply its limited EPIC resources to programs in higher-ranking Working Framework categories.

3.3.4 Cross Cutting Strategies and Technologies Category

This Working Framework category includes issues, such as communication systems, physical and cyber system security, system architecture and system data management, that cut across the other three Working Framework categories. This broad category is a reflection of the smart grid development's goal to develop architecture that overlays an advanced communication infrastructure (based on emerging interoperability standards) on an increasingly complex electrical system. The adoption of available, applicable and cost-effective standardized communication protocols is necessary to enable smart devices to "plug and play" in the new advanced communication infrastructure and avoid costly engineering work every time a new device is added.

This Working Framework category, *Cross Cutting Strategies and Technologies*, encompasses potential EPIC programs designed to provide California and its electric utility ratepayers with foundational and cross-cutting utility system infrastructure, promote standards adoption, and enable facilities and support the continuous integration of a growing number of smart devices into smart grid operations.

Programs within this category vary and may include, but are not limited to:

- Testing system architecture, components, subsystems, and standards for smart grids;[27]
- Demonstrating cybersecurity protections on IOUs' smart grids; and
- Demonstrating data analytics technologies that use increased data volumes without reducing processing speeds.

[26] *See infra* Section 4.1. SDG&E already funds several projects in this area through other Commission-approved programs, notably through its Energy Efficiency and Direct Response Emerging Technologies programs.

[27] For example, demonstrations of conceptual smart grid architecture, including networking of smart devices currently operated autonomously into a coordinated smart system, would fall under this category.

SDG&E has identified this category as a priority because it is an essential part of SDG&E's smart grid development. Therefore, SDG&E's EPIC Plan contains one program, Smart Grid Architecture Demonstrations, which falls primarily in this Working Framework category.

3.4 Gap Analysis and Consultation with the Electric Power Research Institute

As a result of stakeholder feedback received during the August 2012 workshops, the IOU Administrators undertook an abbreviated energy industry gap analysis to pinpoint specific industry needs that could be addressed through EPIC-funded programs. In addition, the gap analysis was done to help the IOU Administrators avoid proposing EPIC Plans that would duplicate existing TD&D work. The gap analysis was also done to help uncover completed TD&D work that the IOU Administrators could build upon in their programs to maximize ratepayer funds.

Despite arduous time constraints, the IOU Administrators were able to complete a basic gap analysis with the assistance of the Electric Power Research Institute ("EPRI") and its Power Delivery & Utilization Sector Roadmaps.[28] These Roadmaps contain comprehensive gap analyses done from an international perspective.[29] The EPRI gap analyses examined the following industry areas and found gaps in each:

- Grid operations and planning
- Transmission and substations research
- Distribution systems
- Power quality research
- IntelliGrid research
- Cyber security and privacy for the electric sector
- Electric transportation and energy storage
- End-use energy efficiency, demand response, and customer behavior

The IOU Administrators and EPRI Staff compared the EPRI gap analyses with the Working Framework. The parties found significant alignment between the gaps identified by EPRI and the four categories identified in the Working Framework. SDG&E used EPRI's gap analyses and their recommendations as guidance when narrowing its program proposals to those in this EPIC Investment Plan.

[28] EPRI, *Power Delivery & Utilization Sector Roadmaps*, February 2012, available at http://mydocs.epri.com/docs/CorporateDocuments/Roadmaps/PDU_Roadmap_2012-02.pdf.
[29] EPRI takes a collaborative approach to roadmapping, which involves a full range of EPRI technical staff, EPRI's utility and public advisors, governmental organizations, universities, and other stakeholders. *Id*. at i.

3.5 Consultation with Stakeholders and the CEC Regarding the Working Framework

To ensure that the Working Framework provided reasonable and accurate guidance for the development of their EPIC Plans, the IOU Administrators consulted with stakeholders, the CEC and Commission Staff numerous times during the Working Framework development process.

On August 16 and 17, 2012, the IOU Administrators jointly held public scoping workshops for the EPIC program.[30] At the workshops, the IOU Administrators discussed their approach to developing the scope for EPIC plans and the Working Framework. Stakeholders were encouraged to participate by commenting on the proposed scope and the Working Framework, and to recommend possible areas of program focus. Both the CEC and Commission Staff attended and participated in the workshops.

In response to their request for written comments, the IOU Administrators, including SDG&E, received limited feedback from the workshops, collectively receiving comments from:

- Michele Rodriguez suggesting that a "smart grid vision and protocol for high speed internet from the consumer perspective" be established to "help inform the utility supply."
- Mehta Associations and Kumana & Associates advocating that consultants be hired to conduct outreach to commercial and industrial customers to "improve the effectiveness of their industrial efficiency".
- Energy Initiatives recommending that the California Energy Efficiency Strategic Plan play a central role in EPIC investment plans.
- Agricultural Energy Consumers Association advocating that the IOU Administrators (1) establish programs to better deploy bio-energy projects in California and (2) fund energy efficiency and clean energy technologies for agricultural and wastewater practices.
- Waste Management suggesting that IOUs committing EPIC funds to support biogas, biomethane and conversion technologies.
- California Institute for Energy and Environment advocating for EPIC programs in *enabling* technologies (for example, tools to support forecasting or visibility on the grid), over *contributing* technologies (for example, specific generation or storage technologies).

While SDG&E respectfully considered all comments submitted, the majority of them were irrelevant to EPIC (i.e., high speed internet programs) or were self-serving (i.e.,

[30] While the EPIC Administrators were required to hold public scoping workshops in July 2012, D.12-05-037 at 31, they were granted leave to hold their scoping workshops in August 2012 by the Commission. Edison publicly noticed the workshops on behalf of the IOU Administrators to all members of the R.11-10-003 service list on July 23, 2012.

recommending the hiring of outreach consultants), and therefore, they were not considered for inclusion into SDG&E's EPIC Plan.

SDG&E considered the various comments regarding bioenergy but ultimately decided not include a bioenergy program in its EPIC Plan in favor of programs more closely tied to directly benefiting SDG&E's electric ratepayers and the smart grid. In addition, SDG&E chose not to expend any of its limited EPIC financial resources ($2.64 million annually for programs) on bioenergy based on the Commission requirement that the CEC spend a considerably larger amount ($9 million annually) just on "bioenergy projects or activities."[31]

SDG&E concurred in large part with the suggestions by California Institute for Energy and Environment, and as a result, most of SDG&E's EPIC programs are focused on demonstrating enabling technologies, specifically the programs on Smart Grid Architecture Demonstrations, Visualization and Situational Awareness Demonstrations, Distributed Control for Smart Grids, and Demonstration of Grid Support Functions of Distributed Energy Resources.

On September 4, 2012, the four EPIC Administrators met with Commission Staff to discuss the Working IOU Framework and the CEC's ongoing plan development efforts. Staff provided helpful oral feedback at the meeting, and followed it up with written feedback to the IOU EPIC Administrators stating, in part, that it is incumbent on the EPIC Administrators to show that their proposed EPIC programs are not duplicative of any other known program. SDG&E has incorporated Staff's feedback into its EPIC Plan.

4. SDG&E's Program Selection Process

After reviewing the various energy-related policy drivers, the abbreviated gaps analysis, stakeholder input and the Working Framework's categories, SDG&E commenced its informal internal process to select the programs that have the potential to provide considerable benefits to electric utility ratepayers within its limited budget for inclusion in its EPIC Plan.

First, the Working IOU Framework's four program categories were distributed internally to a wide range of SDG&E departments with a request for TD&D program proposals.

Second, program proposals were screened for their alignment with the various legislative and regulatory policies influencing the California energy landscape. In particular, program proposals that were driven in part by the State's various RPS, DER[32] and GHG goals received additional focus. Most of the program proposals

[31] D.12-05-037 requires the CEC allocate least 20% of its TD&D funds ($45 million annually) to "bioenergy projects or activities." D.12-05-037 at FOF 20.

[32] For additional information about DER, see *California Distributed Energy Resources Guide*, available at http://www.energy.ca.gov/distgen/index.html and *Distributed Generation Strategic Plan*, June 2002, available at http://www.energy.ca.gov/reports/2002-06-12_700-02-002.PDF.

concerned smart grid development and deployment. Smart grid development aims to create a "smarter" power system. When fully-developed, a smart grid should enable higher penetrations of intermittent renewable generation into the power supply mix, higher power system efficiency, steady and/or improved reliability (given the additional complexity of a grid with a high penetration of intermittent renewables), increased safety, and improved customer services. In essence, a fully-developed smart grid should significantly contribute toward California's RPS, DER and GHG goals.[33]

Third, program proposals were screened for potential duplication with existing programs and alignment with the requirements of D.12-05-037. SDG&E eliminated proposals that were deemed to be too duplicative of existing SDG&E programs. In particular, a program proposal to demonstrate interoperability systems for integrating commercial customer facilities with smart grid operations was eliminated because it was duplicative of another SDG&E activity that has progressed into a commercial program. SDG&E also eliminated a proposal concerning electric vehicle charging infrastructure as redundant because it duplicated another existing program.

Fourth, the remaining program proposals were reviewed by a large internal group, including SDG&E's director-level Leadership Team. A final short list of five programs was agreed upon as the programs best-suited to provide ratepayer benefits efficiently based on SDG&E's limited EPIC budget.

4.1 Summary of SDG&E's Energy Efficiency and Demand Response R&D Programs[34]

As part of its internal screening process, SDG&E reviewed its ongoing R&D programs, including ongoing programs and projects in the Energy Efficiency ("EE") and Demand Response ("DR") areas.

All of SDG&E's ongoing EE and DR projects, as described below, are traditional post-commercialization demonstrations so none of them would qualify as TD&D under the EPIC definitions. In addition, none of them are duplicative of SDG&E's five EPIC programs.

[33] *See*, R.08-12-009, *Order Instituting Rulemaking to Consider Smart Grid Technologies Pursuant to Federal Legislation and on the Commission's own Motion to Actively Guide Policy in California's Development of a Smart Grid System*; A.11-06-006, *SDG&E Smart Grid Deployment Plan 2011-2020*, at 209.

[34] SDG&E is required to include this summary in the EPIC Plan. D.12-05-037 at OP 12(b)(iii).

4.1.1 SDG&E's EE Program R&D Activities

All of SDG&E's R&D activities that fall under energy efficiency are part of SDG&E's Emerging Technologies ("ET") subprogram.[35] The mission of the Emerging Technologies subprogram is to support increased energy efficiency market demand and technology supply by contributing to the development and deployment of new and underutilized energy efficiency technologies, practices, and tools, and by facilitating their adoption as measures supporting California's aggressive energy and demand savings goals.

SDG&E's ongoing projects in this area are depicted in the chart below. None of them overlap with SDG&E's EPIC programs.

[35] SDG&E filed its 2013-2014 Energy Efficiency Application (A.12-07-002) on July 2, 2012. Detailed descriptions of EE activities can be found at *IOU Core Programs* at 636, available at http://www.sdge.com/sites/default/files/regulatory/SDGE%20PIPs%20Vol%203%20of%205%20SW%20IOU.pdf.

SDG&E EE R&D Project	Project Description
Food Bank Office of the Future	Demonstrate the use of advanced lighting systems, lighting controls, office lighting system, VRF air conditioners, roof-top unit controllers, refrigerated warehouse controllers, complete HVAC system control with DR capability, and on-site dashboard technology at the SD Food Bank.
Low-Temperature Freezer Monitoring in Scientific and Pharmaceutical Applications	Real-time web based energy and temperature monitoring system for ultra-low temperature freezer. By being able to monitor the energy consumption and temperature of freezers, a lab manager can assess the quality of a freezer and energy efficieny to avoid high run costs and have early detection for freezer failure.
Software-Based Energy Reduction for Windows/Linux Enterprise Environments	Technology assessment to validate savings from maintaining computers in low-power sleep state longer while still being active. Software and server based energy reduction within enterprise computer setups. Computers are put into sleepmode more often by being able to transer their internet 'presence' to a server module (that can hold up to 250 computer images).
Demand Control Ventilation with Centralized Air Sensors	Technology assessment that investigates the energy savings potential, market applicability and possible incremental effects of a DCV system that uses centralized air quality sensors in combination with miniature air ducts and routers.
CSI Low Cost Solar	Demonstration showcase to demonstrate "deep" energy savings of over 50% and a new "plug & play" solar photovoltaic system in a residential home and to provide a local green job training opportunity.
Bi-level Gas Station Lighting Technologies	Technology assessment to provide a comparison between metal halide HID (base case), LED and induction lighting systems for gas station canopy lighting to determine lighting performance and characteristics as well as potential for dimming.
Advanced Lighting Technologies - Fitness Clubs and Courts	Technology assessment to povide a comparison between metal halide HID (base case) and LED lighting systems for fitness club lighting to determine lighting performance and characteristics as well as potential for dimming.
RTU Efficiency	Study of (4) retrofit packaged rooftop unit controllers which provide innovative fan and/or compressor control.
Shower Monitor and Alarm System	Shower time monitoring and alarming system aimed at reducing water and gas consumption. Device provides visual and audible feedback to user to curtail regular shower lengths.
Advanced Lighting Controls w/HVAC integration	Technology assessment to evaluate an advanced lighting control system, along with integration services to utilize the occupancy data to provide additional HVAC savings.

4.1.2 R&D Activities in SDG&E's Emerging Technology Demand Response Program

SDG&E's ongoing Emerging Technology Demand Response ("ET-DR") efforts consist of evaluating demand-reducing technologies and strategies that are applicable to the San Diego region and market.[36] The ET-DR program's focus is on technologies and strategies that promise significant, cost-effective demand reduction in the short- or mid-term, and that appear to be sufficiently reliable and scalable for market-wide implementation. The ET-DR program is intended to identify, evaluate and demonstrate technologies that have strong potential to reduce power consumption during periods of higher energy prices or tight energy supplies in all SDG&E customer segments (residential, agricultural, commercial and industrial), and to help bring these technologies to commercial availability.

The ET-DR program does not provide direct incentives. Instead, ET shares between 0% and 100% of the pilot implementation cost. The actual rate is determined on a case by case basis, and depends on factors like total project cost, customer eagerness and risk tolerance, project payback and anticipated load drop.

SDG&E's ongoing ET-DR projects in this area are depicted in the chart below. All of SDG&E's ET-DR projects are end-use DR projects. None of them overlap with SDG&E's EPIC programs, which are not end-use DR programs.

SDG&E ET-DR R&D Project	Project Description
Wireless Controls & Monitoring for Comm. Blds (DR)	Identify energy savings potential, provide fault detection and diagnostics, participate in Auto Demand Response.
DR in Data Centers	Conduct field tests to evaluate and improve understanding of feasibility and adoption of DR in data centers, explore practical barrier and opportunities, identify perceived versus actual risks as well as methods to overcome risks.
HAN with Smart Appliances	Smart Appliance with built-in DR and energy saving functionality. Monitors home appliances and devices as well as control DR in Smart Appliances, directly communicates with Smart Meter for usage, displays whole home kW, can be preprogrammed with TOU electric rates.
EIC Smart Home	Exhibit energy saving and demand response projects and activities.

[36] SDG&E's 2012-2014 ET-DR program was approved by the Commission in D.12-04-045.

4.2 SDG&E Presented its Proposed Programs to Stakeholders, Commission Staff, and the Other EPIC Administrators

Next, SDG&E presented its five programs to outside parties for feedback and to ensure that they were not duplicative of any known programs. In late September 2012, SDG&E shared its draft EPIC Plan with interested stakeholders and the other EPIC Administrators to determine if there were any areas of overlap among the various EPIC Plans, or alternatively, if there were potential collaboration opportunities.

On September 28, 2012, the IOU EPIC Administrators hosted a joint webinar to present the Working Framework, as well as specific program areas proposed in the individual EPIC Plans. During the webinar, SDG&E presented three of its five proposed EPIC programs. In addition, SDG&E posted all five of its proposed EPIC programs on its website.[37]

The only stakeholder comment SDG&E received was from the Natural Resources Defense Council ("NRDC"). The NRDC complimented the efforts to date, and suggested that the IOU Administrators consider including EE programs and cooperative programs executed by EPRI in their EPIC Plans.

SDG&E appreciates the NRDC's thoughtful suggestions. SDG&E has opted not to incorporate energy efficiency programs into its EPIC Plan, however, because of the EE R&D work SDG&Es is already funding as part of its EE portfolio.[38] In addition, SDG&E agrees with the NRDC that collaborative projects through EPRI would maximize EPIC funds while simultaneously funding research in a recognized industry gap. SDG&E's limited EPIC budget does not allow it to fund EPRI membership programs at this time, however.

On October 10, 2012, SDG&E met with the CEC via telephone to discuss whether there was any duplication among the two parties' draft EPIC Plans, and identify possible co-funding opportunities. The two parties agreed to differentiate certain programs to avoid duplication, and to consider future collaboration on other programs that presented synergistic opportunities. SDG&E revised its EPIC Plan based on this meeting.

On October 11, 2012, Commission Staff provided SDG&E with written feedback regarding the draft EPIC Plan. While supportive of the SDG&E EPIC Plan's inclusion of smart grid-related programs, Staff encouraged SDG&E to make its program descriptions even more detailed. SDG&E revised its EPIC Plan based on this feedback.

---

[37] SDG&E, *EPIC*, http://sdge.com/regulatory-filing/3749/electric-program-investment-charge-epic.

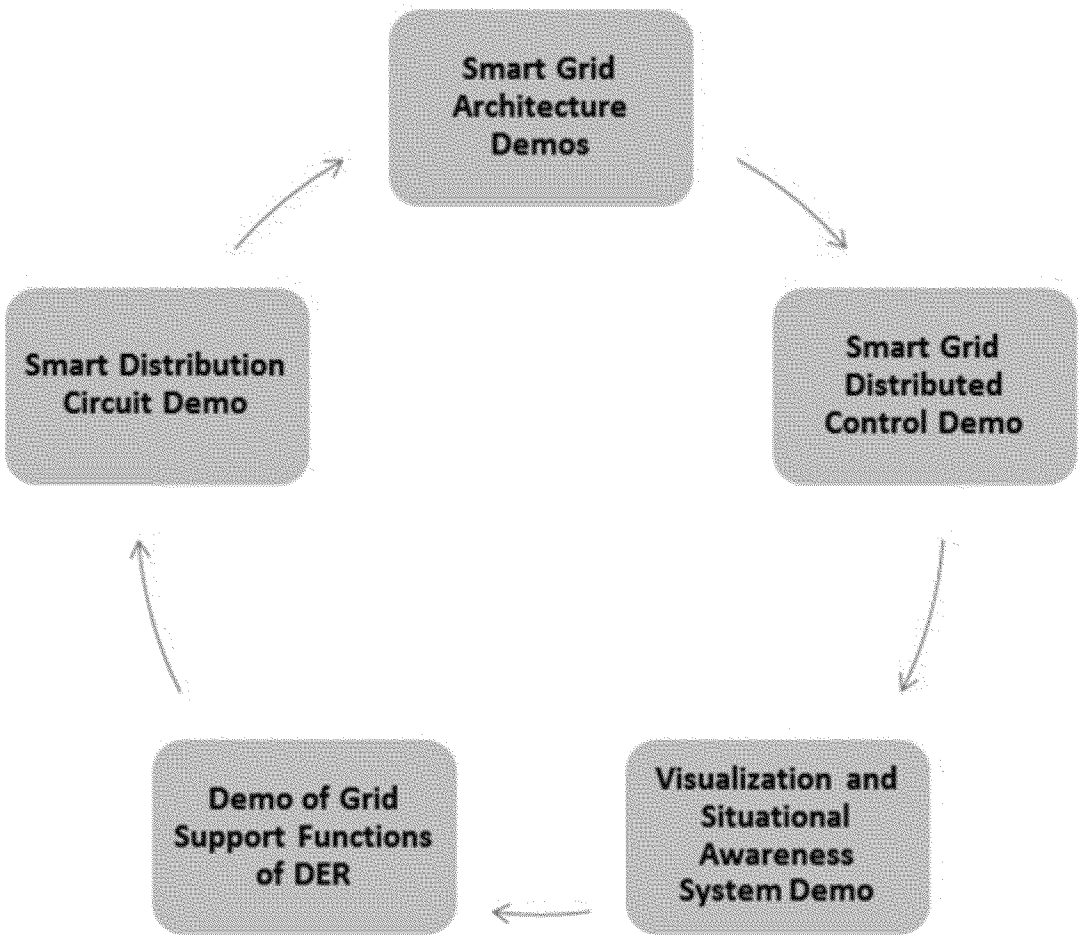
[38] *See* SDG&E EPIC Plan at Section 4.1 for a detailed discussion of SDG&E's current research and development efforts in its EE and DR portfolios. In addition, SDG&E did not consider including EE programs in its EPIC Plan because, unlike most other areas of R&D, it is permitted to pursue funding opportunities for EE outside of EPIC. D.12-05-037 at OP 17.

5. This EPIC Plan is Designed to Benefit Electric Utility Ratepayers By Contributing to SDG&E's Smart Grid Vision

SDG&E's five EPIC programs reflect its thorough internal selection process, as well as the comments and feedback received from stakeholders, Commission Staff, and other EPIC Administrators.

As described in more detail in Section 6, SDG&E's five EPIC programs are:

1. Smart Grid Architecture Demonstrations
2. Visualization and Situational Awareness Demonstrations
3. Distributed Control for Smart Grids
4. Demonstration of Grid Support Functions of DER
5. Smart Distribution Circuit Demonstrations



While the five programs are all stand-alone, distinct programs, they are also complementary. Collectively, they should provide a suite of integration systems needed to make the SDG&E smart grid significantly "smarter" by overlaying a networked communication and control infrastructure on an increasingly complex electric system.

5.1 The Five Programs Will Help SDG&E Achieve its Vision of a "Smarter" Smart Grid

At the time of this writing, Commission approval for SDG&E's Smart Grid Deployment Plan, A.11-06-006, is still pending.[39] In the interim, SDG&E has begun deploying its smart grid. All of its current smart grid activities are deployment activities; none are smart grid demonstration activities. Therefore, to achieve its smart grid vision and to ensure its smart grid deployment is done efficiently, SDG&E needs to conduct research demonstrations of specific smart grid integration systems before they are deployed

All five SDG&E EPIC programs are smart grid integration system demonstration programs. They were specifically chosen because of their potential to help advance the SDG&E smart grid from a mass of autonomous active (smart) devices to a networked system of devices and subsystems. In general, all five programs fill SDG&E's gap of demonstrating smart grid systems prior to deployment by demonstrating new integration systems constructed from available components and software, and supplemented with any software needed to achieve successful compatibility and interoperability with the SDG&E power system. The outcome of the demonstrations will help SDG&E decide which integration systems should be chosen for commercial adoption and the necessary steps and resource requirements for such adoptions.

5.2 A "Smarter" Smart Grid Should Benefit Electric Utility Ratepayers

When fully developed, the SDG&E smart grid will have a networked communication and control infrastructure overlaid on the electrical grid infrastructure to manage smart components deployed in the electrical infrastructure and to coordinate their operation in a way that optimizes system performance. A networked smart grid will be a key enabler of major benefits to SDG&E's electric utility ratepayers.

For example, a networked smart grid should provide a utility with increased automation and greater control over electrical losses in the power system by allowing more precise control of Volt-Ampere reactive ("VAR") flows. Electrical losses should also be reduced as more distributed generation is placed near the load. Fewer electrical losses should result in increased cost savings for electric utility ratepayers. In addition, the reduction of electrical losses (and thus, the reduction in demand for conventional generator) should contribute to fewer GHG emissions.

In addition, a networked smart grid should also improve power quality experienced by electric utility ratepayers because the utility is has better control of voltage profiles in the distribution circuits. Improved power quality should extend the lives of customer appliances and other plug loads.

[39] A.11-06-006 only seeks Commission approval of SDG&E's Smart Grid Deployment Plan. It does not request funding to carry out the Plan. SDG&E has requested funds for its smart grid deployment activities in its currently-pending General Rate Case ("GRC"), A.10-12-005.

A networked smart grid should also improve service reliability and customer safety by identifying potentially hazardous system conditions (i.e., down power lines) faster, enabling the utility to address the issue quickly and possibly prevent an outage. A networked smart grid may also enhance the ability of the customers to exchange information with SDG&E, which will create new options for SDG&E its electric customers to work together to improve the capabilities for demand response, demand management, and distributed generation and storage.

5.3 To the Best of SDG&E's Knowledge, the Five Programs Are Unique

To the best of SDG&E's belief and knowledge, none of the programs are duplicative of any other TD&D programs. Recent efforts to advance smart grid development around the globe have focused on developing new autonomous devices, such as pulse reclosers, dynamic voltage restorers, and automated capacitor banks. These new autonomous devices have not been demonstrated in an integrated manner with overlaid networked communication and control, however. SDG&E's EPIC Plan is the first of its kind that demonstrates key integration systems to support infrastructure choice decisions needed to realize a fully-networked smart grid infrastructure. If successful, the resulting "smarter" smart grid will extract more benefits from integrated smart devices then what is currently recouped from the devices' non-networked (i.e., autonomous) deployment.

6. SDG&E's EPIC Program Proposals

6.1 Smart Grid Architecture Demonstrations Program

6.1.1 Description of Smart Grid Architecture Demonstrations Program

The evolution of the smart grid represents a fundamental shift in the way utility power systems are designed, built, and managed. What was once a largely unidirectional system with power generated at large centralized power systems and distributed to users is being replaced by a new environment of multiple distributed resources and other intelligent electronic devices in the system. These changes greatly increase the complexity of operating and managing utility systems in concert with utility customers, suppliers, and regional operators.

As a result, new smart grid architecture is necessary to provide the blueprints for future system development and operations. The resulting smart grid architecture must be a "system of systems" that can manage the increasing complexity of the smart grid. For example, the communication architecture must be compatible with the electrical architecture. The chosen communication standards for device information models and protocols must ensure necessary information transfers are done to properly operate the more complex system. The chosen architecture must address the information exchange requirements for both actual operations of the physical smart grid and for the business transactions associated with those operations.

SDG&E does not currently have a program for demonstrating the "building blocks" of smart grid architecture, such as electrical system configurations and communication protocols, object models, and related standards. These demonstrations are needed to help SDG&E determine what building blocks should be used to develop a networked architecture for the smart grid. The resulting architecture will help SDG&E to move from a smart grid populated with autonomous smart devices to a more capable networked system of smart devices.

The focus of this program is on architectural constructs so that SDG&E can adapt its legacy protocols and technology to industry standards. The program will build on existing architectural concepts, including the IEC TC-57 reference architecture, federally-funded NIST and Gridwise architectures, the EPRI IntelliGrid architecture, and the Utility Communication Architecture. None of these architectures has been fully developed and adopted, and it will be years or decades before any of those efforts create a complete generic architecture. Therefore, utilities, including SDG&E, must develop their unique architectures now. The issue is particularly pressing for SDG&E because of the rapid rate at which its autonomous smart grid development has recently progressed.

To the best of SDG&E's knowledge, this program is not duplicative of any other program inside SDG&E or in the industry. While SDG&E has an interdepartmental smart grid architecture team, the team lacks a research budget for smart grid architecture demonstrations.[40] The program also differs from similar utility programs because the other utilities will have different architectures based on their unique smart grid features.[41]

6.1.2 Smart Grid Architecture Demonstrations Program Objectives

The specific objectives of this program are to:

- Perform pilot demonstrations of key candidate prototype building blocks of the SDG&E smart grid architecture to determine their suitability for adoption in the architecture;
- Document the results and make recommendations on whether specific building blocks should be adopted; and
- Provide demonstration results to the SDG&E interdepartmental smart grid architecture team to support the implementation phase for any building blocks adopted.

[40] SDG&E plans on pursuing additional funds for smart grid architecture projects because the EPIC budget will be insufficient to fund all of SDG&E's smart grid architecture needs. For example, SDG&E plans on pursuing funding available through CEC's EPIC program. SDG&E has identified the following CEC EPIC initiatives related to smart grid for which it may submit bids: S2.1, S2.2, S2.3, S2.6, S3.3, S6.1, S6.2, S6.3,S 6.4,S 6.5,S 6.6, S7.2, S7.3, S8.1, S8.2, S9.2, S9.5, S12.3, S13.2, and S13.3.

[41] There may be some overlap in utility smart grid architectures, however, so SDG&E will explore coordination and sharing opportunities with other utilities.

6.1.3 Smart Grid Architecture Demonstrations Program Scope

Phase 1 (Nominally one year)

- Work with the SDG&E smart grid architecture team to identify the most important architecture building blocks that need to be demonstrated. Engage an expert consultant in this process, if necessary.
- Prioritize these building blocks for demonstrations; select the highest priority building blocks for demonstration (up to the limit of the program budget).
- Perform competitive procurement to select a test contractor for the architecture building blocks demonstrations.
- Develop a test plan for the demonstrations and identify the best locations to perform specific demonstrations and the needed equipment and software. Wherever possible, the demonstrations will be performed at the SDG&E Integrated Test Facility ("ITF")[42] to save time and money. Only when necessary, would the testing be done in the actual SDG&E system.

Phase 2 (Nominally one year)

- Conduct demonstrations of the architecture building blocks.
- Conduct trials of specific communication standards, such as IEC 61850 or the Common Information Model ("CIM"), for specific roles in the architecture.
- Review results intermittently with the SDG&E architecture design team and perform incremental testing, as may be needed.

Phase 3. (Nominally one year)

- Perform analyses and make recommendations regarding which of the tested building blocks (including standards) should be adopted into the architecture.
- Prepare guidance for implementation of building blocks that are chosen for adoption.
- Prepare recommendations for which additional architecture building blocks should be tested in the next EPIC cycle.

6.1.4 Deliverables of Smart Grid Architecture Demonstrations Program

- Recommendations regarding which building blocks should be adopted into the smart grid architecture.

---

[42] The ITF is a test facility designed to support electric system technology integration for smart concept evaluation and testing of devices and software. Integration tests include both utility and customer owned equipment and systems. The facility is scheduled to open Fall 2013 in Escondido, CA. The facility will be capable of hosting various types of research on-site, including simulations, experimentations, analyses, visualizations, integrations, demonstrations, tests and validations. *SDG&E Smart Grid Development Plan: 2012 Annual Report*, at 59-60, available at http://www.sdge.com/sites/default/files/documents/1138900767/SDGE_Annual_Report_Smart_Grid_Deployment.pdf.

- Test results to support implementation of the adopted smart grid architecture building blocks.
- Rationale for why specific standards or other architecture building blocks are recommended for adoption.
- Final report describing the work and all important results, including the above items.

6.1.5 Solicitation and Execution of Smart Grid Architecture Demonstrations Program

This program will be done primarily by SDG&E staff teamed with a third-party contractor. The contracted work will be done primarily through a competitive bid research contract.[43] SDG&E will use pay-for-performance contracts in accordance with its long-standing and documented procurement policies and procedures, including affiliate compliance rules. The contractor's performance will be measured by completion of milestones outlined in the contract.

The competitive procurement for a contractor is targeted for Q4 of 2013, pending timely approval of the program by the Commission.[44]

There will be no limitations on funding, such as per-project, per-awardee, or matching funding requirements. Cost sharing will be sought, but will not be required.

Bids will have an assigned review team and predetermined evaluation criteria. Successful bidders must demonstrate that they have expertise in the areas of end-to-end smart grid technology and system integration, including emerging international standards and gaps in standards. They will be expected to demonstrate exceptional knowledge of both smart grid electrical and communication architecture issues. They must also demonstrate the ability to design the needed experimental systems, take the data, perform the analyses, and draw critical conclusions from the analyses to support SDG&E smart grid architecture development.

Bonus points will be given for maximizing the use of existing test facilities, such as the ITF or an alternative existing test facility, if the needed capability does not exist at the ITF. For work that needs to be done at a field location in the distribution system, bonus points will be given for using an existing SDG&E facility first, to avoid disturbance to customers, reduce costs of the demonstration, and reduce safety risks. Bonus points will also be given for

[43] While competitive contracts are generally favored, SDG&E reserve the right to use non-competitive awards consistent with its existing corporate procurement practices. For example, smaller services – those nominally less than $75,000 – if any, may be sole sourced to an identified qualified service provider because the cost of a competitive bid process would outweigh the contract cost.
[44] SDG&E anticipates staffing its EPIC programs with different program managers so that programs, and any of their procurements, can occur concurrently.

contractors located in California, or contractors conducting the majority of the contracted work in California.

6.1.6 Intellectual Property Methodology

The Intellectual Property ("IP") created by this program, if any, would likely be created by the contractor. Therefore, SDG&E will seek to retain a perpetual, non-exclusive unrestricted license to practice the invention at issue for or on behalf of the California ratepayers to the extent permissible under applicable laws, including without limitation, the affiliate transaction rules. As a condition of the contract, the contractor will be required to protect SDG&E's and its ratepayers' interests by citing SDG&E's support within the specification of any U.S. patent application for any subject inventions and provide SDG&E with a confirmatory license for subject inventions. This information will be part of the Request for Proposal ("RFP") package.

SDG&E's share of any royalties will be dependent on the terms of the contract between SDG&E and the contractor. SDG&E will split such royalties between its ratepayers and shareholders in accordance with the net revenue sharing mechanism formula approved in the most recent GRC.[45]

6.1.7 Smart Grid Architecture Demonstrations Program Metrics

The smart grid is limited to the autonomous operation of intelligent electronic devices unless a capability to network them in a stable architecture is developed. Therefore, the ultimate measure of success will be completing and documenting demonstrations of candidate architecture building blocks to help the SDG&E architecture team develop smart grid architecture. In particular, findings from the architecture building blocks demonstrations and the adoption of any building blocks into smart grid architecture will be used as signs of program success. Specific program metrics will also include whether the contractor met milestones and completed deliverables in the contract. In addition, findings will be published in the relevant technical conferences and journals.

6.1.8 Smart Grid Architecture Demonstrations Program Schedule

This program will run for 3 years from the time it is approved by CPUC. The schedule assumes a start date for the program of June 2013.

---

[45] The current Commission-approved formula provides ratepayers with 60% of net revenues and shareholders with 40% net revenues (the "60/40" formula). The 60/40 (ratepayer/shareholder) revenue sharing mechanism for net revenues (future or ongoing royalties from the use of a license, sale of securities) related to ratepayer-funded RD&D programs was most recently approved in D.08-07-046, the decision on the *Test Year 2008 General Rate Case for Southern California Gas Company*, issued August 1, 2008. SDG&E has requested the same revenue sharing mechanism in its pending GRC. *See* A.10-12-005, Prepared Direct Testimony of Kathleen H. Cordova (SDG&E-15), at 74. If the situation involved the conversion of warrants, the proceeds would be distributed 67% to ratepayers and 33% to shareholders in accordance with the gain-on-sale allocation approach approved by the Commission in D.06-05-041 (as modified by D.06-12-043).

Phase	Duration
1	June 2013 through June 2014
2	July 2014 through June 2015
3	July 2015 through June 2016

6.1.9 Smart Grid Architecture Demonstrations Program Budget

The budget is drawn entirely from SDG&E's 2012-2014 allotment of EPIC funding. However, it is spent over the years 2013 to 2016 due to the delay in getting an approved investment plan. The assumed start date for the program work is June 2013.

The cost estimate uses inflation escalators for SGD&E direct internal labor and for contracted labor. SDG&E direct labor costs include appropriate overheads. Budget estimates have been rounded to the nearest thousand.

SDG&E Internal Direct Labor (with Escalation)	**2013**	**2014**	**2015**	**2016**	**Total**
Program Team Labor (Hours)	800	1400	1400	600	
Program Management Labor (Hours)	160	200	200	160	
Program Team Hourly Rate ($)	**118**	**120**	**123**	**127**	
Program Management Hourly Rate ($)	**153**	**157**	**161**	**166**	
Subtotal of SDG&E Internal Direct Labor ($k)	**119**	**200**	**205**	**103**	**626.5**
Contracted Labor (with Escalation)					
Consultants and System Integration and Test Contractors ($k)	81.8	257	263	132	
Other Contractors ($k)	0	0	0	0	
Subtotal for Contracted Labor ($k)	**81.8**	**257**	**263**	**132**	**734**
Test Equipment and Materials ($k)					
Misc. Test and Simulation Equipment	40	20	10	0	
Switchgear/ Monitoring Equip.	39.5	20	10	0	
Construction Materials	0	0	0	0	
Subtotal for Test Equipment and Materials ($k)	**79.5**	**40**	**20**	**0**	**139.5**
Grand Totals for Program ($k)	**280**	**497**	**488**	**235**	**1500**

6.2 Visualization and Situational Awareness Demonstrations

6.2.1 Visualization and Situational Awareness Demonstrations Program Description

The role of the system operator is changing in smart grids. Where distribution operators used to deal mainly with limited information from low-bandwidth supervisory control and data acquisition ("SCADA") systems and switching decisions, smart grid operations now must consider new classes of data from numerous devices. The deployment of these numerous sensors, intelligent devices, meters and other communication nodes within the power distribution system generates a massive amount of highly granular information, sometimes referred to as a "*data tsunami*". If presented inappropriately to system operators, the data tsunami may overwhelm system operators and diminish the value of the data in supporting engineering activities. However, if filtered and presented appropriately, these data will increase the operators' ability to visually synthesize and react to relevant information, which would improve grid operations and reliability.

Therefore, system operators need new models of visualization that move beyond simple streams of system status information. New visualization techniques are required to merge these data streams to provide useful and easily understood information to system operators. The transform of these displays and modes of interaction are similar to the introduction of "glass cockpits" and mission avionics software in aircraft experienced during the last 30 years.

This program addresses the data tsunami issue by demonstrating component and subsystem choices for the SDG&E smart grid's visualization and situational awareness system. It complements other SDG&E EPIC programs that are targeted at demonstrations to support the power system, control system, and communications architecture development. It fills a key gap in the capabilities needed to advance the SDG&E smart grid from an autonomous infrastructure (independently operated components) to a networked infrastructure (cooperatively operated components).

SDG&E discussed this program with CEC to different it from the CEC's proposed initiatives S6.2 (*Monitor Customer Premise Networks and Microgrid Activity to Share Resources Across the Grid*) and S7.2 (*Improve Operator Dispatch and Visibility of Distributed Energy Resources*). Unlike the CEC's initiatives, this program addresses visibility and situational awareness for the entire networked smart grid and not just distributed energy resources.

6.2.2 Visualization and Situational Awareness Demonstrations Program Objectives

The objective of this demonstration program is to explore how data collected from sensors and devices can be processed, combined, and presented to system operators in a way that enhances grid monitoring and situational awareness. In particular, this program will look at how data currently unexploited and separately processed can be integrated and visually presented for strategic use by system operators. When

transformed and presented in a visually integrated manner, this data can be invaluable for utilities to optimize grid operations as well as provide insights in the performance of the overall utility system. The visual framework also provides insights into customers' energy consumption behavior to serve them more effectively, foster energy conservation, and reduce peak demand. The demonstrations of specific visualization and situational awareness concepts will be used to help SDG&E make choices on which options should be adopted into a future visualization and situational awareness system for its smart grid.

6.2.3 Visualization and Situational Awareness Demonstrations Program Scope

Phase 1 (Nominally one year)

- Define requirements for the visualization and situational awareness based on where smart grid data could yield significant value.
- Assess the suitability of alternative data filtering, analysis, and fusion techniques to provide integrated measures of smart grid system performance and status.
- Assess the suitability of alternative advanced presentation and visualization techniques to provide operators and other smart grid stakeholders with improved situational awareness of grid operating conditions.
- Prepare an initial specification for the visualization and situational awareness system.
- Develop mock-ups and storyboards to test display concepts.
- Develop a demonstration plan for evaluation of the chosen display concepts, including test facility, equipment, and software recommendations.

Phase 2 (Nominally one year)

- Prototype the data integration schemes, displays and algorithms.
- Set up demonstration systems.
- Implement the demonstration plan and test data integration schemes, displays, and algorithms with operators and engineers.

Phase 3 (Nominally one year)

- Refine and continually test based on lessons learned.
- Revise and finalize the system specification.
- Develop a roadmap for steps to integrate program results deemed suitable for commercial adoption into SDG&E's overall smart grid solution portfolio.

6.2.4 Visualization and Situational Awareness Demonstrations Program Deliverables

- Specifications for data processing and integration schemes, displays, and algorithms.
- Smart grid data visualization and situational awareness solution designs.
- Demonstration results.
- Overall smart grid data visualization and situational awareness strategies and an adoption roadmap.
- Final report describing the work and all important results, including the above items.

6.2.5 Visualization and Situational Awareness Demonstrations Program Solicitation and Execution

This program will be performed primarily in-house, with outsourcing done only when needed to fill internal resource voids. The program execution will require significant involvement of SDG&E technical staff from the power system engineering and information technology areas because the program requires familiarity with the design characteristics of SDG&E's evolving smart grid. The use of internal staff will reduce the costs of the program.

6.2.6 Visualization and Situational Awareness Demonstrations Program Intellectual Property Methodology

IP created through this program, if any, will be created by SDG&E. Therefore, SDG&E will file a patent for the IP with the U.S. Patent and Trademark Office. SDG&E will share any net revenues (i.e., from royalties, license fees, or proceeds from the sale of IP rights) with its ratepayers under the formula approved in the most recent GRC.[46]

6.2.7 Visualization and Situational Awareness Demonstrations Program Metrics

The ultimate measure of success will be the actual commercial implementation of the visualization and situational awareness system, moving from a mock up to an actual system. Specific program metrics will include the completion of the initial specification for a visualization and situational awareness system, the completion of a demonstration of a system display mock-up, and the specifications and recommendations for adoption by SDG&E in its smart grid development. Other metrics will include achieving program milestones and deliverables. The findings will be published in the relevant technical conferences and journals.

[46] *See supra* "60/40" formula, note 45.

6.2.8 Visualization and Situational Awareness Demonstrations Program Schedule

This program will run for 3 years from the time it is approved by CPUC. The schedule assumes a start date for the program of June 2013.

Phase	Duration
1	June 2013 through June 2014
2	July 2014 through June 2015
3	July 2015 through June 2016

6.2.9 Visualization and Situational Awareness Demonstrations Program Budget

The budget is drawn entirely from SDG&E's 2012-2014 allotment of EPIC funding. However, it is spent over the years 2013 to 2016 due to the delay in getting an approved investment plan. The assumed start date for the program work is June 2013.

The cost estimate uses inflation escalators for SGD&E direct internal labor and for contracted labor. SDG&E direct labor costs also include appropriate overheads. Budget estimates have been rounded to the nearest thousand.

SDG&E Internal Direct Labor (with Escalation)	2013	2014	2015	2016	Total
Program Team Labor (Hours)	832	1456	1456	1040	
Program Management Labor (Hours)	208	312	312	208	
Program Team Hourly Rate ($)	**118**	**120**	**123**	**127**	
Program Management Hourly Rate ($)	**153**	**157**	**161**	**166**	
Subtotal of SDG&E Internal Direct Labor ($k)	**130**	**224**	**230**	**166**	**751**
Contracted Labor (with Escalation)					
Consultants and System Integration and Test Contractors ($k)	92.1	199	204	82.8	
Other Contractors ($k)	5.12	5.24	5.37	5.52	
Subtotal for Contracted Labor ($k)	**97.2**	**204**	**209**	**88.3**	**599**
Test Equipment and Materials ($k)					
Misc. Test and Simulation Equipment	40	20	0	0	
Switchgear/ Monitoring Equip.	65	25	0	0	
Construction Materials	0	0	0	0	
Subtotal for Test Equipment and Materials ($k)	**105**	**45**	**0**	**0**	**150**
Grand Totals for Program ($k)	**332**	**474**	**439**	**255**	**1500**

6.3 Distributed Control for Smart Grids Program

6.3.1 Distributed Control for Smart Grids Program Description

One result of the State's numerous goals for DER, such as the Governor's goal of 12,000 MW of distributed generation, is that a multitude of new, potentially controllable devices have been introduced on the smart grid. Each device has inherent control capabilities that must be coordinated and managed as part of a larger "system of systems" to maintain system electrical efficiency, reliability and power quality. To successfully use these potentially controllable devices on to the grid, SDG&E's distributed control system must be able to process the increasing amount of system status information coming from the various new devices, widely-deployed sensors, and monitoring nodes. The distributed control system also must be able to coordinate and dispatch the various potentially controllable devices and reconfigure circuits in contingencies in a fast, automated manner.

SDG&E's smart grid does not currently have such a distributed control system infrastructure, and SDG&E does not know of any existing commercial solutions available to fill this gap in the SDG&E smart grid infrastructure. To fill the gap, this program will pilot and evaluate a distributed control system that achieves the

needed capabilities to support further advancement of the smart grid. The focus of this research will initially be on the management of resources at or below the individual feeder level and their integration into an overall distribution management system ("DMS") approach. The program will first test a distributed control unit that may become part of a hierarchical control infrastructure. The unit would process data coming from smart devices in an individual feeder or larger distribution circuit region and manage the smart devices and the emerging reconfiguring actions of the region in a coordinated manner. The distributed controller would have to be compatible with higher level supervision at the DMS level. This DMS approach may go beyond the implementation of a specific DMS software application. The program will subsequently extend to the management of resources on multiple feeders.

6.3.2 Distributed Control for Smart Grids Program Objectives

This program strives to develop and test methods of communicating and coordinating controls across resources to ensure that devices operate in a complementary manner to ensure grid stability. In addition, the program will attempt to develop and test hierarchical control methods and approaches to control distribution circuit resources and integrate as part of a unified control scheme with other control systems, such as an EMS and DMS. Through this program, SDG&E hopes to understand the preferred operational responsibilities and control characteristics of each controllable grid resource and fully integrate demand response and distributed generation as part of DMS. To achieve these goals, SDG&E will also have to assess the scalability and performance of control schemes against test objectives such as circuit electrical efficiency, stability, reliability, frequency control, voltage support, and asset health maintenance.

6.3.3 Distributed Control for Smart Grids Program Scope

- Phase 1 (Nominally one year) – Concept Development and Simulation
    - Develop operational scenarios for smart grid control.
    - Develop control concepts based on a premise of hierarchical control driving real-time operating responsibility towards edge devices.
    - Develop feeder simulation models enabling the testing of various control algorithms.
    - Explore fast-simulation predictive state estimation methods to determine if they are ready for adoption as part of the control system.
    - Write specifications for distributed control unit.
    - Procure an experimental control unit for laboratory and field demonstration work.
    - Perform simulations that test the adequacy of each proposed control element.
    - Document results and develop plan for follow-up testing.

- Phase 2 (Nominally one year) – ITF Testing

- Develop and integrate leading control algorithms for electric system testing in SDG&E's ITF.
- Perform testing of algorithms and control unit functions.
- Document results and findings pertaining to subsequent demonstration testing in SDG&E's distribution system (assuming success in ITF demonstrations).

- Phase 3 (Nominally one year) – Testing in SDG&E Utility Distribution System
  - Establish the circuit environment in which controller will be tested and the necessary system interfaces.
  - Perform staged testing and operational testing of the unit and take performance data.
  - Analyze the data and report findings, including recommendations on whether or not to move to a deployment program for distributed control.
  - Examine the potential applicability of adopted concepts to the transmission system.

6.3.4 Distributed Control for Smart Grids Program Deliverables

The final program report will describe the work and all important results, including the following items:

- Distributed control concept of operation
- System architecture for control concept(s) including integration into DMS
- Distributed control test algorithms requirements and specifications
- Design information supporting phase 1, 2 and 3
- Specification for experimental controller procurement
- Computer simulation models
- Integration specifications and models for system components (leveraging standards as applicable and appropriate)
- Test results from phase 1, 2, and 3
- Recommendations regarding adoption of distributed control into SDG&E smart grid and follow-up steps

6.3.5 Distributed Control for Smart Grids Program Solicitation and Execution

This program will be performed by SDG&E staff teamed with a system integration and test contractor. SDG&E staff will work with the contractor to plan the testing, provide the contractor with access to SDG&E facilities, and provide guidance for and review of all stages of the work.

The contractor will be sought by competitive procurement.[47] Bonus points will be given for contractors located in California, or contractors conducting the majority

[47] *See supra* footnote 43.

of the contracted work in California. SDG&E will use pay-for performance contracts in accordance with its long-standing and documented procurement policies and procedures, including affiliate compliance rules. The contractors' performance will be measured by the completion of milestones as outlined in the contract.

There will be no limitations on funding, such as per-project, per-awardee, or matching funding requirements. Cost sharing will be sought, but will not be required.

The competitive procurement for a testing contractor is targeted for Q1 of 2014, pending timely approval of the program by the Commission.

6.3.6 Distributed Control for Smart Grids Program Intellectual Property Methodology

The majority of the IP created by this program, if any, would be likely created by the contractor. Therefore, SDG&E will seek to retain a perpetual, non-exclusive unrestricted license to practice the invention at issue for or on behalf of the California ratepayers to the extent permissible under applicable laws, including without limitation, the affiliate transaction rules. As a condition of the EPIC contract with SDG&E, the contractor will be required to protect SDG&E and its ratepayers' interests by citing SDG&E's support within the specification of any U.S. patent application for any subject inventions and provide SDG&E with a confirmatory license for subject inventions. This information will be part of the RFP package.

SDG&E's share of any royalties will be dependent on the terms of the contract between SDG&E and the third party contractor. SDG&E will share any net revenues (i.e., from royalties, license fees, or proceeds from the sale of IP rights) with its ratepayers under the formula approved in the most recent GRC.[48]

Any IP created solely by SDG&E will be the sole property of SDG&E. SDG&E will file a patent for the IP with the U.S. Patent and Trademark Office. SDG&E will share any net revenues (i.e., from royalties, license fees, or proceeds from the sale of IP rights) with its ratepayers under the formula approved in the most recent GRC.[49]

Any IP created jointly by SDG&E and the third-party contractor will be treated in accordance with the contract between the two parties. SDG&E will share any net revenues (i.e., from royalties, license fees, or proceeds from the sale of IP rights) with its ratepayers under the formula approved in the most recent GRC.[50]

[48] *See supra* "60/40" formula, note 45.
[49] *See supra* "60/40" formula, note 45.
[50] *See supra* "60/40" formula, note 45.

6.3.7 Distributed Control for Smart Grids Program Metrics

Metrics for this program will be based on comparing the performance of certain operations when various control schemes are in place to the performance of the same operations when the control schemes are not in place. These performance metrics will include:

- Measures of power quality, such as power factor, voltage, frequency;
- Measures of improvements in electrical efficiency (i.e., electrical loss reduction);
- Ability to meet voltage conservation targets; and
- Ability to enhance DER storage reserves (i.e., battery availability) against a baseline schedule.

To implement these metrics, SDG&E will need measure system performance and reliability with and without the distributed controller to determine how much benefit is derived from distributed control. The operation and maintenance costs with and without distributed control will also need to be measured and analyzed. SDG&E will take its results from this program and adopt successful distributed control concepts to enable a basis for rational and optimized control of its dynamically changing smart grid. Other metrics include meeting program milestones and the degree of subsequent adoption of distributed control into SDG&E's smart grid.

6.3.8 Distributed Control for Smart Grids Program Schedule

This program will run for 3 years from the time it is approved by CPUC. The schedule assumes a start date for the program of June 2013.

Phase	Duration
1	June 2013 through June 2014
2	July 2014 through June 2015
3	July 2015 through June 2016

6.3.9 Distributed Control for Smart Grids Program Budget

The budget is drawn entirely from SDG&E's 2012-2014 allotment of EPIC funding. However, it is spent over the years 2013 to 2016 due to the delay in getting an approved investment plan. The assumed start date for the program work is June 2013.

The cost estimate uses inflation escalators for SGD&E direct internal labor and for contracted labor. SDG&E direct labor costs also include appropriate overheads. Budget estimates have been rounded to the nearest thousand.

SDG&E Internal Direct Labor (with Escalation)	2013	2014	2015	2016	Total
Program Team Labor (Hours)	520	1248	1248	624	
Program Management Labor (Hours)	208	416	416	312	
Program Team Hourly Rate ($)	**118**	**120**	**123**	**127**	
Program Management Hourly Rate ($)	**153**	**157**	**161**	**166**	
Subtotal of SDG&E Internal Direct Labor ($k)	**93.1**	**216**	**221**	**131**	**661**
Contracted Labor (with Escalation)					
Consultants and System Integration and Test Contractors ($k)	51.2	183	188	55.2	
Other Contractors ($k)	0	52.4	80.5	22.1	
Subtotal for Contracted Labor ($k)	**51.2**	**236**	**268**	**77.3**	**633**
Test Equipment and Materials ($k)					
Misc. Test and Simulation Equipment	40	20	0	0	
Switchgear/ Monitoring Equip.	25	100	75	10	
Construction Materials	5	30	40	10	
Subtotal for Test Equipment and Materials ($k)	**70**	**150**	**115**	**20**	**355**
Grand Totals for Program ($k)	**214**	**601**	**605**	**228**	**1648**

6.4 Demonstration of Grid Support Functions of Distributed Energy Resources

6.4.1 Demonstration of Grid Support Functions of DER Program Description

DER, which includes distributed generation, distributed storage, demand response, and combinations of them, can provide non-traditional functions beyond mere energy supply, such as "grid support functions" (sometimes called "ancillary services").[51] These grid support functions have the potential to provide value by improving distribution system operations, such as contributing to volt/VAR regulation, providing fast response emergency power, peak shaving, and providing distribution status information at the locations of the DER. These grid support functions have not been widely adopted into smart grids due to a lack of industry standards, rules and regulations that allow or incentivize these DER uses in practice.[52]

[51] Conversely, the "traditional" DER function is as a kilowatt-hour source.

[52] For example, IEEE 1547, the Standard for Interconnecting Distributed Resources with Electric Power Systems, addresses using DER only for kWh supply. Therefore, it must be updated to enable the additional grid support functionalities.

Before new standards, rules and regulations are drafted, additional information is needed about these grid support DER functions. For example, research is needed to determine if the grid support DER functions accomplish their intended goals in specific application situations. In addition, the grid support DER functions' values, costs, and the interconnection and interoperability requirements in specific application situations must to be determined. Finally, the existence of any applicable interconnection and interoperability standards for these grid support DER functions, and conversely, any gaps, must be assessed. These issues exist for both utility-owned and customer-owned DER.

This program seeks to fill these gaps by executing prototype demonstrations of particular DER functions in specific application situations. The results of these demonstrations will help determine the situations, if any, these grid support functions are technically and economically viable. In addition, the results will help guide new standards, rules and regulations concerning the grid support DER functions.

6.4.2 The Demonstration of Grid Support Functions of DER Program Is Not Duplicative of Other TD&D Programs

To the best of SDG&E's knowledge, this program would not duplicate other TD&D programs. For example, while SDG&E has recently deployed a number of distributed PV and storage systems at various locations, including a substation, community scale installations, residential and commercial establishments, and in the Borrego Springs microgrid project, this program is not duplicative of any of these projects for several reasons.

First, unlike those existing SDG&E commercial projects, this program is pre-commercial activity focused on integration solutions and strategies for DER.

Second, after the initial phase of this program (demonstrating the systems in the SDG&E ITF) is complete, the field demonstrations will be piggybacked on the aforementioned commercial projects to avoid having to repeat the capital investments in DER energy conversion devices that are already there. The commercial systems that best align with the needs of the EPIC demonstrations at that point in time will be picked for the purpose. The experimental integration systems will be overlaid on the DER energy conversion systems that are already in place. The conventional interconnection systems that are already there will be temporarily replaced by the experimental integration (interconnection and interoperability) systems to run the needed testing and analysis. Then they will be removed and the non-experimental systems will be replaced.

Third, the purpose of these EPIC program demonstrations is different than the commercial deployments. The focus of these demonstrations is to validate the grid support functions, integration system strategies, systems, and subsystems, and assess the status and gaps in standards needed to allow commercial use of

DER grid support functions. The aforementioned commercial activities do not focus on these concerns.

Finally, SDG&E acknowledges that it has an outstanding pending funding request for a DER integration project in its GRC.[53] However, if approved, the GRC-funded program would focus on a pilot test of a specific integration system in a specific application, which is distinguishable from the comprehensive EPIC program proposed here.

SDG&E has discussed with program with the CEC to differentiate it from CEC initiatives. It is not duplicative of CEC initiative S3.3, which focuses on cost reduction of residential and community PV. Unlike the CEC, the IOU Administrators are not allowed to fund core generation development programs (including PV). Instead, they may fund integration systems, as this program does. In addition, this program differs from CEC initiative S6.1, which focuses on methods to aggregate and control loads and distributed generation (including plug-in electric vehicles). This program seeks to validate grid support functions and suitable integration systems for those grid support functions for utility-owned DER and DER at large commercial customer locations, while the CEC initiative is focused on residential DER issues.

6.4.3 Demonstration of Grid Support Functions of DER Program Objectives

A principal program objective is to validate the viability of specific DER functions and to identify which, if any, grid support functions of DER and application situations should be pursued in smart grid development. Another principal objective is to clarify which existing standards would help meet the needs of future DER integration systems[54] and what standards, rules and regulations are needed to facilitate the grid support DER functions in smart grids.

6.4.4 Demonstration of Grid Support Functions of DER Program Scope

This program will test pilot grid support DER functions to observe how well specific grid support functions work in specific application situations, to determine the grid support functions' interconnection and interoperability system and standards requirements and gaps, and to establish capabilities for control and dispatch of specific grid support functions in viable application situations.

The work will initially take place at the ITF. It will include real time digital simulator ("RTDS") work, and tests using PV, battery, and other DER simulators in lieu of actual DER. The work at ITF will also pinpoint the exact field testing needs.

Then an actual DER installation will be tested in the field to demonstrate the various functionalities described below. To mitigate risks and recognize that the "smart

[53] A.10-12-005, Prepared Direct Testimony of Kathleen H. Cordova (SDG&E-15), at 63.
[54] Integration systems include both electrical interconnection systems and communication infrastructure interoperability systems.

inverters" used for interconnection are not yet code compliant, an SDG&E facility will be used as the "commercial" site.

The program will consist of performing preplanned pilot testing, data analysis, and results generation. The data analyses will consider the cases of both utility- and customer-owned DER. The advantages and disadvantages of using utility- versus customer-owned DER to provide these grid support functionalities will be examined. Examples of issues to be addressed are:

- Integration of grid support DER grid support functions into a changing landscape of actively-controlled ("smart") components on SDG&E's distribution system.
- Coordination of DER with other smart devices in smart grid operations.
- Use of DER as a component of volt/VAR optimization strategies in conjunction with other voltage regulation equipment in the distribution circuits; determination of when it may make sense to use DER for this function compared to alternatives (such as fast-response dynamic voltage restorers and switched capacitor banks); identification of integration system and standards requirements for this function.
- Use of DER to support intentional islanding of distribution circuits and identification of integration system and standards requirements for this function.
- Use of DER as an emergency power source and identification of integration system and standards requirements for this function.
- Use of DER as a peaking power source and identification of integration system and standards requirements for this function.
- Use of DER as distribution system status monitoring nodes and identification of integration system and standards requirements for this function.
- Trial use of communication architecture standards (such as the IEC 61850-7-420 DER object models) to support standardized interoperability between utility operating systems and multiple vendor DER products. For cases where suitable standards do not yet exist, surrogates will be developed and tested. Determination of where the object models should reside (e.g., in the inverters or elsewhere).
- Trial use of extensions to IEEE 1547 DER interconnection standards as they evolve to accommodate the added functions of DER and their associated multifunctional four-quadrant inverters (now sometimes called "smart inverters").

It is noted that by using the ITF and a strategically chosen SDG&E field test locations, it should be possible to address all of these issues within the budget provided.

In all cases, the emphasis will be on obtaining data to validate grid support DER functionalities, cost/benefit evaluations, and definitions of interconnection and interoperability system requirements. This information will be used to guide decisions regarding the adoption of the functions in the commercial smart grid and to give input to

the standards bodies to help develop the needed standards. The program activities will include:

- Selection of advanced grid support DER functions to be tested and identify needed equipment (e.g., DER, smart inverters, test equipment).
- Leverage the pilot system testing on existing capital assets wherever possible to avoid using the scare EPIC funding on capital purchases.
- Identify testing requirements and interconnection and interoperability standards (or surrogates when there are gaps in standards) to be used.
- Identify an SDG&E facility to act as the commercial test location. The chosen facility will preferably have existing DER so that capital investments are kept minimal.
- Prepare test plans and align with program budget.
- Set up test systems.
- Perform testing and collect data.
- Perform analyses. Analyses will include validation that functional performance meets expectations and projection of costs and benefits of using grid support DER functionalities in specific application situations. The costs of getting these grid support functions from DER will be compared with the costs of accomplishing those same functions by using traditional devices, such as voltage regulation equipment, sensors, static compensators, capacitors, etc. The differences in costs and benefits for utility versus customer DER used for grid support functions will be assessed.
- Formulate results and findings.

6.4.5 Demonstration of Grid Support Functions of DER Program Deliverables

The final report describing the work and all important results will include (but not be limited to) the following items:

- Descriptions of DER functions demonstrated, application situations, testing performed, and test results.
- Recommendations of which DER functions should be pursued commercially in the SDG&E smart grid.
- Roadmap for transfer of knowledge gained (on function viability and interoperability system requirements to support functions) to commercial practice and/or to standards working groups, as may be appropriate.
- Specifications for integration systems to encourage “plug and play” capabilities in the “smart inverters” and other integration components.
- Transfer of relevant information to SDOs and other stakeholders.

6.4.6 Demonstration of Grid Support Functions of DER Program Solicitation and Execution

This program will be performed by SDG&E staff teamed with a system integration and test contractor. SDG&E staff will work with the contractor to plan the testing, provide the contractor with access to SDG&E facilities and related security clearances, and provide guidance and review of all stages of the work.

The contractor will be sought by competitive procurement.[55] SDG&E will use pay-for performance contracts in accordance with its long-standing and documented procurement policies and procedures, including affiliate compliance rules. The contractors' performance will be measured by completion of milestones outlined in the contract.

The competitive procurement for a testing contractor is targeted for Q1 of 2014, pending timely program approval. Successful bidders must demonstrate that they have expertise in the areas of integration of DER (generation and storage) into smart grid operations, the IEC 61850-7-420 and other relevant communication standards for DER interoperability with smart grid operations, the IEEE 1547 series of interconnection standards for electrical interconnection of DER into power distribution systems, and gaps in the existing standards. Bidders must also demonstrate their knowledge of how DER will interact with other smart devices and protection systems in an emerging smart grid environment. Bidders must also demonstrate the ability and methodology to design the needed experimental systems, take the data, perform the analyses, and draw critical conclusions from the analyses. Bidders must also demonstrate their ability to capture lessons learned from experimental activity and make recommendations that will have a large impact on future commercial deployments, as opposed to merely doing a one-time deployment of a DER integration system. Bonus points will be given for contractors located in California, or contractors conducting the majority of the contracted work in California.

There will be no limitations on funding, such as per-project, per-awardee, or matching funding requirements. Cost sharing will be sought, but will not be required.

6.4.7 Demonstration of Grid Support Functions of DER Program Intellectual Property Methodology

The IP created by this program, if any, would be likely created by the contractor. Therefore, SDG&E will seek to retain a perpetual, non-exclusive unrestricted license to practice the invention at issue for or on behalf of the California ratepayers to the extent permissible under applicable laws, including without limitation, the affiliate transaction rules. As a condition of the EPIC contract with SDG&E, the contractor will be required to protect SDG&E's and its ratepayers' interests by citing SDG&E's support within the specification of any U.S. patent application for any subject inventions and provide

[55] *See supra* note 43.

SDG&E with a confirmatory license for subject inventions. This information will be part of the RFP package.

SDG&E's share of any royalties will be dependent on the terms of the contract between SDG&E and the third party contractor. SDG&E will share any net revenues (i.e., from royalties, license fees, or proceeds from the sale of IP rights) with its ratepayers under the formula approved in the most recent GRC.[56]

Any IP created solely by SDG&E will be the sole property of SDG&E. SDG&E will file a patent for the IP with the U.S. Patent and Trademark Office. SDG&E will share any net revenues (i.e., from royalties, license fees, or proceeds from the sale of IP rights) with its ratepayers under the formula approved in the most recent GRC.[57]

Any IP created jointly by SDG&E and the contractor will be treated in accordance with the contract between the two parties. SDG&E will share any net revenues (i.e., from royalties, license fees, or proceeds from the sale of IP rights) with its ratepayers under the formula approved in the most recent GRC.[58]

6.4.8 Demonstration of Grid Support Functions of DER Program Metrics

The ultimate measures of success for this program will be if it provides a basis for deciding which DER functions warrant commercial pursuit in smart grid development. Program metrics will also include the identification of suitable interoperability and interconnection systems that support the functions. Finally, the metrics will include a determination of what standards, rules and regulations are needed to encourage the adoption of these grid support functions and the dissemination of this information to standards writers and government parties that the authority to make applicable industry rules or laws.

6.4.9 Demonstration of Grid Support Functions of DER Program Schedule

This program will run for 3 years from the time it is approved by CPUC. The schedule assumes a start date for the program of June 2013.

Phase	Duration
1	June 2013 through June 2014
2	July 2014 through June 2015
3	July 2015 through June 2016

[56] *See supra* "60/40" formula, note 45.
[57] *See supra* "60/40" formula, note 45.
[58] *See supra* "60/40" formula, note 45.

The tentative phasing of the program is:

Phase 1 (Nominally one year)

- Selection of functions, host sites, and development of test plans.

Phase 2 (Nominally one year)

- Set up and perform testing for specific functions in specific application situations.

Phase 3 (Nominally one year)

- Perform analysis and final report writing. Transfer results into practice. Identify next steps.

6.4.10 Demonstration of Grid Support Functions DER Program Budget

The budget is drawn entirely from SDG&E's 2012-2014 allotment of EPIC funding. However, it is spent over the years 2013 to 2016 due to the delay in getting an approved investment plan. The assumed start date for the program work is June 2013.

The cost estimate uses inflation escalators for SGD&E direct internal labor and for contracted labor. SDG&E direct labor costs also include appropriate overheads. Budget estimates have been rounded to the nearest thousand.

SDG&E Internal Direct Labor (with Escalation)	2013	2014	2015	2016	Total
Program Team Labor (Hours)	520	1040	1040	520	
Program Management Labor (Hours)	303	520	416	303	
Program Team Hourly Rate ($)	**118**	**120**	**123**	**127**	
Program Management Hourly Rate ($)	**153**	**157**	**161**	**166**	
Subtotal of SDG&E Internal Direct Labor ($k)	**108**	**207**	**195**	**116**	**626**
Contracted Labor (with Escalation)					
Consultants and System Integration and Test Contractors ($k)	0	189	188	55.2	
Other Contractors ($k)	35.8	52.4	53.7	33.1	
Subtotal for Contracted Labor ($k)	**35.8**	**241**	**242**	**88.3**	**607**
Test Equipment and Materials ($k)					
Misc. Test and Simulation Equipment	0	160	160	0	
Switchgear/ Monitoring Equip.	0	60	59.9	0	
Construction Materials	0	0	0	0	
Subtotal for Test Equipment and Materials ($k)	**0**	**220**	**220**	**0**	**440**
Grand Totals for Program ($k)	**143**	**668**	**657**	**204**	**1673**

6.5 Smart Distribution Circuit Demonstrations Program

6.5.1 Smart Distribution Circuit Demonstrations Program Description

The contemporary distribution circuit is managed by system operators, who are augmented by field personnel and equipment that operates with simple, autonomous reactions to changes in customer demand. While this scheme has sufficed historically, reliability and efficiency gains will be left "on the table" unless utilities can take advantage of newer communication and control technologies.

SDG&E is currently working on isolated projects to improve distribution circuits, including:

- Replacing switches with equipment operated directly by SCADA.
- Managing electrical losses and improving power quality through improved reactive power control at the distribution circuit level.
- Augmenting human system operator response to outages through SDG&E's new Network Management System, which provides real-time switching plans and direct automatic control without the need for human operator action.

- Installing advanced equipment to react quickly and more precisely to ensure customer power quality, even with increasing numbers of PV and other variable distributed generation sources.

These projects make up many of the components required for a "Smart Distribution Circuit". However, SDG&E has not yet attempted to optimize the operation and coordination of these various smart components together for intelligent circuit control. With the low resolution circuit load data and static circuit simulations available today, advanced control is difficult to develop properly. This Smart Distribution Circuit Demonstrations Program aims to upgrade distribution circuit power quality by improved sensing and distribution circuit simulation quality. This will require that SDG&E implements control algorithms that manage new and existing distribution equipment for reliability, efficiency, and power quality gains.

SDG&E has discussed this program with the CEC to differentiate it from the CEC's proposed initiatives S6.1 and S6.4 (which focus on operational practices for smart distribution systems), whereas this program addresses smart distribution circuit design.

6.5.2 Smart Distribution Circuit Demonstrations Program Objectives

The objective of this program is to 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. Simulations will take advantage of hardware-in-loop technology not currently available at SDG&E. Using simulations to optimize one particular circuit, desired features will be tested in that circuit to assess their suitability for widespread commercial adoption.

6.5.3 Smart Distribution Circuit Demonstrations Program Scope

Phase 1 (Nominally one year)

- Evaluate products and technologies available for improved distribution circuit control and simulation.
- Review distribution circuit equipment in use today.
- Choose a test circuit based on equipment already in place.
- Perform baseline characterization of the test circuit's initial state, for efficiency, reliability, and power quality.
- Collect high resolution baseline data on the chosen circuit (before any changes).
- Gather additional equipment requirements which may include:
  - Protective devices
  - Switches
  - Fast-response voltage controls
  - New distributed controllers that manage devices locally

Phase 2 (Nominally one year)

- Build a RTDS model of the distribution circuit connected to actual distribution system components, including all existing or additional hardware using distribution circuits.
- Optimize hardware switching and control to improve circuit performance based on baseline data and other requirements.
- Implement any hardware or software changes required in the actual test circuit.

Phase 3 (Nominally one year)

- Monitor and analyze circuit data to evaluate performance changes.
- Assess the business case for similar optimization of other circuits.
- Make recommendations of best practices for adoption on SDG&E circuits.

6.5.4 Smart Distribution Circuit Demonstrations Program Deliverables

This program will produce three separate reports containing program data, findings, and recommendations. The Hardware and Circuit Evaluation Report (an interim report) will describe the available and existing hardware capabilities, the required hardware or simulations and any baseline data results and conclusions. The Circuit Simulation Report (an interim report) will provide the simulation model specifics, required control algorithms, optimal equipment placement, and any circuit improvements simulated (based on baseline data). Lastly, the comprehensive Final Report will document all of the work and important programs results, including (but not be limited to) a description of the simulations and demonstrations and their results, recommendations and a roadmap for commercial adoption of best circuit practices as identified in the demonstrations, and recommendations regarding additional R&D needed in this area.

6.5.5 Smart Distribution Circuit Demonstrations - Selection and Execution

This program will be performed by SDG&E staff teamed with a system integration and test contractor. SDG&E staff will work with the contractor to plan the testing, gain access to SDG&E facilities, and provide guidance and review of all stages of the work.

The contractor will be sought by competitive procurement.[59] SDG&E will use pay-for performance contracts in accordance with its long-standing and documented procurement policies and procedures, including affiliate compliance rules. The contractors' performance will be measured by completion of milestones outlined in the contract.

[59] *See supra* footnote 43.

The competitive procurement for a testing contractor is targeted for Q4 of 2013, pending timely approval of the program by the Commission. Successful bidders must demonstrate that they have demonstrated expertise in the areas of end-to-end smart grid technology and system integration, including emerging international standards and gaps in standards. They will be expected to demonstrate exceptional knowledge of both smart grid electrical and communication architecture and control issues. They must also demonstrate the ability and methodology to design the needed test systems, take the data, perform the analyses, and perform other services, as may be needed. Bonus points will also be given for contractors located in California, or contractors conducting the majority of the contracted work in California.

There will be no limitations on funding, such as per-project, per-awardee, or matching funding requirements. Cost sharing will be sought, but will not be required.

6.5.6 Smart Distribution Circuit Demonstrations Program Intellectual Property Methodology

The IP created by this program, if any, would be likely created by the contractor. Therefore, SDG&E will seek to retain a perpetual, non-exclusive unrestricted license to practice the invention at issue for or on behalf of the California ratepayers to the extent permissible under applicable laws, including without limitation, the affiliate transaction rules. As a condition of the EPIC contract with SDG&E, the contractor will be required to protect SDG&E's and its ratepayers' interests by citing SDG&E's support within the specification of any U.S. patent application for any subject inventions and provide SDG&E with a confirmatory license for subject inventions. This information will be part of the RFP package.

SDG&E's share of any royalties will be dependent on the terms of the contract between SDG&E and the contractor. SDG&E will file a patent for the IP with the U.S. Patent and Trademark Office. SDG&E will share any net revenues (i.e., from royalties, license fees, or proceeds from the sale of IP rights) with its ratepayers under the formula approved in the most recent GRC.[60]

Any IP created solely by SDG&E will be the sole property of SDG&E. SDG&E will file a patent for the IP with the U.S. Patent and Trademark Office. SDG&E will share any net revenues (i.e., from royalties, license fees, or proceeds from the sale of IP rights) with its ratepayers under the formula approved in the most recent GRC.[61]

Any IP created jointly by SDG&E and the contractor will be treated in accordance with the contract between the two parties. SDG&E will file a patent for the IP with the U.S. Patent and Trademark Office. SDG&E will share any net revenues (i.e., from royalties,

[60] *See supra* footnote 45.
[61] *See supra* footnote 45.

license fees, or proceeds from the sale of IP rights) with its ratepayers under the formula approved in the most recent GRC.[62]

6.5.7 Smart Distribution Circuit Demonstrations Program Metrics

The ultimate measure of success will be having a benchmark smart distribution circuit design that will enable SDG&E to move forward with its smart grid development. The circuit design will be capable of assimilating a wide variety of smart devices and will have a protection system that allows this to be done without compromising reliability or safety. Program metrics will include meeting program milestones and completing deliverables. The findings will be published in relevant technical conferences and journals. SDG&E's rate of adoption of successful smart distribution circuit design concepts and best practices will also serve as a metric of success.

6.5.8 Smart Distribution Circuit Demonstrations Program Schedule

This program will run for 3 years from the time it is approved by CPUC. The schedule assumes a start date for the program of June 1, 2013.

Phase	Duration
1	June 2013 through June 2014
2	July 2014 through June 2015
3	July 2015 through June 2016

6.5.9 Smart Distribution Circuit Demonstrations Program Budget

The budget is drawn entirely from SDG&E's 2012-2014 allotment of EPIC funding. However, it is spent over the years 2013 to 2016 due to the delay in getting an approved investment plan. The assumed start date for the program work is June 1, 2013.

The cost estimate uses inflation escalators for SGD&E direct internal labor and for contracted labor. SDG&E direct labor costs also include appropriate overheads. Budget estimates have been rounded to the nearest thousand.

[62] *See supra* footnote 45.

SDG&E Internal Direct Labor (with Escalation)	**2013**	**2014**	**2015**	**2016**	**Total**
Program Team Labor (Hours)	250	800	800	600	
Program Management Labor (Hours)	240	200	200	240	
Program Team Hourly Rate ($)	**118**	**120**	**123**	**127**	
Program Management Hourly Rate ($)	**153**	**157**	**161**	**166**	
Subtotal of SDG&E Internal Direct Labor ($k)	**66.2**	**128**	**131**	**116**	**441**
Contracted Labor (with Escalation)					
Consultants and System Integration and Test Contractors ($k)	153	210	215	110	
Other Contractors ($k)	0	0	0	0	
Subtotal for Contracted Labor ($k)	**153**	**210**	**215**	**110**	**688**
Test Equipment and Materials ($k)					
Misc. Test and Simulation Equipment	60	40	15	0	
Switchgear/ Monitoring Equip.	15	130	150	0	
Construction Materials	0	0	30	30	
Subtotal for Test Equipment and Materials ($k)	**75**	**170**	**195**	**30**	**470**
Grand Totals for Program ($k)	**295**	**507**	**541**	**256**	**1599**

7. SDG&E's First Cycle EPIC Program Budget

Year	2012	2013	2014	2015	2016	Sum
Program Cost Estimates ($k)						
#1 Smart Grid Architecture Demonstrations		280	497	488	235	1500
# 2 Visualizaton and Situational Awareness Demonstrations		332	474	439	255	1500
#3 Distributed Control for Smart Grids		214	601	605	228	1648
#4 Demonstratoin of Grid Support Functions of DER		143	668	657	204	1673
#5 Smart Distribution Circuit Demonstrations		295	507	541	256	1599
Grand Total for All Five Programs		**1264**	**2747**	**2730**	**1179**	**7920**
Total Unspent EPIC Funds from EPIC Cycle 1	**2640**	**2640**	**2640**			**7920**
Balance						**0**

Due to the compressed cycle 1 schedule and uncertain program approval date, the programs comprising this EPIC Plan will not be completed before the first cycle ends. Therefore, these programs, and their necessary expenditures, will likely extend into the second EPIC cycle. SDG&E's first cycle budget reflects this reality.

8. SDG&E's EPIC Plan Meets the Requirements of D.12-05-037 by Providing Benefits in a Cost-Efficient Manner

The Commission requires that the EPIC plans meet a variety of requirements, including demonstrating that the programs have the potential to deliver particular benefits to electric utility ratepayers, and demonstrating that the programs align with various complementary benefits and statutory requirements. SDG&E considered all of these requirements while developing its EPIC Plan. As a result, SDG&E's EPIC Plan meets all of these requirements and provides benefits in a cost-efficient manner.[63]

[63] SDG&E chose not to fund any clean transportation demonstration programs with EPIC funds in favor of funding other higher-priority programs.

SDG&E EPIC Programs	Potential to Provide Ratepayer Benefits			Alignment with Complementary Principles					Fufillment of Statutory requirements	
	Promote Greater Reliability	Lower Costs	Increased Safety	Efficient Use of Ratepayer Monies	GHG Emissions Mitigation and Adaption	Lower Emission Vehicles	Economic Development	Societal Benefits	Public Resources Code 740.1	Public Resources Code Section 8360
1. Smart Grid Architecture Demonstrations Program	X	X	X	X	X		X	X	X	X
2 Visualization and Situational Awareness Demonstration	X	X	X	X	X		X	X	X	X
3. Distributed Control for Smart Grid Program	X	X	X	X	X		X	X	X	X
4. Demonstration of Grid Support Functions of Distributed Energy Resources (DER)	X	X	X	X	X		X	X	X	X
5. Smart Distribution Circuit Demonstrations Program	X	X	X	X	X		X	X	X	X

8.1 SDG&E's EPIC Plan Provides the Potential of Ratepayer Benefits

Assuming SDG&E's EPIC programs successfully achieve their objectives, electric utility ratepayers should experience benefits in the form of greater reliability, lower costs, and increased safety.

First, SDG&E's EPIC Plan has the potential to provide ratepayers with greater reliability and power quality in their power supply by fully integrating devices, such as regulating equipment, system monitoring and advanced fault detection and location, in smart circuits.[64] For example, in the event of a system contingency, a fully-integrated smart grid should be able to rapidly respond to reconfigure the system and minimize any adverse effects of the contingency, or even prevent an outage completely by preemptively acting when a system contingency is looming.[65] In addition, dispatchable distributed generation should increase circuit performance and reliability locally.[66]

Second, SDG&E's EPIC Plan has the potential to provide ratepayers with lower costs. Smart distribution circuits[67] and distributed control[68] reduce electrical losses in the system, which reduces costs. The use of DER for grid support functions[69] could help get more value out of DER and avoid the cost of alternative equipment that would be needed for those grid support functions. All five programs should contribute to management of fault current levels, reducing the cycling of voltage regulation equipment and load following generation. These benefits should reduce the stress on equipment and thereby extend equipment life, resulting in lower costs. In addition, the five programs allow SDG&E to test prospective system integration solutions before adopting them for commercial use, thus reducing the possibility of SDG&E selecting suboptimal smart grid options.

Third, SDG&E's EPIC Plan has the potential to improve ratepayers' safety. A smart grid with integrated smart devices should be able to widely monitor the utility system and respond quickly and accurately to any potential hazards,[70] thus reducing the frequency and intensity of dangerous situations, like outages.

---

[64] *See supra*, Section 6.5 (Smart Distribution Circuit Demonstrations Program).
[65] *See supra*, Sections 6.1 (Smart Grid Architecture Demonstrations Programs); 6.2 (Visualization and Situational Awareness Demonstrations Program); and 6.3 (Distributed Controls for Smart Grids Program).
[66] *See supra*, Section 6.4 (Demonstration of Grid Support Functions of DER Program).
[67] *See supra*, Section 6.5 (Smart Distribution Circuit Demonstrations Program).
[68] *See supra*, Section 6.3 (Distributed Controls for Smart Grids Program).
[69] *See supra*, Section 6.5 (Smart Distribution Circuit Demonstrations Program).
[70] *See supra*, Sections 6.1 (Smart Grid Architecture Demonstrations Programs); 6.2 (Visualization and Situational Awareness Demonstrations Program); and 6.3 (Distributed Controls for Smart Grids Program).

8.2 SDG&E's EPIC Plan Reflects the Guiding Principles Articulated in D.12-05-037

In addition to potentially providing ratepayer benefits, SDG&E's EPIC Plan is guided by complementary principles listed in D.12-05-037.[71]

First, if successful, the five programs would deliver societal benefits by helping to make the smart grid even "smarter" through the networked operation of smart devices. For example, this would improve grid operations, grid stability and grid flexibility to the benefit of not only electric utility ratepayers, but also authorities like CAISO and WECC.

Second, "smartening" the smart grid will make it better equipped to handle increased power flowing into the grid from renewable sources, including renewable distributed energy resources. This helps advance the State's goals related to the reduction of greenhouse gas emissions in two ways. First, the EPIC programs should create smart grid infrastructure that is more amenable to use of renewable resources, which displace conventional generation that creates GHG emissions. Second, the smart grid infrastructure enabled by these EPIC demonstrations should reduce electrical losses in the grid, which reduces the amount of power that needs to be generated and therefore reduces GHG emissions.

For these same reasons, the SDG&E's EPIC Plan aligns with the third principle listed by D.12-05-037, the Loading Order, by helping make the smart grid infrastructure and its system operation better adapted for energy efficiency, demand response and renewables procurements.

Fourth, SDG&E's EPIC Plan strikes the critical balance of promoting economic development while simultaneously using ratepayer monies efficiently and effectively. Several of SDG&E's programs require third party contractors to complete work. Any work contracted outside of SDG&E will promote economic development in that research community. At the same time, SDG&E is consciousness of using the EPIC ratepayer funds wisely and efficiently. Therefore, in accordance with its internal procurement policy, SDG&E will only put out an RFP for contract work in excess of $75,000. The RFP process will ensure that the most qualified contractors at the lowest price will be selected. In addition, by setting a floor on the RFP work, SDG&E avoids needlessly financing an RFP for small work amounts. In addition, SDG&E will perform many of these demonstrations at its own test facilities or grid infrastructure. This eliminates paying for expensive lab and field testing fees.

[71] D.12-05-037 describes "complementary principles" to include societal benefits, GHG emissions reductions in the electricity sector at the lowest possible cost, the Loading Order, low-emission vehicles and transportation, economic development, and efficient use of ratepayer monies. D.12-05-037 at 20. SDG&E's EPIC Plan following almost all of these listed principles, but not all of them. It would be unreasonable and unrealistic to expect a single EPIC Plan, especially a plan with a low-level of funding like the SDG&E EPIC Plan, to align with all of these complementary principles.

8.3 SDG&E's EPIC Plan Fulfill the Requirements of Section 740.1

Section 740.1 requires that the Commission consider specific guidelines when evaluating the research, development and demonstration projects proposed by electrical and gas corporations. SDG&E's EPIC Program meets these requirements.

First, proposed projects should offer a reasonable probability of providing benefits to ratepayers. As has been thoroughly discussed above, SDG&E's EPIC programs all have the potential to provide electric utility ratepayers benefits, including greater reliability, lower costs, and increased safety, as well as various other complementary benefits.

Second, section 740.1 states that expenditures on projects with a low probability for success should be minimized.[72] SDG&E has selected five programs that demonstrate smart grid system integration solutions that are to be cornerstones of advancement of its smart grid infrastructure. The integration solutions are to be built up from existing components, standards, and software, wherever possible. Therefore, the probability of success in the selected SDG&E EPIC programs is reasonable.

The third guideline in section 740.1 requires that projects remain consistent with the corporation's resource plan. Again, this requirement is fulfilled by SDG&E's plans because they were selected after a rigorous internal process that ensured the plans aligned with SDG&E's corporate objectives.[73]

Section 740.1 also compels SDG&E to avoid unnecessarily duplicating research being done by another entity. As has been thoroughly discussed throughout this EPIC Plan, SDG&E has worked diligently to ensure that to its belief and knowledge, its five plans are not duplicative of other known TD&D plans by completely an initial gaps analysis, researching other known TD&D efforts, and soliciting feedback on its plans from stakeholders, the Commission, the other EPIC Administrators, EPRI and its internal business units. When duplicative programs were uncovered, SDG&E either eliminated the program as a potential recipient of EPIC funds or modified the program to ensure differentiation.

[72] The Commission restricts the IOU Administrators to only demonstration programs, which are designed to prove a technology's viability and cost effectiveness. Obviously, not all programs will be successful.
[73] *See supra,* SDG&E Smart Grid Deployment Plan 2011-2020, note 39.

Finally, section 740.1 requires the Commission to consider whether a program is supported by one of several objectives.[74] All five SDG&E EPIC programs are supported by several of these objectives.

8.4 SDG&E's EPIC Follows the Guidance of Section 8360

EPIC expenditures must follow the statutory guidance provided by section 8360 of the California Public Utilities Code. Section 8360 states that it is the policy of the State to modernize the state's electrical transmission and distribution system to maintain safe, reliable, efficient, and secure electrical service, with infrastructure that can meet future growth in demand and achieve ten separate objectives.[75] In essence, it is the policy of the State to support smart grid development.

SDG&E's Plan meets this smart grid-centric statutory standard with ample sufficiency because SDG&E's entire EPIC Plan and its program components are designed to modernize its smart grid by integrating smart devices into a controlled, networked system.

8.5 SDG&E's EPIC Plan Maps to the EPIC Value Chain

SDG&E's five programs map well to the applicable sections of the electric utility value chain described in D.12-05-037. The only element of the EPIC Value Chain not represented in SDG&E's EPIC Plan is "Generation" because D.12-05-037 prohibits SDG&E from funding generation programs with EPIC funds.[76]

---

[74] Section 740.1(e) states:

> Each project should also support one or more of the following objectives:
> (1) Environmental improvement.
> (2) Public and employee safety.
> (3) Conservation by efficient resource use or by reducing or shifting system load.
> (4) Development of new resources and processes, particularly renewable resources and processes which further supply technologies.
> (5) Improve operating efficiency and reliability or otherwise reduce operating costs.

[75] The four Working Framework categories were specifically were designed to address each of the ten objectives described in section 8360. All ten objectives strive to develop and deploy smart grids.

[76] The IOU Administrators are not allowed to fund generation programs through EPIC. D.12-05-037 at OP 13.

Mapping of SDG&E's EPIC Programs to Electricity System Value Chain					
SDG&E EPIC Programs	**Grid Operations/ Market Design**	**Generation**	**Transmission**	**Distribution**	**Demand-Side Management**
1. Smart Grid Architecture Demonstrations					
2. Visualization and Situational Awareness Demonstration					
3. Distributed Control for Smart Grids					
4. Demonstration of Grid Support Functions of Distributed Energy Resources (DER)					
5. Smart Distribution Circuit Demonstrations					

Key

= Primary Value

= Secondary Value

8.6 Cost-Benefit Analysis Supports SDG&E's EPIC Plan

A cost-benefit ("CB") analysis of SDG&E's EPIC Plan demonstrates that it provides reasonable benefits to ratepayers in a cost-efficient manner. **Even with the conservative case, the SDG&E EPIC program benefits were found to be 1.5 times the costs.**

The CB methodology developed for SDG&E's EPIC programs focuses specifically on the pre-commercial demonstrations called for by EPIC, rather than on life-cycle CB that may be associated with a subsequent commercialization process. The CB methodology differentiates the EPIC program demonstration costs and benefits from subsequent

commercial deployment costs and benefits. A sensitivity analysis was used to assign a quantitative basis to the benefits of the EPIC demonstration programs.

Based on the budget prescribed by the Commission, SDG&E's costs for the five demonstration programs will be $7.92 million. The quantifiable benefits basis for the EPIC demonstrations was based on a sensitivity analysis of cost efficiency and benefit efficiency in subsequent commercial smart grid deployments which can be attributed to conducting the EPIC demonstrations prior to the smart grid deployments. Eighteen projects in SDG&E's Smart Grid Deployment Plan were identified as potential beneficiaries of the five EPIC demonstration programs. The assumption is that the eighteen projects might achieve cost and benefits efficiencies when making integration strategy decisions thanks to knowledge gained in the EPIC demonstrations.[77]

A sensitivity analysis was performed to determine the cost efficiency and benefit efficiency assumptions for these eighteen smart grid projects. The analysis looked at different scenarios for the deployments in terms of:

- Different levels of costs and benefits of the smart grid commercial deployments that would follow the demonstrations and were obtainable from the smart grid deployment plan.
- Timing of the impact on the knowledge gained from the demonstrations on the commercial deployments.
- Cost and benefit efficiencies resulting from the knowledge gained through the EPIC demonstrations. These efficiencies include the percentages of commercial deployment and O&M costs saved and additional benefits realized by virtue of more intelligent integration system strategies and systems attributable to the EPIC demonstrations.

Examination of alternative scenarios in the sensitivity analysis found that, even under a very conservative scenario, **the benefit/cost ratio was 1.5**. The conservative case assumed:

- The actual commercial deployment costs are at the low end of the range in the smart grid deployment plan.

- The commercial deployments did not achieve any benefits from the knowledge coming out of the EPIC demonstrations until 2016. In reality, as knowledge begins to flow from the EPIC programs, some of the benefits can be obtained prior to full completion of the EPIC programs by factoring that knowledge into the planning of the subsequent commercial programs right away.

- The cost efficiency and benefit efficiency from using the knowledge from the EPIC demonstrations were only 2% on costs and 0. 5% on benefits for figures in the eighteen identified projects. The last assumptions would mean that only 2%

[77] For example, the better informed decisions can result at the commercialization stage in either getting the same benefits at lower cost or more benefits at the same cost or a combination of both.

of deployment cost savings and 0. 5% additional benefits would be realized from deployment choices that were better informed by the EPIC demonstrations.

Even with the conservative case, the SDG&E EPIC program benefits were found to be 1.5 times the costs. For the other scenarios with less pessimistic assumptions, the benefit-to-cost ratio increases significantly as the potential benefits of the EPIC programs are increased. The ratio result applies to the entire set of five proposed EPIC demonstration programs as a whole. They comprise a package of interrelated smart grid integration system demonstrations that collectively will benefit the eighteen smart grid projects. The whole for these five demonstration programs is greater than the sum of the parts.

The quantified basis, described above, for the CB EPIC Plan analysis is based on the following expected benefits, which cannot be independently quantified:

- Cost Avoidance: In the EPIC programs, smart grid integration strategies and systems will be demonstrated to support future decision-making regarding choices for the commercial smart grid deployment programs. By demonstrating prospective integration system options, SDG&E should create a better informed decision basis on which to adopt in widespread commercial use in its evolving smart grid. SDG&E should also reduce the risk of making wrong choices that may be very costly to fix or replace, yielding cost savings.

- Increased Customer Benefits: Thanks to the demonstrations, SDG&E should make more informed choices about which features provide the most benefits to customers, and therefore, should be adopted in SDG&E's evolving smart grid.

- Accelerated Adoption: The knowledge gained from the demonstrations should help SDG&E accelerate the commercial adoption phase, resulting in a more rapid deployment of smart grid technologies and earlier delivery of the benefits to customers.

- Better Feasibility Determinations: The demonstrations should help SDG&E ascertain the availability of a solution or part of a solution from a supply source. In other words, the demonstrations should provide SDG&E with knowledge to help determine the suitability, readiness, and quantities available to implement a solution on a commercial basis from alternative supply sources.

- Enhanced Competitive Processes to Lower Costs: The demonstrations should provide SDG&E with helpful information on how best to do a competitive procurement for a specific prospective solution in a commercial adoption program.

- Clarifications of Operational Requirements: The demonstrations should help SDG&E clarify necessary system compatibility issues, operational requirements and maintenance costs prior to adoption, which should lower overall costs and help ensure the system will be reliably operated.

9. Proposed Metrics By Which SDG&E's EPIC Plan Should be Judged

SDG&E cautions that because of its research-based nature and the short funding cycles, it will not necessarily be possible to evaluate if the EPIC Plan meets or exceeds any metrics before the second program cycle commences. SDG&E will attempt to quantify its Plan's successes in these metric areas to the extent possible, however. SDG&E will also work with the other EPIC Administrators, to the extent feasible, to devise a common set of metrics by which the EPIC Plans should be evaluated.

9.1 Metrics Related to Estimated Benefits to Ratepayers and to the State

SDG&E believes that this EPIC Plan has the potential to provide multiple benefits to electric utility ratepayers and the State. Therefore, as outlined in D.12-05-037, program metrics related to these potential benefits would be appropriate, such as metrics in the following areas:[78]

- Potential energy savings and new cost efficiencies: The EPIC Plan has the potential to produce gains in energy efficiency, including reduction of electrical losses, and related cost savings. Pre-commercial demonstrations of integration systems, subsystems, and standards in the five SDG&E EPIC programs should result in cost efficiencies and additional benefits in subsequent commercial deployments in the SDG&E smart grid development above and beyond what would have occurred without the knowledge gained from the pre-commercial demonstrations.

- Potential Economic Benefits: The EPIC Plan has the potential to provide various economic benefits including, but not limited to, direct benefits to ratepayers and business growth within California thanks in-state demonstrations. In addition, by making the smart grid "smarter", this EPIC Plan could help attract new businesses to California or retaining Californian businesses with state-of-the-art reliable electrical services.

- Potential Job Creation: The various third-party contracting and consulting plans outlined in this EPIC Plan have to potential to create jobs, especially in California.

- Potential Environmental Benefits: The EPIC Plan has the potential to provide numerous environmental benefits. For example, if the programs are successful, SDG&E should have a more efficient smart grid and should be able to reduce

[78] D.12-05-037 at OP 12(c).

electrical loss. Less electrical loss should result in less required generation, some of which may be GHG-emitting generation.

- Additional Benefits: The enhancements to smart grid design and operations resulting from these demonstrations may result in increased safety for both utility workers and customers. In addition, some of the new systems created through this EPIC Plan, such as an improved visualization display for system operators, will require new job training for relevant industry workers. Finally, some of the system integration solutions (i.e., technology, software, strategies, and data) that are demonstrated through this EPIC Plan may be transferable concepts to other industries besides electric utilities, which could amplify the gains in economic growth and job creation beyond those solely associated with the electric utility infrastructure development industry.

9.2 Metrics Related to Overcoming Specific Barriers to Technology Deployment or Adoption

SDG&E believes that this EPIC Plan has the potential to overcome specific barriers and issues currently impeding the widespread deployment and adoption of certain technologies or strategies related to smart grid. To fully realize the smart grid's potential, smart devices deployed on the smart grid must be able to operate cooperatively through a networked communication and control infrastructure instead of autonomously. Achieving this vision for smart grids has been hampered by the lack of the standards and integrations strategies, systems and subsystems needed to provide the strategic infrastructure to support networked operations. The SDG&E EPIC Plan aims to address these needs.

Therefore, program metrics related to the EPIC Program's success in overcoming these barriers would be appropriate. The metrics will relate to the effective dissemination of program findings, the adoption of technologies, strategies or research findings from the programs by others, and increased funding support for this issue.

First, SDG&E will track how effectively it is able to disseminate the EPIC Plan findings. To do this, the five programs' results will be documented in individual program final reports as well as in SDG&E's annual EPIC report to the Commission, and in conference papers, journal papers, and other media, when appropriate. SDG&E will establish a website to disseminate program findings. SDG&E will also team with the other EPIC Administrators on technology transfer and information dissemination efforts, when feasible.

Second, SDG&E will track the adoption of any technology, strategy, and research findings. Any adoptions by SDG&E for its own smart grid will be monitored and documented to determine the extent and rate of adoption, and to identify cases in which a demonstration resulted in the decision to commercially adopt a strategy or solution. Where information is available, adoptions by non-SDG&E parties will also be monitored.

In addition, the extent to which the program findings help the standards organizations and government agencies develop new standards and industry rules will be monitored.

Third, SDG&E will track any direct cost-sharing for the EPIC Plan's demonstration programs. In addition, to the extent feasible, it will monitor any collateral funding provided by parties that commercially adopt the integration solutions and strategies resulting from the SDG&E deployments.

10. Future Program Coordination by Administrators

EPIC strives to create a statewide energy research effort by the EPIC Administrators.[79] To help reach that goal and to fulfill the Commission's requirements enunciated in D.12-05-037, the EPIC Administrators will continue coordinating with each other and consulting with stakeholders during the lifetime of EPIC, to the extend legally permissible.

10.1 Future Consultations with Stakeholders

D.12-05-037 requires the administrators to consult with interested stakeholders no less than twice per year.[80] It does not require the consultation to take the form of a formal advisory committee or any specific form.[81]

SDG&E found the publicly-noticed meetings and webinar held for stakeholder participation to be cost-efficient fora for providing stakeholders with relevant EPIC information and soliciting their feedback. SDG&E will continue to hold these stakeholder-focused meetings in person or through a webinar semiannually. The public meetings will occur during planning cycles as required by the schedule in D.12-05-037[82] and at beneficial times during the off-planning cycle years, perhaps when the annual EPIC reports are filed with the Commission.

EPRI will be invited to the stakeholder workshops and encouraged to assist SDG&E identify industry gaps, possible duplicity and any collaborative opportunities.

10.2 Future Collaboration with EPIC Administrators

The IOU Administrators propose an annual meeting for all the Administrators and the Commission to discuss the respective EPIC portfolios, identify any potential areas of duplication, and discuss possible joint funding opportunities.

Collaboration among the EPIC Administrators should not be limited to a single annual meeting, however. In furtherance of the guiding principles and goals of EPIC, and to maximize the benefits of the program to electric utility ratepayers, the EPIC

[79] *Id*. at FOF 9.
[80] *Id*. at OP 15.
[81] *Id*. at 77. D.12-05-037 states that the Commission should not establish a formal advisory committee structure for EPIC. *Id*. at COL 26.
[82] *Id*. at 31.

Administrators have agreed to pursue, to the extent reasonable and feasible, the following principles for cooperating and collaborating for EPIC-funded energy RD&D programs:

- **Information Sharing:** The EPIC Administrators will share information regarding their EPIC investment plans, programs and projects as much as practicable to maximize the efficient use of RD&D funds and facilitate the dissemination of the results of EPIC efforts for the benefit of electric utility ratepayers.
- **Leveraging Funding and Avoiding Duplication of Projects:** To the extent legally permissible, the EPIC Administrators will work together to avoid duplication of efforts, consistent with section 740.1, and to leverage EPIC funding for the benefit of electric utility ratepayers.
- **Consistent Evaluation, Measurement and Verification of RD&D Results:** The EPIC Administrators will work together to establish consistent and common evaluation, measurement and verification protocols for developing and reporting to the Commission and stakeholders the performance and results of EPIC-funded projects.
- **Coordinated Input and Advice from Stakeholders:** The EPIC Administrators will work together to schedule, solicit and respond to comments and advice from stakeholders on proposed and on-going EPIC Plans and programs.
- **Intellectual Property:** The EPIC Administrators will work together and use best efforts to agree on common approaches to intellectual property rights that benefit electric utility ratepayers.

Additionally, as directed by D.12-05-037,[83] the EPIC Administrators will work together to establish a process to remit programmatic funding from the IOU Administrators' EPIC balancing accounts to the CEC once funds have been encumbered by the CEC.

[83] *Id*. at 70.

Glossary of Acronyms and Abbreviations

Acronym/Abbreviation	
CAISO	California Independent System Operator
CB	Cost-Benefit
CEC	California Energy Commission
CIM	Common Information Model
Commission	California Public Utilities Commission
CSI	California Solar Initiative
DER	Distributed Energy Resources
DMS	Distribution Management System
DR	Demand Response
EE	Energy Efficiency
EPIC	Electric Program Investment Charge
EPRI	Electric Power Research Institute
ET	Emerging Technology
ET-DR	Emerging Technology Demand Response Program
EV	Electric Vehicles
GHG	Greenhouse Gas
GRC	General Rate Case
IOU	Investor-Owned Utility
IOU Administrators	Three Large Investor-Owned Utilities (PG&E, SDG&E, SCE)
IP	Intellectual Property
ITF	Integrated Test Facility
NIST	National Institute of Standards and Technology
NRDC	Natural Resources Defense Council
O&M	Operation & Maintenance
PG&E	Pacific Gas and Electric Company
PV	Photovoltaic
R&D	Research and development
RD&D	Research, Development, and Deployment
RFP	Request for Proposal
RPS	Renewable Portfolio Standard
RTDS	Real Time Digital Simulator
SCADA	Supervisory Control and Data Acquisition
SCE	Southern California Edison
SDG&E	San Diego Gas & Electric Company
TD&D	Technology Demonstration and Deployment
VAR	Volt-Ampere Reactive
WECC	Western Electricity Coordinating Council
Working Framework	IOU Working EPIC Framework
ZNE	Zero Net Energy