DRA

Division of Ratepayer Advocates
California Public Utilities Commission

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CPUC Energy Division
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Subject: Protest of the Division of Ratepayer Advocates to Pacific Gas and Electric Company's Advice Letter 3379-G/4215-E, Southern California Edison Company's Advice Letter 2887-E, and San Diego Gas & Electric Company's Advice Letter 2473-E

Introduction

Pursuant to the California Public Utilities Commission's (Commission) General Order (GO) 96-B, Section 7.4, the Division of Ratepayer Advocates (DRA) hereby submits this protest of Pacific Gas and Electric Company's (PG&E), Southern California Edison Company's (SCE), and San Diego Gas & Electric Company's (SDG&E) (collectively, Joint Utilities) joint Tier 3 Advice Letter[1] filed on April 19, 2013. The Advice Letter (AL) is submitted pursuant to Ordering Paragraphs (OPs) 8, 9, 12, 14 of Decision (D.) 12-12-031 issued on December 28, 2012.

In the AL, the Joint Utilities request Commission approval of projects and associated budgets for the first 18 months of the five-year California Energy Systems for the 21st Century (CES-21) program and for the Cooperative Research and Development Agreement (CRADA) between Joint Utilities and Lawrence Livermore National Laboratory (LLNL). DRA protests and recommends the Commission reject the Joint Utilities' AL for the following reasons:

- The Joint Utilities' pending petition for modification does not affect the review of this advice letter.

[1] PG&E Advice Letter 3379-G/4215-E; SCE Advice Letter 2887-E; SDG&E Advice Letter 2473-E

- The Joint Utilities' proposed 18-month research portfolio of eleven business cases, administrative budget, and CRADA included in this AL do not comply with the directives in D.12-12-031.

- The proposed research projects' business cases do not provide the necessary information required to satisfy the criteria imposed by the Commission**.**

- The Joint Utilities fail to demonstrate that the proposed research projects do not duplicate research undertaken by other utilities, research institutes, the California Energy Commission (CEC), the Electric Power Institute (EPRI), or the United States Department of Energy (DoE).

- The Joint Utilities fail to demonstrate quantifiable customer benefits or that the proposed budgets are just and reasonable; and

- The Joint Utilities' proposed common costs are vague and undetailed, making a reasonableness review impossible.

DRA recommends that the Energy Division immediately suspend the AL's effectiveness pursuant to GO 96-B, Section 7.5. As described below, the AL inappropriately incorporates authorities that were not granted to the Joint Utilities in D.12-12-031. The Joint Utilities further failed to comply with the AL preparation and filing guidelines the Commission ordered in OPs 10 and 12 of D.12-12-031. Therefore, DRA recommends that the Commission reject the AL pursuant to GO 96-B, Section 7.6.[2]

Background

In July 2011, the Joint Utilities filed Application (A.) 11-07-008 seeking approval to establish and recover costs from ratepayers to fund a research agreement with LLNL for 21st Century Energy System (CES-21) program. The Joint Utilities stated that the purpose of the CES-21 program was to conduct research and development activities and that the "objective of the CES-21 Project is to apply computationally-based problem solving resources to the emerging challenges of the 21st century energy system (electric and natural gas) for California."[3]

On December 20, 2012, the Commission issued D.12-12-031, which established the CES-21 program and authorized the Joint Utilities to spend up to $30 million a year

[2] Note: silence on any particular issue should not be construed as assent by DRA.
[3] October 19, 2011, Joint Utilities' Prepared Testimony, p. 1-3.

for five years on research activities, for a total of $152.19 million total costs (when franchise fees and uncollectibles are included).[4] The Commission ordered the Joint Utilities to file an annual Tier 3 AL with the Commission that includes, at minimum, the proposed research projects for the upcoming year. The Commission additionally ordered that the initial AL filing, at issue here, include CES-21 implementation plans, project proposals and budgets, and the draft CRADA, as well as meet strict guidelines imposed in the decision. Guidelines for the CRADA include the following:

> a. The research shall be limited to the areas of cyber security, electricity operations, gas operations, and electric resource planning.
>
> b. The research shall be limited to $30 million in a calendar year and be limited to $150 million during the five years of the project.
>
> c. The implementing advice letters shall track and record, allocate, and recover costs consistent with ordering paragraphs 3, 4, and 5.
>
> d. The Board of Directors shall consist of six members, one designated by each utility, and three members with a background in academic or institutional research selected by the three utilities.[5]

For the preparation and filing of the proposed projects, implementation plan, and budget, the Commission ordered that the letter demonstrate:

> a. That research projects are limited to the areas of electric system operations, electric resource planning, gas system operations and cyber security which this decision has identified as offering major research opportunities consistent with the needs of ratepayers;
>
> b. that the total spent on research in a given year in the 21st Century Energy Systems research project does not exceed $30 million;
>
> c. that there is a positive business case for each proposed research project. The business case for each new research project

[4] D.12-12-031, pp. 2-3.
[5] D.12-12-031, OP 10, p. 96.

proposed should i) demonstrate quantifiable customer benefits, including safety and environmental benefits exceed costs on a net present value basis, using an Commission approved methodology, such as that used in calculating a Market Price Referent. The business case should also ii) map planned research projects to the energy system value chain, iii) detail the project costs fall within the overall allocation to each specific project, iv) analyze the justifications for specific projects against the goals in Section 740.1, and v) ensure that the project does not duplicate other research. The purpose of the business case is to ensure that funded projects in each of the four research areas are beneficial to ratepayers and to facilitate review and approval by the Commission. Therefore, the business case shall discuss the following: i) What is the overall value of the results from the potential research to ratepayers and to the utility system's safety and reliability? ii) How do the costs of the research compare to potential benefits? iii) Would the results of the research have an impact on the ability of the grid to support the competitive provision of electric power or on the ability to integrate non-utility assets and distributed generation onto the grid? iv) Does the proposed research align with CPUC policies? Does it, for example, support, specific programs such as the Commission’s 33% renewable goal by 2020 and Gas Pipeline Safety plans? v) Does the proposed research produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight? vi) Does the research help foster safe, reliable service at just and reasonable costs?

d. that the research projects do not duplicate other research funded by California utilities, the California Energy Commission, the Electric Power Research Institute, or the United States Department of Energy

e. that each proposed research project has the approval of a majority of the Board of Directors of the 21st Century Energy Systems research project

f. that, in the event that a research proposal is not funded by all research participants, that the advice letter include a full

> explanation for consideration by the Commission.[6]

On January 18, 2013, the Joint Utilities request an extension of time to comply with the ordered 90-day filing period. On January 24, 2013, the Commission's Executive Director approved the request for extension of time and provided the Joint Utilities with additional 30-days to file.

On April 19, 2013, the Joint Utilities filed their AL with the Commission. On May 6, 2013 DRA requested an extension of time to protest the AL from the Commission's Energy Division. The protest date was extended from May 9 2013 to May 16, 2013 via an email to the service list on May 7, 2013. Thus, DRA's protest is timely.

Analysis and Recommendations

1) The Joint Utilities' pending petition for modification does not affect the review of this advice letter.

The AL states that the Joint Utilities' "plan to request through a companion Petition for Modification of D.12-12-031 to be filed shortly after this Advice [Letter] filing the ability to extend the CES-21 Year One funding authorization from one year to 18 months." On April 25, 2013, the Joint Utilities filed a petition for modification of D.12-12-031 seeking an extension of the Year One funding, as well as other programmatic changes. The Joint Utilities' pending petition for modification is irrelevant as it pertains to the review and adjudication of this AL. As a procedural matter, a petition for modification does not suspend compliance with an order or decision of the Commission. This AL filing is a compliance filing, pursuant to OPs 8-14 of D.12-12-031. Consistent with the Commission's Rules of Practice and Procedure (Rules), no party may circumvent a standing order or decision of the Commission by simply filing a petition for modification. In particular, Rule 16.4(G) states:

> (h) Unless otherwise ordered by the Commission, the filing of a petition for modification does not stay or excuse compliance with the order of the decision proposed to be modified. The decision remains in effect until the effective date of any decision modifying the decision.

The Commission's Rules thus clearly require compliance with D.12-12-031 unless and until the Commission decides to modify the decision. The Joint Utilities may not assume in their AL that the Commission will grant their pending petition for modification.

[6] D.12-12-031, OP 12, pp. 96-99.

Their decision to incorporate a proposed "18-month research portfolio and business cases, administrative budget, and CRADA" into this AL, without first obtaining Commission approval, renders the filing noncompliant.

Under GO 96-B, Section 7.6.1, Industry Division Disposition of Advice Letters, the "Industry Division will (1) reject any advice letter where the advice letter or workpapers are clearly erroneous, including without limitation where there are clear inconsistencies with statute or Commission order." For the reasons stated herein, DRA recommends that the Commission reject the Joint Utilities' requests for additional authorities not granted to them in D.12-12-031.

2) The Joint Utilities' proposed 18-month research portfolio of eleven business cases, administrative budget, and CRADA included in the AL does not comply with the directives adopted in D.12-12-031

According to the Joint Utilities, on April 11, 2013 "the CES-21 Board of Directors approved the proposed 18-month research portfolio and business cases, administrative budget, and CRADA"[7] included in the AL. In addition to approval of the budget, portfolio, business cases, and CRADA, the Joint Utilities' AL requests the following authorities:

- To extend the proposal in the first annual AL filing from one year to 18 months;[8]
- To extend the duration of the total program beyond five years to allow adequate time to complete the research projects and accommodate the extended first year transition period;[9]
- To roll over any unspent funds from one program year to the next, so long as the total CES-21 Program costs do not exceed the authorized funding limit of $150[10] million; and[11]
- Ability for the CES-21 Board of Directors to shift funds between expenditure categories equal to no more than 5% of the adopted annual

[7] Joint Utilities' AL, p. 3.
[8] Joint Utilities' AL, p. 14.
[9] Joint Utilities' AL, pp. 3-4.
[10] $152.19 million, including franchise fees and uncollectibles pursuant to OP 2 of D.12.12.031
[11] Joint Utilities' AL, p. 3.

> budget or $1.5 million and the Executive Director to shift funds as needed between projects or activities within the expenditure categories.[12]

The Commission's orders set forth in D.12-12-031 provide clear guidance to the Joint Utilities regarding the guidelines and conditions for filing the annual AL.[13] Rather than follow those guidelines, the Joint Utilities instead submitted an AL that fundamentally changes the structure of the CES-21 program. In doing so, the Joint Utilities' AL disregards the oversight mechanisms established by the Commission to monitor the CES-21 program. The Commission should reject each of the Joint Utilities requests to increase the CES-21 program' authorities because the requests violate the orders set forth in D.12-12-031.

a) The proposed 18-month program budget is noncompliant with D.12-12-031.

The Joint Utilities request that the Commission issue a resolution that "[a]uthorizes that the first program period will be 18-months beginning on the effective date of the resolution approving this Advice filing."[14] This AL is not the appropriate venue to make such a request, and the proposed 18-month program period is inconsistent with OPs 13 and 14 of D.12-12-031. In OP 14, the Commission orders that "[in] each year of the research project, the Joint [Utilities] shall file the proposed research projects and budget for the upcoming year as a Tier 3 advice letter with this Commission."[15] And, in OP 13, the Commission concluded that the CES-21 "research program has a <u>full 12 months</u> to spend a program year's worth of funding."[16]

The request is also inconsistent with the Commission's guidelines for approval of the CRADA. In OP 10, the Commission required that the CRADA must demonstrate that research expenditures "shall be limited to $30 million <u>in a calendar year</u> [.]"[17] The Commission clearly ordered the Joint Utilities to submit a 12-month first year program budget. However, the Joint Utilities openly defy the Commission's orders and instead present an 18-month program budget for approval.

Further, the Joint Utilities' request for an approval of an 18-month first year program budget should be rejected because the budget exceeds the $30 million limit. In Attachment 2 of the AL, the Joint Utilities include sections identified as "Cost Estimate and Allocation" for each proposed business case. When the "Cost Estimate and

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[12] Joint Utilities' AL, p. 14.
[13] D.12-12-031, OPs 2, 8-14, pp. 93 & 95-98.
[14] Joint Utilities' AL, p. 14.
[15] D.12-12-031, OP 14, p. 98.
[16] D.12-12-031, OP 13, p. 98 <u>[emphasis added].</u>
[17] D.12-12-031, OP 10, p. 96 <u>[emphasis added].</u>

Allocation" sections for all the business cases are added together with the Joint Utilities' proposed common costs budgets, the first year program budget exceeds the $30 million annual cap by $250,000. For the reasons stated above, DRA recommends that the Commission reject the Joint Utilities' proposed 12-month budget because it violates the Commission's expressed orders.

b) The proposal to extend the CES-21 beyond five-years violates D.12-12-031.

The Joint Utilities' AL assumes that the Commission will grant their petition for modification seeking authorization "to extend the duration of the total program beyond 5 years to allow adequate time to complete the research projects and accommodate the extended first year transition period."[18] In doing so, the Joint Utilities included research projects in the CES-21 program that range from 21 to 66 months.[19] The proposal to extend the CES-21 program beyond five-years is inconsistent with the Commission's decision. In Finding of Facts 47, the Commission found it "reasonable to limit the duration of the CES-21 program to five years."[20] Similarly, in OP 2, the Commission ordered that the "research project is authorized for a five-year period and the total costs of the project shall not exceed $150 million during that five-year period [.]"[21] The proposal is noncompliant with the Commission's orders and should be rejected.

Moreover, the proposal to extend the CES-21 program beyond the five-year limit conflicts with the governance structure that the Joint Utilities set forth in their application and testimony supporting the CES-21 program, and adopted by the Commission.[22] In their prepared testimony, the Joint Utilities assured the Commission that the Board of Directors would not have the authority to extend the CES-21 beyond five-years. Specifically, the Joint Utilities stated:

> The Board of Directors will not have the authority to approve any new commitments or expenditures extending beyond the five-year term of the CRADA, or beyond the authority granted in this Application.[23]

The Commission already concluded that it was reasonable to fund the CES-21 program for a 5-year duration. It is inappropriate for the Joint Utilities to file this AL with proposed projects and budget timelines that disregard the Commission's explicit orders.

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[18] Joint Utilities' AL, p. 4.
[19] Joint Utilities' AL, p. 4.
[20] D.12-12-031, Finding of Facts (FoF) 47, p. 87.
[21] D.12-12-031, OP 2, p. 93.
[22] D.12-12-031, Section 4.4 Governance, pp. 23-25; *Also See* Joint Applicants Opening Brief at 32.
[23] October 19, 2011 Joint Utility Prepared Testimony, p. 1-12.

DRA recommends that the Commission reject the Joint Utilities' request to extend the CES-21 program beyond the authorized five-years because the request violates the orders set forth in D.12-12-031.

c) The proposal to roll over unspent funds to the next year is inconsistent with D.12-12-031.

The Joint Utilities request "to roll over any unspent funds from one program year to the next, so long as the total CES-21 Program costs do not exceed the authorized funding limit of $150 million." This AL is not the appropriate venue to make such request, and rolling over unspent funds is expressly prohibited in D.12-12-031. In OP 13, the Commission ordered that the CES-21 "research program has a full 12 months to spend a program years' worth of funding."[24]

Additionally, the Joint Utilities proposal would negate the oversights instituted in the decision. If funds are rolled over to the next year, there are only two possible outcomes: 1) an extension of the CES-21 program past five years; and/or 2) creating an annual budget that exceeds $30 million limit for the year to which funds are rolled over. As DRA describes above, either possibility is inconsistent with the Commission's orders and should not be permitted. The Commission should deny the Joint Utilities' attempt to incorporate additional authorities that are expressly barred in D.12-12-031. DRA recommends that the Commission reject the Joint Utilities' request to rollover unspent funds into the following year because it violates the orders adopted in D.12-12-031.

d) The proposal to shift funds between expenditure categories and between projects or activities within the expenditure categories eviscerates Commission oversight and should be rejected.

The Joint Utilities request authority for "the CES-21 Board of Directors to shift funds between expenditure categories equal to no more than 5% of the adopted annual budget or $1.5 million and Executive Director to shift funds as needed between projects or activities within the expenditure categories."[25] The Commission should reject the Joint Utilities' proposal because it effectively removes the Commission's oversight of the CES-21 program.

In D.12-12-031, the Commission adopted measures to ensure that it has final authority to approve CES-21 program proposals. The Commission concluded that "California state law supports Commission oversight of utility research projects."[26] Thus,

[24] D.12-12-031, OP 13, p. 98.
[25] Joint Utilities' AL, p. 14.
[26] D.12-12-031, Conclusion of Law 1, p. 90.

the Commission required the Joint Utilities to demonstrate that their CES-21 proposals are consistent with D.12-12-031, state policy, and are reasonable prior to spending ratepayer funds.[27] In OP 8, the Commission declared:

> 8. Prior to expending any funds authorized by this decision, Pacific Gas and Electric Company, Southern California Edison Company, San Diego Gas & Electric Company and Lawrence Livermore National Laboratory will negotiate and enter into a Cooperative Research and Development Agreement consistent with Ordering Paragraph 10. <u>This Cooperative Research and Development Agreement shall be subject to final approval through a Tier 3 advice letter filed at the Commission.</u>[28]

The Commission's orders providing that it review and issue a resolution on the merits of the Joint Utilities' AL filing are reiterated in OPs 9 and 14 of D.12-12-031. The orders provide safeguards and oversight of the CES-21 program's activities, projects, and expenditures.

However, the Joint Utilities' request to shift funds between research categories and between projects within those research categories at any point nullifies that oversight. Effectively, the Commission would be voting on a resolution that the Board of Directors or CES-21 executive director could immediately modify, thus rendering the Commission's resolution meaningless. DRA recommends that the Commission reject the Joint Utilities' request to shift funds between categories and between projects because to eviscerates the Commission's oversight of the CES-21 program and is inconsistent with the orders set forth in D.12-12-031.

3) The proposed research projects' business cases do not provide the necessary information required to satisfy the criteria imposed by the Commission.

As detailed above, in OP 12 of D.12-12-031, the Commission established criteria that each proposed research project's business case had to comply with in order to be found reasonable for ratepayer funding. DRA performed an initial review of the eleven business cases using the Commission's criteria and determined that none of the business cases satisfied all the standards imposed by D.12-12-031. In fact, many of the business cases failed to sufficiently satisfy any of the criteria required by the Commission. DRA Table 1 provides a summary of DRA's business case evaluations. The proposed project name is listed under the proposal column, and the criteria from

[27] D.12-12-031, FoF 37, p. 86.
[28] D.12-12-031, OP 8, p. 95 (emphasis added).

D.12-12-031 are listed on the first row. For additional information, see Attachment 1 to this protest, which includes an overview of DRA's initial analysis for each of the eleven proposed business cases.

DRA Table 1
Business Case Evaluation Summary[29]

Proposal	Positive Business Case?	Positive NPV Shown?	Overall Value?	Cost Benefits	Competitive & DG?	Align w/CPUC Policies?	Possible Utility Benefits?	Safe, Reliable, Just, & Reasonable?
Advanced Threat Analysis	No	No	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*
Modeling and Simulation	No	No	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*
Ensemble Weather Forecast	No	No	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*
Flexibility Metrics & Standards	No	No	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*
Planning Engine	No	No	*Unknown*	*Unknown*	*Unknown*	*Unknown*	Possibly	*Unknown*
Distribution Modeling and Optimization	No	No	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*
Real Time Hybrid Digital Simulation	No	No	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*
Integrated Transmission and Distribution Modeling	No	No	None	*Unknown*	*Unknown*	*Unknown*	No	*Unknown*

[29] Note: For DRA Table 1, Business Case Evaluation:

- "No" means that the business case shows no value or benefit for the criterion.
- "None" means that no information was provided meeting the criterion.
- "Unknown" means that not enough information was provided to determine whether the criterion was adequately addressed.
- "Possibly" means that based on the information provided it seems that the criterion was at least partially, but not adequately, addressed.

Electric System Modeling and Control	No	No	None	*Unknown*	*Unknown*	*Unknown*	No	*Unknown*
Data Integration	No	No	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*	*Unknown*
Advanced Modeling and Simulation Environment	No	No	None	*Unknown*	*Unknown*	*Unknown*	No	*Unknown*

4) Joint Utilities AL fails to demonstrate that the proposed research projects do not duplicate research currently, previously, or imminently undertaken by other utilities, research institutes, the California Energy Commission (CEC), the Electric Power Research Institute (EPRI), or the United States Department of Energy (DoE).

Pursuant to OP 12 of D.12-12-031, the Joint Utilities' AL must provide a positive business case for each proposed research project and "ensure that the project does not duplicate other research." The Commission also ordered "that the research projects do not duplicate other research funded by California utilities, the California Energy Commission, the Electric Power Research Institute, or the United Stated Department of Energy."[30] As referenced in D.12-12-12031, the fundamental prohibition against funding duplicative research and development projects is provide in Public Utilities (Pub. Util.) Code Section 740.1.[31] In Section 740.1(d), the Legislature mandates that "[projects] should not unnecessarily duplicate research currently, previously, or imminently undertaken by other electrical or gas corporations or research organizations."

Despite orders not to duplicate other research, the Joint Utilities submit business cases that clearly intrude on current, previous, and imminent research projects found in other Commission programs and throughout the energy industry. The business cases fail to demonstrate that the Joint Utilities undertook any serious effort to ensure the research projects are not duplicative. And, in some cases, it appears that the Joint Utilities attempt to reintroduce projects that the Commission has already rejected in the course of other proceedings. The following sections address apparent duplicative research efforts that DRA identified.

[30] D.12-12-031, OPs 10 & 12, pp. 96-98.
[31] D.12-12-031, p. 12.

a) The Commission previously rejected the proposed Geographic Data Integration for Enhanced Gas System Risk Management.

The Joint Utilities' present a business case for a Geographic Data Integration for Enhanced Gas System Risk Management (Data Integration) project. The business case indicates that PG&E is the only utility sponsor of this particular project. PG&E's Data Integration project proposes to:

> [C]reate tools that enable the integration of large amounts of both traditional (paper records) and non-traditional (e.g., electronic data and models) forms of gas infrastructure and environmental information to support comprehensive integrity assessment studies as well as asset operation and maintenance planning.[32]

However, after reviewing PG&E's past record integration proposals, it is clear that the Data Integration project is duplicative of the Pipeline Records Integration Program outlined in PG&E's Pipeline Safety Enhancement Plan.[33] In Rulemaking (R.)11-02-019, PG&E requested, and the Commission disallowed, ratepayer funding for the following project:

> PG&E states that it will begin by entering critical pipeline information into its existing Geographic Information System from source documentation. Then, PG&E will validate the piping systems information, and upgrade the system to allow users to access supporting original source records. PG&E explains that much of the source drawings and specifications necessary to develop pipeline features lists for the high consequence areas of its system have been collected. The next step consists of compiling an electronic data set containing key information for each pipeline. To compile the electronic data set, PG&E will (1) code documents by type, such as as-built drawings or pressure test results, (2) identify missing items, and then (3) scan, code, and upload records into the electronic data base.[34]

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[32] Joint Utilities' AL, Attachment 2, Data Integration Business Case, p. 5.
[33] *See* R.11-02-019, Order Instituting Rulemaking on the Commission's Own Motion to Adopt New Safety and Reliability Regulations for Natural Gas Transmission and Distribution Pipelines and Related Ratemaking Mechanisms.
[34] D.12-12-030, pp. 18-19.

This matter was already adjudicated in D.12-12-031, where PG&E's request for a records integration program was denied because:

> PG&E became responsible for its natural gas transmission system the day it installed facilities and equipment for the system. That responsibility includes creating and maintaining records of the location and engineering details of system components. Over the years, PG&E has sought and obtained ratepayer funding for its record-keeping functions. PG&E has imprudently managed its gas system records such that extensive remedial work is now needed to correct past deficiencies. Having created the need for this remedial work by its imprudent historic document management practices, PG&E has not shown by a preponderance of the evidence that the costs of the current document search and organization projects can be included in revenue requirement and that the resulting rates will be just and reasonable.[35]

The Commission has already concluded that PG&E's customers should not pay for PG&E's past mismanagement of its pipeline records and that funding a data integration project was not just and reasonable. As the Commission has fully adjudicated this proposal, it should stand by its decision and reject the CES-21 Program proposed Data Integration project.

b) Ensemble Weather Forecasting for Wind and Solar Generation project appears to duplicates existing research.

The Joint Utilities present a business case for an Ensemble Weather Forecasting for Wind and Solar Generation (Ensemble Weather Forecasting) project. The proposal's objective is to "develop an ensemble-based forecasting system to improve forecast accuracy and provide uncertainty bounds that reflect the inherent uncertainties in those predictions." The Ensemble Weather Forecasting project appears duplicative of several projects being conducted by other utilities, research institutes and government entities.

In fact, the proposal seems similar to an ensemble forecasting research project LLNL recently conducted. As the AL acknowledges, the CEC previously provided funds to LLNL to develop a forecasting system that:

[35] D.12-12-030, p. 87.

> [U]tilized multi-physics ensemble-based weather forecasts to provide alternative weather, power generation, and load scenarios, along with their likelihoods to a productive simulation (PLEXOS), which optimized unit commitment and economic dispatch based on those probabilistic scenarios.[36]

The Joint Utilities have not demonstrated that the Ensemble Weather Forecasting project is different from the research project LLNL conducted for the CEC. To the contrary, the Joint Utilities explain that the proposal is not different but simply extends the CEC funded project, without justifying that project should be extended. In the business case, the Joint Utilities stated that the "work will build on the forecasting system developed for the California Energy Commission (CEC) funded Lawrence Livermore National Laboratory (LLNL) study" and "will extend and improve several facets of the existing framework."[37] The Joint Utilities do not explain why the CEC funded project, as constructed, does not adequately address their needs and why more public funds need to be expended on that project. Further, the Joint Utilities do not describe the status of the CEC funded project, whether any ratepayer benefits have been achieved as a result of LLNL's research, or how additional funding will result in incremental benefits. The Commission should require the Joint Utilities to answer these questions before authorizing additional ratepayer funds for the Ensemble Weather Forecasting project.

Further, the Joint Utilities' Ensemble Weather Forecast project seems similar to a $4.1 million DoE funded research project currently underway at the National Center for Atmospheric Research (NCAR). NCAR recently launched a national public-private partnership to create an "unprecedented, 36-hour forecasts of incoming energy from the Sun for solar energy plants."[38] The research project will include partnerships with the National Renewable Energy Laboratory (NREL), Brookhaven National Laboratory, the National Oceanic and Atmospheric Administration's (NOAA) Earth System Research Laboratory, and several universities. NCAR also stated that it is partnering with numerous utilities including Sacramento Municipal Utility District (SMUD) and SCE. NCAR announced that:

> The research team is designing a prototype system to forecast sunlight and resulting power every 15 minutes over specific solar facilities, thereby enabling utilities to continuously anticipate the amount of available solar energy. . . Much of the

[36] Joint Utilities' AL, Attachment 2, Ensemble Weather Forecast Business Case, p. 11.
[37] Joint Utilities' AL, Attachment 2, Ensemble Weather Forecast Business Case, p. 11.
[38] National Center for Atmospheric Research, Solar Energy to Get Boost from Cutting-Edge Forecasts (February 2013), available at https://www2.ucar.edu/atmosnews/news/8972/solar-energy-get-boost-cutting-edge-forecasts, accessed May 10, 2013

> focus will be on generating detailed predictions of clouds and atmospheric particles that can reduce incoming energy from the Sun.[39]

In addition, NCAR stated that the computing time will be provided by the New York State Department of Economic Development's Division of Science, Technology and Innovation on an IBM Gene supercomputer at Brookhaven National Laboratory. When compared to the Joint Utilities' proposed Ensemble Weather Forecast project, the projects appear identical.[40] In addition, the Ensemble Weather Forecast project shares the same characteristics and objectives as the following research projects listed in DRA Table 2, Ensemble Weather Forecast Related Projects.

DRA Table 2
Ensemble Weather Forecast Related Projects[41]

Project Title	Sponsor	Partners
Wind Prediction Project[42]	NCAR's Applications Laboratory (RAL)	• Xcel Energy Services, Inc. • NREL
PG&E EPIC Project # 5: Demonstrate New Resource Forecast Methods to Better Predict Variable Output[43]	PG&E	Unknown
CSI R&D Solicitation #1: Improving Economics of Solar Power Through Resource Analysis, Forecasting and Dynamic System Modeling[44]	University of California San Diego (UCSD)	• EPRI • ESDA Power Analytics • CAISO • SDG&E • CA Solar Collaborative

[39] *Id.* at https://www2.ucar.edu/atmosnews/news/8972/solar-energy-get-boost-cutting-edge-forecasts
[40] *Ibid.*
[41] Note: For DRA Table 2, Ensemble Weather Forecast Related Projects:
- "Project Title" refers to the title associated with the research project.
- "Sponsor" refers to the primary entity associated with the research projects activities.
- "Partners" refers to the entities identified as collaborators on the research project.

[42] National Center for Atmospheric Research, Advanced Wind Prediction System, http://ral.ucar.edu/projects/awps/, accessed May 10, 2013.
[43] A.12-11-003, Attachment 1, Project #5, p. 38.
[44] Go Solar California, CSI RD&D First Solicitation Funded Projects, http://calsolarresearch.ca.gov/component/option,com_sobipro/Itemid,0/sid,54/tag,Solicitation%201/task,list.tag.field_tags/, accessed on May 10, 2013.

CSI R&D Solicitation #3: High-Fidelity Solar Forecasting Demonstration for Grid Integration[45]	UCSD	• Green Power Labs • Clean Power Research • SMUD • NREL • Power Analytics

DRA reviewed the Commission's and CEC's ratepayer funded R&D programs, and conducted a simple internet search of various national laboratories, research institutes, and federal agencies. In this short protest period, DRA was able to locate numerous projects that seem to fulfill the functions described in the Ensemble Weather Forecast project. While these projects may be different than the Joint Utilities' proposal, it is not possible to determine such based on the information provided in the AL. The burden of ensuring proposed research is not duplicative lies with the Joint Utilities. With all the research underway at the numerous national laboratories, universities, and other utilities, it makes no sense to provide California ratepayer funds to a project that likely duplicates past and present work. For the reasons provided above, DRA urges the Commission to reject the Joint Utilities' Ensemble Weather Forecasting proposal.

c) Distribution Modeling and Optimization is premature and duplicative.

The Joint Utilities present a business case for a Distribution Modeling and Optimization project, stating the objective is to:

> [D]evelop a detailed representative model of the distribution grid, analyze various adoption scenarios, determine market and control mechanisms that would optimize the balancing of resources (both traditional and local) and demand, review the impacts on the grid and communications network infrastructures, and evaluate methods to encourage optimized distributed generation and demand response.[46]

As the Joint Utilities rightfully acknowledge, there is "significant work in this area" including research proposals in the Commission's Electric Program Investment Charge (EPIC) program and the California Solar Initiative (CSI) Research and Development

[45] Go Solar California, CSI RD&D Third Solicitation Funded Projects, http://calsolarresearch.ca.gov/component/option,com_sobipro/Itemid,0/sid,54/tag,Solicitation%203/task,list.tag.field_tags/, accessed on May 10, 2013.
[46] Joint Utilities' AL, Attachment 2, Distribution Modeling and Optimization Business Case, p. 6.

program. There is also significant modeling and optimization work underway in other states and at the national level. For example, the Advanced Research Projects Agency-Energy (ARPA-E), which is an agency within the DoE, recently awarded Sandia National Laboratories a $2.9 million contract for Probability-Based Software for Grid Optimization project. The ARPA-E states the research will be for the following purposes:

> [To] develop software for market management systems (MMS) that enable greater use of renewable energy sources throughout the grid. MMS are used to securely and optimally determine which energy resources should be used to service energy demand across the country. Contributions of electricity to the grid from renewable energy sources such as wind and solar are intermittent, including complications from for MMS, which have trouble accommodating the multiple sources of price and supply uncertainties associated with bringing these new types of energy into the grid. Sandia's software will bring a new, probability-based formulation to account for these uncertainties. By factoring in various probability scenarios for electricity production from renewable energy sources in real times, Sandia's formula can reduce the risk of inefficient electricity transmission, save ratepayers money, conserve power, and support the future use of renewable energy.[47]

The project currently underway at Sandia National Laboratories regarding grid optimization seems similar to the Joint Utilities' Distribution Modeling and Optimization project. The Joint Utilities did not mention this project, nor did they explain how the proposed research differs from existing projects such as the one at Sandia National Laboratories. The Commission should review this particular project and determine if it is necessary considering all the significant work currently going on in this field.

Another inconsistency with the proposed Distribution Modeling and Optimization project is the Joint Utilities' discussion regarding synergies and leveraging other funded research. In particular, the Joint Utilities state they will synergize with and leverage the numerous research projects the CEC proposed in their first EPIC triennial investment

[47] ARPA-E, *Probability-Based Software for Grid Optimization* (2012), available at http://arpa-e.energy.gov/?q=projects%2Fsearch-projects&field_program_tid=All&term_node_tid_depth=4&field_location_value=&=Apply+Filter, accessed may 10, 2013.

plan.[48] However, the Joint Utilities' plans to leverage and synergize are misleading. In reality, the Commission has not yet made a determination on the CEC's proposed first EPIC triennial investment. A decision on that investment plan is not scheduled until June.[49] And, there is still a possibility that the Commission may determine some of the CEC's proposed EPIC projects are not just and reasonable to fund. Further, the CEC's triennial investment plans do not fully develop the scope of work for each proposed EPIC project. That task will be undertaken after the Commission issues a decision on the triennial investment plans.[50] Considering this proposed Distribution Modeling and Optimization project is only scheduled for 30 months, it is unclear how the Joint Utilities will synergize and leverage EPIC projects that have not yet been scoped, solicited, and funded.

d) The Joint Utilities did not attempt to avoid duplicating projects.

In Attachment 2 of the AL, the Joint Utilities include sections identified as "Duplication and Synergies" for each proposed business case. For most of the eleven proposed business cases, the "Duplication and Synergies" sections provide uniformed, generic responses that do not detail any processes employed to avoid duplication. For example, the Joint Utilities' present two business cases specific to gas system operations. For those projects, the Joint Utilities state:

> All project scope has been coordinated with other CES-21 projects, EPIC projects and other research efforts underway at the utilities and other research entities to ensure no duplication of efforts.[51]

Such vague assurances are not encouraging, especially when the assurance itself is inaccurate. For example, the Joint Utilities had no reason to coordinate their CES-21 proposed gas system projects with the EPIC administrators and/or review proposed EPIC projects for duplication because the Commission did not authorize any natural gas research funding under EPIC. The Commission clarified that "it is possible that in the future the Commission may want to consolidate the electricity and natural gas RD&D activities into one venue for consideration,"[52] but has not yet done so. Instead, the Commission explicitly stated that it was limiting EPIC funding to activities that benefit <u>electricity ratepayers – not natural gas ratepayers</u>.[53] This 'rubber-stamped' approach does

[48] Joint Utilities' AL, Attachment 2, Distribution Modeling and Optimization Business Case, pp. 4-5.
[49] A.12-11-001, February 22, 2013 ALJ Ruling, p. 8.
[50] A.12-11-001, CEC EPIC Triennial Investment Plan Application, Attachment 1, Chapter 7, pp. 202-221.
[51] The Joint Utilities' AL, Attachment 2, Data Integration, and Advanced Modeling and Simulation Environment for Gas System Planning and Operation Business Cases, pp. 1 & 1 respectively.
[52] D.12-05-037, p. 84.
[53] D.12-05-037, OPs 1 & 2, p. 99.

not assure DRA that the Joint Utilities did their due diligence to ensure the proposed research is not duplicative.

As noted above, DRA was able to locate numerous duplicative funding opportunities and research projects by simply performing an internet search and reviewing Commission and CEC R&D programs. However, it is not DRA's responsibility to show that the Joint Utilities proposals are duplicative of other research. It is the obligation of the Joint Utilities to demonstrate that their proposed research is not duplicative. The apparent duplicative areas of research, the lack of any methodology for determining the proposed research is not duplicative, and the empty boilerplate assurances that research is not duplicative raises concerns that the CES-21 program is not well-situated to effectively spend ratepayer money on beneficial research..

5) The Joint Utilities fail to demonstrate quantifiable customer benefits and that the research costs are just and reasonable

Under Pub Util Code Section 740.1(a), the Legislature mandated that ratepayer funded research and development projects "should offer a reasonable probability of providing benefits to ratepayers." The Commission approved CES-21 based on the expectation of ratepayer benefits, including "expected research benefits of this project include $552 in saving by 2020[.]"[54] To ensure these benefits are achieved, the Commission stated:

> The decision requires the preparation of a "business case" for each research project. The "business case" shall demonstrate, among other things, that benefits to ratepayers exceed costs to ratepayers and that the research does not duplicate other research conducted by the utilities.[55]

Since filing the initial application, the Joint Utilities claim there will be significant benefits, even stating that CES-21 is needed "to ensure the long-run success of California's electric and natural gas industries and the State's future economic growth, competitiveness, and quality of life."[56] However, all eleven of the business cases presented in the Joint Utilities AL fail to *demonstrate* that the research will produce any of the benefits claimed by the Joint Utilities. In fact, most of the discussion regarding customer benefits is directed at benefits achieved by other researchers or a reliance on "illustrative examples." The Commission explicitly ordered the Joint Utilities to present

[54] D.12-12-031, p. 1.
[55] D.12-12-031, p. 59.
[56] March 19, 2012 Joint Utilities' Rebuttal Testimony, p. 1-5.

business cases with quantifiable customer benefits,[57] yet the Joint Utilities have failed to do so. The following are a few examples where the Joint Utilities failed to provide both reasonable and quantifiable California ratepayer benefits:

- Ensemble Weather Forecast business case. Joint Utilities state:

  > Illustrative examples provided by the utilities as part of the CES-21 application showed how new methodologies and tools such as improvements in renewable generation forecasts developed as part of this business case could provide benefits of $30 million per year by reducing load following costs.[58]

- Flexibility Metrics and Standards Projects. Joint Utilities state:

  > Improving the accuracy of flexible resource need determination could result in substantial benefits of California electricity consumers. Improved understanding of flexibility needs may provide insight into the how to best take advantage of existing and new alternatives such as energy storage. Illustrative benefits for this project were quantified in the IOUs rebuttal testimony filed in connection with the CES-21 application. They included $552 million in savings from improved resource planning.[59]

- Planning Engine Project. The Joint Utilities state:

  > Given the large capital investment required by the industry, the potential for even a 1% savings in cost from better decisions could save about $30 million in capital cost for investments currently under consideration. Hence, the potential savings are over ten times the $2.4M cost of this project.[60]

The examples above demonstrate the illustrative nature of the business cases. The claims for a possible $30 million benefit in the first example, and potential for 1% savings in the third example are not substantiated by any workpapers or analysis. Unsubstantiated, hypothetical and illustrative benefits do not, in any way, meet the

[57] D.12-12-031, OP 12, p. 97.
[58] Joint Utilities' AL, Attachment 2, Ensemble Weather Forecast Business Case, p. 18 [emphasis added]. Note that the $30 million is unsubstantiated.
[59] The Joint Utilities' AL, Attachment 2, Flexibility Metrics and Standards Business Case, p. 15 [emphasis added].
[60] The Joint Utilities' AL, Attachment 2, Modeling Engine Business Case, p. 12 [emphasis added]. Note that the 1% savings is not based on any analysis.

Commission's directive that the business cases "shall demonstrate, among other things, that benefits to ratepayers exceed costs to ratepayers."[61] As demonstrated above, the Joint Utilities do not present any credible quantifiable, or even qualitative, ratepayer benefits, but rather the Joint Utilities rely on the illustrative examples used in their initial application filing. And, even if it were appropriate to present illustrative benefits, the Joint Utilities did not provide any workpapers or analysis to indicate that those illustrative benefits were possible to achieve. The Commission cannot rely on these unsubstantiated figures to conclude this project is cost-effective or ratepayer benefits will be achieved. For analysis of all eleven business cases, see DRA's Attachment 1, Business Case Evaluation.

The one unmistakable deficiency with the proposed business cases is that the Joint Utilities did not produce anything that resembles a cost-benefit analysis for their projects. The Joint Utilities did not produce any workpapers, spreadsheets, or notes demonstrating that a real effort was made to calculate ratepayer benefits, and analyze those benefits against the purported costs. Instead, the Joint Utilities rely on the work of other researchers for other projects, recycled illustrative benefits, and arbitrary figures to claim ratepayer benefits will be accrued. The Commission should reject the proposed projects because the Joint Utilities failed to demonstrate that the proposed projects will produce quantifiable benefits or are cost-effective.

6) The Joint Utilities' proposed common costs are also vague and undetailed making a reasonableness review very difficult.

a) Program Management

The Joint Utilities request $2.6 million for program management activities in their proposed first period budget. The program management budget, however, lacks detail, and includes funding proposals that seem unnecessary and duplicative. DRA has serious concerns regarding the duplication of funding activities as well as the appropriateness of some of the proposed budgets. DRA recommends that the Commission reject the Joint Utilities' proposed common costs budgets for the reasons described below.

i) Office of the Executive Director

The Joint Utilities requests $500,000 to allocate to the Office of the Executive Director. The Joint Utilities state:

[61] D.12-12-031, p. 59.

> The $500,000 cost estimate includes compensation for the Executive Director, the cost of support services necessary to carry out the Executive Director's responsibilities, and reimbursement for reasonable expenses.[62]

However, the Joint Utilities do not detail how the $500,000 ratepayer funds will be spent beyond vague and undefined generalities. It is unclear to DRA how the Commission can determine if it is prudent to approve ratepayer funds for "reasonable expenses" or "support services" because the Joint Utilities fail to provide any description of those expenses. The following is a list of just some possible unanswered expense questions related to the executive director budgetary item:

- What is the executive director's annual salary?
- Is the executive director a full time position? If no, how much time does the position entail?
- Will the executive director receive per diem expenses? If so, what is the per diem expense limit?
- Will the executive director receive a travel allowance? If so, how much?
- Will the executive director rent or lease a work-space? If so, where is the work-space located and how much does it cost to rent or lease the work-space?
- Will the executive director employ administrative staff? If so, what are the salaries of administrative staff?
- Will the Office of the Executive Director receive funds for administrative supplies? If so, how much?
- Will the Office of the Executive Director receive funds for any other purposes that are not identified above? If so, identify those purposes and associated costs.

These questions are necessary to ensure that funds directed to the Office of the Executive Director are spent prudently. DRA recommends that the Commission reject the proposed budget for the executive director because it lacks the detail to determine whether it is reasonable.

ii) External Communications and Outreach

[62] The Joint Utilities' AL, p. 8.

It is unclear to DRA why the CES-21 program requires $110,000 in ratepayer funds for public relations activities. The only justification provided by Joint Utilities for why there is a need for a comprehensive communications program to promote the CES-21 program is:

> The Joint Utilities recognize the constant need for external communications and outreach to support the CES-21 Program. The Executive Director, the Joint Utilities, and LLNL will develop and execute an integrated communications program that effectively presents the CES-21 to regulators, legislators, research institutions, and the media.[63]

The CES-21 program was approved for the sole purpose of executing research and development. The proposed communications and outreach budget sounds more like a lobbying and publicity effort. DRA does not understand the need to present "the CES-21 to regulators, legislators, research institutions, and the media" when the funding has already been approved and there are not yet any reason to publicize. Further, it is unreasonable to approve ratepayer funds for the Joint Utilities to engage in regulatory and public affairs activities because the Joint Utilities already receive ratepayer funds for regulatory and public affairs in their general rate cases (GRCs). It is also highly inappropriate to provide ratepayer funds to LLNL to communicate with "regulators, legislators, research institutions, and the media" because LLNL is an independent, unregulated entity that is not entitled to receive and expend ratepayer funds for its own interests. The Commission should not allow the Joint Utilities to use CES-21 research and development funds to engage in lobbying, political, and/or marketing activities, and should reject the external communications and outreach budget. DRA recommends that the Commission reject the proposed budget for external communications and outreach because it is inappropriate and unreasonable.

iii) Joint Utilities and LLNL Program Oversight and Coordination

The Joint Utilities request $995,000 in ratepayer funds for program oversight and coordination. In particular, the Joint Utilities state:

> Each Utility and LLNL will be responsible for maintaining program oversight and coordination to support CES-21. This program management function includes budget management with each of the Joint Utilities and at LLNL, forecasting of resources needs to support the program, and monitoring and

[63] The Joint Utilities' AL, p. 9.

> control of the research projects to ensure deliverables are being met. In addition, the Joint Utilities and LLNL will ensure compliance with all contracting requirements and goals, including supplier diversity.[64]

It is unclear how the proposed Joint Utilities and LLNL Program Oversight and Coordination budget is different from any of the other proposed program management budgets. The requested $995,000 seems duplicative of funds aimed to be spent for other CES-21 program management purposes, in particular:

- $500,000 – To the Office of the Executive director to design, develop, and implement strategic plans for the CES-21 Program as well as manage day-to-day CES-21 operations in collaboration with the Board of Directors and program management staff from LLNL. To promote close working relationships between the LLNL research team members and the Joint Utilities' team members, and to conduct outreach to encourage collaborative opportunities with state and federal government institutes, and to avoid duplicative projects.[65]

- $95, 000 – To the Board of Directors for administering and implementing the CES-21 Program; and for approving a strategic plan, annual budgets, and allocation of staff and other resources to provide services under individual work orders requested by the Joint Utilities. To approve all funding of projects to support the work orders, including procurement of equipment, facilities, tools, computer software, and hardware.[66]

- $800,000 – To Prepare a Second Year Research Portfolio and Budget. The funds are proposed to evaluate the 18-month research progress as well as developments in energy policy and advances in energy technologies. And, to develop new research concepts, the research portfolio, workplans, and cost estimates for the second program year.[67]

All these program management funds appear to overlap. The Joint Utilities did not explain why they need $995,000 to perform tasks that are already assigned to the Board of Directors and executive director. As seen above, the AL makes it clear that it is the responsibility of the Board of Directors to administer and oversee the CES-21 program. DRA recommends that the Commission reject the program oversight and coordination

[64] The Joint Utilities' AL, p. 7.
[65] The Joint Utilities' AL, pp. 7-8.
[66] The Joint Utilities' AL, p. 8.
[67] The Joint Utilities' AL, pp. 8-9.

budget because Joint Utilities fail to justify the need, or how it differs from other budgetary items.

iv) Third Party Management

The Joint Utilities request $100,000 in ratepayer funds to "actively explore collaborative activities with third party vendors and research institutes in order to achieve the research project objectives as approved by the Board of Directors."[68] However, it is unclear how this budget request is any different from the proposed budgets for the Office of the Executive Director and preparation of second program year research portfolio and budget.

The Joint Utilities already indicated that third party and outreach will be undertaken by the executive director. Specifically, the Joint Utilities state:

> [The] Executive Director will conduct outreach to encourage collaborative opportunities with state and federal government institutions as well as academia, research institutes, industrial entities, and other state officials. [69]

Further, ratepayer funds allocated to the preparation of a second program year research portfolio and budget should certainly address "collaborative activities" needed to "achieve the research project objectives as approved by the Board of Directors." It does not make sense for the Board of Directors to approve a research portfolio that did not first contemplate collaborative activities with other vendors or research institutes. In light of the stated duties of the executive director, it is unclear why the Joint Utilities need $100,000 in additional ratepayer funds to engage in collaborative efforts with the third party entities. DRA recommends that the Commission reject the third party management budget because it is duplicative.

v) Board of Directors Compensation and Reimbursement

The Joint Utilities request $95,000 in ratepayer funds to provide compensation and reimbursement to the CES-21 Board of Directors. The Joint Utilities state that the funds will only be "compensation for the three non-utility Directors and reimbursement for reasonable expenses."[70] However, similar to the proposed budget for the Office of the Executive Director, it is unclear how these funds will be spent. The following is a list of

[68] The Joint Utilities' AL, p. 9.
[69] The Joint Utilities' AL, p. 8.
[70] The Joint Utilities' AL, p. 8.

just some possible unanswered expense questions related to the Board of Directors budgetary item:

- What is the annual salary for each non-utility Director?
- Is the non-utility Director a full time position? If not, how much time does the position entail?
- Will the Directors receive per diem expenses? If so, what is the per diem expense limit?
- Will the Directors receive a travel allowance? If so, how much?
- Will the Board of Directors rent or lease a work-space? If so, where is the work-space located and how much does it cost to rent or lease the work-space?
- Will the Board of Directors receive funds for any other purposes that are not identified above? If so, identify those purposes and associated costs.

The questions are necessary to ensure that funds directed to the Board of Directors are spent prudently. DRA recommends that the Commission reject the proposed budget for the Board of Directors because it lacks the detail to determine whether it is reasonable.

vi) Preparation of Second Program Year Research Portfolio and Budget

The Joint Utilities request $800,000 in ratepayer funds to prepare their second program year research portfolio and budget. The Joint Utilities allege that the funds will:

> [Evaluate] the 18-month research progress as well as developments in energy policy and advances in energy technologies. The $800,000 cost estimates for this activity is based on an assessment of the LLNL, Joint Utilities, and other resources that will be required to develop new research concepts, the research portfolio, workplans, and cost estimates for the second program year. [71]

It is unclear why the Joint Utilities need nearly $1 million in ratepayer funds to draft a second year research portfolio and budget. Similar to the other program management proposals, the Joint Utilities do not identify any itemized expenses. For example, the Joint Utilities fail to provide forecasted costs related to travel, staffing,

[71] The Joint Utilities' AL, pp. 8-9.

contracting, legal and/or regulatory activities required for drafting the second year's research portfolio and budget. The Joint Utilities also failed to present accrued costs for the first year's research portfolio and budget to compare to the proposed second year's budget. Indeed, without more specific information, $800,000 in ratepayer funds to draft a filing appears to be an expense request. DRA recommends that the Commission reject the budget for preparation of second program year research portfolio and budget because there is not enough information to determine whether it is reasonable.

b) Workforce Preparedness

The Joint Utilities request a "budget of $250,000" for each program year which results in an overall cost of $2.25 million.[72] Specifically, the Joint Utilities state:

> Students of the program will be guided through steps that will transition them from the current work tools environment to use of the new tools, interpretation of results from those tools, and understanding of the new capabilities and limitations of the tools. Elements of workforce preparedness will also focus on establishing a workforce that is prepared to create even better tools for the future so the program may endure after each research project is complete. [73]

The Joint Utilities request is not authorized in D.12-12-031 and should be rejected. In OP 10(a) of D.12-12-031, the Commission ordered, "[The] research shall be limited to the areas of cyber security, electricity operations, gas operations, and electric resources planning."[74] The Commission should not approve funds directed at activities outside research and development.

Further, it unclear why the Joint Utilities need ratepayer funds to support workforce preparedness for a program that deals explicitly in research and development. As the Joint Utilities recognize, the "first 18 months will be a start-up period since many of the new tools will have yet to be developed."[75] In fact, it is true that none of the tools will have been developed as witnessed in the Joint Utilities' estimated potential cost and duration for each proposed project. The earliest forecast for project completion is 21 months.[76]

[72] The Joint Utilities' AL, p. 9.
[73] The Joint Utilities' AL, pp. 9-10.
[74] D.12-12-031, OP 10, p. 96.
[75] The Joint Utilities' AL, p. 10.
[76] The Joint Utilities' AL, Table 1, p. 5.

The request for workforce preparedness belies the Commission regulatory process. First, there is no guarantee that any of the proposed research projects will be successful so it is impossible to train a workforce on something that does not yet exist. Second, even if a viable product is produced, the Commission must still make a determination if full deployment of that project is cost-effective and appropriate. DRA recommends that the Commission reject the proposed workforce preparedness budget item because it is extremely premature and outside the scope of the CES-21 program.

c) Advanced Computing Services

The Joint Utilities request approximately $5 million in ratepayer funds to use LLNL's advanced computing services for the first 18-months.[77] However, it is unclear whether this estimate is just and reasonable because the Joint Utilities failed to present forecasted costs for each proposed research project. The Joint Utilities did not produce any workpapers that estimated the cost associated with using LLNL's supercomputer for specific projects. Instead, the Joint Utilities' request a flat amount for use of the supercomputer, unrelated to any specific task. The Commission should reject the advanced computing services budget because Joint Utilities did not explain what the funding is for.

Conclusion

GO 96-B, Section 7.6.1 states that staff "(1) reject any advice letter where the advice letter or workpapers are clearly erroneous, including without limitation where there are clear inconsistencies with statute or Commission order, and (2) reject without prejudice an advice letter whose disposition would require an evidentiary hearing or otherwise require review in a formal proceeding." As described in this protest, the Joint Utilities failed to sufficiently demonstrate:

- That the proposed research projects do not duplicate research currently, previously, or imminently undertake by other utilities, research institutes, CEC, EPRI or the DoE;
- Quantifiable customer benefits, including safety and environmental benefits exceed costs on a net present value basis using a Commission approved methodology;
- How the costs of the research compare to potential benefits;

[77] The Joint Utilities' AL, p. 10.

- That the proposed research will produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight; or

- That the research will help foster safe, reliable service at just and reasonable costs.

As a result, it is impossible to determine the reasonableness and cost-effectiveness of each proposed research project. The AL filing fails to transcend the "illustrative use cases" provided in the original Application, and fails to provide the information required by OPs 10 and 12 of D.12-12-031.

For the reasons given above, DRA recommends that the Energy Division should immediately suspend the advice letter's effectiveness pursuant to GO 96-B, Section 7.5, and the Commission should ultimately reject the advice letter pursuant to GO 96-B, Section 7.6.

Please address any questions about this protest to Chris Myer at 415-703-2908 or christopher.myers@cpuc.ca.gov.

/s/ Chloe Lukins

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Program Manager

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ATTACHMENT

Business Case Evaluation

California Energy Systems for the 21st Century

Introduction

DRA performed an initial analysis on each of the eleven business cases in the Advice Letter filed by the three Investor Owned Utilities (IOUs). The analysis was performed to determine whether each business case met criteria required by Decision (D.12-12-031), Ordering Paragraph 12.c. A summary of the analyses is provided below. For each business case, DRA first provides a brief description of the proposed project, in which DRA did not attempt to interpret any of the descriptive material. To the extent any project, project component, or term is vague or unclear; it is based on the information provided in the business cases by the IOUs. Next, DRA lists required criteria and briefly addresses whether the business case meets each criterion.

Proposed Project 1 – Advanced Threat Analysis Capability[1]

This proposal is to establish a relationship between the three IOU and Lawrence Livermore National Laboratory (LLNL)[2] to develop advanced cyber technology and tools not currently commercially available. This relationship would purportedly enable the IOUs to utilize the super computing power and advanced data analysis capabilities of LLNL and the development of tools to improve the cyber resilience of the California utility grid. The advancement in cyber security technology would enable the IOUs to identify and take action on advanced cyber threats before they impact California's critical infrastructure.

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[1] California Energy Systems for the 21st Century, Advanced Threat Analysis Capability, Proposed Research Project: Business Case; pp. 1-11, passim.

[2] Lawrence Livermore National Laboratory is operated by Lawrence Livermore National Security, LLC, for the U.S. Department of Energy, National Nuclear Security Administration under Contract DE-AC52-07NA27344.

Two components are proposed – (a) threat modeling and data mining, and (b) device and vulnerability analysis – that would enable the IOUs to identify stealthy advanced threats targeting critical infrastructure and reduce the impact and disruption of critical infrastructure services to California's residents and businesses.

Evaluation

Is there a "Positive business case"?

No.

Have the utilities demonstrated that quantifiable customer benefits, including safety and environmental benefits, exceed costs on a net present value basis, using a Commission approved methodology?

No. No benefits that exceed costs on a net present value basis, using a Commission approved methodology, have been demonstrated. Four possible "customer benefits" were identified:

- Define and develop forward looking technology, strategies and tools.
- Create a line of defense against today's advanced persistent threats by enhancing shared situational awareness of network vulnerabilities, threats, and events to enable the California Utilities to act quickly to reduce vulnerabilities and prevent intrusion.
- Strengthen cyber security environment by expanding cyber education;
- Define and develop enduring deterrence strategies and programs.[3]

No quantitative analysis was performed to demonstrate the benefits of this business case, and because the possible benefits are so qualitative, it does not seem likely that they are quantifiable.

[3] California Energy Systems for the 21st Century, Advanced Threat Analysis Capability, Proposed Research Project: Business Case; pp. 2-4.

What is the overall value of the results from the potential research to ratepayers and to the utility system's safety and reliability?

Unknown, as no overall value of the project's results, to either ratepayers or to the utility systems' safety and reliability, have been provided.

Utilities' references to any potential benefits to ratepayers and to the utility system's safety and reliability are vague and highly qualitative, as follows:

- "To identify and implement … actions to mitigate … that pose a risk to public safety and reliability of gas and electric operations in California."[4]
- To "increase the security of California's critical infrastructure."[5]

How do the costs of the research compare to potential benefits?

Unknown, as no potential benefits have been quantified within this business case.

Would the results of the research have an impact on the ability of the grid to support the competitive provision of electric power or on the ability to integrate non-utility assets and distributed generation onto the grid?

Unknown, as there is no mention of either the competitive provision of electricity or the ability to integrate non-utility assets and DG in the grid anywhere within this business case.

Does the proposed research align with CPUC policies?

Unknown, as no CPUC policies are mentioned anywhere within this business case.

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[4] California Energy Systems for the 21st Century, Advanced Threat Analysis Capability, Proposed Research Project: Business Case; p. 2.

[5] California Energy Systems for the 21st Century, Advanced Threat Analysis Capability, Proposed Research Project: Business Case; p. 3.

Does the proposed research produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight?

Unknown, as no specific benefits concerning utility resources —whether transmission, distribution, generation, system operations, management, or oversight— are mentioned within this business case.

Does the research help foster safe, reliable service at just and reasonable costs?"

Unknown, as there is no mention of either safe or reliable service or of just and reasonable costs within the business case.

Proposed Project 2 – Modeling and Simulation to Identify Cyber Security Vulnerabilities[6]

This proposal is to co-develop the device and topology catalogs for the electric grid and communication networks. These catalog development tasks are co-developed to ensure that the specific requirements of each project are met while eliminating duplication of effort for the common requirements.

Having a simulator would purportedly allow the IOUs to model the effects of attacks and failures on the system in a structured lab environment. They would also be able to study the impact of future changes to the system to evaluate vulnerabilities in a variety of future scenarios.

Because the grid is coupled at several levels, a comprehensive model has to be developed to a sufficient level of detail to identify vulnerabilities and paths across those levels. The increasing use of edge devices (*e.g.*, distributed generation, smart meters, and home area networks) with two-way communication creates an emerging threat to grid control systems. These devices and their interaction with utility back office systems and control systems are growing in complexity. The IOUs state that detailed models identifying control characteristics and communication protocols have not been developed for a large-scale analysis across the State of California.

The IOUs propose to build and successively refine a computational model that couples:

- Communication infrastructure (wired and wireless networks and communication systems);
- Primary electric generation and transmission behavior;
- Utility distribution networks;
- Utility-operated energy storage, beyond hydro;
- End-user loads and generation; and
- Utility ICS systems.

This model would aim to be predictive across the entire state. The IOUs anticipate needing to model approximately 12,000 circuits, approximately 1,200 substations, with approximately 15 million communication devices (*e.g.* smart

[6] California Energy Systems for the 21st Century, Modeling and Simulation to Identify Cyber Security Vulnerabilities, Proposed Research Project: Business Case; pp. 1-11, passim.

meters, home area networks, distributed generation, relays). Initially, the IOUs would use low-fidelity device models, and capture the diversity of as-deployed devices by the end of the project.

Evaluation

Is there a "Positive business case"?

No. No positive business case is presented.

Have the utilities demonstrated that quantifiable customer benefits, including safety and environmental benefits, exceed costs on a net present value basis, using a Commission approved methodology?

No. No benefits that exceed costs on a net present value basis, using a Commission approved methodology, have been demonstrated. Several conceptual benefits were discussed, although none appeared to be quantifiable and no quantitative analysis was conducted within this business case.

What is the overall value of the results from the potential research to ratepayers and to the utility system's safety and reliability?

Unknown, as no overall value of the project's results, to either ratepayers or to the utility systems' safety and reliability, is discussed anywhere within this business case beyond passing reference to "higher reliability" which would ultimately have significant benefits."[7]

How do the costs of the research compare to potential benefits?

Unknown, as no potential benefits have been quantified anywhere within this business case.

[7] California Energy Systems for the 21st Century, Modeling and Simulation to Identify Cyber Security Vulnerabilities, Proposed Research Project: Business Case; p. 2.

Would the results of the research have an impact on the ability of the grid to support the competitive provision of electric power or on the ability to integrate non-utility assets and distributed generation onto the grid?

Unknown, as there is no discussion of the competitive provision of electricity or the ability to integrate non-utility assets and DG in the grid within this business case, beyond a single, passing mention to technology "represented in the model" including … customer "devices connected with two-way communications (e.g., … Distributed Generation)."[8]

Does the proposed research align with CPUC policies?

Unknown, as no CPUC policies are mentioned within this business case.

Does the proposed research produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight?

Unknown, as no specific benefits concerning utility resources —whether transmission, distribution, generation, system operations, management, or oversight— are discussed anywhere within this business case, beyond passing mention —without any quantification— of six operational benefits that large-scale predictive models "could" include:

- Ability to develop detection and mitigation strategies to emerging vulnerabilities before they can be exploited.
- Explore and evaluate incident response scenarios in advance of need, to improve the time to respond and recover.
- Capability to replay cyber incidents, with variations, to understand the range of risk exposures in similar situations, and the possible consequences of response strategies other those utilized at the time of incident.
- As a planning tool in assessing operational benefits and risk reduction that could be realized by future grid improvement proposals. Such information would enable rapid quantitative assessment of potential benefits as part of developing future rate cases.

[8] California Energy Systems for the 21st Century, Modeling and Simulation to Identify Cyber Security Vulnerabilities, Proposed Research Project: Business Case; pp. 5-6.

- Provide training and exercise capability for incident detection and response.
- Evaluation of disaster response, recovery and restoration plans at the IOU and California Independent System Operator (CAISO) level, enabling all stakeholders to understand drivers and consequences outside their own domain.[9]

Does the research help foster safe, reliable service at just and reasonable costs?"

Unknown. The only mention of either safe or reliable service or just and reasonable costs is a single, is a brief mention that the "long term the potential impact of large-scale models" would be "… higher reliability," and would "ultimately have significant benefits for public safety."[10] These claims are not quantified, and no analysis or supporting information is provided to back the claims.

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[9] California Energy Systems for the 21st Century, Modeling and Simulation to Identify Cyber Security Vulnerabilities, Proposed Research Project: Business Case; p. 3.

[10] California Energy Systems for the 21st Century, Modeling and Simulation to Identify Cyber Security Vulnerabilities, Proposed Research Project: Business Case; p. 2.

Proposed Project 3 – Ensemble Weather Forecasting for Wind and Solar Generation[11]

This proposal is to develop prototype visualization and decision tools tailored to the IOUs specific needs which, at the end of the project, may be transferred to the CAISO, the IOUs, or a third party vendor for commercialization. The technical report delivered at the end of this project would contain the necessary level of scientific and operational detail for private vendors of weather forecast data to use the 'best practices' findings to improve their weather forecasting capabilities and would provide guidance on how the IOUs and ISO could run a reduced order version of the developed forecasting tool in-house on a moderately sized Linux cluster or optionally take advantage of cloud computing resources to run the full version of the recommended forecast tool.

The proposed methodologies would incorporate sources of uncertainty inherent in numerical weather prediction in modeling for multiple forecasts vital to the efficient and robust operation of the electrical grid under high renewable penetration scenarios, replacing the single forecast and uncertainty band that have been used for renewable integration studies.

This project would implement and evaluate two basic approaches to developing ensembles of possible future weather conditions:

- The "Multi-Physics" approach recognizes the uncertainty regarding the physics processes that would dominate the evolution of the atmosphere over a span of one to a few days.
- The "Multi-Analysis" approach accounts for the uncertainties in the initial conditions at the start of a forecast period.

The IOUs propose to explore the benefits of both these approaches to wind and solar energy prediction in California by generating a database of 3-hour and day-head forecasts for one month of each season. With this capability, the utilities and other renewable electricity producers can more accurately predict the power that can be produced, and can potentially avoid under-prediction scenarios which are costly and add stress to the system. They can also reduce the likelihood of having to spill renewable energy that could have been harvested.

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[11] California Energy Systems for the 21st Century, Ensemble Weather Forecasting for Wind and Solar Generation, Proposed Research Project: Business Case; pp. 1-17, passim.

Evaluation

Is there a "Positive business case"?

No. No positive business case is presented.

Have the utilities demonstrated that quantifiable customer benefits, including safety and environmental benefits, exceed costs on a net present value basis, using an Commission approved methodology?

No. No benefits that exceed costs on a net present value basis, using a Commission approved methodology, have been demonstrated. Only six, potentially-quantifiable benefits were even identified. However, these benefits were not quantified:

- Benefits for the CAISO:
  - "Make better net load predictions, allowing for more optimal unit commitment decisions and transmission line scheduling (for day-ahead forecasts).
  - "Make better planning decisions related to the resources necessary for load following (for 3-hour ahead forecasts).
  - "Purchase only the necessary quantity of reserves to account for the net load uncertainty faced on a daily basis.
  - "Purchase additional reserves on days when the net load forecast is highly uncertain, thereby reducing the chance of over/underproduction and the expenses associated with them."[12]

- Benefits for the IOUs and other wind/solar generation owners:
  - "both improvements in the overall accuracy of forecasts of critical parameters, as well as uncertainty bounds in those predicted parameters. These improvements in renewable generation

[12] California Energy Systems for the 21st Century, Ensemble Weather Forecasting for Wind and Solar Generation, Proposed Research Project: Business Case; p. 3

forecasting and associated quantification of uncertainty will better prepare them for the daily bidding of renewable resources as well as load affected by behind the meter or distributed renewable generation."[13]

- Benefits for the rate-payers:
    - "[who would] ultimately benefit by increased reliability and lower cost of electricity."[14]

Despite repeated references to specific benefits in this proposal, to beneficiaries such as the CAISO, the IOUs, other wind/solar generation owners, and rate-payers, the few potentitally-quantifiable benefits listed above hare indirect, unrelated, speculative, unjustified, or "illustrative."[15]

What is the overall value of the results from the potential research to ratepayers and to the utility system's safety and reliability?

Unknown, as no overall value of the project's results, to either ratepayers or to the utility systems' safety and reliability, have been provided anywhere within the business case.

How do the costs of the research compare to potential benefits?

Unknown. Though the IOUs claim to have quantified certain benefits, they are indirect quantifications, unrelated to the project proposal, speculative, hypothetical, or "illustrative."[16]

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[13] California Energy Systems for the 21st Century, Ensemble Weather Forecasting for Wind and Solar Generation, Proposed Research Project: Business Case; pp. 2-3.

[14] California Energy Systems for the 21st Century, Ensemble Weather Forecasting for Wind and Solar Generation, Proposed Research Project: Business Case; p. 3

[15] California Energy Systems for the 21st Century, Ensemble Weather Forecasting for Wind and Solar Generation, Proposed Research Project: Business Case; p. 18

[16] *See* Ibid.

Would the results of the research have an impact on the ability of the grid to support the competitive provision of electric power or on the ability to integrate non-utility assets and distributed generation onto the grid?

Unknown, as there was no discussion of the competitive provision of electricity or the ability to integrate non-utility assets and DG in the grid within this business case, beyond passing assertions that new forecasting approaches "must be developed to meet a new set of demands imposed by the integration of large amounts of weather-based electricity generation,"[17] that "new forecasting tools must … improve the prediction of relevant weather parameters, upon which renewable production and integration depend,"[18] "provide a measure of the uncertainty associated with weather and renewable generation forecasts,"[19] and that these would "result in a probabilistic power production model that can be used by power producers and the CAISO … IOUs and other generation owners … to inform their bids into the market. "[20]

Does the proposed research align with CPUC policies?

Unknown, as no CPUC policies are mentioned within this business case.

Does the proposed research produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight?

Unknown, as no specific benefits concerning utility resources —whether transmission, distribution, generation, system operations, management, or oversight— are defined anywhere within the business case. The only mention of even a potential benefit to utility resources is the assertion that:

> "The IOUs and other wind/solar generation owners, who will benefit from both improvements in the overall accuracy of forecasts of critical parameters, as well as uncertainty bounds in those predicted

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[17] California Energy Systems for the 21st Century, Ensemble Weather Forecasting for Wind and Solar Generation, Proposed Research Project: Business Case; p. 1

[18] Ibid.

[19] Ibid.

[20] California Energy Systems for the 21st Century, Ensemble Weather Forecasting for Wind and Solar Generation, Proposed Research Project: Business Case; p. 16

> parameters. These improvements in renewable generation forecasting and associated quantification of uncertainty will better prepare them for the daily bidding of renewable resources as well as load affected by behind the meter or distributed renewable generation."[21]

Does the research help foster safe, reliable service at just and reasonable costs?"

Unknown, as there is no mention of either safe or reliable service or just and reasonable costs anywhere within the business case.

[21] California Energy Systems for the 21st Century, Ensemble Weather Forecasting for Wind and Solar Generation, Proposed Research Project: Business Case; pp. 1-2

Project Proposal 4 – Flexibility Metrics and Standards[22]

This project proposal is to:

- Review and critique existing flexibility metrics and tools now in use and under development by the utilities, CAISO, and others to identify flexibility needs;
- Define flexibility metrics, such as insufficient ramping capacity, that a system requires to balance loads and resources during different time intervals;
- Operationalize the flexibility metrics for long-term planning purposes, either as separate metrics or combined with existing reliability metrics, such loss of load expectation (LOLE) or planning reserve margin (PRM) requirement.
- Develop new or improved models that incorporate flexibility metrics with traditional production simulation and reliability models; and
- Develop new or improved tools to measure the contribution of different types of resources toward the system's flexibility requirements, and determine system need.

The integrated optimization model would purportedly improve estimates of system need, incorporating operating flexibility metrics under a variety of weather scenarios, and provide new or improved tools to evaluate the effectiveness of resources with different operating attributes to meet those needs.

This project would define operating flexibility metrics and targets based on a probability measure of the occurrence, the magnitude, and the duration of ramping shortages at different time intervals. These metrics would be tested using production simulation and reliability models of the California system to determine their robustness under a wide range of realistic scenarios of weather conditions, and loads and renewable generation scenarios.

Evaluation

Is there a "Positive business case"?

No. No positive business case is presented.

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[22] California Energy Systems for the 21st Century, Flexibility Metrics and Standards, Proposed Research Project: Business Case; pp. 1-14, passim.

Have the utilities demonstrated that quantifiable customer benefits, including safety and environmental benefits, exceed costs on a net present value basis, using an Commission approved methodology?

No. No benefits that exceed costs on a net present value basis, using a Commission approved methodology, have been demonstrated. Only a few, potentially-quantifiable customer benefits have been identified. However, these benefits have not been quantified, but remain speculative or illustrative. For example:

> "Improving the accuracy of flexible resource need determination could result in substantial benefit to California electricity consumers. Improved understanding of flexibility needs may provide insight into the how to best take advantage of existing and new alternatives such as energy storage. *Illustrative benefits* for this project were quantified in the IOUs rebuttal testimony field in connection with the CES-21 application." [23]

What is the overall value of the results from the potential research to ratepayers and to the utility system's safety and reliability?

Unknown, as no overall value of the project's results, to either ratepayers or to the utility systems' safety and reliability, has been discussed anywhere within this business case, beyond passing mention that, depending on the outcome of the initial stages of the project, "the work may be extended to study the benefits of improved quality of the forecasts and decision procedures used to operate the system."[24]

How do the costs of the research compare to potential benefits?

Unknown, as no potential benefits have been quantified, beyond repeating the illustrative benefits of the CES-21 application, or the hypothetical suggestion that at a cost of "*perhaps* $1 million per MW, improving the accuracy of flexible

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[23] California Energy Systems for the 21st Century, Flexibility Metrics and Standards, Proposed Research Project: Business Case; p. 15 (emphasis added)

[24] California Energy Systems for the 21st Century, Flexibility Metrics and Standards, Proposed Research Project: Business Case; p. 6.

resource need determination *could* result in *substantial* benefit to California electricity consumers."[25]

Would the results of the research have an impact on the ability of the grid to support the competitive provision of electric power or on the ability to integrate non-utility assets and distributed generation onto the grid?

Unknown, as there is no discussion of the competitive provision of electricity or the ability to integrate non-utility assets and DG in the grid anywhere within this business case, beyond the passing mention that "there is a need to update planning criteria … to integrate intermittent renewables."[26]

Does the proposed research align with CPUC policies?

Unknown, as no CPUC policies are discussed anywhere within this business case, beyond the passing mention that this project would "facilitate more accurate estimates of … ramping requirements for different operating flexibility policies or standards."[27]

Does the proposed research produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight?

Unknown, as no specific benefits concerning utility resources —whether transmission, distribution, generation, system operations, management, or oversight— are mentioned within the business case.

Does the research help foster safe, reliable service at just and reasonable costs?"

Unknown, as no mention of either safe or reliable service or just and reasonable costs is made within the business case.

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[25] California Energy Systems for the 21st Century, Flexibility Metrics and Standards, Proposed Research Project: Business Case; p. 3 (emphasis added).

[26] California Energy Systems for the 21st Century, Flexibility Metrics and Standards, Proposed Research Project: Business Case; p. 5.

[27] California Energy Systems for the 21st Century, Flexibility Metrics and Standards, Proposed Research Project: Business Case; p. 2.

Proposed Project 5 – Planning Engine[28]

This proposal is to provide utilities with the modeling ability and knowledge to ensure that they can provide safe, reliable, and affordable power to their customers. Specifically, this project aims to provide utilities with a modeling tool that would enable system planners to evaluate the cost and reliability impacts of various transmission and/or generation capacity expansions, as well as to help them seek optimal solutions to existing or potential grid reliability issues.

This research seeks to develop a tool that would be able to optimize generation dispatch and test power flow over transmission lines. A tool that would be able to both dispatch generation assets and model the power flow over transmission lines resulting from that generation dispatch would allow system planners to model and quantify the trade-offs they face as they weigh different transmission and generation solutions. By necessity, this tool would require the development of a higher resolution model than normally used in production simulation and a more comprehensive model than normally used in power flow analysis. To enable a solution of higher resolution models, the IOUs would engage commercial software and hardware vendors to develop improved solution algorithms. As part of this effort, high performance computing (HPC) platforms would be used to solve problems more rapidly. The solutions to these large scale problems would be used to develop and validate simpler reduced-order models that can be solved on more conventional computing platforms by a range of stakeholders.

An optimal outcome of this research is a tool that can simulate generation and power flow from generators in the Western Electricity Coordinating Council (WECC) to load centers in a high resolution manner that would simultaneously optimize production costs and reveal the impacts on transmission reliability. Such a tool would need to be able to simulate a year's worth of generation and transmission in a reasonable amount of time (hours or days) and produce useful, comprehensible output that would allow system planners to make informed decisions about the reliability of California's electrical grid and the potential costs of various scenarios. Specifically, this tool would need to be able to model

[28] California Energy Systems for the 21st Century, Planning Engine, Proposed Research Project: Business Case; pp. 1-11, passim.

greenhouse gases produced in California and the WECC, as well as hourly power prices, ancillary services and reliability statistics.

Evaluation

Is there a "Positive business case"?

No. No positive business case is presented.

Have the utilities demonstrated that quantifiable customer benefits, including safety and environmental benefits, exceed costs on a net present value basis, using a Commission approved methodology?

No. No benefits that exceed costs on a net present value basis, using a Commission approved methodology, have been demonstrated.
A few potentially-quantifiable benefits have been identified. However, none of these were actually quantified within this business case. The purported benefits of this proposal claimed only that:

- "The analysis of common planning tools proposed in Phase 1 of this business case will identify areas for improvements in planning processes and potential savings," and
- "The production simulation model with enhanced representation of the transmission system proposed in Phase 2 in this business case will likely reduce customer costs by enabling CAISO, and the utilities to make better decisions regarding future investment in new transmission, demand response programs, or generation, including energy storage." [29]

This proposal is, essentially, a proposal to "likely" develop a "potential" business case.

[29] California Energy Systems for the 21st Century, Planning Engine, Proposed Research Project: Business Case; p. 12.

What is the overall value of the results from the potential research to ratepayers and to the utility system's safety and reliability?

Unknown, as no overall value of the project's results, to either ratepayers or to the utility systems' safety and reliability, has been discussed anywhere within this business case, that "enhanced, higher resolution planning tools" would "help" to reduce costs and improve reliability of the grid.[30] No analysis or supporting information is provided to demonstrate how costs would be reduced, or reliability of the grid improved.

How do the costs of the research compare to potential benefits?

Unknown, as no potential benefits have been discussed anywhere within this business case, beyond a brief mention that higher resolution planning tools would "help" reduce costs and improve reliability of the grid.[31]

Would the results of the research have an impact on the ability of the grid to support the competitive provision of electric power or on the ability to integrate non-utility assets and distributed generation onto the grid?

Unknown, as there is no mention of the competitive provision of electricity or the ability to integrate non-utility assets and DG in the grid anywhere within this business case.

Does the proposed research align with CPUC policies?

Unknown, as no CPUC policies are discussed within this "business case," beyond the brief mention that:

> "Scenario analysis commonly varies exogenous factors (such as peak load or policy directives) to identify a particular mix of future resource types that satisfy cost, reliability and economic criteria."[32]

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[30] California Energy Systems for the 21st Century, Planning Engine, Proposed Research Project: Business Case; p. 8.

[31] California Energy Systems for the 21st Century, Planning Engine, Proposed Research Project: Business Case; pp. 3, 8.

[32] California Energy Systems for the 21st Century, Planning Engine, Proposed Research Project: Business Case; p. 2.

Does the proposed research produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight?

Possibly. While no specific benefits concerning utility resources —whether transmission, distribution, generation, system operations, management, or oversight— are discussed at any length within the business case, the claim that a ”tool that would be able to both dispatch generation assets and model the power flow over transmission lines resulting from that generation dispatch would allow system planners to model and quantify the trade-offs they face as they weigh different transmission and generation solutions,”[33] seems generally credible. Unfortunately, no analysis is provided to back this claim, and no attempt is made to describe how such tool would enable system planners in their modeling efforts.

Does the research help foster safe, reliable service at just and reasonable costs?”

Unknown, as there is no mention of either safe or reliable service or just and reasonable costs anywhere within the business case.

[33] California Energy Systems for the 21st Century, Planning Engine, Proposed Research Project: Business Case; p. 1.

Project Proposal 6 – Distribution Modeling and Optimization[34]

This research effort would develop a detailed representative model of the distribution grid, analyze various adoption scenarios, determine market and control mechanisms that would optimize the balancing of resources (both traditional and local) and demand, review the impacts on grid and communications network infrastructures, and evaluate methods to encourage optimized distributed generation and demand response.

- **Detailed Model of Distribution Grid**: This would require creating a collection of distribution feeder circuits that sufficiently captures the major differences amongst feeder circuits (e.g. voltage level, climate zone, distributed generation adoption, load characteristics behind-the-meter). This collection of representative distribution feeder circuits would be applied to each feeder circuit in each of the three utility services areas to arrive at a representative model of the IOU distribution grids.
- **Adoption Scenarios**: The team would explore various adoption models for pre-commercial and emerging technologies including Solar PV, Fuel Cells, Plug-in Electric Vehicles, Programmable Thermostats, and Storage Devices. These adoption scenarios would be applied to the distribution model to analyze impacts and trends.
- **Control Optimization**: The team would identify high potential control strategies to optimize the scenarios identified.
- **Market Concept**: The team would review the opportunities through the control optimization analysis to propose possible control systems to enable a market mechanism. The market mechanism would provide a platform for resources and demand to participate in a market based incentive program rather than the traditional regulatory based incentive program. The team would also develop a high-level approach of interacting with the wholesale market to optimize balancing across the transmission and distribution systems.

This project would provide an overall framework to determine optimization of the next generation distribution system.

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[34] California Energy Systems for the 21st Century, Distribution Modeling and Optimization, Proposed Research Project: Business Case; pp. 1-13, passim.

Evaluation

Is there a "Positive business case"?

No. No positive business case is presented.

Have the utilities demonstrated that quantifiable customer benefits, including safety and environmental benefits, exceed costs on a net present value basis, using a Commission approved methodology?

No. No benefits that exceed costs on a net present value basis, using a Commission approved methodology, have been demonstrated.

Indeed, few potentially-quantifiable customer benefits were identified and no benefits were quantified. The most specific reference was to assert that the model would "enable" the utility to "evaluate" benefits and implementation strategies for VAR control systems.[35]

What is the overall value of the results from the potential research to ratepayers and to the utility system's safety and reliability?

Unknown, as no overall value of the project's results, to either ratepayers or to the utility systems' safety and reliability, have been provided anywhere within this business case.

How do the costs of the research compare to potential benefits?

Unknown, as no potential benefits have been quantified anywhere within this business case.

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[35] California Energy Systems for the 21st Century, Distribution Modeling and Optimization, Proposed Research Project: Business Case; p. 8.

Would the results of the research have an impact on the ability of the grid to support the competitive provision of electric power or on the ability to integrate non-utility assets and distributed generation onto the grid?

Unknown, as there is no discussion of the competitive provision of electricity or the ability to integrate non-utility assets and DG in the grid anywhere within this business case, beyond the brief mention that the "research effort would … evaluate methods to encourage optimized distributed generation and demand response;" and that the "distribution model … to capture the current distribution grid in the State of California ... would require creating a collection of distribution feeder circuits that sufficiently captures the major differences amongst feeder circuits (e.g. …, distributed generation adoption, …).[36]

Does the proposed research align with CPUC policies?

Unknown, as no CPUC policies are discussed anywhere within this business case, beyond the brief mention that the project "supports current policy objectives including… [Order Instituting Rulemaking on Residential Rate Structures]" in that Smart Grid investments would "support the growth in distributed generation technologies;" and [Order Instituting Rulemaking on Storage] in that the proposed scenarios in the Final Proposal would "allow focused analysis of barriers and policy options."[37]

Does the proposed research produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight?

Unknown, as no specific benefits concerning utility resources —whether transmission, distribution, generation, system operations, management, or oversight— are mentioned within the business case.

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[36] California Energy Systems for the 21st Century, Distribution Modeling and Optimization, Proposed Research Project: Business Case; p. 6.

[37] California Energy Systems for the 21st Century, Distribution Modeling and Optimization, Proposed Research Project: Business Case; p. 13.

Does the research help foster safe, reliable service at just and reasonable costs?"

Unknown, as no discussion of either safe or reliable service or just and reasonable costs is presented anywhere within the business case, beyond the vague claim that this initiative "would work to identify opportunities to create a price based distribution market that would also be able to operate the distribution grid in a safe, reliable, efficient and secure manner."[38] No information or analysis is provided to back this claim, and no attempt is made to describe how such opportunities would be identified, or how ratepayers would benefit from the opportunity to create a price based distribution market.

[38] California Energy Systems for the 21st Century, Distribution Modeling and Optimization, Proposed Research Project: Business Case; p. 6.

Project Proposal 7 – Real Time Electromagnetic and Electromechnical Hybrid Transient Simulation[39]

This proposal is to develop a hybrid simulator that would enable the analysis of the electromagnetic and electromagnetic characteristics of the system that result from the effects of small and medium sized generators, associated with power electronic devices, such as power electronics used in integrating renewables to the grid. Electromechanical procedures simulate the other AC systems.

A Hybrid tool would consist of combining programs, transient stability and electromagnetic transient, to simulate large power system networks at very high speed. The Hybrid simulator would capture the dynamic behavior of wind generation and its impact to the grid. The proposed hybrid would be the first simulator to integrate both protocols to enable operators with increased visibility.

In addition, the Hybrid simulator may be used as a Dynamic Stability Assessment (DSA) tool, which would enable evaluation of simultaneous contingencies in the medium term (5 seconds to 5 minutes) and long term (longer than 5 minutes). This work would expand capabilities of these kinds of analytical tools to accommodate the levels of data intensity and computational capacity required to develop effective solutions.

Another important area that the Hybrid simulator would address is the proper modeling of large scale wind generation especially the type 3 and type 4 turbines.

Evaluation

Is there a "Positive business case"?

No. No positive business case is presented.

[39] California Energy Systems for the 21st Century, Real Time Electromagnetic and Electromechnical Hybrid Transient Simulation, Proposed Research Project: Business Case; pp. 1-13, passim.

Have the utilities demonstrated that quantifiable customer benefits, including safety and environmental benefits, exceed costs on a net present value basis, using a Commission approved methodology?

No. No quantifiable benefits that exceed costs on a net present value basis, using a Commission approved methodology, have been demonstrated.

Although four, potentially-quantifiable benefits were identified, all are speculative;

> "The potential benefits from the Hybrid Simulator project *may* include:
>
> - Improved real time simulation capability related to integration of renewable resources that are critical to meeting California' Renewables Portfolio Standard. The complexities and more accurate simulation of inverter based renewable resources (e.g. wind generators and Solar PV) may be address by the Hybrid Simulator tool.
> - Reduced wide-scale brown/black-outs and avoided customer costs of outage through real-time simulation capability by having a tool that can run to a large number of scenarios at a much higher speed that the existing power system simulators. The speed and higher accuracy of the simulation allows operator to make better and faster decisions especially during stress system conditions.
> - Improved visibility of the health of the system and ability to locate risks which may reduce the incidence of brown/black-outs, and hence avoid customer outage costs. The Hybrid Simulator will improve the accuracy and speed of the results in a highly interconnected system where disturbance are easily spread around the system and having the ability to simulate these effects and reducing computation time to and make operating from a wider system prospective.
> - The ability to evaluate equipment (e.g. wide area protection and controls, special protection schemes) by including the actual devices into the simulation before these are actually installed may reduce the uncertainty and potential mis-operation that can result in wide-scale brown/black-outs.

> "These benefits could help reduce some of the cost related to the following areas. It is also important to point out that as the work progresses the cost will be better quantified." [40]

What is the overall value of the results from the potential research to ratepayers and to the utility system's safety and reliability?

Unknown, as no overall value of the project's results, to either ratepayers or to the utility systems' safety and reliability, has been discussed anywhere within this business case, beyond a brief mention that the main intent of the Hybrid Simulation is to "boost simulations capabilities and increase the speed at which different system contingencies are solved with a high degree of accuracy, which may reduce the impact of the cost identified below."[41]

How do the costs of the research compare to potential benefits?

Unknown, as no potential benefits have been quantified within this business case.

Would the results of the research have an impact on the ability of the grid to support the competitive provision of electric power or on the ability to integrate non-utility assets and distributed generation onto the grid?

Unknown, as there is no discussion of the competitive provision of electricity or the ability to integrate non-utility assets and DG in the grid anywhere within this business case, beyond the brief mention that the California grid is "becoming complex" due to the" increase in renewable generation," and "increase in distributed energy resources;" [42] and that the " complexities and more accurate simulation of inverter based renewable resources (e.g. wind generators and Solar PV) *may* be addressed by the Hybrid Simulator tool."[43]

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[40] California Energy Systems for the 21st Century, Real Time Electromagnetic and Electromechnical Hybrid Transient Simulation, Proposed Research Project: Business Case; pp. 2-3 (emphasis added).

[41] California Energy Systems for the 21st Century, Real Time Electromagnetic and Electromechnical Hybrid Transient Simulation, Proposed Research Project: Business Case; p. 13.

[42] California Energy Systems for the 21st Century, Real Time Electromagnetic and Electromechnical Hybrid Transient Simulation, Proposed Research Project: Business Case; pp. 12-13.

[43] California Energy Systems for the 21st Century, Real Time Electromagnetic and Electromechnical Hybrid Transient Simulation, Proposed Research Project: Business Case; p. 2 (emphasis added).

Does the proposed research align with CPUC policies?

Unknown, as no CPUC policies are discussed anywhere within this business case, beyond repeated mention that the Real Time Hybrid Digital Simulation could "provide grid operators a high resolution view of the power system and its stability" and, with California's goal of 33% Renewable Portfolio by 2020, "improvements in congestion management could yield significant cost savings and help achieve the State's public policy goals."[44]

Does the proposed research produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight?

Unknown, as no specific benefits concerning utility resources —whether transmission, distribution, generation, system operations, management, or oversight— are discussed within the business case, beyond a brief mention of several "potential benefits" (as listed, above) that the Hybrid Simulator project "may" include.[45] No analysis was provided to support these potential benefits.

Does the research help foster safe, reliable service at just and reasonable costs?"

Unknown, as there is no mention of either safe or reliable service or just and reasonable costs within the business case.

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[44] California Energy Systems for the 21st Century, Real Time Electromagnetic and Electromechnical Hybrid Transient Simulation, Proposed Research Project: Business Case; pp. 3, 13.

[45] California Energy Systems for the 21st Century, Real Time Electromagnetic and Electromechnical Hybrid Transient Simulation, Proposed Research Project: Business Case; p. 2.

Project Proposal 8 – Integrated Transmission and Distribution Model[46]

This proposal is to develop integrated Transmission and Distribution (T&D) model that would be used to better understand critical scenarios where resources and loads are affected by unprecedented levels of intermittency, from both large and small scale renewable generation. Of particular interest is the circumstance of a cyber-attack or a major cascading outage, where utilities could face significant challenges to restore power to the backbone of the system. The model can be used as a tool to model the true capabilities to restore the system with current black-start resources.

Distribution operators' observations of significant MWs of load shifts around distribution networks and between transmission sources with little involvement or analysis from transmission operation, suggests a disconnected paradigm in need of a better computational model for these proposed "integrated grid modeling" platforms. A representative T&D model would identify opportunities, target locations and prioritize applications to inform decisions to support and influence policy, implement procedures, control systems and the deployment of technology.

As more renewable generation comes online, utilities would increasingly have portfolios of resources lacking dynamic reactive power, essential to control voltage and frequency during grid restart and restoration. Other related scenarios would simulate the value of integrating larger amounts of distributed resources, injection of reactive power and energy storage to inform decisions before making large capital investments for reliability.

This project would expand on the idea of recognizing the real-time state of the distribution system when modeling transmission reliability and contingency studies. By knowing the real time state/topology of the distribution network during a loss of or more critical transmission resources, the analysis may be able to recognize the impacts of the distribution topology in order to get a better understanding of the effects on the transmission system reliability. Since the topology on the distribution side changes more frequently than on the

[46] California Energy Systems for the 21st Century, Integrated Transmission and Distribution Model, Proposed Research Project: Business Case; pp. 1-14, passim.

transmission system, the model would be constantly updated to the model as the system configuration changes.

Evaluation

Is there a "Positive business case"?

No. No positive business case is presented.

Have the utilities demonstrated that quantifiable customer benefits, including safety and environmental benefits, exceed costs on a net present value basis, using a Commission approved methodology?

No. No benefits that exceed costs on a net present value basis, using a Commission approved methodology, have been demonstrated.

Few potentially-quantifiable customer benefits have been identified and the few potentially-quantifiable benefits suggested have not actually been quantified, but remain expressly conceptual, provisional, and preliminary estimates. For example:

> "A *representative* Integrated Transmission & Distribution model will identify opportunities, target locations and prioritize applications to inform decisions to support and influence policy, implement procedures, control systems and the deployment of technology to *ultimately*:
>
> - *Avoid* high customer costs due to unlikely, but potentially impactful outages
> - *Improve* strategies to upgrade/ invest in, procure, build and replace infrastructure with the goal of evaluating service, reliability, as well as carbon reduction goals
> - *Improve* planning and reduce costs through improved understanding of technology adoption scenarios
> - *Anticipate* challenges in a controlled simulated environment to avoid "near-crisis-level" experiences
> - *Increase* the utilization of already purchased and deployed technology
> - *Reduce* line losses

- *Quantify* the operational value of energy storage and distributed resources on reliability
- *Improve* customer satisfaction by reducing the time to restore service[47]

The IOUs do acknowledge that:

> "The quantification of benefits is challenging. It depends more upon how utilities utilize the developed algorithms and tools to inform operational and planning decisions to avoid major blackouts, reduce line losses, and defer transmission and distribution capital investment. …
>
> "This project *may help* avoid unnecessary capacity buildup through more representative modeling and simulation and through better understanding of technology adoption scenarios across the state."[48]

What is the overall value of the results from the potential research to ratepayers and to the utility system's safety and reliability?

None, as no potential benefits have been quantified within this business case. The results of the research are entirely speculative, envisioned without substantiation to:

> "… provide a platform to validate the benefits of transmission and distribution networks operated and planned together.
>
> " … provide parameters for the investment outcomes based on different network configurations and the observation of interactions across systems;" and
>
> "Finally, the tested scenarios may also be used to understand the costs and benefits of implementing current and new energy policies. "[49]

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[47] California Energy Systems for the 21st Century, Integrated Transmission and Distribution Model, Proposed Research Project: Business Case; p. 2.

[48] California Energy Systems for the 21st Century, Integrated Transmission and Distribution Model, Proposed Research Project: Business Case; p. 3 (emphasis added).

How do the costs of the research compare to potential benefits?

Unknown. No quantitative analysis of the potential benefits of the business case was conducted.

Would the results of the research have an impact on the ability of the grid to support the competitive provision of electric power or on the ability to integrate non-utility assets and distributed generation onto the grid?

Unknown, as there is no mention of the competitive provision of electricity within this business case and no discussion of the ability to integrate non-utility assets and DG in the grid, beyond the brief mention of the difficulties presented by accommodating DG in the traditional T&D system and reiteration of the intent of this project to:

- Expand the transmission network model to include distribution network and model distributed generation as a generator;
- Use results to analyze reliability impacts of increased renewable penetration in the distribution network;
- Identify the restoration impacts due to the increased penetration of renewable energy; and
- Identify the value of distributed resources and energy storage on transmission reliability.[50]

Does the proposed research align with CPUC policies?

Unknown, as no CPUC policies are discussed anywhere within this business case, beyond the brief mention that a utility "spends billions of dollars on infrastructure replacement and upgrades and significant investment in reliability and to fulfill State policy goals;"[51] and assertions that this project:

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[49] California Energy Systems for the 21st Century, Integrated Transmission and Distribution Model, Proposed Research Project: Business Case; pp. 2-3.

[50] California Energy Systems for the 21st Century, Integrated Transmission and Distribution Model, Proposed Research Project: Business Case; p. 6.

[51] California Energy Systems for the 21st Century, Integrated Transmission and Distribution Model, Proposed Research Project: Business Case; p. 3.

- "would identify opportunities, target locations and prioritize applications to inform decisions to support and influence policy;"[52]
- "(by the tested scenarios) may also be used to understand the costs and benefits of implementing current and new energy policies;"[53] and
- "[would] support broad state environmental goals and policies." [54]

Does the proposed research produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight?

No, as no specific benefits concerning utility resources —whether transmission, distribution, generation, system operations, management, or oversight— are quantified within the business case, beyond passing mention that, as more renewable generation comes online, utilities would "increasingly have portfolios of resources lacking dynamic reactive power, essential to control voltage and frequency during grid restart and restoration;" and that the model:

- Would be used to "better understand critical scenarios" where resources and loads are affected by unprecedented levels of intermittency, from both large and small scale renewable generation;
- Could be used as "a tool to model the true capabilities to restore the system" with current black-start resources; and

[52] California Energy Systems for the 21st Century, Integrated Transmission and Distribution Model, Proposed Research Project: Business Case; p. 2.

[53] California Energy Systems for the 21st Century, Integrated Transmission and Distribution Model, Proposed Research Project: Business Case; p. 3.

[54] California Energy Systems for the 21st Century, Integrated Transmission and Distribution Model, Proposed Research Project: Business Case; p. 14.

- Would “simulate the value of integrating larger amounts of distributed resources, injection of reactive power and energy storage to inform decisions before making large capital investments for reliability.”[55]

Does the research help foster safe, reliable service at just and reasonable costs?”

Unknown, as no discussion of either safe or reliable service or just and reasonable costs is presented anywhere within the business case, beyond passing mention that, at best, the Integrated Transmission & Distribution model would:

> ”Improve strategies …with the goal of evaluating service, reliability …;” and
>
> “Quantify the operational value of energy storage and distributed resources on reliability…”[56]

[55] California Energy Systems for the 21st Century, Integrated Transmission and Distribution Model, Proposed Research Project: Business Case; p. 1.

[56] California Energy Systems for the 21st Century, Integrated Transmission and Distribution Model, Proposed Research Project: Business Case; p. 2.

Project Proposal 9 – Electric System Monitoring and Control[57]

This proposal is to develop methods to monitor and control the bulk power system in the presence of these renewable resources and methods to increase the analytical capabilities of tools which would be of meaningful value to planners and operators of the participating California utilities, as well as sector-wide stakeholders.

The goal of this project is to develop methods to monitor and control the bulk power system and methods to increase the analytical capabilities of the utilities. The objectives of this project are to:

- Enhance existing simulation packages for long term dynamics and resource intermittency;
- Develop predictive engine based on data mining and pattern recognition algorithms;
- Develop adaptive protection and control schemes; and
- Enhance Transmission path capability calculation based on actual system conditions.

Evaluation

Is there a "Positive business case"?

No. No positive business case is presented.

Have the utilities demonstrated that quantifiable customer benefits, including safety and environmental benefits, exceed costs on a net present value basis, using an Commission approved methodology?

No. No benefits that exceed costs on a net present value basis, using a Commission approved methodology, have been demonstrated.

Few quantifiable customer benefits have even been identified, and none have been quantified:

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[57] California Energy Systems for the 21st Century, Electric System Monitoring and Control, Proposed Research Project: Business Case; pp. 1-11, passim.

- The IOUs "*expect* to achieve a *sizable* reduction in the cost of exceptional dispatches."[58]
- "The advanced Electric System Monitoring and Control research *may* enable grid operators in raising stability limit of a transmission line or system interface, so that congestion cost *could* be reduced without reducing grid reliability."[59]
- "With implementation of results from this project, transmission losses will be *minimized*."[60]

Indeed, these estimates of quantifiable benefits are conceptual and provisional. The only quantification provided is not viable. The IOUs state:

> "Below, we summarize the conceptual and provisional preliminary estimates of the quantifiable benefits from the proposed research area. The quantifiable benefits are as follows…"[61]

Based on the assumptions below, the IOUs conclude that a blackout lasting 1 hour and affecting an average city with an electric demand of 5000 MW, the cost of that outage would be about $45 million:

(1) industry surveys indicating the societal cost of outage to be about 100 times that of the average retail electricity rates, and

(2) the average electricity cost in the *northeastern* region of the US in *2003* being about $90/MWh,

The IOU analysis is based on cost assumptions that are not viable for several reasons: 1) the average electricity cost is from 2003; 2) no explanation of

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[58] California Energy Systems for the 21st Century, Electric System Monitoring and Control, Proposed Research Project: Business Case; p. 9 (emphasis added).

[59] California Energy Systems for the 21st Century, Electric System Monitoring and Control, Proposed Research Project: Business Case; p. 16 (emphasis added).

[60] California Energy Systems for the 21st Century, Electric System Monitoring and Control, Proposed Research Project: Business Case; p. 10 (emphasis added).

[61] California Energy Systems for the 21st Century, Electric System Monitoring and Control, Proposed Research Project: Business Case; p. 9.

"societal costs" as used in the survey is provided; 3) the assumed cost is based on the Northeastern area of the country, which tends to have the highest costs in the nation; and 4) in the recent ERRA proceedings here at the CPUC,[62] these same utilities have accepted values averaging about $35/MWH for the cost of electric generation.

What is the overall value of the results from the potential research to ratepayers and to the utility system's safety and reliability?

None, as no credible overall value of the project's results, to either ratepayers or to the utility systems' safety and reliability, have been provided anywhere within this business case.

How do the costs of the research compare to potential benefits?

Unknown, as no potential benefits have been credibly quantified anywhere within this business case.

Would the results of the research have an impact on the ability of the grid to support the competitive provision of electric power or on the ability to integrate non-utility assets and distributed generation onto the grid?

Unknown, as there is no mention of the competitive provision of electricity within this business case, and no discussion of the ability to integrate non-utility assets and DG in the grid beyond the passing mention of the various difficulties presently encountered with "the increasing amount of intermittent resources,"[63] and the "emergence of renewable generation (variable energy resources)… ."[64]

Does the proposed research align with CPUC policies?

Unknown, as no CPUC policies are mentioned within this business case.

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[62] PG&E RP2010 ERRA Compliance, A.11-02-011; SCE RP2010 ERRA Compliance, A.11-04-001; and SDG&E RP2010 ERRA Compliance, A.11-06-003; et seq.

[63] California Energy Systems for the 21st Century, Electric System Monitoring and Control, Proposed Research Project: Business Case; pp. 1, 4.

[64] California Energy Systems for the 21st Century, Electric System Monitoring and Control, Proposed Research Project: Business Case; p. 9.

Does the proposed research produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight?

No, as no specific benefits concerning utility resources —whether transmission, distribution, generation, system operations, management, or oversight— are discussed within business case, beyond passing mention of the difficulties posed by optimized system operation, congestion and electricity losses, and a summary of "the conceptual and provisional preliminary estimates of quantifiable benefits of the proposed research area."[65]

Does the research help foster safe, reliable service at just and reasonable costs?"

Unknown, as no discussion of either safe or reliable service or just and reasonable costs is presented within the business case, beyond a brief mention of the difficulties posed by optimized system operation, congestion, and electricity losses.

[65] California Energy Systems for the 21st Century, Electric System Monitoring and Control, Proposed Research Project: Business Case; pp. 9-10.

Project Proposal 10 – Geographic Data Integration for Enhanced Gas System Risk Management[66]

This proposal is to improve the understanding and quantification of risk from and to natural gas infrastructure. This would be done by working with the utilities to better understand their multifaceted approach to risk assessment and in improving those data risk assessments. This project would do so, in part, by creating tools that enable the integration of large amounts of both traditional (paper records) and non-traditional (electronic data and models) forms of gas infrastructure and environmental information to support comprehensive integrity assessment studies as well as asset operation integrity, and maintenance planning.

The goal of this project is to create tools that enable the integration of large amounts of both traditional (paper records) and non-traditional (e.g., electronic data and models) forms of gas infrastructure and environmental information to support comprehensive integrity assessment studies as well as asset operation and maintenance planning.

The project would entail two phases.

- Phase 1: Extraction of geographical information from historical maintenance records.
- Phase 2: A framework for assessing system-wide risk from natural gas infrastructure.

Evaluation

Is there a "Positive business case"?

No. No positive business case is presented.

[66] California Energy Systems for the 21st Century, Geographic Data Integration for Enhanced Gas System Risk Management, Proposed Research Project: Business Case; pp. 1-16, passim.

Have the utilities demonstrated that quantifiable customer benefits, including safety and environmental benefits, exceed costs on a net present value basis, using an Commission approved methodology?

No. No benefits that exceed costs on a net present value basis, using a Commission approved methodology, have been demonstrated.

The one quantifiable customer benefit identified was quantified based on unsupported assumptions.

The IOUs assert that the possible customer benefits resulting from developing new tools include improved safety, reliability and cost optimization. An estimate of quantitative benefits is provided by comparing the costs of tool development with the cost of using current methods to perform the same task. In order to develop the estimate, the IOUs follow the following line of assumptions:

> "From a recent study processing A-form to collect information about leak repair, the cost per manually processed document (including information extraction, location identification and data recording in a flat file) is estimated to $50.
>
> "Assuming that the residual manual work will represent 5% of the time required in the current process when the automated process is successful, that the success rate of the automated process is 50%, and that the scaling-up discount is of 80%, the value created by the Phase 2 of the projects is estimated to $90M for PG&E (20 million documents to be processed)."[67]

The IOUs did not provide any supporting documentation, analysis, or workpapers that explain or justify these assumptions, therefore they are not verifiable

What is the overall value of the results from the potential research to ratepayers and to the utility system's safety and reliability?

Unknown, as no overall value of the project's results, to either ratepayers or to the utility systems' safety and reliability, has been discussed within this business case, other than vague, unsupported claims that the proposal would "lead to a variety of direct customer benefits," including:

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[67] California Energy Systems for the 21st Century, Geographic Data Integration for Enhanced Gas System Risk Management, Proposed Research Project: Business Case; p. 16.

- Leveraging databases and models developed for a broad range of security and business applications by the National Laboratories provides a reliable solution at a minimal cost;
- Enabling new possibilities in operation and resource management to minimize response time, reduce costs, and improve safety;
- Providing a reliable, fast and cost-effective method to process very large numbers of historical records of assets for pipeline maintenance and risk assessment; and
- Accelerating the development of understanding quantitative comprehensive risk-based integrity management plans that are currently limited by the lack of accurate and reliable data.[68]

How do the costs of the research compare to potential benefits?

Unknown, as no potential benefits have been discussed anywhere within this business case, beyond passing mention that the "expected benefits combine improved safety and reliability as well as cost reduction by effective data-driven decisions and priorities;" that it would "address two major challenges of this radical business transformation: the acquisition of reliable data, and the integration of a huge amount of multi-format data into the decision process;"[69] and that the expected value "is to develop tools to do much more while maintaining the affordability of gas delivery."[70]

Would the results of the research have an impact on the ability of the grid to support the competitive provision of electric power or on the ability to integrate non-utility assets and distributed generation onto the grid?

Unknown, as there is no mention of the competitive provision of electricity or the ability to integrate non-utility assets and DG in the grid anywhere within this business case.

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[68] California Energy Systems for the 21st Century, Geographic Data Integration for Enhanced Gas System Risk Management, Proposed Research Project: Business Case; pp. 2-3.

[69] California Energy Systems for the 21st Century, Geographic Data Integration for Enhanced Gas System Risk Management, Proposed Research Project: Business Case; pp. 2-3.

[70] California Energy Systems for the 21st Century, Geographic Data Integration for Enhanced Gas System Risk Management, Proposed Research Project: Business Case; p. 15.

Does the proposed research align with CPUC policies?

Unknown, as no CPUC policies are mentioned within this business case.

Does the proposed research produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight?

Unknown, as no specific benefits concerning utility resources —whether transmission, distribution, generation, system operations, management, or oversight— are discussed anywhere within the business case, beyond passing mention that the efforts presented here would "explore new and developing concepts of 'Big Data': integration of disparate and vast data forms to generate actionable information, and visualization of multifaceted and complex data-intensive concepts, like understanding risk,"[71] leading to "a variety of direct customer benefits, including … new possibilities in operation and resource management to minimize response time, reduce costs, and improve safety," and providing "a reliable, fast and cost-effective method to process very large numbers of historical records of assets for pipeline maintenance and risk assessment."[72]

Does the research help foster safe, reliable service at just and reasonable costs?"

Unknown, as no discussion of either safe or reliable service or just and reasonable costs is presented within the business case, beyond repeated mention that natural gas utilities are "faced with the dual challenge of managing aging infrastructure while adapting that infrastructure to current and future customer needs and safety requirements,"[73] and the customer benefits brought by this research " combine improved safety, reliability and cost optimization'" and emphasizing that the expected value is "to develop tools to do much more while

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[71] California Energy Systems for the 21st Century, Geographic Data Integration for Enhanced Gas System Risk Management, Proposed Research Project: Business Case; pp. 1-2.

[72] California Energy Systems for the 21st Century, Geographic Data Integration for Enhanced Gas System Risk Management, Proposed Research Project: Business Case; p. 2.

[73] California Energy Systems for the 21st Century, Geographic Data Integration for Enhanced Gas System Risk Management, Proposed Research Project: Business Case; pp. 1, 4.

maintaining the affordability of gas delivery."[74] No supporting information or analysis is provided to back these claims, discuss how such claims would be achieved, or to explain what kind of "much more" the tools would accomplish.

[74] California Energy Systems for the 21st Century, Geographic Data Integration for Enhanced Gas System Risk Management, Proposed Research Project: Business Case; p. 15.

Project Proposal 11 – Advanced Modeling and Simulation Environment for Gas System Planning and Operation[75]

This proposal is to advance pipeline modeling by implementing a quantified uncertainty framework, which would enhance modeling accuracy as well as the level of understanding and confidence in modeling results and to apply this framework to pipeline models.

These general techniques have been applied by the laboratory to a wide variety of nonlinear modeling applications, including seismic modeling[76], climate research[77], and stockpile stewardship. LLNL expects the high computational demands of these types of analysis to allow it to make a unique contribution to enhancing gas systems modeling. Unique challenges and opportunities for applying such strategies to pipeline system models include determining the best methods to leverage the graph structure of pipeline analysis to better capture uncertainty and reduce computational demands, as well as the eventual integration of massive amounts of sensor data in the form of Smart Meter readings.

PG&E would implement an advanced calibration methodology, known as stochastic inversion, for PG&E pipeline models. In addition to automating what is currently a costly and time-consuming calibration process, stochastic inversion often increases the accuracy of the calibrated model and also provides an accuracy assessment for model predictions. Access to predictions with quantified accuracy, in turn, increases confidence in model-based assessments and enables models to be used in new contexts. Such models, when combined with data reduction and visualization strategies, would be valuable to guiding risk assessment and inform decisions by energy stakeholders. This effort would be accomplished by the application of expertise in computation, optimization, network modeling, and uncertainty quantification.

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[75] California Energy Systems for the 21st Century, Advanced Modeling and Simulation Environment for Gas System Planning and Operation, Proposed Research Project: Business Case; pp. 1-16, passim.

[76] Myers, S.C., Johannesson, G., and Hanley, W. A Bayesian hierarchical method for multiple-event seismic location. Geophysical Journal International. 171:1049-1063. 2007.

[77] Johannesson, G. Accounting for global climate model projection uncertainty in modern statistical downscaling LLNL-TR-426343, Lawrence Livermore National Laboratory. 2010.

Evaluation

Is there a "Positive business case"?

No. No positive business case is presented.

Have the utilities demonstrated that quantifiable customer benefits, including safety and environmental benefits, exceed costs on a net present value basis, using a Commission approved methodology?

No. No benefits that exceed costs on a net present value basis, using a Commission approved methodology, have been demonstrated.

While some potentially-quantifiable customer benefits have been suggested, with hypothetical values attached to them, no real effort has gone into developing credible or meaningful estimates within this business case.

What is the overall value of the results from the potential research to ratepayers and to the utility system's safety and reliability?

None, as no overall value of the project's results, to either ratepayers or to the utility systems' safety and reliability, has been discussed anywhere within this business case, beyond mention that the "proposed work has the potential to reduce risk posed by the consequences associated with possible pipeline failure both by identifying potential problems early and by allowing the utility to explore the effects of various proposals to increase safety in their operations…"[78] No analysis or supporting information is provided to substantiate this claim.

How do the costs of the research compare to potential benefits?

Unknown, as no potential benefits have been credibly quantified within this business case.

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[78] California Energy Systems for the 21st Century, Advanced Modeling and Simulation Environment for Gas System Planning and Operation, Proposed Research Project: Business Case; p. 3.

Would the results of the research have an impact on the ability of the grid to support the competitive provision of electric power or on the ability to integrate non-utility assets and distributed generation onto the grid?

Unknown, as there is no mention of the competitive provision of electricity or the ability to integrate non-utility assets and DG in the grid within this business case.

Does the proposed research align with CPUC policies?

Unknown, as no CPUC policies are mentioned within this business case.

Does the proposed research produce specific benefits concerning utility resources including transmission, distribution, generation, system operations, management, and oversight?

No, as no specific benefits concerning utility resources —whether transmission, distribution, generation, system operations, management, or oversight— are discussed within the "business case," beyond a brief mention that this project would provide benefits in "Modeling Accuracy … Safety … Emergency Response … Cost Saving," and "Visualization."[79] Those benefits are not further described, and no supporting analysis is provided. The "cost savings" and "efficiency" estimates lack any substantive development and are not credible.

Does the research help foster safe, reliable service at just and reasonable costs?"

Unknown, as there is no mention, of either safe or reliable service or just and reasonable costs within the business case.

[79] California Energy Systems for the 21st Century, Advanced Modeling and Simulation Environment for Gas System Planning and Operation, Proposed Research Project: Business Case; pp. 15-16.