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ATTACHMENT A
Second Independent EPIC Evaluation

Second Independent Electric Program Investment Charge (EPIC) Evaluation

Final Report

Submitted by Evergreen Economics

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1 Executive Summary

The Electric Program Investment Charge (EPIC) supports the development of new, emerging, and pre-commercialized clean energy innovations in California. These projects must be designed to ensure benefits in the form of equitable access to safe, affordable, reliable, and environmentally sustainable energy for electricity ratepayers. EPIC is administered by the California Energy Commission (CEC), Pacific Gas and Electric Company (PG&E), Southern California Edison (SCE), and San Diego Gas & Electric Company (SDG&E). This program is funded by California utility customers under the auspices of the California Public Utilities Commission (CPUC).

The Second Independent Evaluation of EPIC sought to assess the effectiveness of EPIC investments in moving innovation to deployment while supporting California's energy, climate, and equity goals. The evaluation, conducted between March and September 2024, focused on four key areas: impact, timeliness, coordination, and transparency/documentation.

The evaluation approach included two main research components, supplemented by a review of relevant CPUC decisions and program documentation. The two main research components involved 1) an assessment of EPIC Administrator program reporting and 2) a series of qualitative structured interviews and discussions with representatives from various organizations with direct involvement in EPIC administration or indirect but related involvement or insight into large-scale research and development.

1.1 Core Findings

The evaluation revealed two core findings that emerged from the evaluation effort:

1. The California Energy Commission (CEC) primarily uses its Energize Innovations database rather than the California Public Utilities Commission's (CPUC) required EPIC database, resulting in incomplete information for many CEC projects in the EPIC database. While much of this information exists in Energize Innovations, some crucial data points remain missing entirely. This practice has created significant transparency issues and makes it impossible to validate information in the CEC's annual reporting against EPIC database records and led to challenges in evaluating the performance and outcomes of the CEC's EPIC portfolio of projects.
2. Several structural and operational issues in the EPIC database make project documentation harder to find and decrease the overall effectiveness of the documentation effort. Structural issues affect project records from all EPIC Administrators but particularly impact the ability to track project progress and outcomes over time.

1.2 Focus Area Findings

1.2.1 Impact

The evaluation's assessment of impacts revealed significant variation in documentation across EPIC Administrators, with significant gaps in CEC reporting within the EPIC database. Impact statements often lack supporting assumptions and methodologies, while documentation of impacts in environmental and social justice (ESJ) communities requires more detail beyond simple checkbox indicators. Additionally, post-project outcomes and long-term market transformation impacts are not systematically tracked.

1.2.2 Timeliness

Completed IOU projects average 3.5 years in duration, while significant data gaps exist for CEC projects making it impossible to determine project durations. Common challenges in project-level timeliness include lengthy contracting processes and COVID-19-related delays beginning in 2020. Project progress tracking is limited by the database structure, which overwrites previous updates rather than maintaining a history. The program also lacks comprehensive tracking of longer-term outcomes and market transformation impacts.

1.2.3 Coordination

EPIC Administrators engage in regular coordination meetings, but documentation of outcomes is limited. The CEC reports extensive coordination with CPUC proceedings, but CPUC subject matter experts note gaps in follow-through and implementation. IOU coordination with proceedings varies, with some focused mainly on mandatory requirements. The CEC effectively leverages other funding sources, with 85% of projects having match funding, while IOUs rarely do so.

1.2.4 Transparency and Documentation

IOU project documentation is generally more complete than CEC documentation in the EPIC database, and annual reports are not consistently aligned with database content. Project selection rationale and impact assessment methods are often unclear, and the database's structure limits effective tracking of project progress and updates.

1.3 Recommendations

Evaluation recommendations are provided below, along with the relevant focus area(s) in parenthesis.

1. **Database Completion (Transparency and Documentation & Impact):** The CEC must ensure the EPIC database is updated and complete, working with the PICG to facilitate information transfer from Energize Innovations.

2. **Automated Data Population (Transparency and Documentation):** Explore extending the automated data population process used for CEC projects to IOU projects to improve consistency and reduce manual entry errors.
3. **Project Justification (Impact):** Add a dedicated section in the database for project justification, including alignment with EPIC goals and CPUC proceedings.
4. **ESJ Impact Documentation (Transparency and Documentation & Impact):** Implement more comprehensive fields for documenting impacts in ESJ communities, including percentage of impacts and underlying assumptions.
5. **Progress Tracking (Transparency and Documentation & Timeliness):** Replace the current project updates field with either a historical record of updates or milestone-based tracking system.
6. **Project Compliance Oversight (Transparency and Documentation):** Add CPUC staff project reporting compliance role to ensure ongoing oversight of individual projects.
7. **Ecosystem Project Assessment (Impact):** Evaluate whether measuring entrepreneurial ecosystem projects against commercialization and technology development metrics alone is sufficient.
8. **Outcomes Framework (Coordination & Impact):** Establish a structured process for documenting longer-term EPIC program outcomes and impacts, including specific methodologies for measuring and attributing impacts.

These recommendations aim to enhance program transparency, improve impact documentation, and strengthen the connection between EPIC investments and ratepayer benefits. Improved coordination, especially in establishing an approach for assessing long-term impacts, is needed to better align the CPUC and EPIC Administrators on how EPIC-funded projects meet California's longer-term objectives. Implementation should focus on practical, actionable steps that maintain program efficiency while increasing accountability and documentation quality.

2 Evaluation Background

This evaluation is a timely check-in focused on understanding the impact of the Electric Program Investment Charge (EPIC) program to date to inform an upcoming California Public Utilities Commission (CPUC)-proposed decision related to the administration of the 2026-2030 (EPIC 5) program cycle. Per Decision (D.)18-10-052, continued evaluation of the EPIC program is essential to ensure EPIC projects are demonstrating ratepayer benefits and to inform continuous program improvement over time.

The CPUC seeks to ensure that ratepayer benefits—in the form of moving innovative projects to deployment—are transparent and readily accessible, and that analyzing EPIC program outcomes (as they relate to statewide climate, equity, and energy goals) is achievable and readily supported by the EPIC database. The CPUC adopted several adjustments to the EPIC program based on the *First Independent Electric Program Investment Charge (EPIC) Evaluation*,[1] and the way the program defines and tracks impacts is changing as a result.

This evaluation is intended to produce **specific** and **actionable** recommendations to help the CPUC and EPIC Administrators in their efforts to ensure EPIC investment is and has been impactful, timely, coordinated, transparent, and documented with respect to its mission and guiding principles in response to these changes. Additionally, the evaluation seeks to identify potential adjustments in existing processes and low value administrative requirements that could be streamlined to reduce administrative burden overall. The evaluation intends to inform the EPIC 5 portfolio planning effort and provide a path forward for the overall EPIC program.

The evaluation held a kick-off meeting on March 15, 2024, with research activities occurring between May 15, 2024, and August 2, 2024. Additional research occurred during the development of the draft and final reports to inform research questions not fully answered by the evaluation scope. The evaluation team delivered a draft report on August 23, 2024, and iterated with the CPUC study team to deliver a final report on January 23, 2025.

[1] D.23-04-042, Appendix B, summarizes the adjustments and associated CPUC decisions: https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M507/K499/507499284.PDF

3 Evaluation Approach

The Second Independent Electric Program Investment Charge (EPIC) Evaluation's research objectives were split into four focus areas, each with an overarching guiding research question, as well as more specific research questions. The four focus areas and the overarching questions included:

- **Focus Area 1: Impact.** How has the EPIC program demonstrated measurable ratepayer impacts of its investments, including in support of the state's equity goals?
- **Focus Area 2: Timeliness.** Has EPIC moved innovation to deployment in a timely manner that has effectively supported market transformation and scalability to address the state's energy, climate, and equity goals to benefit ratepayers?
- **Focus Area 3: Coordination.** How has EPIC demonstrated linkages with CPUC proceedings as well as coordination with other EPIC Administrators and other R&D efforts to ensure direct ratepayer benefits and that the funds are used efficiently, effectively, align with CPUC policies, and avoid duplication or conflict in CPUC policy?
- **Focus Area 4: Transparency and Documentation.** Does the EPIC project database transparently, accurately, and effectively support EPIC program evaluation and annual reporting, including being easily accessible to and understandable for a broad range of public stakeholders and practitioners?

The evaluation approach included two main research components, supplemented by a review of relevant CPUC decisions and program documentation. The two main research components involved 1) an assessment of the EPIC database and documentation (split into three components, described subsequently) and 2) a series of qualitative structured interviews and discussions with representatives from various organizations with direct involvement in EPIC administration or indirect but related involvement or insight into large-scale research and development.

The evaluation research tasks are described next.

3.1 Database and Documentation Review

As part of the database review, Evergreen reviewed the EPIC database (epicpartnership.org) for consistency with the EPIC orders and administration guidelines. The database review sought to highly leverage the database to inform the evaluation instead of relying on other disparate sources of information such as annual reports, interviews with EPIC Administrators, and other program project documentation. To utilize the database to inform the various research

objectives, we first conducted a comprehensive examination of the EPIC database (described subsequently) to determine in part whether the database is complete and accurate.

The database and documentation review comprised three components:

1. **A Comprehensive Examination of the EPIC Database:** This involved addressing objectives related to database gap assessment, timeliness, duplication of efforts (e.g., with the California Energy Commission [CEC] database), and evaluating how equity entries demonstrated impacts within disadvantaged, low-income, and tribal communities (rather than merely documenting spending within these communities). This initial review provided the foundation for preliminary interviews with EPIC Administrators and CPUC subject matter experts (SMEs).
2. **A Detailed Review of a Sample of Approximately 40 Projects:** This included at least four projects from each California investor-owned utility (IOU) and the remainder from the CEC. The focus was on mapping projects to EPIC goals and reviewing project narratives to determine whether impacts were well-documented, logical, and beneficial to ratepayers. Evergreen proposed a list of projects to the CPUC Study Team and refined the list based on feedback.
3. **An Assessment of Reported Impacts:** This involved comparing CEC and IOU annual reports to the EPIC database to verify that assertions were robust and defensible. Due to the scale of the annual reports for the CEC, PG&E, and SCE, the evaluation did not seek to validate all project-specific information (we reviewed samples of projects) but did seek to validate summary statistics such as annual expenditures. The goal was to understand whether the annual reports and database were consistent. Additionally, the study included a review of the annual reports to inform the assessments of impacts, timeliness, and coordination more generally (additional to the comparison to the EPIC database).

Evergreen also met with the lead of the EPIC Policy + Innovation Coordination Group (PICG) from Accelerate Group, the developer and administrator of the EPIC database, to gather additional information about the database.

Overall, the database review intended to identify impacts, inform an assessment of project and overall program timeliness, identify coordination activities and outcomes, and assess the degree of transparency provided by database entries. It also aimed to identify gaps in the available data and assess the overall database structure and content to guide subsequent discussions with EPIC Administrators. Additionally, we inquired about how Accelerate views tracking and defining equity related to projects and discussed already identified data-related and functionality updates.

3.2 In-Depth Interviews

The evaluation included multiple discussions with CPUC staff as well as with the PICG lead. The discussions with CPUC staff informed them not only of progress to-date, but also of research findings as they were uncovered, allowing for follow-up discussions or additional research as needed. Additionally, these discussions uncovered the need to iterate with the PICG lead on multiple fronts related to front-end database updates and back-end database functionality.

The evaluation also included interviews with CPUC SMEs engaged in EPIC-related proceedings and with staff members from EPIC Administrators involved in overseeing EPIC projects. In many cases, follow-up discussions or emails also occurred following discussions with the CPUC and upon uncovering substantive findings from the database review and related research (e.g., finding information available in the CEC's Energize Innovations database that is missing from the EPIC database).

Evergreen also completed interviews with representatives from the US Department of Energy to better understand lessons from their research and development processes. While this was not a full "best practices" assessment, the interviews were informative and provided necessary context for considering recommendations towards a path forward for the EPIC program.

Considering the issues uncovered in the database review—primarily around incompleteness and transparency—and the evaluation's limited ability to draw insightful conclusions from the database review on its own, the interviews provide qualitative information to support the evaluation's findings, albeit without concrete substantiation in the form of documentation. This is a finding itself; the EPIC database, as well as other materials (i.e., annual reports), do not provide sufficient information for the evaluation of EPIC's overall impacts, and thus we had to rely on statements from EPIC Administrators regarding EPIC's impacts. This was especially true for CEC projects.

4 Findings by Focus Area

In this section, we provide findings for each of the four study focus areas. Findings are provided in an outline format consistent with the study scope of work.

4.1 Focus Area 1: Impact

The demonstration of EPIC program impacts and transparency varies significantly across different EPIC Administrators.

4.1.1 Project-level Outputs

The EPIC Administrator documentation in the EPIC database is found to be inconsistent from project to project, and is missing entirely for many CEC projects (see Table 4 for more detail regarding missing information). The use of a uniform benefits assessment approach—an ongoing effort led by the CPUC—should lead to improvements in the documentation of assumptions and methods for assessing impacts.

The ability to measure and document project-level outputs varies across EPIC Administrators, with different challenges and methods identified (and self-reported) through interviews:

- **Southern California Edison (SCE)** stated that it can measure direct impacts for site-specific projects such as those from electric vehicle (EV) charging stations. SCE stated that it can struggle with quantifying benefits related to projects with less direct impacts such as wildfire prevention projects, grid resiliency projects, and transmission improvements. SCE also stated that it is focusing on these types of projects that it assesses will provide ratepayer benefits based on the logical outcomes, but which are harder to tie to specific, measurable impacts to communities due to the fact that the impacts are measured by the *absence* of future negative effects (e.g., fewer power outages in an area).[2] SCE stated that it focuses on evaluating ongoing projects and adjusting as needed, though it admits that benefits from these types of projects are difficult to quantify.
- **Pacific Gas and Electric (PG&E)** stated that it documents quantitative benefits where the calculations are defensible (with qualitative benefits noted in other cases) and

[2] The evaluation team asserts that establishing a baseline- and counterfactual-based assessment of impacts may be necessary to understand the likely impacts of projects where the benefits (i.e., lower impact wildfires or fewer wildfires) are measured by a reduction in the severity of a future event or the absence of future events (when they would have otherwise occurred). This is not straightforward and will require that the EPIC Administrators and CPUC agree on methods for establishing baselines and counterfactuals. Additionally, it may be imperative to track project outcomes after the projects are completed to understand if the impacts are realized.

stated that forecasting quantitative research and development (R&D) outcomes is challenging. It stated using a structured approach with business plans and monthly reports but acknowledged that it faces difficulties in capturing the nuanced impacts of failed projects and exact benefits in specific communities (i.e., DACs and low-income areas). PG&E stated that its EPIC projects follow its overall R&D strategy, which is tied to CPUC decisions and state policy; it does not pursue projects for technologies that are either too early in the development process or that are already mature. PG&E also noted that all its projects receive a final report, even if the project is stopped before completion. For these projects, it aims to "fail fast" if a course correction is not feasible (PG&E noted that it is not easy to document these steps or decisions in the EPIC database, however).

- **San Diego Gas & Electric (SDG&E)** stated that it estimates impacts based on internal business needs and policy alignment, focusing on reduced operational costs as a benefit to ratepayers. It stated that there is currently less emphasis on detailed impact documentation, particularly regarding specific benefits to environmental and social justice (ESJ) communities (as this has not been required to-date).
- The **California Energy Commission (CEC)** stated that it relies on a benefits liaison (a new position at the CEC) to track metrics for each project. The benefits liaison is from the CEC's strategic analysis unit and for each project, they conduct a benefits analysis by documenting the project team's understanding of project benefits using a benefits questionnaire. The liaison also tracks the benefit metrics over the course of the project, and adjusts approaches based on the latest developments. However, transparency to the CPUC of benefits from CEC projects is currently fundamentally flawed—the CEC primarily tracks benefits information in the CEC's Energize Innovations database instead of the CPUC's EPIC database. Furthermore, both databases lack the ability to track metrics over time in a sensible way (i.e., there is only a single project update field in the EPIC database).

4.1.2 CEC Entrepreneurial Ecosystem Project Outputs

The CEC's entrepreneurial ecosystem projects consist of funding or supporting numerous entrepreneurs, and since specific information about each engagement is not available in the EPIC database, the ecosystem projects lack transparency, and it is not possible to assess their impacts.

CEC EPIC Administrators claimed to be most heavily involved in CalSEED, and less involved with other ecosystem projects beyond ensuring that funding is aligned with EPIC investment plans (e.g., no funding of gas technologies). The CEC tracks progress in terms of commercialization and technology development metrics—follow-on funding, partnerships, development agreements—but not the specific types of impacts that necessarily align with EPIC goals.

4.1.3 Program Outcomes and Impacts

The EPIC program consists of hundreds of EPIC-funded projects, each of which is intended to have outputs in the form of innovation or insights (e.g., from failed projects). The EPIC program also requires accurate measurement and reporting of impacts[3] in the form of ratepayer benefits,[4] and that address California's energy and climate goals.

The EPIC database serves primarily as a *project*-specific outputs tracker that predicts or forecasts wider-spread scalability and impacts (when project information is reasonably complete in the database). Once a project is closed, further updates to the project records are not required, and it appears that post-project activities and outcomes are not tracked, so information related to actual technology scaling and deployment is very limited.

The 2023 EPIC annual reports reveal limited systematic tracking of longer-term outcomes and market transformation impacts. While the CEC tracks some quantitative metrics (e.g., $1.5 million in on-bill energy savings, 16,854 metric tons of avoided CO_2 emissions from 18 projects[5]), they do not provide detailed methodologies for measuring these impacts, particularly in disadvantaged communities. The CEC's reporting on ecosystem projects (CalSEED, CalTestBed) focuses primarily on business development metrics like companies supported (340+) and follow-on investment ($4 billion) rather than equity, affordability, reliability, safety or GHG reduction impacts (which comprise the targeted benefits of EPIC as identified by the CPUC[6]). Among utilities, PG&E demonstrates the most structured approach to outcome tracking in its annual report, having developed a formal value assessment framework in coordination with other administrators and committing to provide forward-looking benefit estimates for EPIC 3 projects at closeout. However, SCE and SDG&E reports focus mainly on immediate project results without discussing systematic tracking of market adoption or broader impacts after project completion.

4.1.4 Spending and Impacts in DACs and Low-Income Communities

Efforts to address equity and benefit DACs and low-income areas vary across EPIC Administrators, reflecting differing approaches to achieving EPIC's equity objectives. Importantly, DAC- and low-income-related goals for spending EPIC funds and creating impacts within targeted communities has only been a requirement for the CEC and is now a requirement for the IOU EPIC Administrators as well. Thus, the IOUs are in the process of

[3] D.23-04-042, Appendix A at A-1.
[4] D.12-05-037, at Ordering Paragraph (OP) 2.
[5] Source: pages 2-3 from the *CEC's Electric Program Investment Charge 2023 Annual Report*, available here: https://www.energy.ca.gov/sites/default/files/2024-04/CEC-500-2024-028-CMF.pdf
[6] D.12-05-037, OP 2, and D.21-11-028, Appendix A at A1.

implementing related activities while the CEC has experience focusing on impacts in these communities already.

The CEC has had a legislative requirement under Assembly Bill (AB) 523[7] to allocate minimums of 25 percent and 10 percent of the funding for technology demonstration and deployment projects to projects located in and benefiting DACs and low-income communities, respectively. Despite the repeal of AB 523 on January 1, 2024, CPUC decision D.23-04-042[8] adopted the same minimum requirements for the CEC's EPIC program.

The evaluation of the EPIC database found that information to substantiate EPIC project impacts in DACs and low-income communities is frequently not provided. The EPIC database includes basic indicators (i.e., check boxes) for whether impacts will occur in DACs or low-income areas, which are often checked. Whether and how a project's impacts—or, importantly, a portion of a project's impacts—are expected to occur in a DAC requires a deeper understanding of the project inputs and logical outcomes *specifically with respect to impacts in a DAC*.

According to the 2023 annual reports, while the CEC consistently tracks funding allocations to disadvantaged and low-income communities, detailed impact assessment in these areas remains limited. The CEC reports nearly 60 percent of technology demonstration and deployment funds were invested in projects with sites in low-income or disadvantaged communities, along with $21 million invested in projects on California Native American tribal lands. However, the reporting focuses primarily on tracking investments and broad metrics rather than comprehensive impact assessment. The CEC collects some quantitative data, such as on-bill energy cost savings from projects in under-resourced communities and the number of residential units involved in building electrification efforts, but doesn't provide detailed methodologies for measuring or attributing these impacts specifically to disadvantaged or low-income communities. While the CEC applies scoring criteria when selecting projects to ensure ESJ communities benefit from clean energy resources and considers factors like localized health impacts and community engagement, the report doesn't present quantified impacts in terms of non-energy benefits, air quality improvements, public health outcomes, or community engagement metrics. This suggests a gap between tracking funding allocations and measuring actual community-level impacts from these investments.

Based on CEC reporting in its more public facing highlights report, which the evaluation is unable to substantiate, it has exceeded the stated goals (although assumptions are not specified). While the documentation in the EPIC database is insufficient for assessing the

[7] Source: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201720180AB523
[8] Source: https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M507/K499/507499284.PDF

impacts of CEC projects with respect to specific metrics, the CEC reported that it focuses much effort towards meeting or exceeding stated objectives, including the following:

- The **California Energy Commission (CEC)** stated that it currently captures whether demonstration projects are in DACs and uses a scoring criterion to track potential impacts. Project proposal narratives include descriptions of how prospective project leads quantify impacts to DACs and document assumptions. Nonetheless, to-date, the focus has been on demonstration projects' location rather than whether the specific impacts are experienced by the DACs. However, the CEC only indicates whether projects are sited in DACs, without reporting the actual impacts in these communities[9] (a noted area of improvement from the evaluation team would be to expand on the database's tracking related to equity-specific metrics and narratives). Understanding the impacts of future commercialization of these technologies and whether those impacts would also occur in DACs is not reported.
- It may be possible for the CEC to populate a narrative field regarding impacts in DACs based on the information it reportedly captures during the project solicitation phase.

The IOUs reported the following activities as they began to navigate the equity requirements:

- **Southern California Edison (SCE)** is establishing a community advisory panel to better integrate ESJ communities and ensure that projects benefit these areas. SCE also stated that it is working to document the processes for estimating impacts in ESJ communities, such as how technologies that improve transmission will lead to benefits in specific areas. However, quantifying specific benefits for ESJ communities reportedly remains complex, particularly for large-scale transmission projects where the benefits are not immediate or necessarily as direct—such as grid reliability and resiliency, for example.
- **Pacific Gas and Electric (PG&E)** stated that it requires project teams to identify potential benefits to DACs and low-income areas and documents the percentage of project dollars and impacts expected to benefit these communities Despite this, the documentation is not always detailed, and quantifying specific benefits remains challenging.
- **San Diego Gas & Electric (SDG&E)** stated that it plans to review and document which projects are demonstrated in a DAC to meet equity goals. SDG&E also expressed interest in exploring workforce impacts in ESJ communities, but it does not currently incorporate this factor into project selection or impact documentation.

[9] For technology demonstration projects, the physical location or siting of the project *may* coincide with where the direct outputs (or benefits) of the demonstration are experienced. However, there is no evidence beyond the siting of demonstration projects in DACs to prove that they are benefiting the communities.

At this critical juncture as the CPUC and EPIC Administrators are working to establish a uniform impacts analysis framework and as the IOU EPIC Administrators are now required to demonstrate impacts in ESJ communities, the CPUC may want to consider working with the EPIC Administrators to leverage work done by the Pacific Northwest National Laboratory (PNNL) to establish a consistent framework to estimate impacts of projects in ESJ communities for the Federal Justice40 Initiative.[10] While this may not retroactively inform impacts from closed CEC projects, establishing a consistent framework for assessing and measuring impacts in ESJ communities should be a priority for the EPIC Program.

4.1.5 Summary of Evaluation Findings for Impacts

The completeness of EPIC Administrator records in the database varies widely across projects and EPIC Administrators, and assumptions supporting impact claims—including how project impacts in DACs or low-income areas are measured—are often not provided. There is a notable lack of transparency in the EPIC database regarding project rationales and impacts, especially assumptions that substantiate impact quantification.

Measurement of impacts varies, with different EPIC Administrators facing challenges in quantifying benefits, especially for complex projects and those in DACs. The annual reporting demonstrates a disconnect between tracking funding allocations and measuring actual impacts in disadvantaged communities. While the CEC reports significant investment metrics (60% of demonstration funds in low-income/disadvantaged communities, $21 million in tribal lands), and collects some quantitative data on energy savings and electrification efforts, detailed methodologies for measuring specific community impacts are lacking. Despite having project selection criteria focused on ESJ benefits, the reports don't quantify non-energy benefits, air quality improvements, or community engagement outcomes, revealing a gap between investment tracking and impact measurement.

The ongoing CPUC effort to provide an impact analysis framework is intended to add structure and consistency to the documentation of impacts. While SCE, PG&E, and SDG&E have developed various methods to measure direct impacts, challenges persist in quantifying benefits, particularly for large-scale or grid-related projects where the impacts may be the absence of future detrimental events (e.g., wildfires, power outages), as well as those in ESJ communities. Furthermore, CEC project information such as impacts must be added to the CPUC's EPIC database and not just the Energize Innovations database maintained by the CEC. Lastly, the CEC documents the potential impacts in DACs as part of project selection and rationale, but this information is not captured in the EPIC database.

[10] Pacific Northwest National Laboratory recently provided guidance related to the Federal Justice40 Initiative regarding how to estimate impacts in ESJ communities that could be adapted for EPIC projects. "Energy Justice and Equity in Deployment Programs." (https://www.pnnl.gov/projects/energy-equity/deployment-programs).

Lastly, while administrators focus on project-specific achievements (with the above noted concerns), there remains a gap in comprehensive, long-term tracking of program-wide market transformation outcomes and impacts.

Table 1 provides the list of detailed research questions for Focus Area 1: Impacts, as well as research findings related to each question. Note that some findings are included from other focus areas due to topical overlap.

Table 1: Focus Area 1: Impacts

Impact Research Questions	Research Findings
How have EPIC Administrators demonstrated tangible impacts and benefits of EPIC investments including to disadvantaged and low-income communities, including tribal communities?	• Not all EPIC Administrators consistently demonstrate project impacts for all projects in the required EPIC reporting. Many projects in the EPIC database and annual reporting have missing impacts information. • Impact statements from all EPIC Administrators often lack mention of assumptions and methods for estimating impacts. • Understanding impacts in ESJ communities requires more than a simple check box in the database; at present, they are not easy to understand and impacts to these communities may be partial (not the entire impact of the project). • Administrators stated that identifying the likelihood of impacts, including to ESJ communities, is also part of the project selection process.
In the absence of measurable goals and objectives, how have EPIC Administrators reported ratepayer impacts?	• Not all EPIC Administrators consistently report ratepayer impacts for all projects in the required EPIC reporting. Many projects in the EPIC database and annual reporting are missing ratepayer impacts information. • Impact statements from all EPIC Administrators often lack mention of assumptions and methods for estimating impacts. • Administrators stated that identifying the likelihood of ratepayer impacts is also part of the project selection process (discussed in Section 6.2.2).
How have EPIC's investments, including market facilitation efforts, demonstrated progress in advancing innovation to support achievement of the state's climate goals?	• The lack of reported impact information for many projects in the EPIC database and annual reporting makes it challenging to assess how these projects demonstrate progress in support of California's climate goals.

	• Individual projects from each EPIC Administrator appear aligned with these goals. However, given the lack of consistency in reporting impacts and related assumptions (and significant missing information), it is impossible to assess how EPIC's overall investments have led to advancing innovation to support meeting climate goals. • Post-project outcomes and impacts are not currently documented.
How have EPIC's investments been incorporated in IOU operations?	• IOU Administrators state that their projects that are focused on improving the grid and projects related to wildfire mitigation are incorporated into their operations. • The IOUs did not state if any CEC projects are incorporated into IOU operations.
How have EPIC innovation investments demonstrated market transformation impacts in a timely and cost-efficient manner, as well as demonstrated consideration of ratepayer benefits?	• Market transformation is not well documented or accounted for given the project-level focus of the EPIC database. Post-project outcomes are not tracked. • Project screening for potential ratepayer benefits is stated as an important step taken by EPIC Administrators. • Projects that intend to have large-scale impacts such as to the grid or for wildfire mitigation are intuitively focused on ratepayer benefits, although tying specific benefits to specific communities (or ratepayers, at large) is reportedly challenging for these projects (compared to more localized projects, including demonstration projects impacting specific communities).
How have EPIC Administrators used lessons learned from projects that did not move forward? What lessons have been learned?	• All EPIC Administrators (other than SDG&E) stated that they have processes for ending projects that are not meeting mid-course objectives. • PG&E stated that it requires final reports for failed projects, which may be a best practice that other Administrators should adopt. • The factors that lead to a decision to stop a project are not captured well in the EPIC database.

4.2 Focus Area 2: Timeliness

The findings related to the timeliness of EPIC projects are primarily based on discussions with the EPIC Administrators, as the database does not capture adequate information on project stages or timeliness to inform the overall assessment. Note that final project reports for

completed projects from the IOU Administrators do provide project schedules, however this is not useful for tracking ongoing projects.

4.2.1 Project-level Timeliness

With respect to timeliness of EPIC-funded projects themselves, each EPIC Administrator claimed to have faced typical challenges (such as lengthy contracting processes and supply chain constraints) that impact the efficiency and speed of project execution; however, these challenges are not necessarily apparent in the EPIC project documentation. Administrators noted that contracting can be a significant undertaking at the start of a project, that the COVID-19 pandemic beginning in 2020 led to delays for ongoing projects and for projects started during the pandemic, and that they have internal processes for tracking project tasks and timelines.

The average duration for closed projects across all administrators could not be determined because project end dates are not always provided for projects in the EPIC database that are reportedly closed. Additionally, there are inconsistencies between database fields. For example, many of the CEC projects listed as ongoing also reported end dates in the past. Among the IOU Administrators, for closed projects, SCE had the highest average duration at 4.1 years, with PG&E and SDG&E averaging around three years.

The database review also highlighted inconsistencies in scalability reporting, with only 28 percent of projects having the scalability field populated. SDG&E and PG&E were more comprehensive in describing scalability, reporting it for 95 percent and 75 percent of their projects respectively. SCE populated the scalability field for 50 percent of its projects, and the CEC reported on scalability for only 18 percent of its projects.

EPIC Administrators reported the following related to moving innovation to deployment in a timely manner through the EPIC program:

- **Southern California Edison (SCE)** stated that it encountered several obstacles related to timeliness. The execution of contracts, project completion, and commercialization were often hindered by challenging terms and conditions, particularly when working with national laboratories. Intellectual property concerns further complicated these collaborations. The COVID-19 pandemic exacerbated these issues by limiting lab access, which stretched timelines due to reduced personnel and supply chain disruptions affecting resource availability. These factors collectively contributed to SCE's projects often experiencing longer durations, with an average project duration of 4.1 years, the highest among the IOU EPIC Administrators.
- **Pacific Gas and Electric (PG&E)** stated that it faced its own set of timeliness challenges. Selecting the right vendor for a project proved to be a time-consuming process. Additionally, negotiating intellectual property terms and navigating the sourcing process

were lengthy due to the lack of a dedicated EPIC project contracting queue within the contracting review department at PG&E (i.e., the EPIC project contracts are given the same prioritization for review as other PG&E contractor contracts, which adds to the overall review timeline). The COVID-19 pandemic further complicated matters, causing delays in projects involving physical hardware and introducing uncertainty in regulatory approval timelines. PG&E's average project duration has been approximately three years, with similar delays reflected in the extended timelines observed.

- **San Diego Gas & Electric (SDG&E)** stated that it has a relatively lean EPIC staffing structure, with only one primary staff member responsible for managing bidding, proposals, and contracting. While they borrowed staff from other departments as needed, this approach had its limitations. The pandemic-induced supply chain constraints also had a noticeable impact on project timelines, contributing to delays. SDG&E's average project duration has been three years, and it did not have any projects lasting five years or more.
- The **California Energy Commission (CEC)** was noted to have gaps in timeliness reporting in the EPIC database. These gaps make it challenging to fully assess how the CEC's projects align with market transformation and scalability objectives. However, the CEC stated that it tracks a lot of progress-related metrics during a project that are not currently present in either its Energize Innovations database or the EPIC database (there is no place for this information in either database at present). For some projects (but not all), annual updates are provided in the CEC's annual report. Many CEC project records in the EPIC database do not include final reports with completed project timelines (some final reports or presentations are available to download in the Energize Innovations database). Every project has a detailed scope of work and schedule based on project tasks, and they have milestones with associated project reviews and meetings (sometimes with external parties) to determine "go/no-go" status.

4.2.2 Program Timeliness and Longer-Term Outcomes

The annual reports reveal limited systematic tracking of longer-term outcomes across EPIC administrators, with varying approaches to monitoring post-project impacts. The CEC reports tracking some longer-term outcomes through follow-on funding ($10.1 billion reported, representing a tenfold amplification of initial investments) and technology commercialization progress. While the CEC asserts that CalFlexHub research has informed CPUC's Demand Flexibility Rulemaking, CPUC SMEs indicate that EPIC projects selected for demand response and flexibility are not effectively addressing key issues or testing critical problems identified in relevant proceedings. Among the IOUs, PG&E demonstrates the most structured approach, having developed a formal value assessment framework in coordination with other administrators. PG&E commits in its 2023 annual report to providing forward-looking benefit estimates for EPIC 3 projects at closeout and promises ongoing benefits updates for key projects even after closure. SCE and SDG&E annual reports focus primarily on immediate

project deliverables without discussing systematic tracking of market adoption or longer-term impacts.

None of the administrators present a comprehensive framework for "zooming out" to evaluate holistic, long-term program impacts or market transformation outcomes. Regarding timeliness, the reports do not specifically address program timeline performance or provide metrics on project completion rates relative to initial schedules.

4.2.3 Summary of Evaluation Findings for Timeliness

In summary, addressing project-level timeliness within the EPIC program involves overcoming various challenges, including complex contracting processes, resource constraints, and inconsistent reporting. Streamlining these areas, improving scalability documentation, and implementing flexible milestone tracking (documented within the EPIC database) would lead to more transparent project execution and a more thorough understanding of how EPIC-funded projects are proceeding through their scopes.

While the CEC tracks some long-term indicators like follow-on funding and technology commercialization progress, no administrator presents a comprehensive framework for evaluating long-term program impacts or market transformation outcomes in the annual reports (or elsewhere), and project timeline performance metrics are not included in annual reporting.

Table 2 provides the list of detailed research questions for Focus Area 2: Timeliness.

Table 2: Focus Area 2: Timeliness

Timeliness Research Questions	Research Findings
In what timeframe and under what conditions have administrators executed contracts, completed projects, deployed research results to inform the next stage of innovation, and commercialized/deployed project innovation?	• Contracting can take up to a year to complete. • The length of projects is hard to discern from the EPIC database due to inconsistent information (e.g., projects listed as complete with completion dates in the future, or projects listed as ongoing with completion dates in the past). • There is limited information about deploying outcomes from EPIC projects at a wider scale (i.e., commercialization) or tracking longer term impacts.
How have lessons from off-ramped projects been identified and communicated to inform innovation learnings and improve program design in a timely manner?	• It is unclear how lessons from off-ramped projects are leveraged in the future as this type of information is not available in the EPIC database or annual reporting. PG&E does require a final report for off-ramped projects to share lessons learned.

	• All EPIC Administrators (other than SDG&E) stated they have processes for ending projects that are not meeting mid-course objectives. • While some EPIC Administrators require final reports for these projects, others do not. • The factors that lead to a decision to stop a project are not captured well in Administrator reporting.
How did COVID-19, or other barriers, impact timelines?	• COVID-19, which began in 2020, led to supply chain barriers, with some lingering effects in 2024. • Contracting barriers regarding intellectual property (IP) are reportedly particularly challenging for EPIC Administrators who must balance the need for transparency with the desire of private companies seeking to leverage their IP.

4.3 Focus Area 3: Coordination

The assessment of EPIC Administrator coordination across agencies is largely based on findings from interviews with the EPIC Administrators and CPUC SMEs and from the review of EPIC Administrator annual reports. The interviews aimed to understand if and how each EPIC Administrator engages with CPUC SMEs, whether they leverage learnings from other EPIC Administrators, and how they incorporate considerations from ESJ communities into their program strategies. Additionally, the evaluation sought to determine EPIC project coordination with CPUC proceedings.

4.3.1 Coordination with CPUC SMEs and Proceedings

The interaction between the EPIC Administrators and the California Public Utilities Commission (CPUC), including CPUC SMEs, has both strengths and areas for improvement. SMEs from the CPUC have observed that EPIC administrator staff actively participate in workshops to stay informed about new technologies. However, there is some uncertainty about how well this information is utilized after the workshops. Successful EPIC projects, such as those focused on microgrids and reducing greenhouse gas emissions, are seen as valuable examples that might influence CPUC actions. One SME noted EPIC Administrator staff were knowledgeable and forward-thinking in their interactions with the CPUC.

Despite these positive contributions, challenges in communication and coordination persist. Some SMEs feel that EPIC projects and their EPIC Administrators have not effectively communicated findings related to CPUC proceedings, and there are concerns about a lack of follow-up on the information shared. Additionally, SMEs are unsure whether CPUC policies and proceedings directly impact EPIC project selection. Although EPIC Administrators do sometimes

reach out to SMEs for feedback on their activities, SMEs stated that these interactions can lack depth and continuity.

There were also some concerns from CPUC SMEs about potential overlaps between EPIC's activities and other state and federal funding sources, such as those from the California Air Resources Board (CARB). This highlights a need for clearer coordination to avoid duplication of efforts or to more explicitly leverage co-funding with other sources. At present, match funding information is available in the EPIC database, but the sources are not always apparent.

The annual reports demonstrate varying levels of coordination with CPUC proceedings across administrators. The CEC reports extensive coordination efforts, including participating in monthly meetings on transportation electrification proceedings, monitoring and coordinating the High DER Proceeding through biweekly calls with ED and IOU staff, hosting or participating in over 25 events supporting the CPUC DER Action Plan 2.0, and aligning with the CPUC's ESJ Action Plan metrics (Decision 23-04-042). The CEC report also notes that it participated in "all-party" workshops on EPIC strategic goals.

Among utilities, PG&E's annual reporting notes structured coordination through participation in bi-weekly review meetings with CPUC staff and other EPIC Administrators, conducting joint webinars, and developing a benefits analysis framework in coordination with CPUC Staff. PG&E's report specifically references coordination with several CPUC proceedings, including the EPIC Program Renewal OIR R.19-10-005 and Resolution E-5038. SCE's annual report indicates more limited coordination, primarily focused on required filings and participation in CPUC-mandated workshops and symposiums, without evidence of how these activities influenced their EPIC portfolio. SDG&E's report merely notes that they are "tracking" two relevant CPUC proceedings (Microgrid OIR and Vehicle Electrification OIR) but provides no information on how insights from these proceedings shaped their EPIC project selection or design. Neither administrator demonstrates how their coordination activities resulted in concrete changes or improvements to their EPIC work.

While the EPIC reporting available in the EPIC database provides *related* CPUC proceedings, there is very little mention (based on our Deep Dive review) of *coordination* with CPUC proceedings (see Table 6). Of the eight IOU projects reviewed in detail, descriptions of coordination with proceedings were found for two projects. For CEC projects, many provided related proceedings, but none of the records described coordination with the proceedings. The CEC's annual report, however, provides additional information regarding their overall coordination efforts with CPUC proceedings (such as the High Distributed Energy Resources Future, or "High DER" proceeding and transportation electrification related proceedings).

4.3.2 Administrator Coordination

The EPIC Administrators are involved in various coordination efforts. The IOUs state they hold weekly meetings as well as biweekly meetings with the CEC. According to PG&E's annual report, a key objective of these meetings is to "coordinate Investment Plans and ensure investments are complementary and not unnecessarily duplicative" and to "discuss project learnings and facilitate the dissemination of the results of the program efforts." The CEC's annual report describes extensive coordination activities with other agencies—including with DOE and the US Department of Defense (DOD)—as well as with the IOU EPIC Administrators. The EPIC Administrators also stated they engage in ad-hoc meetings with CPUC staff and public workshops to ensure alignment. Additionally, each EPIC Administrator stated it is engaged in coordination with outside organizations covering a range of functions, including:

- **Pacific Gas and Electric (PG&E)** stated that it is expanding its Community Perspectives Advisory Council (C-PAC) under EPIC 4 to improve public communication about its plans and progress. PG&E also noted that some projects do not inform CPUC proceedings and mentioned an example of a project related to the destruction of utility poles as an example. On the other hand, PG&E noted that a microgrid tariff project directly informed proceedings, highlighting that some projects are more linked to ongoing proceedings than others.

  Southern California Edison (SCE) stated that it works to integrate EPIC projects into CPUC proceedings by linking project documentation to CPUC decisions and state policies and using the decisions and policies to guide project plans and to inform project selection. Like PG&E, SCE cited microgrid-related projects as an example of EPIC projects informing CPUC proceedings, as well as vehicle-to-grid and other EV-related projects. Relatedly, SCE noted coordinating with the Institute of Electrical and Electronics Engineers (IEEE) regarding automotive standards to share work from EPIC funded projects. SCE is also focusing on community impacts, especially in ESJ communities, and is setting up a community advisory panel to ensure these communities observe actual benefits.
- **San Diego Gas & Electric (SDG&E)** stated that it coordinates with the CPUC mainly through discussions on climate adaptation and distributed energy resources (DER) and stays informed by attending industry conferences. SDG&E also will present on EPIC 4 projects at a community partner meeting to obtain feedback and input on potential projects and to solicit ideas for additional work that could be funded through EPIC.
- The **California Energy Commission (CEC)** stated that it evaluates project proposals based on current plans and priorities, incorporating feedback from internal CEC SMEs and commissioners. According to the CEC, there is a lot of coordination and stakeholder engagement to ensure planned research topics are relevant, including through public workshops, requests for information, and internal ideation (including briefings to CEC commissioners). They then develop a research concept for public comment and refine

specific project solicitation scopes. Once specific projects are selected, they assemble a technical advisory committee consisting of advisors from groups such as the California Independent System Operator (CAISO), the CPUC, national labs, community-based organizations (CBOs), subject matter experts, and others. During a project, there are check-ins related to milestones with the advisory group.

The CEC also stated that they have more recently engaged with tribes for scoping project solicitations, and for demonstration projects in DACs, they often require engagement with a local CBO from the project scoping phase. Additionally, the CEC engages with the DAC Advisory Group (DACAG) annually to provide a description of what the CEC's EPIC portfolio of projects will focus on for the year. If a particular solicitation is designed to benefit a DAC, the CEC will bring this to the attention of the DACAG.

While engagement with the DACAG and with other organizations focused on equity issues are a good sign, the evaluation team believes that the EPIC Administrators could also interview organizations involved in the implementation of other DAC programs (i.e., DAC-SASH, DAC-GT, CSGT, SJV DAC Program[11]) such as Self Help and GRID Alternatives to identify organizations they should be engage with in specific regions.

The CEC also leverages a lot of non-EPIC funding sources, with 85 percent of their projects listing match funding in the EPIC database. The CEC's annual report highlighted a grant funding opportunity called "Cost Share for Federal Clean Energy Funding Opportunities," which supports federal cost-sharing for topics such as transportation electrification. Additionally, the report noted that three battery-related projects also received federal cost-sharing. The IOUs rarely leverage funding sources beyond EPIC, with 4 percent of PG&E projects and 5 percent of SDG&E projects (but no SCE projects) listing match funding.

4.3.3 CEC Coordination with Ecosystem Projects

As noted in Section 4.1.2, the CEC is most heavily involved in CalSEED, but less involved with other entrepreneurial ecosystem projects supported by EPIC funding.

Even so, according to the CEC, **maintaining effective communication remains a challenge for CEC's CalSEED project.** The CEC stated that it receives regular progress reports from companies funded through CalSEED, which is managed by New Energy Nexus. Each project has a Commission Agreement Manager (CAM) who communicates with project managers, though this process can sometimes face communication issues. While this is claimed by the CEC, since the program is reported as one entry in annual reports and the EPIC database by the CEC, there

[11] DAC-SASH refers to the Disadvantaged Communities – Single-Family Solar Homes Program; DAC-GT refers to the Disadvantaged Communities Green Tariff Program; CSGT refers to the Community Solar Green Tariff Program; and SJV DAC Program refers to the San Joaquin Valley Disadvantaged Communities Program.

is no information about individual projects or their relative challenges or successes for the evaluation to consider.

4.3.4 Summary of Evaluation Findings for Coordination

In summary, EPIC Administrators have made contributions to CPUC proceedings (especially related to microgrids and EVs), and they are increasingly engaging with stakeholder groups (especially as the IOUs work towards fulfilling equity-related goals). The CEC leverages other funding sources, but the IOUs tend not to do so for EPIC projects. Feedback from SMEs points to the need for a path towards more proactive information sharing both from and to the SMEs to improve alignment with proceedings and to inform SMEs of project learnings.

Lastly, EPIC Administrator coordination efforts and outcomes are not documented in the EPIC database but are documented in annual reports. The CEC reports extensive coordination activities, including regular participation in meetings, engagement in over 25 events, and stated alignment with CPUC initiatives like the DER Action Plan 2.0 and ESJ metrics. However, while the CEC's 2023 annual report documents numerous coordination meetings and events, it provides limited evidence demonstrating how this coordination has specifically influenced EPIC project selection, design, or outcomes. PG&E reports structured coordination through regular meetings (including with the other EPIC Administrators) and framework development, while SCE and SDG&E reporting only discusses minimal coordination activities, mainly focused on compliance requirements and proceedings tracking. Overall, the evaluation found minimal documentation showing how coordination activities led to meaningful changes in EPIC strategies or investments.

Table 3 provides the list of detailed research questions for Focus Area 3: Coordination.

Table 3: Focus Area 3: Coordination

Coordination Research Questions	Research Findings
How have the CPUC's policies in its proceedings informed EPIC strategic planning and project design to implement innovation design efficiently and effectively in achieving the state's goals?	• EPIC Administrators stated that identifying alignment with CPUC policies (from proceedings) is part of the project selection process, although the documentation is lacking in EPIC Administrator reporting. • The CEC's annual report discusses coordination with DER-related CPUC proceedings. • IOU EPIC Administrator annual reports primarily discuss coordination with mandatory CPUC proceedings (i.e., EPIC Program Renewal OIR R.19-10-005), but do note some additional alignment and tracking of proceedings. • IOU EPIC Administrators stated that certain EPIC projects receive more attention from the CPUC than others (regarding informing proceedings), specifically

	citing projects that involve microgrids and electric vehicles.
How do EPIC Administrators coordinate with each other as well as with other state and federal RD&D programs to optimize funding, efficiencies, opportunities, and lessons learned? How is progress due to coordination demonstrated?	• The IOU EPIC Administrators stated that they have weekly meetings, and biweekly meetings involving the CEC Administrators. • SCE has coordinated with the IEEE to inform automotive standards from lessons learned during electric vehicle-related EPIC projects. 85 percent of CEC projects had match funding, while only 4 percent of PG&E projects and 5 percent of SDG&E projects had match funding (no SCE projects). EPIC Administrator staff are loosely engaged with the DOE, primarily for information sharing purposes (but not deeper coordination). • The CEC identified in their annual report a grant funding opportunity that include a federal cost share component ("Cost Share for Federal Clean Energy Funding Opportunities"), which provides federal cost share opportunities for multiple topics, including transportation electrification. • The CEC identified in their annual report that three battery-related projects received federal cost sharing, as well. • Coordination efforts are not demonstrated in the EPIC database but are documented in annual reports.

4.4 Focus Area 4: Transparency and Documentation

The evaluation's assessment of transparency and documentation is largely informed by the three database review components as well as the comparison to EPIC Administrator annual reporting.

4.4.1 Reporting Completeness and Gaps

The review of the EPIC database reveals significant differences in the amount and quality of information available, depending on the EPIC Administrator and database element. Generally, the IOU Administrator projects (especially SDG&E projects) contain more detailed information in the EPIC database compared to projects from the CEC.

Table 4 provides statistics from the evaluation's review of the EPIC database. These values represent populated fields without a detailed assessment of the populated values themselves (the evaluation scope was unable to incorporate a review of the entire content of the EPIC database; for information regarding what the evaluation found upon reviewing 40 records in detail, see Section 6.1).

Table 4: Reporting Completeness in EPIC Database, by EPIC Administrator

Database Element	Reporting Completeness by EPIC Admin			
	CEC	PG&E	SDG&E	SCE
Project Summary	100%*	100%	100%	100%
Detailed Project Description	11%	100%	100%	100%
Project Updates	76%	29%	100%	79%
Deliverables	18%	100%	100%	100%
State Policy Support	0%	76%	100%	93%
Barriers (one or more type provided)	31%	92%	100%	98%
Projected Project Benefits	84%	96%	100%	88%
Rate Payer Benefits	11%	73%	57%	33%
Impacts (one or more type provided)	41%	90%	100%	90%
Getting to Scale	27%	92%	100%	76%
Key Learnings	15%	76%	100%	62%

*two of 498 CEC projects did not have project summaries

During the evaluation's deep dive of 40 EPIC projects, which encompassed a more detailed review of reported information, the evaluation found that documentation of assumptions that support impact statements are often lacking or nonexistent. The deep dives also highlighted that information in the EPIC database may be in the wrong location in certain instances, along with other inconsistencies (e.g., the Project Update field for a "closed" project indicating a forthcoming report, with no report present and no subsequent update).

4.4.2 Database Comparison to Annual Reports

The evaluation sought to validate EPIC Administrator annual reports with the content of the EPIC database. All EPIC Administrators stated that the EPIC database is not the source of the content for their annual reports—they rely on other internal databases that they pull from for the reports. As a result, when comparing the database information with annual reports, several discrepancies emerged:

- **Southern California Edison (SCE):** The database consistently shows higher funding amounts than those in the annual report. There are also minor inconsistencies throughout, but notably, the Project Update field is regularly updated, although after a project is closed it only shows a final project summary.
- **Pacific Gas and Electric (PG&E):** For a sample of projects reviewed and compared against the content of the annual report, the database only includes the most recent annual report updates in the Project Update field, without retaining historical update information. This is more a function (or failing) of the database as there exists no place to retain prior updates. PG&E stated that it relies on its internal systems for reporting, manually copying data into the EPIC database, which introduces potential errors. To avoid inaccuracies, it uses SAP financial data for annual reports instead of what is present in the database, leading to minor discrepancies.
- **San Diego Gas & Electric (SDG&E):** There are minor inconsistencies, such as one project that is incorrectly marked as incomplete in the database but as complete in the annual report.
- **California Energy Commission (CEC):** The comparison of CEC database records with the annual report shows more substantial issues compared to the IOUs. Some projects listed in the CEC's annual report Appendix C are missing from the EPIC database, and vice versa. Discrepancies also exist in the reported project statuses between the database and the annual report, making it challenging to reconcile funding figures.

Overall, the review highlights a need for improved integration and consistency in how project data are managed and reported across different EPIC Administrators. Addressing these issues will help enhance the accuracy and transparency of the EPIC database and alignment with the annual reports.

The CPUC study managers highlighted as a priority that the EPIC database and annual reports should be aligned, and they currently are not in alignment. Achieving alignment will require investigating two specific opportunities: 1) automating data transfers from the IOUs and 2) project reconciliation by the CEC and the PICG across the EPIC database and Energize Innovations database (or the CEC must *ensure* that the EPIC database is also updated).

If the database is up-to-date and populated through more automated means, there should be no reason that the EPIC Administrators would be unable to follow the CPUC's requirement that written annual reports and database entries are fully consistent and accurate.[12]

[12] D.23-04-042, OP 8.

4.4.3 Summary of Evaluation Findings for Transparency and Documentation

The evaluation's initial pass at assessing transparency and documentation led to major concerns regarding CEC compliance, especially pertaining to fields related to project impacts or barriers (although many other fields were found to lack information, as well). Notably, 69 percent of CEC project records in the EPIC database do not identify a barrier, and 59 percent do not identify impacts. During the evaluation, the CEC informed the evaluation team that this information is available in the CEC's Energize Innovation database but not in the data that they regularly transfer to the PICG (the CEC's PIMS database). Upon review, the evaluation uncovered that much of the information required by D.13-11-025 was not reported in the EPIC database. A cursory review found that the CEC has been tracking some of the relevant information that is missing in the CPUC's EPIC database in the CEC's Energize Innovation database.[13] The CEC has informed the PICG that the data exist. The CEC should coordinate with the PICG to facilitate transfer of existing information to the EPIC database from Energize Innovations. The CEC must ensure that these data are provided to the PICG on a regular basis so that the EPIC database is up to date and complete.

Additionally, consistent reporting of assumptions and analysis methodologies—ideally as prescribed by the CPUC in its efforts to deploy a uniform impact analysis framework for EPIC—is needed to improve the transparency of stated impacts.

Table 5 provides the list of detailed research questions for Focus Area 4: Transparency and Documentation. Importantly, the current EPIC database is not demonstrably up to date or complete, and to provide increased transparency also requires some re-working.

Table 5: Focus Area 4: Transparency and Documentation

Transparency and Documentation Research Questions	Research Findings
Is the database demonstrably up to date, complete, and understandable to inform both individual project status and overall program accomplishments to support its CPUC annual reporting requirements?	• The database is <u>not</u> demonstrably up to date or complete. IOU project information is considerably more up to date and more complete than found for CEC projects. • Project status tracking is handled in a single field that is overwritten with every subsequent update, which should be a focus of improvement.

[13] While the evaluation did not include an in-depth review of the content of the CEC's Energize Innovation database (or a comparison of the database to the CPUC's EPIC database), many relevant fields were found to be populated for projects in the Energize Innovation database that were not populated for the same projects in the CPUC's EPIC database.

	• Overall program accomplishments are very difficult to ascertain as impact fields lack consistency and assumptions are not always documented. • All EPIC Administrators rely on other sources for developing annual reports.
How does the database convey EPIC project outcomes including scaling, deployment, commercialization, research impacts, and off-ramping?	• The EPIC database does contain a field to document EPIC Administrator perceptions of scalability, but assumptions are not always present. • The database does not document post-project outcomes such as deployment, commercialization, etc. • It is unclear how lessons from off-ramped projects are leveraged in the future. Furthermore, it is hard to determine which projects are ended before completion.
How does the database convey investments, impacts, and benefits to ratepayers, particularly ESJ/Disadvantaged/Low-Income communities, and in compliance with CPUC orders?	• EPIC project funding information is largely complete, based on the evaluation's comprehensive review of the database. • IOU projects have more information regarding impacts than CEC projects, which are found to be in the Energize Innovations database. • The database contains a flag for whether a project has impacts in a DAC or low-income area, but the evaluation finds two issues with this approach. First, impacts are not binary, and the database does not allow for any nuance or proportional impact into a DAC or low-income area (i.e., there is no place to estimate a percent of project impacts in ESJ communities). Second, there is no specific place to document assumptions used by EPIC Administrators to assess whether a project has impacts in DACs or low-income areas, so the rationale for assuming impacts in these communities is unavailable to assess.
How does the database convey information on off ramping of deprioritized projects and lessons learned? How does the database transparently convey EPIC project overhead and administrative costs?	• It is unclear how lessons from off-ramped projects are leveraged in the future, based on the database. • PG&E stated that it develops a final project report for all projects, including off-ramped projects. • The EPIC database contains a field for administrative and overhead costs, which is largely populated. The evaluation did not assess whether the values are accurate.
What improvements, if any, should be made to the database to support program progress, impacts, evaluation, oversight, and ability to serve as a resource to a broad	• Please refer to Section 7.2 Evaluation Recommendations for detailed recommendations aimed at improving the EPIC database.

spectrum of stakeholders, including demonstrating impacts of electrification via coordination with gas R&D projects and strategies?	

5 Insights and Guidance from the US DOE

The evaluation also included interviews with representatives from the US Department of Energy to better understand lessons from their research and development processes.

5.1 U.S. Department of Energy on Documenting Impacts

The U.S. Department of Energy (DOE) provided insights into impact documentation, emphasizing the importance of a strong compliance culture and adaptability in achieving impacts. DOE's strategies focus on flexibility and strategic engagement with communities and recommended similar approaches for EPIC to enhance impact assessment, particularly in DACs.

The DOE representatives also stated that there is a position within the Office of Electricity akin to a Chief Operating Officer, or COO. The COO is tasked with ensuring all the research work is done under a strong controls environment and culture of ensuring compliance and impact. They are responsible for ensuring every person and project is compliant without requiring everyone to focus on compliance on their own. According to the DOE, this has worked well in navigating the intersection between research and business operations inherent in publicly funded R&D involving private companies.

While not directly addressed by the DOE representatives, the CPUC may want to consider adopting elements of this role to ensure improved compliance with EPIC requirements by EPIC Administrators. For EPIC, each EPIC Administrator is currently responsible for overseeing their own individual projects. The CPUC may wish to consider mechanisms to improve project-level oversight to ensure a stronger controls environment.

5.2 Timeliness Guidance from DOE

The DOE offered valuable guidance on balancing oversight and progress. DOE representatives emphasized the importance of focusing on outcomes rather than outputs, suggesting that rigid metrics can become irrelevant and hinder progress. Instead, outcomes should be adaptable to the changing pace of technology. The DOE representatives also highlighted the need for effective communication and incentives (such as prizes) to ensure real-time information sharing about projects, particularly those that do not proceed as planned. Tracking milestones was deemed useful but should be flexible, with justifications required for any deviations from the original plan. Despite the need for flexibility, compliance requirements are needed to keep projects on a path, and removing funding for projects that are found to be non-compliant is reasonable.

5.3 DOE's Coordination with EPIC

The DOE has shifted its focus from direct engagement and coordination with the CEC towards providing transparent access to information across the country. While the DOE representatives stated that the DOE values EPIC's contributions, especially in areas such as risk science (e.g., wildfire mitigation) and grid modernization (e.g., microgrids), and appreciates California's leadership in addressing both technical and social aspects of energy justice, its national breadth limits its ability to go as deep on projects with the CEC (or the IOUs) as it had in the past. IOU EPIC Administrators mentioned limited engagement with the DOE, as well (PG&E mentioned sharing some of its activities with the DOE, for example).

5.4 Energy Justice

Representatives from the DOE stated that energy justice is a growing priority for the), with a focus on both technical needs and social impacts. They stated that California is seen as a leader in this space. A key challenge noted by the DOE is assessing the impacts on disadvantaged communities (DACs), even with Justice40's directive to allocate 40% of benefits to these areas. There is a push for developing metrics to gauge the benefits delivered to DACs, but much of the impacts are noted to be judgment-based, involving meaningful community engagement. The impacts of this type of engagement are not quantified (or, as stated, "quantifiable"), and the representatives noted specifically that it is hard to measure this type of strategic intent.

However, recently, the Pacific Northwest National Laboratory (PNNL) has completed an initial attempt to establish a best practice for estimating impacts of projects in ESJ communities for the Federal Justice40 Initiative.[14]

[14] Pacific Northwest National Laboratory recently provided guidance related to the Federal Justice40 Initiative regarding how to estimate impacts in ESJ communities that could be adapted for EPIC projects. "Energy Justice and Equity in Deployment Programs." https://www.pnnl.gov/projects/energy-equity/deployment-programs.

6 Reporting Review – Additional Findings

6.1 Evaluation Deep Dive Project Review Summary

The evaluation included a review of a selection of 40 completed EPIC projects. The deep dive review confirmed that the IOUs tend to provide thorough and complete reporting of projects in the database, while the CEC exhibits a noticeable pattern of incomplete, inconsistent reporting (in part due to the use of the Energize Innovations database).

Table 6 provides a detailed summary of the review findings for each project. The evaluation team assessed each project using the following criteria:

- Clarity of Project Purpose
- Clarity of Project Outputs and Outcomes
- Clarity of information dissemination strategy and plans for next steps
- Accurate Start and End Dates
- Consistency of timeline and text
- Completeness of all database fields
- Completeness of project financial data (including overhead for project with layered administration)
- CPUC Proceeding Coordination
- Quantitative Impacts
- Impact Methodology, Data, and Assumptions provided

Beyond completeness, there are other common issues across all EPIC Administrators' entries. In some cases, projects flagged as having impacts in low-income or DACs do not appear to have significant impacts in these areas. For instance, some projects that produced research papers are labeled as impacting low-income communities or DACs, while other entries list concrete benefits in these communities. It seems that the criteria for this designation are applied inconsistently across different EPIC Administrators and projects. Secondly, while many projects quantify impacts, none of the 40 reviewed projects sufficiently list the assumptions that led to the stated impacts.

The CEC has several major issues in reporting. While some CEC entries are thorough and most benefits, impacts, key information, and barriers fields are populated, many project records are lacking information beyond the project summary, project update, and one or two other fields. Among the CEC projects reviewed, there are numerous instances in which the project summary and project update fields are completed in detail along with non-greenhouse gas (GHG)

environmental impacts and projected project benefits. Often these completed fields state specific impacts and benefits that point to the effectiveness and rigor of the project. However, the remaining benefits, impacts, key information, and barriers fields are left blank. There are instances in which the CEC could copy impacts listed in the project update to the relevant impact fields, completing the database entry. This issue may be indicative of a larger database mapping issue between the CEC's PIMS database and EPIC database, and the presence of significant information in the Energize Innovations database that is not populated in the EPIC database.

There are three final issues with CEC reporting. First, there are several instances of the CEC listing GHG impacts under the non-GHG environmental impacts field; the meaning seems to have been misinterpreted or there is a database mapping issue. Secondly, many project updates mention that a final report is forthcoming and/or that work is ongoing, even though the project is listed as closed. This leads to confusion about project duration and status. Finally, many project summaries and project updates mention how results have been shared publicly, but the CEC left the information dissemination field blank for all sampled projects.

The overall characterization of the database from the deep dive on 40 selected projects reveals a need for improved consistency, more rigorous and frequent updating practices, and a clearer connection between project impacts and their reporting to ensure stakeholders can accurately assess the value and success of these projects. The IOU entries, though not without flaws, are relatively more consistent in terms of their reporting, but could still improve by populating all fields and listing assumptions for stated impacts. The CEC needs to update most of its entries to include impacts, benefits, barriers, and key information fields and ensure that entries are up to date.

Table 6: Summary of Deep Dive Review Findings by Reviewed Project

Project Number	Admin	Clarity of Project Purpose (Clear, Somewhat Clear, Unclear)	Clarity of Project Outputs and Outcomes (Clear, Somewhat Clear, Unclear)	Clarity of information dissemination strategy and plans for next steps (Clear, Somewhat Clear, Unclear)	Accurate Start and End Dates	Consistency of timeline and text	Completeness of all database fields (including at least one barrier, one type of impact)	Completeness of project financial data (including overhead for project with layered administration, such as CalSEED and CalTestBed)	CPUC Proceeding Coordination	Quantitative Impacts	Impact Methodology, Data, and Assumptions provided
SCE IIM-15-0012	SCE	Clear	Clear	Unclear - points to final report mentions a single presentation at a conference	Accurate	Consistent	Very Complete	Complete (budget and overhead)	No mention	Yes, some	Yes
PG&E 1.22	PG&E	Clear	Very Clear	Very Clear-no next steps	Accurate	Consistent	Complete	Complete (budget and overhead)	No mention	Yes, proved no market for product	No, just summary level and results
SCE: IM-15-0008	SCE	Clear	Very Clear	Very Clear, Excellent	Accurate	Consistent	Very Complete	Complete (budget and overhead)	No mention	Yes	Yes
PG&E 2.02	PG&E	Very Clear	Very Clear	Very Clear, Excellent	Accurate	Consistent	Very Complete	Complete (budget and overhead)	Excellent description	Yes, very detailed	No assumptions, methodology and impact described
PG&E 2.34	PG&E	Very Clear	Very Clear	Very Clear, Excellent	Accurate	Consistent	Very Complete	Complete (budget and overhead)	Excellent description	Yes	No assumptions, methodology and impact described
SDG&E EPIC 3 - Project 5	SDG&E	Clear	Clear	Unclear - final report only	Accurate	Consistent	Complete	Complete (budget and overhead)	No mention	Some	Very cursory, no assumptions

Project Number	Admin	Clarity of Project Purpose (Clear, Somewhat Clear, Unclear)	Clarity of Project Outputs and Outcomes (Clear, Somewhat Clear, Unclear)	Clarity of information dissemination strategy and plans for next steps (Clear, Somewhat Clear, Unclear)	Accurate Start and End Dates	Consistency of timeline and text	Completeness of all database fields (including at least one barrier, one type of impact)	Completeness of project financial data (including overhead for project with layered administration, such as CalSEED and CalTestBed)	CPUC Proceeding Coordination	Quantitative Impacts	Impact Methodology, Data, and Assumptions provided
SCE EPIC 1 - Project 1	SCE	Very Clear	Very Clear	Very Clear with specific KPI metrics	Not Shown	Consistent	Many impacts missing (ratepayer benefits, electricity system, environmental)	Complete (budget and overhead)	No mention	Yes	Yes
SDG&E EPIC 1- Project 2	SDG&E	Clear	Clear	Very Clear	Not Shown	Consistent	Complete	Complete (budget and overhead)	No mention	Yes	No assumptions, methodology and impact described
300-15-009	CEC	Somewhat Clear	Unclear	Unclear	Accurate	None	Barely Complete	Overhead not shown, layered funding not shown, budget and matched funding is shown	None	No	None
EPC-15-016	CEC	Clear	Clear	Unclear	Accurate	None	Barely Complete	Overhead not shown, budget and matched fundings is shown	None	Yes	None
EPC-14-085	CEC	Clear	Clear	Unclear	Accurate	None	Incomplete, No Barriers	Overhead not shown, budget and matched fundings is shown	None	Yes	None
EPC-15-003	CEC	Clear	Clear	Unclear	Accurate	None	Incomplete, No Barriers	Overhead not shown, budget and matched fundings is shown	None	Yes	None
EPC-16-017	CEC	Clear	Clear	Unclear	Accurate	Some	Incomplete, No Barriers	Overhead not shown, budget and matched fundings is shown	None	No	None

Project Number	Admin	Clarity of Project Purpose (Clear, Somewhat Clear, Unclear)	Clarity of Project Outputs and Outcomes (Clear, Somewhat Clear, Unclear)	Clarity of information dissemination strategy and plans for next steps (Clear, Somewhat Clear, Unclear)	Accurate Start and End Dates	Consistency of timeline and text	Completeness of all database fields (including at least one barrier, one type of impact)	Completeness of project financial data (including overhead for project with layered administration, such as CalSEED and CalTestBed)	CPUC Proceeding Coordination	Quantitative Impacts	Impact Methodology, Data, and Assumptions provided
EPC-15-042	CEC	Clear	Clear	Unclear	Accurate	None	Incomplete, No Barriers	Overhead not shown, budget and matched fundings is shown	None	No	None
EPC-15-018	CEC	Clear	Clear	Unclear	Accurate	None	Incomplete, No Barriers	Overhead not shown, budget and matched fundings is shown	None	No	None
EPC-14-052	CEC	Clear	Clear	Unclear	Accurate	None	Incomplete, No Barriers	Overhead not shown, budget and matched fundings is shown	None	No	None
EPC-14-079	CEC	Clear	Clear	Unclear	Accurate	None	Incomplete, No Barriers	Overhead not shown, budget and matched fundings is shown	None	No	None
EPC-15-009	CEC	Clear	Clear	Unclear	Accurate	None	Incomplete, No Barriers	Overhead not shown, budget and matched fundings is shown	None	No	None
EPC-15-010	CEC	Clear	Clear	Unclear	Accurate	None	Incomplete, No Barriers	Overhead not shown, budget and matched fundings is shown	None	No	None
EPC-14-082	CEC	Clear	Clear	Unclear	Accurate	Consistent	Incomplete	Overhead not shown, budget and matched fundings is shown	None	Yes	Some
EPC-14-024	CEC	Clear	Clear	Somewhat Clear	Accurate	Consistent	Incomplete	Overhead not shown, budget and matched fundings is shown	None	Yes	Some

Project Number	Admin	Clarity of Project Purpose (Clear, Somewhat Clear, Unclear)	Clarity of Project Outputs and Outcomes (Clear, Somewhat Clear, Unclear)	Clarity of information dissemination strategy and plans for next steps (Clear, Somewhat Clear, Unclear)	Accurate Start and End Dates	Consistency of timeline and text	Completeness of all database fields (including at least one barrier, one type of impact)	Completeness of project financial data (including overhead for project with layered administration, such as CalSEED and CalTestBed)	CPUC Proceeding Coordination	Quantitative Impacts	Impact Methodology, Data, and Assumptions provided
EPC-15-057	CEC	Clear	Clear	Somewhat Clear	Accurate	None	Incomplete	Overhead not shown, budget and matched fundings is shown	None	Yes	Some
EPC-14-046	CEC	Clear	Clear	Somewhat Clear	Accurate	None	Somewhat Complete	Overhead not shown, budget and matched fundings is shown	None	Yes	Some
EPC-14-064	CEC	Unclear	Unclear	Unclear	Accurate	None	Incomplete	Overhead not shown, budget and matched fundings is shown	None	Yes, but unexplained	None
EPC-14-031	CEC	Unclear	Unclear	Unclear	Accurate	None	Incomplete	Overhead not shown, budget and matched fundings is shown	None	None-not completed	None
EPC-14-076	CEC	Very Clear	Very Clear	Clear	Accurate	Consistent	Very Complete	Overhead not shown, budget and matched fundings is shown	None	Yes	Yes
EPC-16-007	CEC	Unclear	Unclear	Unclear	Accurate	None	Incomplete	Overhead not shown, budget and matched fundings is shown	None	None-not completed	None
EPC-14-045	CEC	Clear	Clear	Somewhat Clear	Accurate	somewhat consistent	Incomplete	Overhead not shown, budget and matched fundings is shown	None	Some	None
300-15-010	CEC	Clear	Clear	Clear	Accurate	Consistent	Complete	Overhead not shown, budget and matched fundings is shown	None	Yes	Yes

Project Number	Admin	Clarity of Project Purpose (Clear, Somewhat Clear, Unclear)	Clarity of Project Outputs and Outcomes (Clear, Somewhat Clear, Unclear)	Clarity of information dissemination strategy and plans for next steps (Clear, Somewhat Clear, Unclear)	Accurate Start and End Dates	Consistency of timeline and text	Completeness of all database fields (including at least one barrier, one type of impact)	Completeness of project financial data (including overhead for project with layered administration, such as CalSEED and CalTestBed)	CPUC Proceeding Coordination	Quantitative Impacts	Impact Methodology, Data, and Assumptions provided
EPC-14-037	CEC	Clear	Clear	Clear	Accurate	Consistent	Complete	Overhead not shown, budget and matched fundings is shown	None	Yes	Yes
EPC-17-012	CEC	Clear	Unclear	Unclear	Accurate	Inconsistent	Incomplete	Overhead not shown, budget and matched fundings is shown	None	No	None
EPC-14-054	CEC	Clear	Clear	Clear	Accurate	Consistent	Complete	Overhead not shown, budget and matched fundings is shown	None	Yes	Yes
300-15-008	CEC	Clear	Unclear	Unclear	Accurate	Consistent	Incomplete	Overhead not shown, budget and matched fundings is shown	None	Yes	None
EPC-17-024	CEC	Clear	Clear	Clear	Accurate	somewhat consistent	Incomplete	Overhead not shown, budget and matched fundings is shown	None	Yes	None
300-17-004	CEC	Clear	Somewhat Clear	Clear	Accurate	Consistent	Incomplete	Overhead not shown, layered funding not shown, budget and matched funding is shown	None	Yes	None
300-15-013	CEC	Clear	Clear	Clear	Accurate	Consistent	Complete	Overhead not shown, budget and matched fundings is shown	None	Yes	Yes
300-17-003	CEC	Clear	Clear	Somewhat Clear	Accurate	Consistent	Complete	Overhead not shown, budget and matched fundings is shown	None	Yes	Yes

Project Number	Admin	Clarity of Project Purpose (Clear, Somewhat Clear, Unclear)	Clarity of Project Outputs and Outcomes (Clear, Somewhat Clear, Unclear)	Clarity of information dissemination strategy and plans for next steps (Clear, Somewhat Clear, Unclear)	Accurate Start and End Dates	Consistency of timeline and text	Completeness of all database fields (including at least one barrier, one type of impact)	Completeness of project financial data (including overhead for project with layered administration, such as CalSEED and CalTestBed)	CPUC Proceeding Coordination	Quantitative Impacts	Impact Methodology, Data, and Assumptions provided
EPC-15-076	CEC	Clear	Clear	Very Clear	Accurate	Consistent	Complete	Overhead not shown, budget and matched fundings is shown	None	Yes	Yes
300-15-007	CEC	Unclear	Unclear	Unclear	Accurate	Inconsistent	Incomplete	Overhead not shown, layered funding not shown, budget and matched funding is shown	None	Somewhat (grants were provided)	None
EPC-18-002	CEC	Unclear	Unclear	Unclear	Accurate	Inconsistent	Incomplete	Overhead not shown, layered funding not shown, budget and matched funding is shown	None	Somewhat (grants were provided)	None

6.2 Reporting and Tracking Deficiencies

The EPIC project database is a positive step towards transparency for the EPIC program. However, there are several issues that exist with the current database, including with the use of a separate database by the CEC, inconsistent EPIC Administrator documentation of project rationales within the database, and the static structure of the database's update fields.

6.2.1 CEC Database Completeness and Energize Innovations

While the EPIC database lacks information regarding CEC projects, the CEC's Energize Innovations database holds a substantial amount of the information that is missing from the EPIC database. Discussions with the PICG suggest that integrating this missing information directly from the CEC could greatly enhance the transparency of EPIC project outcomes and address barriers, particularly for CEC-related projects.

To resolve the issue of missing information in the EPIC database for CEC project impacts, the evaluation finds that the CEC must work with the CPUC to ensure project benefits documentation is included in the EPIC database (not just Energize Innovations).

6.2.2 Project Selection Process and Documentation

Across all EPIC Administrators, project screening and selection is universally emphasized as a critical step taken to ensure alignment with EPIC goals and other relevant CPUC decisions (as asserted by the EPIC Administrators). However, there are gaps in EPIC Administrator reporting that affect the transparency and rationale of project selection.

The following evidence from the interviews supports that screening and selection information may be valuable in assessing EPIC project alignment with EPIC goals and proceedings and for transparency regarding pre-project impact potential rationale:

- **Southern California Edison (SCE)** stated that it employs a rigorous Project Governance Process, including a stage gate process[15] for evaluating projects before and during their execution. This process helps identify and address underperforming projects but lacks detailed public documentation of how project selection aligns with EPIC goals.
- **Pacific Gas and Electric (PG&E)** stated that it uses upfront screening criteria to assess project feasibility and alignment with EPIC goals. This includes a focus on potential quantitative benefits and the exclusion of projects that do not meet their criteria.

[15] A "stage gate process" is a project management method used to guide a project from conception to completion through a series of stages or phases. Each stage ends with a "gate," where the project's progress is evaluated against predefined criteria. Decisions are made at each gate to either continue to the next stage, modify the project, or stop it altogether

Despite this, PG&E acknowledges that there is potential for greater transparency in how projects are selected and assessed.

- **San Diego Gas & Electric (SDG&E)** stated that it filters prospective projects based on business needs and EPIC mission alignment, considering lower operational costs as a primary benefit. However, there is limited documentation on the rationale for project selection beyond high-level alignment.
- The **California Energy Commission (CEC)** stated that an initial step is filtering projects based on their potential benefits and alignment with EPIC goals. Despite this, the database lacks detailed explanations of project selection and impacts, particularly concerning impacts to DACs and low-income areas, so the documentation of their screening is not currently captured and presented transparently within the EPIC database.

The CPUC does not require the EPIC Administrators to provide documentation regarding how and why projects are selected—information that the EPIC Administrators stated that they are tracking. This gap limits transparency and may hinder understanding of how selected projects align with EPIC goals and how they are understood to have impacts in ESJ communities, which may be resolvable through adding a project justification section or field to the database (for example).

6.2.3 Project Implementation Progress Tracking

The evaluation's review of the EPIC database revealed limited insights into project-level timeliness issues as project stages are not tracked. As a result, the evaluation's database review was limited to focusing on overall project durations and the presence of information related to project scalability.

A notable issue identified by the evaluation is the way project updates are handled. Currently, updates are recorded in a single field that gets overwritten with each new entry, erasing previous updates. The evaluation team is concerned that this conceals lessons learned during the project implementation that may be valuable to future projects intending to build on what was done in the past.

Implementing a system where updates are tracked sequentially, preserving the full history of each project, would significantly improve transparency and accessibility for both evaluators and the public. Alternatively, tracking projects based on the metrics already used by the EPIC Administrators (i.e., project tasks and/or milestones) would greatly enhance the transparency of EPIC project progress and how funds are being spent to meet objectives.

Introducing a system where the CPUC could oversee and (potentially) require justifications for continued project funding in the absence of meeting agreed-upon milestones could foster

greater accountability and a better understanding of project challenges and successes with respect to moving innovation to deployment.

6.3 Challenges Using the EPIC Database

All EPIC Administrators mentioned challenges with the database related to the front-end usability and functionality (i.e., keyword searches failing, etc.). One IOU Administrator reported that they do not use the online database (i.e., to learn about projects from other EPIC Administrators) due to these types of challenges. The evaluation team faced similar challenges and have brought up many of them with the PICG.

IOU EPIC Administrators also mentioned that manual updates are time consuming and duplicative to what they are tracking. CEC EPIC Administrators track project information primarily in its Energize Innovations database and the PIMS database, and only the PIMS database is transferred to the PICG for inclusion in the EPIC database. Some back-end database work may be worthwhile to remedy both issues so that the IOUs do not have to rely on manual updates and so that information contained in the Energize Innovations database (and possibly from other CEC datasets, such as its project solicitation database) is available in the EPIC database.

Lastly, the database does not fully support transparency. However, reasonably straightforward updates (e.g., to the way it captures impacts in ESJ communities and how it tracks project updates) will aid in increasing overall transparency around important metrics and project statuses (especially with the consistency improvements from deploying a uniform impact analysis framework).

7 Conclusions and Recommendations

7.1 Evaluation Conclusions

Across the four evaluation focus areas, two core findings came up repeatedly:

1. **The California Energy Commission (CEC) utilizes its Energize Innovations database to document metrics required for inclusion in the California Public Utilities Commission's (CPUC's) Electric Program Investment Charge (EPIC) database.** This practice results in many of the CEC's EPIC-funded projects not having complete or all relevant information in the EPIC database, and it is not possible to substantiate the information in the CEC's annual reporting with the information in the EPIC database. Although Energize Innovations covers many gaps, some crucial data points are still missing, which need to be addressed by the CEC directly.

   As a result of the CEC's use of the Energize Innovations database instead of the CPUC's EPIC database, the Evergreen team concludes that the CEC's administration of EPIC requires adjustment to comply with various CPUC decisions. However, much of the information is reported to exist, and the CEC stated that it is willing to work with the PICG and the CPUC to address the deficiency in overall transparency.

2. **The CPUC's EPIC database suffers from numerous structural and operational issues that impede its effectiveness.** While some of the issues have been addressed alongside the evaluation (such as issues with the filtering function), as other database modifications might be made because of this evaluation, we also recommend that the PICG troubleshoot the database and make appropriate updates to fix operational issues.

   Database functionality issues make the EPIC project documentation harder to find and decrease the overall effectiveness (and intent) of the database documentation effort. To the degree that the PICG needs additional resources to update and continuously manage (or improve) the EPIC database, we believe those resources are justified and would result in significant improvements to the range of database users (including ratepayers).

Additionally, the evaluation finds that EPIC Administrators are mindful of EPIC requirements and California's statutory clean energy goals, including equity considerations, when selecting projects. The CEC employs a scoring rubric and publishes project concept scoring on its website. The current lack of detailed information in the EPIC database about project alignment with California's goals can create confusion, however the EPIC Administrators do document project and overall program linkages to EPIC requirements and California's goals in their annual reports.

Furthermore, documentation about the impacts of EPIC projects, particularly in ESJ communities, is often lacking. While the database allows projects to be flagged as having impacts in ESJ communities, EPIC Administrator documentation in the database does not include detailed explanations or narratives of how the impacts are determined. There is a need for a more comprehensive system to document assumptions and estimate the proportions of impacts within ESJ communities. Implementing uniform methods for documenting these impacts across all projects would enhance overall transparency and understanding of the program's effectiveness.

Quarterly project updates are not consistently recorded as required, and the database currently overwrites prior updates, which severely restricts the ability to track project progress over time. This limitation and lack of consistent reporting makes it difficult to monitor compliance and assess whether projects are advancing on schedule or facing delays. For example, EPIC Administrators have mechanisms to terminate unsuccessful projects, but the database does not effectively reflect these terminations. Additionally, the contracting process often extends to a year due to intellectual property issues, and efforts should be made to expedite this process to avoid delays in project implementation.

Currently, there is limited systematic tracking of longer-term outcomes and market transformation impacts stemming from EPIC projects. While some immediate project-level output metrics are tracked (as well as forecasted broader impacts), detailed methodologies for measuring and attributing these impacts are lacking. No administrator presents a comprehensive framework for evaluating holistic, program-wide market transformation outcomes or demonstrates systematic tracking of technology adoption after project completion. This pattern suggests that while administrators can demonstrate project-specific achievements, they lack robust mechanisms for tracking and measuring broader, long-term program impacts.

Lastly, while the COVID-19 pandemic unfortunately caused supply chain disruptions that led to project delays, these issues have largely been resolved. The EPIC program should remain alert to prevent any remaining supply chain problems from affecting future projects.

7.2 Evaluation Recommendations

Several recommendations are proposed to help address these issues, with a focus on improving transparency and consistency. These recommendations, in Table 7, are focused on practical and actionable course corrections and serve as a path forward for the EPIC program.

Table 7: Evaluation Recommendations

Recommendation	Detailed Recommendation and Substantiation
1. The CEC must ensure that the EPIC database is updated and complete, in line with CPUC decisions.	The PICG should work with the CEC to facilitate the transfer of information from Energize Innovations to the EPIC database, leveraging the data available in Energize Innovations to fill gaps in the EPIC records. A discussion between the PICG and the CEC is needed to determine if future updates from Energize Innovations should automatically populate the EPIC database. Additionally, for fields not tracked in Energize Innovations or the CEC's PIMS database, the CEC should either manually update these fields in the EPIC database or create and update them in PIMS or Energize Innovations. The CPUC and PICG should be open to accommodating an efficient workflow to meet these objectives, potentially avoiding manual updates if a better solution exists. Furthermore, the CEC collects information during a project solicitation phase that is relevant to alignment with EPIC goals; these data should be made available to the PICG so that it can populate appropriate data fields in the EPIC database. For fields that are required but are not tracked in the Energize Innovations database or the CEC's PIMS database, the CEC needs to either manually update these fields in the EPIC database or create the fields in PIMS or Energize Innovations and update them there. Missing required information without a plan to provide the information is not tenable. The CPUC and PICG should be open to accommodating a workflow from the CEC that meets this objective in an efficient manner (i.e., not requiring manual updates if another solution is possible).
2. The PICG should explore whether the more automated data population process used for CEC projects can be adapted for IOUs.	Manual data transfers between IOU internal databases and the EPIC database have led to minor inconsistencies between the database and annual reports, and manual population of database fields is time consuming and creates the potential for introducing human error. If adapting this process is determined to be infeasible, the IOUs should ensure their annual reports align with the EPIC database through manual review. Any discrepancies should be corrected by updating either the annual report or the database content, as needed.
3. The EPIC database should include a Project Justification section for each project.	Project justification information is not always readily available and to determine how a project fits within the parameters of EPIC requires too much effort on the part of the reviewer. The IOUs and CEC all state that they put a lot of effort into project screening and

	selection and require project justification information in alignment with EPIC goals. This information should be shared in a consolidated fashion for all projects going forward to enhance transparency with respect to why projects deserve ratepayer funds. This section should be populated by the project type variable and should include checkboxes for the five EPIC goals, requiring at least one goal to be selected. Additionally, projects should be linked to CPUC proceedings within this section, and a narrative field should be added to describe other criteria used for project selection, including prospective ratepayer benefits and the assessed likelihood of project success (and what success means).
4. The EPIC database should include a field for ESJ community impacts narratives.	The current DAC and Low-Income checkboxes are insufficient for documenting ESJ community impacts. The EPIC database should include a narrative field for detailing potential or realized impacts in ESJ communities. Projects should be required to estimate the ***percentage of funds and impacts*** occurring in ESJ communities and should document all assumptions. The EPIC program may want to consider leveraging work done by the Pacific Northwest National Laboratory (PNNL) to establish a consistent framework to estimate impacts of projects in ESJ communities for the Federal Justice40 Initiative.[16]
5. The "Project Updates" field should be replaced to allow for more actionable oversight by the CPUC and to increase accountability for EPIC Administrators and specific projects.	• One option is to track quarterly updates without overwriting prior quarterly updates. The public-facing side of the database should show the most recent update and offer an expandable view of all updates. • A superior option would be to replace Project Updates with Milestones, reflecting the stage gate approach used by EPIC Administrators. Each project should have defined milestones. The CPUC should consider a first milestone (Milestone 1) focusing on setting up the project in the EPIC database. Subsequent milestones should be flexible but could require CPUC approval if dates are adjusted. Projects stopped before completing all milestones should have a "Reason for Project Stoppage" field to document the reasons and learnings from the project's termination, such as why the project was unable to reach the next milestone.

[16] Pacific Northwest National Laboratory recently provided guidance related to the Federal Justice40 Initiative regarding how to estimate impacts in ESJ communities that could be adapted for EPIC projects. "Energy Justice and Equity in Deployment Programs." https://www.pnnl.gov/projects/energy-equity/deployment-programs.

6. Add an EPIC project compliance oversight role within the CPUC.	Ongoing oversight of EPIC Administrator programs at the project-level is necessary to ensure compliance with CPUC decisions and to provide greater accountability to the overall EPIC Program. According to the DOE, this has worked well in establishing a culture of compliance while not overburdening individuals involved in deploying research and development projects.
7. Consider whether measuring the success of the CEC's entrepreneurial ecosystem projects against commercialization and technology development metrics is sufficient.	The CEC requires that entrepreneurial ecosystem supported projects are aligned topically with EPIC goals. However, the ecosystems track and report impacts (i.e., commercialization and technology development metrics) that are different from other EPIC projects. The CPUC should consider whether funding entrepreneurs that are topically aligned with EPIC goals fits within the overall objectives of the EPIC program. If it does, the CPUC needs to consider whether measuring ecosystem impacts based on commercialization and technology development metrics is sufficient. The CEC may be required to provide more information about the entrepreneurs if other impact metrics are required to substantiate the benefit of the ecosystems.
8. Establish a structured process for documenting longer term EPIC program outcomes and impacts.	The CPUC and EPIC Administrators should continue work to establish a standardized, comprehensive framework for tracking mid-term outcomes and long-term impacts[17] that extend beyond project completion. This framework should require administrators to: (1) develop specific methodologies for measuring and attributing impacts, particularly in disadvantaged communities; (2) implement consistent post-project monitoring protocols for technology adoption and market transformation outcomes; and (3) regularly report on longer-term metrics through a formal tracking system. Additionally, the CPUC should establish clear timeframes for post-project monitoring (e.g., 3-5 years after completion) and require annual updates on mid-term outcomes and long-term impacts in future EPIC annual reporting cycles. Importantly, the outcomes and impacts should align with EPIC objectives (safety, reliability, affordability, environmental sustainability, and equity).

[17] See slide 4 for definitions of mid-term outcomes and long-term impacts as defined by the CPUC: https://www.epicpartnership.org/resources/ImpactAnalysisKickoff_Beck.pdf

Appendix A: Project Deep Dives

The evaluation included a review of a selection of 40 completed EPIC projects, which is summarized in Section 6.1 Evaluation Deep Dive Project Review Summary. Full summaries of each reviewed project, including the evaluation's assessment of each project's reporting, are provided in this appendix. Table 8 provides a table of contents for the appendix.

Table 8: Deep Dive Project List

EPC-15-018	Pilot Testing of Eos' Znyth Battery Technology in Distributed Energy Storage Systems	76
EPC-14-052	Community Scale Digester with Advanced Interconnection to the Electrical Grid	78
EPC-14-079	Assessing the Ability of Smart Inverters and Smart Consumer Devices to Enable more Residential Solar Energy	80
EPC-15-009	Workforce Instruction for Standards and Efficiency (WISE)	81
EPC-15-010	Expanding Energy-Related Career Pathways in the Electrical Industry	82
EPC-14-082	Advancing Biomass Combined Heat and Power Technology to Support Rural California, the Environment, and the Electrical Grid	84
EPC-14-024	Modular Biomass Power Systems to Facilitate Forest Fuel Reduction Treatment	86
EPC-15-057	Customer-controlled, Price-mediated, Automated Demand Response for Commercial Buildings	88
EPC-14-046	Lowering Food-Waste Co-digestion Costs through an Innovative Combination of a Pre-Sorting Technique and a Strategy for Cake Solids Reduction	90
EPC-14-064	Aerosol Impacts on the Hydrology and Hydropower Generation in California	92
EPC-14-031	Pollution Control and Power Generation for Low Quality Renewable Fuel Streams	93
EPC-14-076	Raw Wastewater Filtration to Increase Organic Removal Efficiency and Achieve Significant Electrical Savings	94
EPC-16-007	Optimization of Energy Efficiency to Achieve Zero-Net Energy in Multifamily and Commercial Buildings	96
EPC-14-045	Advanced Recycling to 1-MW Municipal Solid Waste of Electricity Generation	98
300-15-010	Research Roadmap for Advancing Technologies in California's Industrial, Agricultural, and Water Sectors	100
EPC-14-037	Home Energy Efficiency Retrofits in California: An Analysis of Sociocultural Factors Influencing Customer Adoption	102
EPC-17-012	Biomass-to-Electricity: Pilot-Scale Testing of Baseload Compared to Flexible Power	104

Project 1: SCE IIM-15-0012
Project Name: Next-Generation Distribution Equipment & Automation – Phase 2
Project ID: 132491
Project Start Date: 5/30/2016
Project End Date: 3/31/2023
Administrator: Southern California Edison (SCE)
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☒ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$7,163,694	$0	$6,631,798

The Next-Generation Distribution Equipment & Automation – Phase 2 project focused on technologies that are applicable to overhead and underground circuits and aimed to provide solutions to improve system reliability. The project was selected for review because it was one of two long term SCE projects and one of five high dollar projects. This project was a second phase and built on prior lessons learned from phase one. Phase two was focused more on integrating advanced control systems, modern wireless communication systems, and other distribution equipment and sensing technology to standardize this process.

The project update expected a final report to be completed in Q1 2023 and the information dissemination field in the database points to a final report. It also appears that the findings for the remote intelligent switch use case was presented at an industry conference in February 2022. SCE estimates that remote intelligent switches that rapidly locate and isolate faults could reduce customer interruptions by 36% and the duration of interruptions by 40%, but do not cite their assumptions for the claims. They recommend moving to a small-scale rollout to further test the technologies.

In the database, electricity system reliability impacts, electricity system safety impacts, ratepayer benefits, infrastructure cost benefits, and other benefits were updated thoroughly.

Other impact fields, such as non-GHG environmental impacts, community benefits impacts, energy impacts were marked as non-applicable with a note that they did not foresee any benefits specific to those categories.

Project 2: PG&E 1.22
Project Name: EV Submetering/ Plug-In Electric Vehicle Submetering Pilot
Project ID: 33014
Project Start Date: 11/13/2013
Project End Date: 11/26/2019
Administrator: Pacific Gas & Electric
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☒ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 2,299,078	$0	$ 2,299,078

The EV Submetering/ Plug-In Electric Vehicle Submetering Pilot project aimed to demonstrate the use of EV submetering to provide EV owners access to electricity at a less expensive electric rate. This project was selected because it was the only long term (5+ year) project for PG&E (out of the projects that met selection criteria).

While the demonstration was not successful in its third-party EV submetering goals, the project did identify specific areas for improvement and came to conclusions that will inform submetering protocol. The project deliverables column of the database provided only the end result and main finding that there is currently no path forward. This due to the high error rate and complexity associated with third-party submetering. This burden prevents real ratepayer benefits for this technology. Key Learnings showed that improved submetering accuracy standards, robust communication standards and proper data verification and validation procedures would be necessary for future developments of this technology. PG&E seems to have interpreted deliverables as key findings, rather than any work products or reports.

PG&E was thorough, consistent, and specific in their documentation of key findings and barriers. Lessons learned were documented for each task. The tense and timeline of the impacts listed was consistent with project updates and the latest project information (e.g. the

Energy Impacts were reflective, “If submetering were feasible customers could have timed charging to achieve load reduction”).

While no discrepancies were identified, it seems noteworthy that the committed funding amount exactly matched funds expended to date, $2,299,078.

Project 3: SCE: IM-15-0008
Project Name: Integrated Grid Project II
Project ID: 32504
Project Start Date: 12/31/2016
Project End Date: 12/30/2021
Administrator: Southern California Edison (SCE)
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☒ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$21,636,023	$0	$18,731,666

The Integrated Grid Project II project demonstrated new control systems to operate DERs (Distributed Energy Resources) to test and learn about the effects of different conditions on grid reliability and stability. The project was selected for review because it was one of two long term SCE projects and one of five high dollar projects. This project is the second phase of a prior grid integration project (also detailed above) and picks up where that left off, which was testing of protocols and systems. This phase went further to focus on the effects of actual demonstrations and testing in-field.

Key learnings in the database noted that the participants were all customers with newer inverter equipment and were limited to a 4-square mile in Santa Ana, CA. These limitations likely bias the data and introduces questions of equity and scalability. The database reports that scalability will be the next challenge to explore to ensure the gaps and complication with scaling are well understood before a broader roll out.

The project findings were disseminated in several ways. The database cites six different conferences and two publications (DOE Solar Energy Technologies Office and Technical Advisory Committee). SCE estimates that the infrastructure benefits of this technology could lead to cost-savings and recovery of more than $400 million in planned Grid Modernization investments by 2040. They also estimate that it could provide an additional $300 million in

savings by 2045, assuming that they could continue to defer projects by using this technology. Neither impacts documented assumptions for these estimates.

In the database, electricity system reliability impacts, electricity system safety impacts, ratepayer benefits, infrastructure cost benefits, and other benefits were updated thoroughly. Other impact fields were marked as non-applicable.

Project 4: PG&E 2.02
Project Name: Pilot Distributed Energy Resource Management Systems (DERMS)
Project ID: 33018
Project Start Date: 9/14/2015
Project End Date: 1/30/2019
Administrator: Pacific Gas & Electric
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 6,785,304	$ 419,000	$ 6,785,305

The Pilot Distributed Energy Resource Management System (DERMS) project administered by PG&E is intended to demonstrate the feasibility of utilizing a 3rd party software platform that integrates a portfolio of Distributed Energy Resources (DER) in the form of behind the meter solar + storage and utility storage to be dispatched within the CAISO wholesale market. While the demonstration of the DERMS platform was successful in providing aggregate dispatch as well as voltage and current modulation, in various configurations and under normal and abnormal conditions, the result of the demonstration was that there is not a DERMS platform that is developed sufficiently to allow for the type of system controls that PG&E envisions. This project was selected because it is the highest dollar funding that met criteria.

The project design involved a regional selection of existing residential sites but became revised as it was determined that 3rd party ownership of many of these systems prevented program participation. While the project update field was left blank there was significant entry into the lessons learned which expressed considerable shortcomings in uniform standards, grid-monitoring and regulations for the design of an effective DERMS system.

The DERMS project revealed systemic barriers to adoption and integration of aggregate DER systems for integration as Multi-Use Application platforms. Subsequent EPIC programs were developed and initiated as a result of these identified shortcomings. It is unclear from the

database entries if specific recommendations were developed surrounding identified regulatory concerns though a recommendation was made to engage with regional permitting authorities.

Project 5: PG&E 2.34
Project Name: Predictive Risk Identification with Radio Frequency (RF) Added to Line Sensors
Project ID: 33035
Project Start Date: 8/9/2017
Project End Date: 9/29/2020
Administrator: PG&E
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☒ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 3,897,352	$0	$ 3,897,352

The Predictive Risk Identification with Radio Frequency (RF) Added to Line Sensors project installs remote sensing equipment for the monitoring of power line fault prediction and intervention maintenance activity. A proposed system that included both localized RF detectors and system waveform monitoring (ECCVM) technology was implemented and performed well during system operations. This project was selected because of its performance within PG&Es wildfire mitigation plan.

PG&E provided thorough database information on project design, goals and results, including lessons learned. The demonstration of a regional monitoring system that relied on manual monitoring of grid integrity was effective but time consuming and indicated the need for remote and automated data monitoring processes for effective integration into a larger system. Additional lessons learned involved the lack of cellular service in remote, fire-prone locations. The project plan included machine learning capabilities that were demonstrated to alleviate false signal issues and the integration of this component showed robust planning efforts to address potential technical hurdles to successful project implementation. Results dissemination was a strong focus of the project and this component was effectively demonstrated through participation in industry conferences, conference calls and workshops.

Project 6: SDG&E EPIC 3 - Project 5
Project Name: Unmanned Aircraft Systems (UAS) with Advanced Image Processing for Electric Utility Inspection and Operations
Project ID: 32508
Project Start Date: 1/1/2019
Project End Date: 12/31/2021
Administrator: San Diego Gas & Electric
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☒ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 728,396	$0	$ 709,218

The Unmanned Aircraft Systems (UAS) with Advanced Image Processing for Electric Utility Inspection and Operations is a demonstration of technology to determine the feasibility of utilizing remote drones with advanced and coronal imaging cameras to perform equipment material inspections. The technical demonstration showed strong commercialization potential with indications of additional use cases (e.g. line pulling) for added project benefit. This project was selected due to its relationship to wildfire prevention.

The SDG&E database entry for this project provided partial data for results and lessons with reference to the final report for a full listing and discussion of these activities. A result of the project was to develop a UAS protocol for line inspections in remote locations after a Public Safety Power Shutoff (PSPS) event. Another result listed was for the infeasibility of fixed-wing UAS for this activity due to takeoff/landing constraints.

Project 7: SCE EPIC 1 - Project 1
Project Name: Deep Grid Coordination (aka Integrated Grid Project (IGP))
Project ID: 33065
Project Start Date: No Data
Project End Date: No Data
Administrator: Southern California Edison (SCE)
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$17,413,924	$0	$17,413,924

The Deep Grid Coordination (aka Integrated Grid Project (IGP)) project was the first phase of the IGP to perform a pre-production demonstration of how the distribution system could be optimized. This project was selected because of its high dollar funding. The objective of the project was to perform a pre-production demonstration of how the distribution system could be optimized to enable more DERs. Key accomplishments in phase one of this research were that the project identified a site for a test circuit, developed system requirements and integration paths for DER testing, assembled the laboratory test environment, and completed the first series of testing to set them up for phase two. There were no Key Learnings documented in the database, and impact fields for safety, environmental impacts (non-GHG), projected benefits, ratepayer benefits, and energy impacts were not filled out.

While the electrical system reliability impacts field is filled out, it just states baseline figures were collected and that comparisons will be reported on in the next year, but there is no update. Similarly, the community benefits description is filled out, but just provides baseline figures and promises an update in EPIC 2. On the other hand, Infrastructure cost benefits has estimates of DER energy generation and avoided costs and cites the NREL PV Watts generation calculator for the PV resources, the CAISO daylight price of energy for the avoided cost estimate and promises an update at the end of EPIC 2.

The database notes that information was disseminated via reports and fact sheets published online and cites two websites and one magazine. The database also notes that the project has been cited in many presentations at conferences between 2016 and 2017.

Project 8: SDG&E EPIC 1-Project 2
Project Name: Visualization and Situational Awareness Demonstrations
Project ID: 33038
Project Start Date: No Data
Project End Date: No Data
Administrator: San Diego Gas & Electric
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding[18]

Contract Amount	Match Funding	Funds Expended
$ 2,301,000	$0	$ 2,211,000

The Visualization and Situational Awareness Demonstrations project integrates GIS mapping overlays of grid infrastructure with various real-time updated performance data. The primary purpose is to demonstrate feasibility, operability and utility of this system for potential commercialization and widespread adoption. The project found that most of the end use applications were viable or indicated positive directions for further development. This project was selected due to the high level of funds expended compared to other SDG&E projects to ensure impact/thoroughness in documentation.

The project description provides a high-level review of the project justification and methods. In the lessons learned a numbered list references to multiple end-use applications but is given without naming what these end-uses are. There is generalized support for benefits in the project description, but these are not explicitly matched with the few instances of the example information that is being aggregated into the visual platform. The example information listed does not appear to be a complete list of data used in the demonstration. Selection criteria and challenges to implementation on the individual information layer levels is not provided. The demonstration project design and layout, its method of implementation and use, interim

[18] While this project did not meet the established "high dollar project" funding level of $5 million, it was the highest dollar project for SDG&E and was selected as a result.

achievement targets and final demonstration metrics and results are not shown in the database. Some of this information may have been once contained in the project update field but this has been replaced with a note of the completion and submittal of a final report.

Project 9: 300-15-009
Project Name: Connecting Emerging Energy Technologies and Strategies to Market Needs and Opportunities
Project ID: 30973
Project Start Date: 6/12/2016
Project End Date: 5/30/2022
Administrator: California Energy Commission
Project Area: Market Facilitation
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☒ Entrepreneurial Ecosystem
- ☒ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☒ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 6,937,889	$ 0	$ 5,507,134

The Connecting Emerging Energy Technologies and Strategies to Market Needs and Opportunities project aimed to address barriers to commercial development of novel energy technologies through a market analysis. The project scope included tracking successes, considering future EPIC funding opportunities, performing technology gap analyses, and developing online resources. However, the project update focused on work authorization projects that allow CEC staff to "appropriately target investments." One work authorization "launched an online platform that facilitates tailored connections between investors, entrepreneurs, customer adopters and field test sites, and mentors and community-based organizations." The project took six years to complete and was selected because it was a high dollar, long-term, entrepreneurial ecosystem project.

At least one barrier, impact, and benefit field were filled out for this project, but no realized impacts were stated and the project update seemed to stray from the project's intention in the summary. The project summary seemed to suggest that rigorous market research would be performed to identify barriers, but the focus of the project update and deliverables was on work authorizations. The process for identifying specific technology areas for investment or work authorizations was not documented. The project summary suggested that the project would be barriers-focused, but market barriers was the only barriers field populated, and it was

speculating on these implementation barriers that any general new technology might face, regardless of design, innovation or prior market penetration.

Overall, while more fields than other sampled CEC projects were populated for this entry, the project lacked consistency in reporting and there was limited specificity of impacts. The project seemed similar to other CEC projects intended to identify priority EPIC projects, and was similarly vague and incomplete.

Project 10: EPC-15-016
Project Name: A Transformative Flywheel R&D Project
Project ID: 30820
Project Start Date: 1/26/2016
Project End Date: 3/29/2018
Administrator: California Energy Commission
Project Area: Applied Research and Development
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 2,000,000	$ 7,500,000	$ 1,997,631

This project, A Transformative Flywheel R&D Project developed, improved, and tested a flywheel energy storage system being built by Amber Kinetics. The project was focused on improving rotor geometries and then testing for commercialization and scalability. As of the last database update, Amber Kinetics is expanding its business in Massachusetts and Australia and published a report with improvement and testing results. The project took just over two years to complete and was selected because of its DAC status and had the highest match funding of any CEC R&D project.

Deliverables, barriers, and other key fields (e.g. scalability) are thoroughly completed for this project and the impact of the EPIC funds in bringing this product to commercialization is clear. The CEC states in "scalability" that "As a result of this project in October 2018, Amber Kinetics had achieved the commercial release of the M32 flywheel product with the company first shipping production units from their first manufacturing facility."

The CEC makes a strong case for the product in the non-GHG environmental impacts and projected project benefits fields, but notably left the other benefits and impacts fields unpopulated. Specific impacts are listed in other fields in the database, such as the testing results listed in "deliverables," but clearly have not been pasted over or elaborated upon in the actual impact fields. One final discrepancy worth noting is that the deliverables section states

that more than 38,000 operating hours have been accumulated, while the project update says 25,000. This seems indicative of updating specific columns in the database rather than all at once.

Overall, this entry is thorough and the overall impacts are clear, but additional benefits and impacts fields need to be populated.

Project 11: EPC-14-085
Project Name: Demonstration of Community Scale Low Cost Highly Efficient PV and Energy Management System
Project ID: 30140
Project Start Date: 6/29/2015
Project End Date: 3/30/2021
Administrator: California Energy Commission
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☒ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$1,238,491	$739,726	$1,227,762

The Demonstration of Community Scale Low Cost Highly Efficient PV and Energy Management System project was located at the Robert Mondavi Institute at UC Davis and involved the development of a smart electrical energy storage system that integrated retired electric vehicle batteries. The project was selected for review because it was the longest-term TD&D project (5.8 years) and was designated as low-income. The low-income designation is noteworthy because the Robert Mondavi Institute is well-funded and the goal of this project is to expand to other wineries and breweries in California.

The project update points to project successes. A start-up company commercialized the idea and UC Davis shares data with Case Western University to aid in developing batteries. There is consistency with the projected bill savings ($29,000/year) and actual savings ($2,000/month), but predicted CO2 reductions (250 tons/year) were much higher than actual (40 tons/ year).

In the database, it appears that all impacts and benefits were projected at the start of the project, and only the project update reflects the latest. The final impact and benefits would be clearer if all fields were updated. There are many fields left blank, including: deliverables, state policy support, technical barriers, market barriers, policy and regulatory barriers, getting to scale, key innovations, key learnings, scalability, electricity system reliability impacts, electricity

system safety impacts, community benefits, energy impacts, other impacts, and information dissemination. Several of these fields seem to be relevant based on the project update, such as electricity system reliability impacts ("…the project has provided some reliability support for the electrical grid…") and information dissemination (partnership with Case Western, and "the project has hosted a number of tour groups to share the project approach and outcomes").

Project 12: EPC-15-003
Project Name: Demonstration of Community Scale Generation System at the Chemehuevi Community Center
Project ID: 30148
Project Start Date: 10/28/2015
Project End Date: 6/29/2021
Administrator: California Energy Commission
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☒ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 2,588,906	$ 802,478	$ 2,583,748

The Demonstration of Community Scale Generation System at the Chemehuevi Community Center project involved a demonstration of a community microgrid for the Chemehuevi Indian Tribe Community Center. It incorporated a solar PV system, battery energy storage, and an integrated energy management system in order to reduce peak energy demand by using battery storage to load shift. Total annual electricity at the site was reduced by nearly 50 percent as a result of the project. The project took close to six years to complete and was selected because of its DAC and LI income designation and long-term duration.

While the project summary and update pointed to clear impact of the EPIC funds in the success of this project, the database entry was very incomplete. Deliverables, barriers, key information, and the majority of benefits and impacts fields were incomplete. Non-GHG environmental impacts and projected project benefits were the two populated fields and these were shown as a potential benefit of eventual commercialization of this type of demonstrated integrated system. The non-GHG impacts included an estimated "carbon reduction of 1,038 tons over the life of the project," but did not provide assumptions or methods for the estimate.

Overall, this entry suggests impact in the project summary and update but is lacking most information in other fields.

Project 13: EPC-16-017
Project Name: Maximizing Energy Efficiency and Reducing Bio-solids Waste from New Anaerobic Wastewater Treatment Technology
Project ID: 31164
Project Start Date: 11/9/2016
Project End Date: 3/14/2022
Administrator: California Energy Commission
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☒ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 1,999,962	$ 1,219,943	$ 1,977,905

The Maximizing Energy Efficiency and Reducing Bio-solids Waste from New Anaerobic Wastewater Treatment Technology project attempted to demonstrate the elimination of aeration in water treatment by using a novel staged Anaerobic Fluidized Bed Membrane Bioreactor (SAF-MBR) at the Silicon Valley Clean Water wastewater treatment facility. The aeration stage is one of the most energy intensive steps in wastewater treatment. In addition to saving energy via aeration elimination, the project was intended to generate fewer bio-solids and demonstrate the potential for a new local water supply. As of 2020 the system was operational and the project had moved to demonstrating potential for the water supply. The project took over five years to complete and was selected because of its long-term duration.

Similar to other incomplete CEC database entries, this project is lacking in barriers, key information, benefits, and impacts. The only two related fields populated are non-GHG environmental impacts and projected project benefits, and both are anticipatory rather than realized impacts and benefits. The non-GHG environmental impacts listed include “reduce greenhouse gas emissions” in addition to producing higher quality water. The primary projected project benefit is lowering energy costs of wastewater treatment, and the specifics of how SAF-MBR contributes to that are discussed.

The project is closed but the exact duration is unclear; the project update notes that the second phase of treating potable water has been initiated and anticipates that the second phase will end “around the 2023/2024 timeframe.” However, the project end date in the database is March 2022. Additional clarity is needed on project timeline and status in addition to the completion of benefits, barriers, impacts, and key information fields.

Project 14: EPC-15-042
Project Name: Zero Energy Residential Optimization - Community Achievement (ZERO-CA)
Project ID: 30923
Project Start Date: 4/30/2016
Project End Date: 3/30/2021
Administrator: California Energy Commission
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 4,819,805	$ 2,611,014	$ 4,469,630

The Zero Energy Residential Optimization - Community Achievement (ZERO-CA) project was an assessment of how to construct Zero Net Energy (ZNE) single-family homes in California without creating cost burdens on builders, businesses, or consumers. The project sought to develop cost-effective packages of measures and assess builder cost savings and consumer utility cost savings. The project found that:

- The only measure that consistently performed in the top 10 of being most cost-effective was the heat pump water heater.
- All-electric appliances for a home cost $200-$500 less than natural gas appliances when natural gas infrastructure savings are included, such as plumbing and flue vents. Note: this calculation of cost-benefit is contained in the final report and not explored within the database information.
- Only 7 percent of homebuyers can define what is a ZNE home, but 72 percent believe that energy efficiency is very important.

The project took nearly five years to complete and was selected because of its DAC and low-income status. Considering that the primary deliverable was a research paper, it is unclear why the project was designated as DAC and low-income. Besides the project summary, update, and projected project benefits, no fields were populated. The projected benefits listed realized

benefits, and mentioned that the project team worked directly with builders and subcontractors to evaluate technology costs, time, and labor. This field also mentioned that project results were shared at California Building Industry Association (CBIA) events and member newsletters in efforts to promote the potential for cost-effective ZNE to the builder community. Overall, the database entry is somewhat outdated and very incomplete. The project update mentions that a final report is in progress, but the project ended in 2021. Nearly all barriers, key information, benefits, and impacts fields need to be populated.

Project 15: EPC-15-018
Project Name: Pilot Testing of Eos' Znyth Battery Technology in Distributed Energy Storage Systems
Project ID: 30734
Project Start Date: 3/21/2016
Project End Date: 3/30/2021
Administrator: California Energy Commission
Project Area: Applied Research and Development
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☒ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 1,894,866	$ 1,436,801	$ 1,655,433

The Pilot Testing of Eos' Znyth Battery Technology in Distributed Energy Storage Systems project sought to develop and test behind-the-meter battery storage applications using several kW-scale, AC-integrated Znyth battery technology storage systems. The project team activities are described as developing, modeling, and testing of experimental rate designs, developing system control algorithms and the demonstrated aggregation of multiple storage units to create virtual power plants. An economic assessment of impacts and benefits to California utilities and ratepayers would also be conducted. The installation, commissioning, testing, and data collection was completed for the commercial and industrial system in 2020. As of the last project update, the process for the residential system was ongoing. However, the project is listed as closed in the database. According to the database start and end dates, the project took five years to complete and it was selected because it had the highest match funding out of long-term CEC applied research and development projects.

Similar to other incomplete CEC database entries, this project is lacking in barriers, key information, benefits, and impacts. The only two related fields populated are non-GHG environmental impacts and projected project benefits, and reducing greenhouse gas emissions is listed as a non-GHG environmental impact. The projected project benefits of a demonstrable behind-the-meter Zynth battery system that is integrated within an aggregated Virtual Power

Plant (VPP) configuration are identified solely as economic benefits to California utilities and ratepayers but these statements are generalized and specific ways that these savings are transferred are not discussed.

This database entry is outdated and incomplete. Results from data collection of the system testing are not provided and the status of the residential system is unclear. No specific impacts are listed and a new project update and review of barriers, benefits, impacts, and key information fields is needed.

Project 16: EPC-14-052
Project Name: Community Scale Digester with Advanced Interconnection to the Electrical Grid
Project ID: 30049
Project Start Date: 5/31/2015
Project End Date: 3/30/2020
Administrator: California Energy Commission
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☒ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 5,000,000	$ 7,775,939	$ 4,618,517

The Community Scale Digester with Advanced Interconnection to the Electrical Grid project involved the installation and operation of an anaerobic digestion system that processes organic waste from a supermarket distribution center and slurry from organics in wastewater streams. The project is part of the Co-West Commodities Wastewater Pre-Treatment Facility that collects wastewater from businesses and treats the material for disposal into the sewer. The project led to the successful operation of the system, which is stated as having the capacity to produce at least 8,760 MWh of renewable electricity to be sold to Southern California Edison by way of a bioenergy feed-in tariff. The time period of total power generation is not stated explicitly in the documentation but is necessarily dependent on feed stock delivery and the processing into fuel for use. The project took nearly five years to complete and was selected because of its DAC status and high dollar/significant match funding amount.

Similar to other incomplete CEC database entries, this project is lacking in barriers, key information, benefits, and impacts. The only three related fields populated are non-GHG environmental impacts, projected project benefits, and infrastructure cost benefits. There was no mention of impacts to regional air quality in the documentation, though biogas consumption as a combustion source with proper emissions controls is considered to be low-impact. These fields are fairly detailed and list direct impacts, although some are anticipated. The non-GHG environmental impacts field mentions that using food wastes to generate electricity yields

reductions in greenhouse gas emissions; it is unclear why this is listed as a non-GHG environmental impact. Realized and anticipated impacts are quantified across the three fields; the greenhouse gas reductions are listed as a net offset of 4,125 MT CO2e/year, and co-products from the process include "1,226 tons of residual solids for vermicomposting feedstock per year and 1.6M gallons per year of liquid effluent for fertilizer." It is not entirely clear how these values are calculated and if they are anticipated impacts or realized impacts.

This database entry is fairly up-to-date and populated fields point to clear impacts, but additional barriers, key information, benefits, and impacts fields should be populated.

Project 17: EPC-14-079
Project Name: Assessing the Ability of Smart Inverters and Smart Consumer Devices to Enable more Residential Solar Energy
Project ID: 30059
Project Start Date: 6/29/2015
Project End Date: 3/30/2021
Administrator: California Energy Commission
Project Area: Applied Research and Development
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☒ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 1,705,478	$ 891,414	$ 1,704,618

The Assessing the Ability of Smart Inverters and Smart Consumer Devices to Enable more Residential Solar Energy project is a field test and lab analysis of micro-inverter use in distributed solar applications. This project was selected for review due to the long-term R&D effort and the limited level of information provided in the impacts field.

Project design and justification indicate that distribution bottlenecks are a hindrance to wider solar adoption in the state. This project tests the inclusion of micro-inverters for the application of 'smart loads' to relieve this congestion during peak solar generating hours. This project has limited information presented on the database with the deliverables, barriers, scalability, innovations and lessons learned fields left blank. In the Project Update field a benefit is listed as providing added value to residential homeowners with solar though this is not explained within the context of changes to rules that govern the value of the sale of electricity that is generated by residential solar systems to the market that have been made recently by the California Public Utilities Commission. The only project result listed was the development of a smart load management algorithm and communications platform between smart loads and inverters. This was presented as an input to inform regulators for future changes to the Rule 21 architecture. Descriptions of these outcomes are not provided in the documentation.

Project 18: EPC-15-009
Project Name: Workforce Instruction for Standards and Efficiency (WISE)
Project ID: 30794
Project Start Date: 11/29/2015
Project End Date: 6/29/2020
Administrator: California Energy Commission
Project Area: Market Facilitation
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☒ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 4,431,918	$ 15,685,075	$ 4,135,877

The Workforce Instruction for Standards and Efficiency (WISE) project is a Market Facilitation effort that provides training and resources to assist new home construction participants to adopt new High Performance Wall (HPW) and High Performance Attic construction techniques that have been mandated by the new Title 24 efficiency building code. This project was included due to the stated focus toward increased equity and assistance to Disadvantaged Communities (DACs).

There is no mention in the database descriptions of efforts specifically designed to serve DACs. The project appears to be comprehensive in nature with stated results of outreach provided to "most" major builders in the state and will likely impact DACs as a statewide focused project would necessarily include disadvantaged communities. A high-school vocational training project is also described and funded to continue for three years after official project completion date which should also be expected to serve some DACs, though specific focus and breakouts of fund distributions that serve DACs are not shown. Attempts were made to show market trends and inferred impacts of project activity in building construction activity, though source data for this information is not presented. Specific descriptions of training and outreach activities are not provided so logic model conformance cannot be adequately understood. As is the case often in the database analysis, it appears that the detailed information of project activity, results and justification is expressed in the project close-out report.

Project 19: EPC-15-010
Project Name: Expanding Energy-Related Career Pathways in the Electrical Industry: Increasing Workforce Development Opportunities in Disadvantaged Communities and Delivering Training on Automated Demand Response Communication Equipment to Inside Wireman Apprentice
Project ID: 30793
Project Start Date: 12/7/2015
Project End Date: 6/29/2020
Administrator: California Energy Commission
Project Area: Market Facilitation
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☒ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 4,476,189	$ 16,165,080	$ 2,879,168

The Expanding Energy-Related Career Pathways in the Electrical Industry project is designed to develop apprenticeship training projects for 4th and 5th year electrical and controls apprentices that will assist them to meet new automated demand response control requirements in the 2013 Title 24 building code. It also works to recruit workers from Disadvantaged Communities (DACs) to become trained apprentices and had a component that focused on small and medium builders in or near DACs but was discontinued due to barriers of implementation. This project was selected due to very high match funding levels and the focus on equity. Final project expenditures were 64.3% of total project allocated funding though the reason for this is not explained in the database information.

The project activities are not described in detail, with only a very high-level summary of efforts provided. A primary metric listed is the application of an online exam that tests participant knowledge and the total number of new apprentices that received the newly designed class adopted by the seven participant union training facilities. No description of efforts to outreach and serve DACs is listed, though a count of 'workers residing in or near DACs' is provided. There is no breakout of funding that is directly attributed to serve DACs in the database. Post-training surveys are not shown that would provide evaluation of efficacy of training and utilization by

attendees as they move into their professional careers and so total project impacts are not shown.

Project 20: EPC-14-082
Project Name: Advancing Biomass Combined Heat and Power Technology to Support Rural California, the Environment, and the Electrical Grid
Project ID: 30146
Project Start Date: 7/9/2015
Project End Date: 12/30/2019
Administrator: California Energy Commission
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☒ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 2,385,261	$ 593,316	$ 2,385,261

The Advancing Biomass Combined Heat and Power Technology to Support Rural California, the Environment, and the Electrical Grid demonstration project provides funding for the development of a biomass combined heat and power generation facility with associated district heating in the rural county of Plumas. The project was selected due to its unique placement as the only TD&D biomass project and due to its siting within a rural low-income area.

This demonstration project provides both electric power and winter heating for two adjacent buildings. A generalized approach to project design and layout did not reveal the extent of lessons to be learned regarding the development needs that would allow scalability. System operations with regard to fuel development needs were a primary project focus and were detailed extensively in the database documentation with a specific focus to case needs, including fuel procurement and preparation, regional grid monitoring for maximum use benefit during peak energy demand and the correlation of operations with regional heating demands. Fuel from forestry products was labeled as being produced 'sustainably' but does not explain specific sources or industry product streams. Justification as a methodology for sustainably serving extremely rural areas with CHP/biomass systems and their inclusion in state-developed decarbonization plans were complete and project design, analysis and results were consistent and logical. This was also supported by analysis that provided example public and private use

building types that could be served by these systems. The only mention of air-quality impacts within the database was that biomass combustion within a power generation environment with emissions controls results in better regional air quality than the combustion of these same fuels within an open field environment, though it is unclear if these waste products would have been intentionally or unintentionally burned in the absence of project operations.

An additional benefit was listed for wildfire mitigation but specific impacts and metrics in this regard were missing, possibly as a result of the lack of fuel-sourcing detail. No information dissemination activity was listed in the database.

Project 21: EPC-14-024
Project Name: Modular Biomass Power Systems to Facilitate Forest Fuel Reduction Treatment
Project ID: 30067
Project Start Date: 4/12/2015
Project End Date: 3/30/2018
Administrator: California Energy Commission
Project Area: Applied Research and Development
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☒ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 2,000,000	$ 730,148	$ 1,944,894

The Modular Biomass Power Systems to Facilitate Forest Fuel Reduction Treatment project developed a mobile biomass gasification system that was used to produce biogas remotely from forestry waste products. This was seen as a benefit for converting fire-hazard forestry waste streams into value-added feedstocks of biochar and electricity produced from biogas. The result of the project was the development of a modular rotary gasification and electric generation system. Demonstration activity showed that this platform was not cost-effective under current market conditions. This project was selected due to its projected impact on wildfire management and because of the high match funding provided.

The development of a high-efficiency gasification/electricity generation platform is noted in the database as the primary end-result benefit of the project. The conversion of forestry waste to produce biogas and biochar (natural charcoal) is stated as a way to use these feedstocks for the production of zero-emissions fuel (biogas) for power generation and the production of biochar which can be sold as an agricultural soil amendment. The only mention of air quality impacts from this technology is the assertion that the use of this gasification technology greatly reduces pollutant emissions when compared with the wildfire combustion that this technology is helping to alleviate. This project is intended to be sited at the forestry resource extraction location, an area with very low population density, this results in relatively lower local air quality impacts compared to similar gasification activities that could be performed within urban

locations. A detailed explanation of technical barriers and lessons learned explained why it was not a cost-effective solution. The description of project activity was extensive and thorough with a logical flow toward a final feasibility analysis that produced what appears to be robust results in the database.

Economic value analysis results of the study showed that this platform could still be utilized as a community-based effort to yield wildfire management/mitigation. Additionally, the discussion of the low value of biochar under current market conditions indicates that a future market where this feedstock is utilized in a carbon capture and sequestration effort could make widespread applications more feasible.

Project 22: EPC-15-057
Project Name: Customer-controlled, Price-mediated, Automated Demand Response for Commercial Buildings
Project ID: 31035
Project Start Date: 6/29/2016
Project End Date: 9/29/2019
Administrator: California Energy Commission
Project Area: Applied Research and Development
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 4,000,000	$ 424,000	$ 3,993,312

The Customer-controlled, Price-mediated, Automated Demand Response for Commercial Buildings project produced an automated control system that allowed dynamic pricing information to help generate a demand response control profile with subsequent energy use reductions during operations. The project produced a control device that is described as a thermostat in the documentation. This project was selected for review due to the high cost spent by the CEC R&D budget and a large match funding component.

The project description included multiple facets of what a control system with dynamic pricing inputs would need to achieve for success. The project involved a 13-building test of an automated thermostat. It is unclear if all the desired platform components (i.e. multiple device interactions, customer personalization, multiple building system interactions) were accomplished. The goal of multiple device and system interactions implies potential energy savings from more than HVAC systems, though this is not explicit. Market potential analysis indicated that energy research actors would be a good near-term fit as a target customer base. Total potential GHG emissions reductions in the environmental impacts field for this technology are very large, representing 1.6% of all emissions associated with California's electric power

sector in 2022[19] and this seems to imply universal adoption of this control technology through codes and standards.

The projected benefit of maximizing the ease of entry of commercial sector buildings into existing demand response programs is a feasible result of this research platform and though the product description is not well detailed, the development of this platform, as described, would be a logical step toward overcoming this barrier to increased program enrollments. It is unclear if this project produced a successful product or whether it developed insights into the technical and implementation barriers that need to be overcome to facilitate future advancements of this technology.

[19] California Air Resources Board, "Current California GHG Emission Inventory Data 2000–2022," 2024. [Online]. Available: https://ww2.arb.ca.gov/ghg-inventory-data

Project 23: EPC-14-046
Project Name: Lowering Food-Waste Co-digestion Costs through an Innovative Combination of a Pre-Sorting Technique and a Strategy for Cake Solids Reduction
Project ID: 30053
Project Start Date: 5/14/2015
Project End Date: 3/28/2019
Administrator: California Energy Commission
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☒ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 1,496,902	$ 2,630,000	$ 1,382,677

The Lowering Food-Waste Co-digestion Costs through an Innovative Combination of a Pre-Sorting Technique and a Strategy for Cake Solids Reduction project demonstrated the feasibility of combining locally-produced food waste with restaurant FOG (Fat-Oils-Grease) and organic wastes in a waste treatment facility to generate biogas for electric power generation, to reduce the outflows of food waste and FOG into landfills and to reduce the total volume of disposable cake solids, a product of waste treatment facilities. The project successfully demonstrated the economic feasibility of this combined digester strategy. This project was selected due to its high match funding split, indicating a major cost share and due to its placement within a Disadvantaged Community.

A large part of the project operations was developing methodologies for waste treatment facilities to use their equipment to process food wastes so that they are suitable for digester feedstocks in a cost-effective manner by using their in-place equipment. A separate phase of the project involved FOG waste streams. These specific goals were clearly established, and the project appears from the database to be effectively designed to achieve them. The development of volumetric and energy accounting results indicate that a robust monitoring protocol was developed and implemented for system testing, though not detailed in the database. Discussion surrounding policy and regulatory barriers (i.e. the lack of 100% food

waste capture requirements), electric system reliability, and ratepayer benefits is not provided in the database. There was no documentation of information dissemination that specifically targeted municipalities or privately owned waste treatment organizations. Overall, the project design and implementation activities as described in the database are well documented and show logical design to achieve the initial project goals.

Project 24: EPC-14-064
Project Name: Aerosol Impacts on the Hydrology and Hydropower Generation in California
Project ID: 30108
Project Start Date: 5/12/2015
Project End Date: 6/29/2018
Administrator: California Energy Commission
Project Area: Applied Research and Development
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 399,818	$ 306,237	$ 379,062

The Aerosol Impacts on the Hydrology and Hydropower Generation in California research project analyzed the impacts of aerosol emissions[20] on a Southern California Edison hydropower generation facility. This was a modeling exercise. This project was selected for review due to the match funding values and the low income and DAC designation.

As a modeling exercise it is unclear what, if any, expenditures were attributed to low-income and DAC communities. The description of the justification for the project is not made clear as the description of aerosols, (e.g. components, regional, state-wide) and why they may be important or how aerosol loading may change in the future is not shown. Results of the modeling study show significant impacts to hydropower electric generation by aerosols though it is unclear how this may be useful to assist in future resource planning. An environmental impact statement of increased hydropower management capacity that will help meet peak energy demands and reduce GHG emissions does not seem justified as a result of this project activity. The deliverables and key learnings fields in the database have identical entries.

[20] Aerosols are small solids or liquid particles suspended in ambient air.

Project 25: EPC-14-031
Project Name: Pollution Control and Power Generation for Low Quality Renewable Fuel Streams
Project ID: 130052
Project Start Date: 5/31/2015
Project End Date: 3/30/2019
Administrator: California Energy Commission
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☒ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 1,499,386	$ 438,345	$ 1,020,424

The Pollution Control and Power Generation for Low Quality Renewable Fuel Streams project looked to capture and oxidize low-quality biogas from a landfill facility and generate electricity from it. This novel project has been implemented in other states but has not yet been conducted in California. Due to subcontractor and primary technology supplier delivery issues, the project scope was not completed by the end of the agreement term and the database has no results or description of project activities. This project was selected for review due to the match funding and the lack of reporting information.

The slow oxidation of low-quality biogas to allow or the generation of electricity from this fuel source (as opposed to flaring or venting) is a novel concept and appears to have been proven in other locations. This activity would slightly reduce regional air quality impacts with emissions controls in place for the oxidation activity. The lack of project description, interim goals, discussions around barriers, whether technical or market based, and the lack of completion of the project show a lack of engagement by contractors. No logic model for the project can be derived as the details of project activity are missing from the database.

Project 26: EPC-14-076
Project Name: Raw Wastewater Filtration to Increase Organic Removal Efficiency and Achieve Significant Electrical Savings
Project ID: 30094
Project Start Date: 6/29/2015
Project End Date: 3/28/2019
Administrator: California Energy Commission
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 3,476,085	$ 1,288,340	$ 3,439,476

The Raw Wastewater Filtration to Increase Organic Removal Efficiency and Achieve Significant Electrical Savings project worked with a regional waste treatment facility to develop an innovative organic material filter that was proven successful in operations and showed facility reductions in energy costs ranging from $22,000 to $35,000 per million gallons per day of average facility processing activity. No specific benefits to electric rate payers were noted in the EPIC database for this project. Independent M&V was documented in the database to provide robust project results. The result of this project was the extension of operations to three additional waste treatment facilities and the commercialization outreach of this product to other waste treatment organizations. This project was selected for review due to its placement within a Disadvantaged Community (DAC) and because of the high-level of match funding.

The project goals, as laid out in the key innovations field of the database, are well thought out and logical to the project design. The documentation of impacts of the demonstrated technology are exhaustive and the economic and environmental savings demonstrated are robust. Specific technical descriptions of the product implementation, down to an analysis of specific chemical oxidation reactions and benefits of increased waste stream clarity are detailed and show strong justification for project adoption. Efforts were made to show results for all

project goals. The employment of independent M&V showed strong commitment to achieving valid and reproduceable results.

Project 27: EPC-16-007
Project Name: Optimization of Energy Efficiency to Achieve Zero-Net Energy in Multifamily and Commercial Buildings
Project ID: 31080
Project Start Date: 7/31/2016
Project End Date: 3/29/2022
Administrator: California Energy Commission
Project Area: Applied Research and Development
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☒ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 1,000,000	$ 105,000	$ 989,068

The Optimization of Energy Efficiency to Achieve Zero-Net Energy in Multifamily and Commercial Buildings project is a modeling study that does cost-effectiveness analysis for specific energy efficiency measure implementation activities in Multifamily and Commercial building sectors across all of California's climate zones. This project was selected for review due to its nature as a long-term R&D project and its low-income designation. It also has limited description of project results with a mention of final product delay due to COVID.

Econometric modeling of energy efficient technologies on the granular level of specific climate zones could be a valuable insight for future efficiency project design. Cost-effective measures for multi-family residential can be very difficult to ascertain, especially if they are located in disadvantaged or Low-income communities.

The project description in the database describes a modeling tool to be used but does not indicate building selection or design. It does not show how different sectors (multi-family vs. commercial) will be treated. There is mention of a product database that is to be generated by the project activity that is assumed will assist the adoption of cost-effective measures into energy efficiency programs and delineate them by climate zone. There is no mention of results in the database with the exception of the close-out report being delayed by COVID-related

issues. There is no mention of technical, regulatory or other barriers that this project hopes to alleviate though there are many for this sector.

Project 28: EPC-14-045
Project Name: Advanced Recycling to 1-MW Municipal Solid Waste of Electricity Generation
Project ID: 30061
Project Start Date: 5/14/2015
Project End Date: 3/28/2019
Administrator: California Energy Commission
Project Area: Applied Research and Development
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☒ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 1,499,481	$ 46,616	$ 1,499,480

The Advanced Recycling to 1-MW Municipal Solid Waste of Electricity Generation project designed and tested a waste-to-energy Process Development Unit (PDU) that converted Refuse Derived Biomass into clean fuel gas. The project tested a 3-pound per minute PDU in order to provide engineering data to design a larger plant. The project took approximately four years to successfully complete and the gasifier technology is now being refined for commercialization. The project was selected because it relates to biomass and was located in a low-income DAC.

The project summary and update are detailed and consistent, but claims of impacts are not supported by calculations and assumptions, and many benefit, barriers, and impact fields are not populated. In the project update, the CEC states that the levelized cost of electricity resulting from the PDU "was estimated at $118/MWh for 10-MW scale compared to grid supplier power that will likely average $150/MWh through 2024," but no detail was provided on how the estimate was calculated or the source of the grid supplier power assumption.

Non-GHG environmental impacts and projected project benefits fields were the only two fields populated related to impacts, benefits, or barriers. The non-GHG environmental impact was anticipatory and predicted that the project would result in waste diversion equivalent to reducing NOx emissions by approximately 6.5 TCO2e/year. While this impact was clearly stated, no assumptions or calculations were provided. The projected project benefits mentioned

scaling goals, including a commercial scale of "300-ton/day, generating 10-MW of electricity with costs of less than $3,750/kWh of installed capacity," but details were not provided on how they arrived at that estimate. Notably, deliverables and information dissemination fields were not populated.

Project 29: 300-15-010
Project Name: Research Roadmap for Advancing Technologies in California's Industrial, Agricultural, and Water Sectors
Project ID: 30992
Project Start Date: 6/19/2016
Project End Date: 5/30/2018
Administrator: California Energy Commission
Project Area: Applied Research and Development

Selection Criteria and Project Information

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☒ Biomass/Wildfire
- ☒ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 647,728	$ 29,610	$ 607,470

The Research Roadmap for Advancing Technologies in California's Industrial, Agricultural, and Water (IAW) Sectors project involved the development of a technical assessment and gaps analysis to identify research needs for advancing technologies in California's industrial, agricultural, and water sectors that produce optimal benefits to IOU ratepayers. The project utilized literature reviews and interviews and took two years to complete. Recommendations were consolidated in a research roadmap that recommended a total of 123 energy-saving technologies across six technology areas (industrial processing, industrial facilities, industrial power, agriculture, bioenergy, and water and wastewater). This project was selected as an example of a "technology roadmap" project.

The project summary, project update, and deliverables fields were thorough and consistent, and the CEC was particularly consistent with the stated impact of identifying 123 technologies. The barriers fields were also thoroughly completed and applied across the IAW sectors.

The impacts and benefits fields were mostly unpopulated, besides non-GHG environmental benefits and projected project benefits. A specific breakout of non-GHG environmental benefits was not detailed for bioenergy technology projects. The stated impacts were vague, noting that

"Targeted research will help mitigate the electricity and water usage of California's IAW sectors." Furthermore, there was a focus on how the analysis would be used to "strategically target future EPIC investments," but limited information on where to find the final report. The information dissemination field was not completed.

Project 30: EPC-14-037
Project Name: Home Energy Efficiency Retrofits in California: An Analysis of Sociocultural Factors Influencing Customer Adoption
Project ID: 30056
Project Start Date: 5/7/2015
Project End Date: 3/30/2018
Administrator: California Energy Commission
Project Area: Market facilitation
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☒ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 599,924	$ 214,000	$ 570,017

The Home Energy Efficiency Retrofits in California: An Analysis of Sociocultural Factors Influencing Customer Adoption project conducted research on how demographics influence the adoption and utilization of residential energy efficiency measures, and focused on the Latino population of Fresno. It included a literature review of 60 studies on historically underserved groups in California energy efficiency programs, a market characterization, focus groups, a survey on energy efficiency perspectives, three field studies, and a final report. The project was selected because of its focus on low-income, underserved populations and its market facilitation project area.

Overall, the project summary, project update, deliverables, and barriers fields were complete and thorough. The CEC noted certain fields that were not applicable, such as technical barriers. The only inconsistency was that the project summary identified the Latino population of Fresno as the primary focus, but the project update mentioned that focus groups included Fresno and San Diego Latino households. There is a need for consistency in identifying which fields are or are not applicable to the study and updating all relevant fields with information included in the project update. Many of the impact fields were blank, and it is unclear whether they were not applicable. Projected benefits and ratepayer benefits fields were completed. Several impacts were noted in the project update field and should be in other impact fields. Notably, while the

CEC mentioned stakeholder interviews and webinars and linked the final report in the project update, the information dissemination field was left blank.

The CEC clearly listed the potential scalability impacts, noting that "increased Latino participation… would increase annual electricity savings by 0.55 to 5.30 gigawatt-hours (GWh), annual greenhouse gas reductions by 182 to 1,753 metric tons, and annual utility bill savings by $103,303 to $994,291," but it is unclear how they arrived at those values.

Project 31: EPC-17-012
Project Name: Biomass-to-Electricity: Pilot-Scale Testing of Baseload Compared to Flexible Power
Project ID: 31470
Project Start Date: 7/31/2017
Project End Date: 12/30/2021
Administrator: California Energy Commission
Project Area: Applied Research and Development
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☒ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 1,499,000	$0	$ 1,498,475

The Biomass-to-Electricity: Pilot-Scale Testing of Baseload Compared to Flexible Power project was intended to test and evaluate three different energy pathways for conversion of woody biomass to electricity, then identify an optimal pathway for extended testing. After extended testing, the performance of a full-scale facility would be evaluated. This project was chosen because of its focus on biomass and its DAC and low-income designation.

The project status is closed, nearly all funds have been expended, and it took over four years to complete, but as of the latest project update the project team had only tested one pathway. The CEC noted that "The project team is performing system modifications required for testing of the other two pathways." This is a clear discrepancy, as the project is closed yet the update is framed as if it is ongoing.

Besides non-GHG environmental impacts and projected project benefits, no benefits, impacts, or barriers fields are populated. The projected project benefits include "numerous economic, environmental, and safety benefits to California ratepayers," yet the ratepayers benefits field is left blank and benefits are not quantified. Overall, it appears that initial basic information was provided for this project at the outset but fields have not been updated, and the only updated field, project update, may be outdated.

Project 32: EPC-14-054
Project Name: Demonstrating a renewable based microgrid for a critical facility at the Blue Lake Rancheria
Project ID: 30077
Project Start Date: 7/5/2015
Project End Date: 3/29/2018
Administrator: California Energy Commission
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 5,000,000	$ 1,318,422	$ 5,000,000

The Demonstrating a renewable based microgrid for a critical facility at the Blue Lake Rancheria project involved the successful development and demonstration of a microgrid at an American Red Cross evacuation center. The renewable-based microgrid system provides cost savings for the facility during normal operation and successfully operated independently during a grid outage. The project was completed in just under three years and was selected because of its low-income status and high funding amount.

Barriers and other project information (e.g. key innovations, key learnings) were populated, but benefits and impacts fields were lacking. Many of the fields that were populated seemed to contain content pasted from elsewhere. For example, part of the "getting to scale" description stated, "The remainder of this chapter discusses other key considerations concerning the replicability of microgrids." The key innovations field seemed to contain project objectives rather than a reflection on innovations. Despite this, the fields that were populated were detailed and thorough, and listed clear impacts and scalability assessments.

The non-GHG environmental impacts and the projected project benefits fields were the only two benefits/impacts fields populated. The non-GHG benefits included "reducing greenhouse

gas emissions by 158 metric tons CO2 per year compared to fossil fueled generation," but no calculations or assumptions were listed.

This project was nationally recognized for its success "as a result of knowledge transfer and outreach activities" by the Federal Emergency Management Agency's 2017 Whole Community Preparedness Award and POWERGRID International's Project of the Year (2018) award for Distributed Energy Resource Integration. The project final report was linked in the project update, but the information dissemination field was left blank.

Project 33: 300-15-008
Project Name: Research Roadmap for Getting to Zero Net Energy Buildings
Project ID: 30990
Project Start Date: 5/31/2016
Project End Date: 5/29/2018
Administrator: California Energy Commission
Project Area: Applied Research and Development
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☒ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 999,884	$0	$ 982,214

The Research Roadmap for Getting to Zero Net Energy Buildings project developed a gaps analysis for Zero Net Energy buildings that identified priorities for research and development. This project resulted in over 60 technology briefs for use by the Energy Commissions on high potential technologies and their current research gaps and also produced a prioritization tool to sort these technologies based on importance weights. The project took two years to complete and was selected because of its focus on a technology roadmap.

The barriers, impacts, and benefits fields appear to not have been updated. Only the projected project benefits field is populated, though no explicit benefits are detailed there and instead only a statement that the determinations were performed. It is also unclear if the final report has been published; as of the latest update in the project update, it was noted that "the final report is being prepared for publishing on the Commission website." The information included in the database for this project is therefore incomplete and potentially outdated.

Project 34: EPC-17-024
Project Name: Electric Access System Enhancement (EASE)
Project ID: 31572
Project Start Date: 4/30/2019
Project End Date: 12/30/2021
Administrator: California Energy Commission
Project Area: Technology Demonstration and Deployment
Selection Criteria and Project Information

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☐ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$2,000,000	$8,008,123	$907,900[21]

The Electric Access System Enhancement (EASE) project sought to enhance the electrical grid via distributed control capabilities and by making it easier to connect solar panels and batteries to the grid. It also explored moving some central control tasks to the edges of the grid. The field demonstration of the pilot project was completed in 2021 and the project took 2.5 years to complete. The CEC's final project report indicates that the project was a success and demonstrated a scalable system for integrating distributed energy resources (DERs). Success was determined based on technical performance in simulations and field tests, though this is only documented in the final report and not the EPIC database.

The project is a federal cost share project to SCE's EASE project under the Department of Energy's ENERGISE project, and was selected because it was a major cost share project. It has the highest match funding out of all technology demonstration and deployment projects, but notably does not show any funds expended in the EPIC database.

The project summary and project update are vague and do not mention specific goals or realized impacts. The only field that is populated out of all barriers, benefits, and impacts fields

[21] The "funds expended" for this project come from the CEC's Energize Innovation database and were confirmed via email with the CEC.

is projected project benefits, which mentions a "system of systems" approach that is not mentioned elsewhere and is quantified as a method of streamlining the integration of Distributed Energy Resources (DERs) by allowing cross optimization between different market actors (IOU, third-party, DER owners, CAISO). This database entry is lacking in specificity and completeness and appears outdated.

Project 35: 300-17-004
Project Name: Measuring Innovation Progress to Guide Future Investment: Evaluation of EPIC Benefits Methodology
Project ID: 31680
Project Start Date: 6/28/2018
Project End Date: 2/15/2021
Administrator: California Energy Commission
Project Area: Market Facilitation
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☒ Entrepreneurial Ecosystem
- ☒ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 3,000,000	$0	$ 2,999,989

The Measuring Innovation Progress to Guide Future Investment: Evaluation of EPIC Benefits Methodology unique project involved the development of a standardized methodology to evaluate the electric ratepayer benefits attributable to EPIC-funded projects, in order to help the CEC better evaluate how well the EPIC program is meeting its goals. The project team designed tools and methodologies and conducted case studies that estimated benefits from a selection of EPIC projects, although no final report or tools are available. The project took approximately 2.5 years to complete and was selected because of its entrepreneurial ecosystem and market facilitation classification.

The project summary and update lack specificity and the project update appears outdated, referencing a final review that will occur in 2021 before the deliverables and reports are finalized. The project update notes that the team "completed a suite of tools and methodologies" and conducted case studies that "estimate benefits from a selection of EPIC projects including energy efficiency and renewable generation technologies," but does not provide details about the tools or which projects were selected for case studies. Projected project benefits and infrastructure cost benefits fields are populated, but no other barriers, impacts, or benefits fields are complete. All fields besides project update appear to have been populated at the beginning of the project and are anticipatory.

Project 36: 300-15-013
Project Name: California Investor-Owned Utility Electricity Load Shapes
Project ID: 31147
Project Start Date: 7/28/2016
Project End Date: 12/30/2018
Administrator: California Energy Commission
Project Area: Market Facilitation
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☒ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 1,147,406	$ 58,330	$ 1,127,082

The California Investor-Owned Utility Electricity Load Shapes project developed updated baseline end-use load profiles and new load shapes for EVs and solar use in order to characterize existing and future electricity load in PG&E, SCE, and SDG&E service territories. This characterization is intended to help the CEC develop annual and monthly peak forecasts and hourly forecasts to support peak shift analysis, among other benefits. The project lasted just under 2.5 years and was selected because of its designation as a DAC and low-income project. However, the project lead was ADM Associates, Inc. based out of Sacramento and the work appears to be a computer-based product, so it is unclear why the project is DAC and low-income designated.

The project summary, update, other key information (e.g. key innovations, key learnings) and barriers fields were thoroughly populated and detailed, but the benefits and impacts fields were not. Still, impacts were clearly outlined in other fields. For example, in the getting to scale field, the CEC noted that "The updated load shapes and hourly electric load model allows Energy Commission staff to more accurately produce the Demand Forecast Model which is used by utilities, the California Public Utilities Commission, and the California Independent System Operator to inform energy planning and procurement decisions." There were clearly tangible impacts, but these were not restated in the impacts and benefits fields. The only benefits field that was completed was projected project benefits, which noted the importance of the updated

load shapes in improving the CEC's demand forecasts and explicitly stated that this information would lead to multiple EPI-defined ratepayer benefits.

Project 37: 300-17-003
Project Name: Distributed Energy Resources (DER) Roadmap
Project ID: 31677
Project Start Date: 6/28/2018
Project End Date: 2/15/2021
Administrator: California Energy Commission
Project Area: Market Facilitation
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☐ Low Income
- ☐ Entrepreneurial Ecosystem
- ☒ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☒ Technology Roadmap
- ☐ Long Term
- ☐ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 499,065	$0	$ 471,841

The Distributed Energy Resources (DER) Roadmap project developed a research roadmap for use by the California Energy Commission that identified and prioritized research development, demonstration, and deployment needs to enable high penetration of distributed energy resources (DERs). The roadmap assessed the current status of DERs, identified performance and cost targets, estimated rates for technology performance improvement, cost reduction, and adoption, developed a prioritization methodology, and identified performance and cost indicators to assess benefits. The project team conducted a workshop to summarize the roadmap and delivered a final report. The project took just over two years to complete and was selected as an example of a technology roadmap project.

The project summary, update, other key information (e.g. key innovations, key learnings) and barriers fields were thoroughly populated and detailed, but the benefits and impacts fields were not. The deliverables field specifically noted that the project identified 87 research opportunities that can support the efficient integration of distributed energy resources with the electrical grid, and 41 of those passed an initial screening where they were identified to meet goals of the EPIC program. The barriers fields that were populated identified barriers for DER integration more generally, rather than any barriers that the project itself faced. Finally, three benefits and impact fields were populated but lacked detail. For electricity system reliability

impacts and electricity system safety impacts, the CEC simply stated, “The various findings from the roadmap can improve the safety and reliability of the grid in a cost-effective manner.”

Project 38: EPC-15-076
Project Name: Richmond Advanced Energy Community Project
Project ID: 31020
Project Start Date: 6/12/2016
Project End Date: 3/29/2020
Administrator: California Energy Commission
Project Area: Market Facilitation
Selection Criteria and Project Information:

- ☒ Disadvantaged Community (DAC)
- ☒ Low Income
- ☐ Entrepreneurial Ecosystem
- ☒ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☐ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 1,480,111	$ 2,590,134	$ 1,246,861

The Richmond Advanced Energy Community Project is one of several EPIC Advanced Energy Community (AEC) projects and focused on helping the City of Richmond design a policy and planning project and financing framework to facilitate adoption of advanced energy technologies needed to make the City of Richmond a Zero Net Energy (ZNE) Community. The strategies identified were intended to be piloted as part of a redevelopment effort to convert 20 abandoned homes into affordable ZNE homes. Several tools were updated as part of the project, including an investment tracking system and rating system for evaluating projects to finance. The project took under two years to complete and was selected because it was a low-income community project with high match funding.

All project information, barriers, impacts and benefits fields were thoroughly populated for this project, and impacts, while not quantified, were clearly stated. One of the key impacts of the project was in identifying challenges unique to disadvantaged communities in advancing emissions reduction goals. These challenges included lack of financing options, lack of information and outreach, and an absence of policies to leverage cost advantages of zero-net energy construction. Key deliverables of the project included establishment of a Green Revolving Fund Plan, Zero-Net Energy Building Codes, a Building Energy Savings Ordinance, and Rehabilitation of Abandoned Homes to Zero-Net Energy Standards. It was not clear based on the project summary if the 20 abandoned home redevelopment effort had been completed as

part of the project or if it was intended as a next step. Finally, the CEC highlighted their public awareness campaign and messaging, but the information dissemination field was left blank.

Project 39: 300-15-007
Project Name: California Sustainable Energy Entrepreneurial Development (CalSEED) Initiative
Project ID: 30951
Project Start Date: 4/19/2016
Project End Date: 2/28/2023
Administrator: California Energy Commission
Project Area: Market Facilitation
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☒ Low Income
- ☒ Entrepreneurial Ecosystem
- ☒ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☒ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 60,000,000	$ 3,396,223	$ 19,858,972

The California Sustainable Energy Entrepreneurial Development (CalSEED) Initiative provides seed funding and mentoring, technical consulting, and business development services to energy entrepreneurs and researchers working on energy solutions that will benefit ratepayers in IOU service areas. Concept Awards provide funding of up to $150,000 and Prototype Awards provide additional funding of up to $450,000 for companies that receive a Concept Award. As of 2020, nearly 100 entrepreneurs have been awarded Concept Awards and 10 companies have been awarded Prototype Awards. The project was started in 2016 and though the database shows a project end date of February 28, 2023, the project website shows that they will begin accepting new applications in 2026. This project was selected because it has the highest funding amount of any EPIC project, is long-term (5+ years), is designated low-income, and is an entrepreneurial ecosystem and market facilitation project.

The project update is outdated, and the impacts are not specified, which may be in part due to the ongoing nature of the project. The project update field was last updated in 2020, and it is unclear when the match funding and funds expended fields were last updated. The project update mentions that $5.4 million in Concept Awards have been awarded to underrepresented groups, which is consistent with the project's low-income designation, though the binary flag for these impacts could be easily misinterpreted (i.e., less than 100% of funds/benefits are in low-income areas). Projected project benefits and infrastructure cost benefits are the only

benefits, impact, or barriers fields populated with only a generalized statement that is applied to the entire overall project goals. Both populated fields comment on the crucial role that seed funding plays in bringing new ratepayer-beneficial energy innovations to market though no citation of this fact is offered. By providing small grant funding to entrepreneurs, the initiative aims to attract private sector investment (awardees have reportedly raised $65.8M in follow on funding from other sources). However, there is no information on grant awardees—such as business names, award amounts, or outcomes—available in EPIC reporting.

Overall, this database entry is lacking in detail and updated information, and points to the monetary value of grants awarded as examples of impact, rather than results of the projects.

Project 40: EPC-18-002
Project Name: California Test Bed Initiative
Project ID: 31615
Project Start Date: 12/9/2018
Project End Date: 3/30/2024
Administrator: California Energy Commission
Project Area: Market Facilitation
Selection Criteria and Project Information:

- ☐ Disadvantaged Community (DAC)
- ☒ Low Income
- ☒ Entrepreneurial Ecosystem
- ☒ Market Facilitation/Scaling
- ☐ Biomass/Wildfire
- ☐ Technology Roadmap
- ☒ Long Term
- ☒ High Dollar Project/Significant Match Funding

Contract Amount	Match Funding	Funds Expended
$ 10,999,701	$ 887,053	$ 2,346,322

The California Test Bed (CalTestBed) project has developed a voucher program to provide clean energy companies access to testing facilities to test prototypes of pre-commercial distributed energy resource technologies. The initial facilities include sites at nine University of California campuses and two National Laboratories. Twenty-six entrepreneurs were selected as voucher recipients in 2020 though the list of recipients is not contained within the EPIC database. This project is ongoing and started in 2018, but the database shows a project end date of March 2024. The project was selected because it is a high-dollar, low-income, long-term, entrepreneurial ecosystem and market facilitation project.

The database entry is outdated and listed benefits are anticipatory and lacking in specificity. It appears that database updates were last made in 2020, as the project update notes that "A second solicitation will be issued in 2021 for new applications." While the update mentions that 26 projects were selected for 2020, no tangible impacts of the projects are included. Three benefits fields are populated – projected project benefits, ratepayer benefits, and infrastructure cost benefits. The most consistently emphasized benefit is that CalTestBed will accelerate energy-efficient technologies to market and thereby reduce ratepayer costs. The explicit ratepayer benefit is the "opportunity for target customer groups to give feedback to entrepreneurs letting them know what changes can be made to improve their products to meet customer needs."

Overall, the database entry for CalTestBed is outdated and incomplete, and lacks specificity and valuation of benefits and impacts. No specific voucher recipients are mentioned and the extent to which the program has expanded since 2020 is unclear. Additional program information may be found on the CalTestBed website.[22]

[22] https://www.caltestbed.com/