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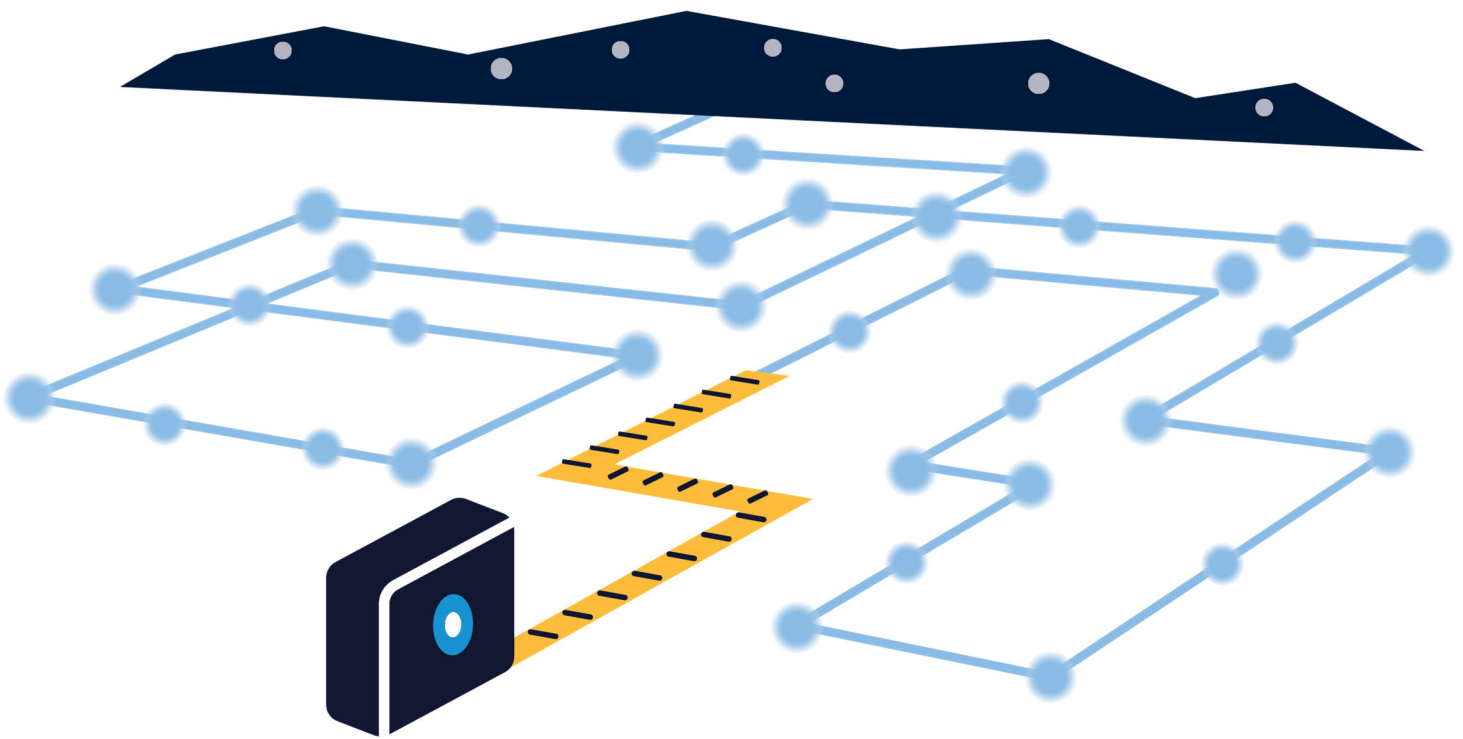
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**Draft EM&V Requirements for BUILD Program**

*Additional submitted attachment is included below.*



# Proposed Evaluation Measurement and Verification Requirements for the Building Initiative for Low Emissions Development Program



December 3, 2021



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# 1. Background

## 1.1 Statutory and Regulatory Requirements for Evaluation, Measurement and Verification (EM&V)

Senate Bill (SB) 1477 requires the California Public Utilities Commission (CPUC) to supervise the administration of the Building Initiative for Low Emissions Development Program (BUILD program). Specifically, Public Utilities code section 921.1(d)(4) requires *“the commission to ensure development of program guidelines that include, at a minimum, a list of eligible technologies, a process for evaluating new technologies, criteria for scoring and selecting projects, and a process and a set of metrics by which to evaluate and track program results. The program metrics must include, at a minimum, the number of low-emission systems installed in each building type, projected utility bill savings, and the cost per metric ton of avoided greenhouse gas emissions.”*

Further, in approving the BUILD program and selecting California Energy Commission (CEC) as the implementer, CPUC’s Decision (D).20-03-027 (the decision), provides guidance on the role of the evaluator in development, monitoring and feedback for the BUILD program design:

*“The program evaluator shall be continuously engaged throughout the initiation of these pilot programs and during the administration of them. This should occur in as close to real time as possible so that timely, substantive feedback can be used to change course when and if appropriate, and to ensure the success of these pilot programs.<sup>1</sup>”*

*“The program evaluator shall be engaged throughout the initiation of the two pilot programs and during the administration of them to ensure that substantive, real time feedback is given, and data and information gathering is meaningful to support the success of these pilots.<sup>2</sup>”*

The decision also lays out expectations from the BUILD program administrator (and the TECH initiative implementer):

*“The CEC shall also collect program performance data and information to inform evaluation and lend insight to program successes and failures. Data collection plans should be coordinated with the Commission and the program evaluator.<sup>3</sup>”*

*“... Data collection will be expected of the BUILD Program administrator and TECH Initiative implementer, who shall work with the program evaluator to understand data needs and implement processes to obtain and share program data.<sup>4</sup>”*

The decision also finds it reasonable to provide IOU customers the option of voluntary public donation of their energy use data rather than assume that every customer is unwilling to share their individual energy use data for public interest decarbonization-related research.<sup>5</sup>

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<sup>1</sup> [D. 20-03-027](#), Section 3.2.3, p.38

<sup>2</sup> Ibid, Conclusion. P.94

<sup>3</sup> Ibid, Section 4.1.3, p.52

<sup>4</sup> Ibid, Ordering Paragraph 36, p.114.

<sup>5</sup> Ibid, Conclusion of Law 30, p. 102

Finally, the decision emphasizes “substantive, real time feedback” to support the success of the pilot programs.

## 1.2 Evaluator Selection: Opinion Dynamics

Opinion Dynamics, with its subcontractors Guidehouse and Mitchell Analytics (the program evaluator), was selected to lead the evaluation of the two SB 1477 pilot programs- the BUILD program and the Technology and Equipment for Clean Heating (TECH) Initiative, with a final Purchase Order issuance date of August 5, 2021 by Southern California Edison (SCE).<sup>6</sup> Since then, the Opinion Dynamics Team has held numerous meetings with the implementers of the BUILD Program to track progress on program design and implementation.

The program evaluator proposed an initial evaluation plan as part of their response to the Request for Proposals issued by SCE in 2020. Their proposal was selected based on its responsiveness and understanding of the statute and principles laid out by the decision, among other considerations.

### 1.2.1 BUILD Evaluation Plan

The program evaluator is currently developing the complete evaluation plan which is expected to be released for public review and comment in January 2022.

There are four overarching goals for the BUILD evaluation plan:

- (1) to evaluate effectiveness of the BUILD program’s implementation,
- (2) to evaluate program impacts in terms of GHG savings, utility bill savings, energy savings, non-energy impacts, and cost-effectiveness, and
- (3) to evaluate BUILD program’s long term market impact.
- (4) Ensure implementers comply with California Air Resources Board rules regarding Cap-and-Trade funds

The program evaluator is proposing an embedded evaluation approach so that real-time, robust data and results can continuously inform program design, implementation enhancements and policy decisions. This approach will enable data-based course correction with short feedback loops as envisioned in D.20-03-027.

## 2. Feasibility of Real-time, Embedded EM&V within the BUILD Program

There are four inherent aspects to the BUILD program that make it viable for tracking energy use data in real-time:

- 1) **BUILD is a whole building, new construction program:** Generally, data collection from individual energy end uses that can be captured near instantly is expensive. Installing web-enabled metering devices after the original incentivized equipment has been placed in service adds cost of labor and materials while also being disruptive to the building occupants. However, in the case of BUILD program, the monitoring devices can be installed at the time of construction, and/or embedded within the equipment. The incremental cost would be

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<sup>6</sup> D.20-03-027 selected SCE as the contracting agent for hiring a joint evaluator for the SB 1477 pilot programs.

significantly less than installing these separately and after the building is occupied. These incremental costs will not be borne by the program applicant, instead will be covered through the BUILD program evaluation funds.

**2) BUILD program caters to multifamily properties:** Multifamily properties suffer a well-known “split incentive” problem wherein the property owner/asset manager does not have direct insight into the condition of equipment installed in individual units and is therefore often unaware of pending maintenance that could optimize equipment performance. Equipment monitoring devices can enable property-wide energy management solutions and save building owners expensive repairs that would otherwise occur from premature equipment breakdown.

**3) BUILD program will incentivize multiple end use appliances:** Appendix B of the draft BUILD program guidelines provides the various technologies, all of which could be incentivized within a project if the applicant chose to do so. Thus, a single project could install program-incentivized heat pump space conditioning equipment, heat pump water heaters, smart thermostats, cooktops, clothes dryers, additional on-site solar and energy storage, and electric vehicle supply equipment. Tracking GHG savings from each of these technologies individually would not be feasible if equipment tracking devices are installed after construction is complete and the equipment is in use. However, submetering technologies- such as smart electrical panels- that can track each incentivized measure already exist and can be installed during the construction process.

**4) BUILD is a pilot program:** The uncodified section of SB 1477 recognizes that there are a range of technologies that can achieve deep emissions reductions in buildings, including advanced energy efficiency technologies, clean heating technologies, energy storage and load management strategies. The statute also distinguishes between “low-emission” technologies for the TECH Initiative versus “near-zero-emission” building technologies for the BUILD program, thus indicating a higher expectation for GHG reductions and advanced technology demonstrations in new buildings and as a whole building system.

Therefore, it is important to be able to:

1. Accurately account for the GHG reduction potential of individual technologies through empirical, field-based data (as opposed to modeled or mathematical estimates) and
2. Understand the lifecycle performance, degradation curves and failure thresholds of these new technologies, so that their large-scale deployment is done based on sound evidence.

This could enable the program regulatory agencies to provide iterative feedback to manufacturers and improve these technologies based on data gathered in real, non-laboratory conditions as well as inform policy decisions to scale future electrification programs.

### 3. Currently Available Submetering Equipment and Devices

1. **Whole House Smart Panel:** A whole house smart panel or whole apartment-level electrical panel can be used in place of a standard electrical panel / breaker box. This enables turning individual circuits on or off from a phone application, ground fault and/or arc fault protection, and otherwise does the job of a standard electrical panel. If an occupant opts-out of the web-based functionality and remote access offered from a smart panel, the smart panel still works as a standard electric panel.

Smart panels are internet connected, with the ability to meter and transmit both whole home and circuit-level metering data to the web at one-minute intervals. For the BUILD program, using them means specific, accurate data on heat pumps, water heaters, cooking appliances, and other high value end uses, as well as data for the whole residential unit can be transmitted without disrupting the building occupant.

Example manufacturers include Schneider Electric, Span, Eaton, Koben

2. **Connected Circuit-level Metering:** A connected circuit-level metering device is installed within a traditional electrical panel (after the panel's installation) that can log both the power main lines within the panel (e.g., whole house energy usage), as well as the energy used by individual circuits. This includes both 240V circuits (such as for kitchen ranges and other large equipment) or 120V circuits (such as for plug loads and smaller equipment). Aside from its presence within the breaker box, installation is unobtrusive, largely relying on current transducers (CTs) that simply clamp around existing wires. Depending on the unit, up to 30 channels might be available to monitor different end uses. These types of meters are also web-enabled.

Example manufacturers include Leviton, Eaton, eGauge, Mitsubishi, Emporia

3. **Disaggregation-type Meters:** A metering device that is installed within a traditional electrical panel (after the panel's installation) that uses only data from the main lines coming into the panel to deduce (via proprietary vendor software and algorithms) the details of the home's electric consumption. This is done by examining the load shapes, amplitude of the current, and the frequency used.

Example manufacturers include Sense, Powerley

## 4. Proposed EM&V Program Requirements for BUILD Program Applicants

To align evaluation requirements with the BUILD program guideline development process, we present here the conceptual EM&V requirements that are relevant to future BUILD program applicants. The final evaluation plan will provide remaining working details such as applicant sample size (that is, what percentage of applicants will be selected for installing real-time monitoring devices), approved list of monitoring devices and manufacturers, process for procuring devices, approved incremental costs, applicant reimbursement choices, disclosure form template, etc.

The program evaluator recommends the following EM&V requirements for the BUILD program applicant and owner:

1. If selected for real-time monitoring, install evaluator-approved monitoring devices on the BUILD-incentivized property. Evaluator will provide a list of approved smart electrical panels, smart circuit breakers, whole building energy disaggregation devices, and/or integrated data loggers for individual appliances that the applicant may choose from. The applicant shall not be responsible for any incremental costs for the monitoring devices, but agrees to coordinate with the evaluator to ensure timely procurement.
2. Ensure availability of a wireless internet connection on the BUILD-incentivized property needed to transmit data from the monitoring devices to the device manufacturer.
3. Agree to inform the future building occupant/s that a) the property is incentivized through ratepayer dollars approved by the legislature and the CPUC for reducing GHG emissions from buildings, and is subject to energy monitoring to ensure bill savings for the building occupant, and b) if selected for real-time monitoring, obtain consent from the building occupant for CPUC and program evaluator to collect data from the installed monitoring devices (for example during signing of the lease or mortgage agreement). The evaluator shall provide the disclosure form to be shared with the building occupant.
4. Cooperate with the evaluator to facilitate EM&V activities such as occupant surveys, interviews with project professionals, and access to incentivized property (if needed).



## 5. Conclusion

Real-time energy monitoring devices can help understand “real world” performance of new technologies, to catch and improve their problematic aspects before commencing large-scale deployment. They also provide an opportunity for owners and asset managers to use energy management systems available with these devices that send timely alerts for required maintenance, enhancing energy savings and reducing the need for costly repairs.

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