Working Group 3 Action Plan

Capabilities & Accuracy: Advancing Simulation Capabilities & Metrics

CalBEM 2019

Table of Contents

Table of Contents ***1***

Subtopic Context ***2***

Advancing Metrics **2**

All-Electric Buildings and Technology Gaps **2**

Developing Interim Calculation Methods for Key Technologies **3**

Problem Statements and Actions ***5***

Problem Statement A: Advanced design measures and technologies have limited ability to be used in codes and incentives energy modeling pathways. **5**

Problem Statement B: Building Policy Goals are Separate from Grid Infrastructure Goals & Decision Making **8**

Problem Statement C: Current Code Compliance / Incentive Metrics and Modeling Capabilities do not reach carbon neutrality targets by 2045. ..... **11**

Appendix A: Notes and Problem Statements from 2019 ..... ***15***

Day 1 Symposium Problem Statements **15**

List of Possible Driving Stakeholders to Problem Statement A **15**

Note to reader: This Working Group plans on developing highlighted content as work on these topics continues in 2020.

Subtopic Context

Advancing Metrics

Building performance metrics allow for energy codes and programs to evaluate projects in a normalized way, promotes efficiency practices and can be achieved by cost effective means.

In California, metrics for energy code compliance are being adjusted to reflect carbon emissions and better align with efficiency practices to decarbonize buildings. A workshop was held by the CEC on October 17th outlining four metrics being considered in residential and non-residential code compliance to evaluate building performance. Residential codes plan to utilize a combination of metrics, one focused primarily on building efficiency and the other focused primarily on building source emissions.

Other states and countries have attempted to evolve regional building code metrics to include elements of performance based outcomes. Thermal Energy Demand Intensity (TEDI) and Energy Use Targets (EUI) have been considered in the Northwest (city of Seattle, BC Vancouver Step Codes) though it is unclear with what success or process for validation.

How could a metric give clear signals and be understood by the market of designers and owners? Or translated to a language or other metrics used today in energy simulation?

What struggles do people have with current California code compliance metrics with regard to performance compliance and software?

How might California best advance metrics used for code compliance and unique ideas are there for non-residential buildings?

All-Electric Buildings and Technology Gaps

As designers, companies, and cities move to promote all electric buildings, are the tools and capabilities ready to support this effort in energy modeling and simulation? Are the gaps in metrics creating unintentional barriers to all electric buildings?

What technologies are currently of most importance to all-electric buildings which are lacking to building energy modelers?

Where is the largest struggle for energy modeling of all electric buildings, such as in calculation engines, code rulesets and allowances, code compliance software?

What mechanisms or activities are needed to develop the capabilities of software and standards to best aid all electric buildings?

How could codes be evolved to better reflect all electric building performance? Such as Code methods: currently fixed baseline set at gas, what thoughts are there for developing a dual baseline, one for gas and one for electric?

Current activities to advance software and standards:

- This year, Bruce Wilcox is developing a **physics based** recirculating loop model for central heat pump water heaters for residential. Goal is to release this year in cbecc-res. Considering manufacture self-certification process for testing equipment.
- PG&E is testing HPWH products and others, data to create a performance curve and limitations, not anticipated for a year+.
- For multifamily, CEC is planning to modify the non-res ACM to get rid of the 8-story limitation to allow for all-electric buildings to have a more realistic baseline.
- VCHP compliance option for CBECC-res is being considered by the CEC.

What technologies lack definition for use in energy compliance, incentives or simulation in general?

What gaps are there in any simulation engines?

What gaps existing in sourcing information on limits to new technology operations and performance?

What type of information is needed to establish a technology definition? And would more information be needed for independent field validation vs physics based model development?

Technology gap analysis from February 2016 was done by CBECC-Com team (see summary slides).

How would creating new metrics impact the viability of certain technologies?

Developing Interim Calculation Methods for Key Technologies

As building simulation advances not all technologies or building features are readily available in commonly utilized software or current energy code software rulesets. Various project goals might drive an energy model to develop an interim calculation with the goal setting the level of detail and effort applied.

While energy code software rulesets seek to a level of validation to protect consumers other project goals in the built environment may need to anticipate energy performance with a certain level of uncertainty. For instance, sizing a net zero solar system with a central heat pump.

Are interim calculators or software work-arounds a commonly occurring issue within the energy modeling community?

Is there a specific area in energy modeling or energy code rulesets people find this frequently?

Where is information sourced today if people make their own interpretations and interim calculation methods?

ASHRAE standard 205 seeks to define a methodology for HVAC products to produce performance maps by technology, which represents a current gap in simulation validation, however this is very specific to HVAC components vs systems or building products. Would this agency or what other agencies be able to provide the framework for sourcing new information?

Problem Statements and Actions

Problem Statement A: Advanced design measures and technologies have limited ability to be used in codes and incentives energy modeling pathways.

Summary

- CEC alternative calculation submission is not viable on project time frames.
- Working with AHJ an **work around**, not scalable or feasible for all projects

Relevant Subtopics

- Advancing Metrics
- Interim Calculation Methods

Key Barriers

- Software development needs for California are not always aligned with new capability research and development.
- Lack of available data to prove operational performance.
- CEC concerns with new measures may underperform and jeopardize envelope efficiency.
- Lack of a consensus-based process for reviewing and vetting new measures for code environment.
- CEC resources too limited to provide expeditious pathways.

Actions

Action 1	**Develop flow chart that summarizes existing compliance options which have an exceptional need**
Description	This action is primarily to develop a summary of the process and who owns the advancement of this process into a memo for the working group to use. The memo should summarize the state of options as they exist today for the working group to fully understand. This includes a summary of what code allows today and what types of additional means are done by designers which may or may not be conflicting with code compliance intentions. This is focused on Exceptional Design option in performance, Exceptional Method outside the primary performance path, Compliance Options, or Compliance allowance. The flow chart should attempt to estimate the length of time and relevant project team stakeholders from a design team typically involved. The memo should summarize those parties involved in changing the compliance option pathways and any relevant processes already in place to do this. The memo should include reference to the discussed mechanisms which could be considered for future enhancements including:

	• Compliance Option seems most feasible for major measures. • Workarounds / "guidelines" may be appropriate for some cases though this type of reference or option does not exist today.
Status	Not started
Driving Stakeholders	[TBD] Possible Considerations: IOU(s), SCE Software Symposium Coordination Team (2050 Partners/Red Car Analytics), IBPSA-CA Chapters
Impacted Stakeholders	California Energy Commission, CBECC-Com/CBECC-Res development teams, Practitioners
Key Barriers	• Adjustments to Compliance Options are on a set timeframe which is hard to adjust. • Funding for any review or development of options or submissions does not exist or is currently allocated elsewhere. • [additional]
Milestones	01/31/2020 Draft diagram of state of existing compliance options pathway designers must choose from. XX/XX/2020 Proposal diagram of a future state, built off action 3

Action 2	**Prioritize key technologies missing today for All-Electric or common building practices.**
Description	This action is to compile a list of missing technologies or design practice allowances missing for all-electric building compliance today. This may include a survey via email or other means of energy modelers or all-electric building designers to contribute on gaps and then to help rank items. The focus should be to identify technologies and the type of gap in compliance today, be it performance rulesets, performance software, energy simulation engines, etc.
Status	Not Started
Driving Stakeholders	[TBD] Possibilities: (SCE, IBPSA CA chapters, Building Decarbonization Coalition, NRDC)
Impacted Stakeholders	CBECC-Com/CBECC-Res development teams, energy simulation engine developers (private and national labs), Product Manufacturers, Practitioners
Key Barriers	• [Barrier]
Milestones	01/31/2020 Draft approach to gathering this information and time/funding request it will take to compile, as well as concept of who or where to request support. 06/01/2020 Memo of who was surveyed and a list of the resultant technologies and design practices.

Action 3	[pending Actions 1 & 2] **Develop a framework / template for process to be followed / information needed to allow proposed measure options for implementing new technologies or modeling methods.**
Description	Currently there is no public way for advancements or proposals to compliance options or technology inclusions to be submitted or reviewed to be considered for software enhancement in CA. All advancements are currently done and researched by those who develop and maintain the state compliance software and are often de prioritized even if highly beneficial to state policy goals. Past work has been drafted by IOU consultants who work with Codes & Standards Enhancements on documentation approaches and methodologies to include software enhancements for the needs of specific CASE teams though nothing has been developed generically for developments outside the CASE process. This action requires a scope of work be developed to assess the process now, review any similar mechanisms used in other technical bodies such as CAL-TF or LEED, and determine a process by which enhancements could happen faster and were financial support would come from.
Status	Not Started
Driving Stakeholders	[TBD] Possibilities: Statewide IOUs, SCE, IBPSA-CA Chapters, CABEC
Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• [Barrier] • [Additional barriers as needed]
Milestones	06/01/2020 [Description of milestone]
	XX/XX/20XX [Additional milestones as needed]

Action 4	[Pending Action 3] **Propose committee of experts to support and streamline the process to review and advance proposed technology and design modeling measures for use in CA.**
Description	This could build on past processes created by these organizations: EA tags LEED/USGBC, CalTF, Passivehouse, Build-It-Green, Canada Certified Energy Modeling Group, CABec This action requires a clear gap and framework from Actions 2 and 3. To advance this action, develop a scope of work to find the most appropriate vehicle for these activities. Scope to include interview and documentation on procedural methods conducted by other bodies who currently do similar functions of reviewing energy modeling and compliance option proposals.
Status	Not Started
Driving Stakeholders	TBD

Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• [Barrier] •
Milestones	Xx/xx/2020 [Description of milestone] XX/XX/20XX [Additional milestones as needed]

Action 5	**[Future] Develop a web platform for providing status of ongoing proposals / measures.**
Description	Where Action 4 was implemented or being trialed, this action would be to develop a public engagement framework for this ongoing effort.
Status	Not Started
Driving Stakeholders	TBD
Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• [Barrier] •
Milestones	Xx/xx/2020 Xx/xx/2020

Problem Statement B: Building Policy Goals are Separate from Grid Infrastructure Goals & Decision Making

Summary

Codes do not address resiliency capabilities (power shut offs)
Critical loads, what power demand a building needs.
End use loads, setting limits by end use.
End use loads, what are critical to keep running vs not?
Modeling answers cannot be used to answer grid questions.
Metrics like annual net zero is not granular enough to simulate grid interactions.
Cost effectiveness metrics for TDV do not equal TOU and creates different outcomes for batteries and generation.

Relevant Subtopics

- Advancing Metrics
- All-Electric Buildings

Actions

Action 1	Create publicly available resource for location specific (distribution) grid loads from utilities.
Description	The intent was to consider how future building designers and state compliance agencies would be able to incorporate local electrical grid distribution needs into building design. The action would be to develop a scope of work for surveying the proper agencies to develop a 'state of grid load information' report on how grid load shape is or is not known today at this level and where the information could even come from in the future.
Status	Not started
Driving Stakeholders	[Name, additional names as needed]
Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• Lack of agency for where this information would ultimately reside to be maintained and publicly accessible. • Lack of clarity on how or if this information exists in current grid maintenance.
Milestones	TBD [Description of milestone] XX/XX/20XX [Additional milestones as needed]

Action 2	Create grid territory (location specific) TDV to informative for incentive programs and local reach codes.
Description	This action would focus on creating incremental resources for incentive programs and reach codes to implement future building systems with a higher level of grid awareness than code compliance process. This relies on the TDV development process being done at more granular levels and on a timeline faster than current code cycles. The task is to discuss with the CEC and E3 the feasibility of this and report to the working group on how this would be best accomplished.
Status	Not started
Driving Stakeholders	[TBD]
Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• [Barrier]
Milestones	10/01/2020 SCE 2020 Software Symposium

Action 3	**Research statement on optimal load flexibility control strategies (for electric or thermal storage, or shiftable load appliances) to integrate into building energy modeling.**
Description	The intent for this action would be to identify flexibility criteria of key technologies being considered and evaluate any gaps in building energy modeling means and methods today which should be developed. This action encompasses several efforts currently underway between National Laboratories as well as State Agencies, including IOU, Muni, and CCAs. This description and tangible next step need to be first developed by members of Working Group 3 or re-considered at the next symposium.
Status	Not started
Driving Stakeholders	[Name, additional names as needed]
Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• [Barrier] • [Additional barriers as needed]
Milestones	TBD [Description of milestone] XX/XX/20XX [Additional milestones as needed]

Action 4	**Add resiliency modeling features that give the ability to tag loads as critical loads and set critical fallback thermostats setpoints.**
Description	The goal of this action is to identify how future building loads could be modeled and what criteria would be needed to specify their controls and capabilities. This action may involve documenting gaps today in compliance rules or energy modeling software directly. Information from Actions in Problem Statement A on technology gaps may inform this or other actions included in this problem statement. This description and tangible next step need to be first developed by members of Working Group 3 or re-considered at the next symposium.
Status	[Not started / In Progress]
Driving Stakeholders	[Name, additional names as needed]
Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• [Barrier] • [Additional barriers as needed]
Milestones	TBD [Description of milestone] XX/XX/20XX [Additional milestones as needed]

Problem Statement C: Current Code Compliance / Incentive Metrics and Modeling Capabilities do not reach carbon neutrality targets by 2045.

Summary

Current metrics in California codes compliance or how incentive programs base performance metrics are not aligned to achieve the level of carbon neutrality set by California by the year 2045. Short term changes are underway by the CEC to adopt dual metrics for code compliance which would further advance low carbon buildings though it is at this stage just an option being considered and not adopted.

Advancements to move the market may require consideration of reach code criteria which could evolve quickly. The biggest observation was for metrics and labeling of building performance to be clear and actionable by both designers, owners, and policy makers. Where possible, energy modeling can help inform extra efficiency options in Reach Code. Energy modelers and industry experts can also help inform optional labeling for building code outputs to be more intuitive and understood by the wider market.

Relevant Subtopics

- Advancing Metrics
- All-Electric Buildings and Technology Gaps

Actions

Action 1	Verify the 2022 TDV and Source Metrics are on a Track for 2045
Description	This action was to verify with the research teams who worked on the TDV and Source Metrics the trajectory of the current metrics and where codes and standards advancements would be short between 2025 and 2045. The result of this would be a memo to report back to the working group on the state of the decisions for adoption the 2022 metrics and any feedback from the metrics development team.
Status	Not started
Driving Stakeholders	[Name, additional names as needed]
Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• [Barrier] • [Additional barriers as needed]
Milestones	03/01/2020 Have completed the interviews of key participants for their comments and have a draft memo. 10/01/2020 CAL BEM 2020 report on status of TDV/Source energy at the CEC for 2022.

Action 2	**Develop a Process by Which Cities Could Track Savings from Buildings and Reach codes using energy modeling information already generated and/or available.**
Description	Cities and local jurisdictions would be able to benefit from performance compliance submissions to their departments for building permits to capture information to inform their energy and or carbon savings from any state codes or local reach codes being utilized. This action is to describe how this would feasibly work and document what information could be asked of project teams from the energy model itself and a recommended process cities could implement. A scope of work to complete this procedural guideline for cities needs to be developed first.
Status	Not started
Driving Stakeholders	[Name, additional names as needed]
Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• [Barrier] • [Additional barriers as needed]
Milestones	07/01/2020 [Description of milestone] XX/XX/20XX [Additional milestones as needed]

Action 3	**Develop and research extra efficiency options Reach Codes could prescriptively be adopted.**
Description	As a means of advancing energy efficiency and reach codes a table of prescriptive options, like the menu of choices used in IECC 2018, could be developed to incentive locally applicable building solutions. A scope of what this would govern in codes needs to be developed and could be based on further discussions with key working group 3 members. Prior to developing a scope of work to research the appropriate measures, this action should be assessed with IOU Codes and Standards teams to inform how to fit this into ongoing regulatory processes.
Status	Not started
Driving Stakeholders	[Name, additional names as needed]
Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• [Barrier] • [Additional barriers as needed]
Milestones	04/01/2020 Determine how this scope would work with ongoing regulator processes and report to the group.

	10/01/2020 [CALBEM 2020]

Action 4	**To advance future non-residential codes, develop a survey of information to be used to gather new prototype energy models on a donation basis.**
Description	The intent of this action is to create new prototypes for the advancement of creating new simulation techniques or technology evaluations not possible in today's framework or with today's prototypes. The intent was to develop a means by which models could be donated to be enhanced or modified to become valid prototypes for use by codes and standards or program teams. It is not the intent to have all donations be perfectly defined for those needs. Prior to any scope of work for how this could be created, this action and working group should collaborate with any similar efforts on prototype model storage and documentation under way by Groups 1 and 2.
Status	Not Started
Driving Stakeholders	[Name, additional names as needed]
Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• [Barrier] • [Additional barriers as needed]
Milestones	05/01/2020 [Description of milestone]
	XX/XX/20XX [Additional milestones as needed]

Action 5	**Create a simple diagram for 2022 Compliance Metrics to communicate to energy modelers and designers.**
Description	This action is to create a process diagram for building designers to understand how the new metrics for code compliance on a performance pathway would work for permits. The diagram is meant to relay the envisioned draft processes being proposed with use of two metrics for compliance. The goal is to convey how the process works today and the major differences in compliance with two metrics to quickly explain this new concept to both members of the working groups and a primary audience type of building designers and practitioners.
Status	Not Started
Driving Stakeholders	[Name, additional names as needed]
Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• [Barrier] • [Additional barriers as needed]
Milestones	02/15/2020 [Description of milestone]

	XX/XX/20XX [Additional milestones as needed]

Action 6	**Develop a draft optional label for building code outputs to be more intuitive and reflect metrics a broader audience can readily digest.**
Description	The intent of this action would be to provide a tool and or process by which results from performance energy models for code compliance could be translated into metrics intended to relay to a broader audience of owners, designers, real estate agents etc. This action is like the intent for an action to assess how energy modeling results could be used to help cities advance their energy savings and carbon savings tracking information. A draft scope of work needs to be developed as well as research for what driving stakeholders would be able to complete this.
Status	Not started
Driving Stakeholders	[Name, additional names as needed]
Impacted Stakeholders	[Name, additional names as needed]
Key Barriers	• [Barrier] • [Additional barriers as needed]
Milestones	06/01/2020 [Description of milestone]
	XX/XX/20XX [Additional milestones as needed]

Back to: Table of Contents

Appendix A: Notes and Problem Statements from 2019

Day 1 Symposium Problem Statements

A. New Interim Calculations have Ability to be Used in Codes or Incentives
B. Building Policy Goals are Separate from Grid Infrastructure Goals / Existing Metrics do not include grid costs
C. Current metrics don't align with carbon neutral targets by 2045.
D. Current metrics don't align with resiliency survivability wildfire mitigation needs.
E. Building policy and metrics are too complicated, inhibit wider use and adoption by builders, contractors, designers.
F. Metric and calculation enhancements primarily focus on new vs existing buildings
G. Life cycle of sub systems is not considered in performance codes (env vs HVAC vs controls).
H. Current mixed fuel baseline makes it difficult for all electric buildings to comply
I. Building code results are complex and lack a connection to asset rating
J. Code doesn't support use of buildings as distributed storage (power plants)
K. Code compliance detracts from good design and BEM.

List of Possible Driving Stakeholders to Problem Statement A

- IBPSA CA Chapters
- EA tags LEED/USGBC
- CalTF
- Passivehouse
- Build-It-Green
- CABec
- (ex group Canada Certified Energy Modeling Group)

Relevant Subtopics

- Developing Interim Calculation Methods for Key Technologies

Description	[Description of action to be taken]
Status	Software advancement is limited to a select group, individual projects directly work with Jurisdiction for alt calculation
Driving Stakeholders	IBPSA CA Chapters, EA tags LEED/USGBC, CalTF, Passivehouse, Build-It-Green, Canada Certified Energy Modeling Group, CABec
Impacted Stakeholders	[Name, Name, Name, Name, as needed]

Key Barriers	• A consensus based process to vet a tool or method? • To approve a prescriptive code pathway. • Best available data to prove operations. • New technology criteria for minimum number of vendors to be tech agnostic. • Miss alignment of timeline of technology review uncertainty with project timelines. • Trade off risk of building design measures or new technology to envelope efficiency is a risk the CEC may be holding back opportunities. • Missing Technologies • How can the CEC lawyers act to deem or approve any alternative approaches? • Vetting based on allowed to be installed vs given credit for energy trade-offs ○
Actions Ideas	Who could be a body of volunteers or technical experts to provide review / insight to work-around or unusual calc? Prescriptive pathways Should any past methods or processes be housed or able to shared with other projects? How can information on limit or manufacture results be gathered? What formats could be leveraged, ASHRAE 205? Peer review process utilizing approved list of vendors, ex Washington state (Seattle). Is there another body or review agency for Jurisdictions to engage with? How would past methods be re-used and built upon for other projects?