



December 21, 2018

436 14th Street
Oakland, CA 94612

510.368.4427 PHONE
510.451.7002 FAX



MEMORANDUM

To: Bach Tsan, William Vicent, Dallen Coulter (SCE)
From: Abhijeet Pande, David Douglass-Jaimes (TRC)
Re: **California Compliance Software Symposium III – Discussion Notes**

CALIFORNIA COMPLIANCE SOFTWARE SYMPOSIUM III

This document outlines the discussions that occurred as part of the third California Compliance Software Symposium, convened by the Statewide IOUs led by Southern California Edison, held at the California Museum on November 5 and 6, 2018.

Original presentations from the Symposium will be made available separately.

Day One – Discussion Notes

Attendees

- ◆ Martha Brook, Larry Froess, Mazi Shirakh (California Energy Commission)
- ◆ Bach Tsan, William Vicent, Dallen Coulter, Andres Fergadiotti, Randall Higa, Charles Kim, Christopher Kuch, Ryan McFadyen, Ruby Yopez (Southern California Edison)
- ◆ Kelly Cunningham (Pacific Gas and Electric)
- ◆ Dimitri Contoyannis (Noresco)
- ◆ Roger Baker (California Technical Forum)
- ◆ Supriya Goel, Mike Rosenberg (Pacific Northwest National Laboratory)
- ◆ Kaiyu Sun (Lawrence Berkeley National Laboratory)
- ◆ Panos Bakos (Arup)
- ◆ Liam Buckley (IES)
- ◆ Neil Bulger (Red Car Analytics)
- ◆ Greg Collins (Zero Envy)
- ◆ Scott Criswell (SAC)
- ◆ Charles Eley

- ◆ Lincoln Harmer (kW Engineering)
- ◆ Mike Hodgson (ConSol)
- ◆ Erik Kolderup (Kolderup Consulting)
- ◆ Steve Kromer
- ◆ Neal Kruis (Big Ladder Software)
- ◆ Lucas Morton (Morton Green Building Services)
- ◆ Leslie Nelson (Energy Solutions)
- ◆ Gina Rodda (Gabel Energy)
- ◆ Jeff Stein (Taylor Engineering)
- ◆ Ted Tiffany (Guttmann & Blaevoet)
- ◆ Bruce Wilcox
- ◆ Mike Wilson (IBPSA)
- ◆ Abhijeet Pande, David Douglass-Jaimes (TRC)

Introductions

- ◆ Poll Everywhere questions:

Describe in one word what comes to mind when you think Compliance Software



- Streamline Processes

- ◆ Education - Ruby Yopez

- ◆ Accuracy - Andres

- ◆ Testing to improve the accuracy of simulation algorithms

- ◆ Metrics - Charles Kim

- ◆ How do we want to measure these things (efficiency, renewables, GHG, etc.), and what is the message those measurements send to Californians?

- ◆ Benchmarking - Ryan / Lincoln

- ◆ Reference database, draft by end of the year, public-facing Q1 2019

- ◆ Streamlining - Will

- ◆ How all the pieces come together to support and accelerate the clean power and electrification plan
 - ◆ How to get funding to the support both the building and the operation toward those goals

- ◆ Discussion

- ◆ Mike W.: What are the legal implications of enforcement, etc? Seems like a complex issues, what do those issues look like?
 - Will: Enforcement is already a huge issue, and it's something that we are thinking about. Will this be better or worse? We're not sure. Building departments are already under-resourced.
 - ◆ Mike R.: How do you adjust for changing situations over the life a building, families growing, occupancies changing, etc?
 - Will: We're hoping to use this as a pilot to evaluate some of those issues, looking at piloting this as an NMEC process to increase sample size and get better accuracy of results.
 - Bach: Yes, NMEC for residential.
 - ◆ Mazi: Compliance and enforcement are not the same, for residential new construction compliance is pretty good, existing buildings are where we run into problems. Most production builders actually comply with the standards. The big difference is between existing buildings and new construction.
 - ◆ Erik: On the baseline carbon budget, that's coming from the database, based on standard assumptions of building factors? It seems like there are limitations in the database, but it would be a fixed target based on some rules?
 - Ryan: The database is ultimately agnostic to design, it outputs an EUI target. But yes, there are assumptions.
 - Will: The database is infinitely scalable
 - ◆ Martha: Will the models for the database be publicly available?
 - Ryan: Yes.
 - ◆ Supriya: Is there any ability to upload models directly to the database?

- ◆ Charles K.: Don't think about this a single channel workstream. There are different standards for different types of buildings. Code is the minimum efficiency, incentive programs are above and beyond. Enforcement is about minimum efficiency, incentive programs are above that. Don't assume a single channel, there are multiple channels for incentives, customer types.
- ◆ Mike W.: Do you have any simulations of what this program would cost annually if it were actually successful?
 - Will: We're working through that. We think because of the cost of carbon, it would work out. Some of those incentives may taper off, similar to what happened with PV.
- ◆ Mike R.: Would you be requiring the same software for the benchmarking database?
 - Will: The hope is that it's software agnostic.
 - Ryan: The benchmark is just an EUI, so you can use any software.
 - Mike R: Right, but different softwares give you different outputs, so it's not really software agnostic. This is why we've used a reference building approach for so long, so I wonder why this approach would work now when it hasn't worked in the past.
 - Will: That's a question we have too.
- ◆ Martha: When can a prototype capture a range of EUI, and consider the pros and cons?
- ◆ Dimitri: There are a number of factors that impact the outcomes for a prototype, things like number of floors, space distributions, etc. These things can get normalized out, but once you lock in a single EUI number it gets harder.
 - Will: This is the kind of feedback that is really productive and we want to dig further into.
- ◆ Mike R: When we update our reference models from one version of Energy Plus to another we see as much as a 15% difference in outcomes.
- ◆ Will: From my perspective, if the automotive industry has MPG, why can't we do the same kind of thing?
- ◆ Martha: We just need to be aware of the pitfalls of this type of approach, and prepare for that.
- ◆ Mike W.: How do we sell this to policymakers, politicians, people? It has to stand up both to technical scrutiny and in the public eye. So identifying and addressing those pitfalls is important.
 - Will: That's why we're here today.
- ◆ Chris: If we can align production and incentives to GHG it's more important to jurisdictions, and if it's important to jurisdictions, enforcement also goes up. If we can align these priorities it improves a lot of things.
- ◆ Neil B.: Switching to these types of processes often result in modeled buildings using more energy, so creates other challenges, especially in relation to regulated vs unregulated loads, etc.
- ◆ Greg: It's clear that this is a big issue, all the data tied to the baseline buildings don't actually match what's getting built, but we're not going to get better at connecting those dots unless we do something like this. But we need a parallel path with real data to continue to improve, rather than just avoiding it because we're afraid it won't match.

- ◆ Bach: This is a great example of what we need to continue with discussions happening in a more fluid way, rather than just us presenting what we've done so far.

CEC Updates

- ◆ Presentation – Larry Froess
 - ◆ Planned updates and next steps looking forward
- ◆ Discussion:
 - ◆ Charles E.: Are you considering electrification in the mapping?
 - Larry: CEC is working hard on that. Based on "energy savings" gas is still cost effective, so we're thinking about how to get around that. It's on our radar.
 - ◆ Ted: Some of the system mapping baseline is less efficient than what we had before.
 - Larry: We're aware of that, we're moving in that direction to align more closely with national standards.
 - ◆ Mike R.: The intent is that you still have to exceed that fixed baseline by a certain percent, so even if the baseline changes, the standard is still about a margin for exceeding the baseline.
 - ◆ Andres: What policies are you using to determine the fuel switching approach?
 - Larry: For 2019?
 - Martha: We aren't required to follow the CPUC's three-pronged test.
 - Dimitri: Current policy disincentivizes all-electric, which needs to be addressed either with new metrics, or a dual baseline. There is a lot of talk around encouraging all electric. It's not easy, but we're working on figuring it out.
 - ◆ Greg: Can you speak to how this symposium process has impacted what is on this to-do list?
 - Larry: We gained a lot of insights from the previous, but due to other constraints there hasn't been much change to this to-do list. But after the new Standards go into effect, we will have more freedom to make improvements to the 2022 software.
 - ◆ Ted: Is there an opportunity to fix the 2019 system mapping?
 - Larry: Yes, that can be addressed during the workshops.
 - ◆ Gina: Prescriptive is the elephant in the room. As long as people can pull out and go prescriptive for certain elements, what are we really accomplishing?
 - Martha: CEC has committed to working on nonresidential going forward because we've been so focused on residential recently. We know these are issues, and we know we're behind, but we're pivoting and we need your input on that.
 - ◆ Jeff S.: Why can't we incentivize all-electric though TDV. We need to value the fuel sources correctly.
 - Martha: Yes, I'm going to talk about that next.
- ◆ Presentation – Martha Brook

- ◆ How does CEC staff proceed in this process to continue these aggressive Standards with limited resources?
- ◆ I want to see CEC own the ruleset layer of the process, it's part of the job of the Standards developer. It will require a transition of the staff, but it's doable. Every CASE measure should come with the ruleset enhancement proposal.
- ◆ Data models is a core area for collaboration.
- ◆ Engine development is also a necessary area for collaboration. We do so much engine development across public policy, but we don't collaborate. The CEC will never be the hub for collaboration, so we need to think about a different type of collaboration entity that we can all contribute our efforts to. There is a role for an middle entity to provide that collaboration support.
- ◆ Lessons learned:
 - Government will always be constrained, and pressured to spend less. We all need to acknowledge that constraint to work effectively and innovatively.
 - The state shouldn't put forward standards that we cannot support. Sometimes we need to go back to improve the standards rather than creating complicated software solutions.
 - Industry will always want more than government can deliver.
 - The partnership between government and industry can be painful, but it promises great benefits, so we can work together.
- ◆ Zero Carbon Buildings Presentation – Martha Brook
 - ◆ Natural gas use is flat over time, which is not improving the GHG situation.
 - ◆ 93% of Californians live in ozone non-attainment areas.
 - ◆ We do not have a carbon neutral standard.
 - ◆ Working toward adopting future metrics that align with GHG emissions.
- ◆ Discussion
 - ◆ Will: With CEC's desire to hold on to rulesets, to what extent does that apply to software?
 - Martha: CEC software is available open source. I support the one model vision. I think software development should be collaborative. We can't achieve our climate goals without collaboration.
 - ◆ Ted: To go back to lessons learned, I just want to thank you for being responsive to consultants.
 - ◆ Erik: On emissions from electricity relative to gas, does that include system efficiencies, etc?
 - Martha: No, this only includes the energy serving the building.
 - ◆ Kaiyu: Related to the resiliency of ZNE, if CA is using TDV, but the values of TDV change with each cycle, how do you address those changes in how ZNE is evaluated for each cycle?
 - Martha: I'm intentionally not using the term ZNE anymore because I think we're bending toward carbon. TDV is not today's value, it takes into account the past values and then adjusts for net present value. We could change the policy of how we determine those metrics to better address this.

DOE - Amir

- ◆ Will: Do you have any application examples of the bootstrapping model that you talk about?
 - ◆ Amir: No, I don't have any examples. We're using outputs to prove equivalence with CBECC.
- ◆ Neal K: This structure implies that we have some sort of standard model definition for these ruleset comparisons. Is that an area that we as an industry should be focusing on?
 - ◆ Amir: I think that's good in theory, if you look at previous attempts to standardize data modeling. But it's not very robust. In theory, that kind of collaboration toward a common standard is one thing.
 - ◆ Neal K.: gbXML has been around for a while, but it's not a standard in itself. One discussion that started at the last IBPSA conference is whether the industry could get behind gbXML as an industry standard to encourage greater interoperability.

Fixed Baseline - Dimitri Contoyannis

- ◆ Steve K.: How is cost effectiveness considered in this process?
 - ◆ Dimitri/Mike R.: The prototype design for the baseline is based on cost-effective prescriptive measures that are included in the applicable baseline model.
- ◆ Steve K.: This is a really simple way to compare T24 and 90.1, is there any way to do that now?
 - ◆ Dimitri: Some work on this has already been done, including mapping of climate zones, and developing prototype buildings. We're working on expanding this analysis to include more building types, and to address all-electric buildings.
- ◆ Jeff S.: I have a lot of concerns with this, starting with the problem statement. What are we trying to fix? The goal is to save energy, not to put buildings neatly in boxes. T24 is so far ahead of 90.1, that changing to this approach seems like a step backward in many ways. Coming up with these basic numbers hide a lot of information that are now available in the ACM. It doesn't seem to save any effort in developing the baseline, or in how to model it.
 - ◆ Dimitri: As far as what the baseline is and how to model it, it's adopting a performance baseline as it's been adopted. For the stringency values, there is a significant modeling effort to develop those values. There is a lot of effort that goes into those kinds of things, presumably this could be part of future CASE process.
- ◆ Mazi: I'm curious why you chose not to include unregulated loads.
 - ◆ Dimitri: They are included in the calculation, but what we're saying is that since the baseline model is based on regulated loads we could ratchet down the total allowable regulated load.
- ◆ Mazi: And if we're moving away from TDV toward GHG, how would this impact that?
 - ◆ Dimitri: You could choose whatever metric you want.
- ◆ Randall: For the baseline, would it also be a 2004 90.1 building, the same way that EDR is based on IECC 2006 home? What would the baseline be for T24 nonresidential?
 - ◆ Dimitri: The idea is that the baseline would be the same as it would be for 90.1.

- ◆ Charles E.: I think this is a terrific approach. One of the problems is that current prescriptive standards are becoming very complex, and they don't always achieve the same level of energy performance. If you roll back to a 2004 baseline there are a lot fewer uncertainties. The Appendix G procedure has legs, it has already been adopted in Standard 189.1, and we have three metrics there based on the same thing: carbon, cost, and source energy metrics, and you have to comply using all three metrics. When we applied this process to Standard 189.1, the sensitivity to climate zone washed away because the baseline value also adjusts with the climate zone. There's definitely a lot of merit here. As a former software developer, having to chase all the changes and addenda and rules is an enormous problem that goes away with this type of procedure, making this type of process more attractive to developers.
- ◆ Jeff: We made a big change in the ACM in 2013, it is essentially a fixed baseline, which already addresses some the challenges posed here. There is still some work to do on this, but we're already working with a fixed baseline.
 - ◆ Dimitri: But it's a baseline that changes for each code cycle.
 - ◆ Jeff: The baseline should change with each code cycle. The 2013 version represented the state of the art building at the time. The modeling challenges are not on the baseline, they're on the proposed building. I'm concerned that we're trying to oversimplify and that we lose a lot of the energy savings that are baked into what we've done.
 - ◆ Dimitri: Any new requirement in the code still impacts this performance approach.
- ◆ Mike R.: I think the intent is that everyone can see what's behind the baseline model. It's available for everyone to see how the targets were developed.
- ◆ Jeff: It seems like we're trying to solve problems that existed before 2013. We already have an Appendix G type baseline.
- ◆ Mike R.: But it's only half of the Appendix G approach, you have the independent part, not the stable part. This way those same models could be used for more than just compliance. Things like tax credits, programs, etc.
- ◆ Ted: There are a lot of challenges that I think this addresses.
- ◆ Greg: I'm in support of the idea, it seems like it streamlines a lot of the challenges that come up with new cycles every three years. And it's a good idea to move into more alignment with national standards. We're able to spend more time trying to improve performance results rather than figuring out the intricacies of the modeling.
- ◆ Dimitri: We're talking about refining the calculation procedure, not the stringency, so this is a good beginning of that discussion.

LBNL - Kaiyu Sun

- ◆ Martha: Are the city models you discussed publicly available?
 - ◆ Kaiyu: The way we create the building model, we use the data sets that we create from each city, including building details, assuming they are compliant with the building code of their vintage. Yes, it is all publicly available. You can download the model from the website.

- ◆ Ted: Has there been any opportunity to link these city models back to the municipal energy benchmark goals?
 - ◆ Kaiyu: Yes, for example we are collaborating with the city of San Francisco, and working with the city's benchmark data.
- ◆ Martha: Are the models calibrated to match the city data?
 - ◆ Kaiyu: We have an automated calibration method in CBES, so we calibrate the model to the monthly EUI if that data is available. We are trying to implement that at the city scale instead of just the individual buildings scale
- ◆ Kelly: For cost data you're using for the ECMs, does that include labor and materials?
 - ◆ Kaiyu: Yes, it includes the installation labor, all the cost factors included.
 - ◆ Kelly: Is it possible to isolate those factors for review?
 - ◆ Kaiyu: The data is all compiled under the hood, but only the total cost data is available to the public.

IBPSA - Erik Kolderup

- ◆ Martha: For the data standardization the question is which use case are you talking about? Would this be a higher level data model, or would you determine that as part of the conversation?
 - ◆ Neal: Currently we're just discussing this at the higher level, but determining where we go from there.
- ◆ Martha: For the second proposal, as the CEC we're always frustrated by the constant cycle of upgrading the code. We need to agree on some of these exceptional design compliance processes, but we have a lot of barriers to implementing that as a regulatory agency. Let's do the informal thing to work through the methods, but don't forget that we have to work through the process for each code cycle.
 - ◆ Greg: That is already the process for Savings by Design. For just about every case there is a Title 24 exceptional modeling approach.
- ◆ Chris: To add a little urgency to this, on the reach code side, a lot of jurisdictions are looking to push the envelope on this now, trying to work towards decarbonization. Because there is interest on the nonresidential side, and we're all aware of some of the shortcomings currently on the modeling, pushing forward on this to help support these jurisdictions
- ◆ Gina: I just want to caution that for alternative pathways the local jurisdictions need an authoritative source to reference. It has to be enforceable.
 - ◆ Martha: Hopefully this group could help support those resources.
- ◆ Dimitri: Back in 2013, we anticipated that there would be a lot of models that would need to go outside the bounds, and it requires that the CEC review every exceptional modeling approach. At the time the CEC didn't have the resources to support that. We would need to have some language change to allow the AHJs (Authorities Having Jurisdiction) to follow that process.
 - ◆ Greg: Is there a pathway to support having separate third-party reviews?
 - ◆ Dimitri: It needs to be done carefully anytime you bring in third parties.
 - ◆ Gina: CABEC would love to work with IBPSA to support this.

CABEC - Luke Morton

This presentation did not have accompanying slides. The notes below summarize the presentation.

- ◆ What does it mean to make simulation software simpler?
 - ◆ Simplicity is complexity that is well understood
 - ◆ Making compliance pathways more eloquent
- ◆ Complexity is difficult to avoid in an environment where buildings and the grid are necessarily more integrated. How do we improve how we do our work to support that future?
- ◆ Clarity in inputs - wrangling some of the workarounds
- ◆ Modeler as the first line of enforcement of the energy standards - taking that responsibility, and the spirit of the standards seriously.
- ◆ CABEC is entirely volunteer run, we want to help promote best practices.
 - ◆ Energy analyst certifications, and rolling out an associate energy analyst step.
 - ◆ Initiative right now for code support, providing a resource for code officials to help with modeling questions, helping to demystify the enforcement in the field
 - ◆ Initial phases of developing a mentorship program, looking toward the future

Benchmarking - Ryan McFadyen, Lincoln Harmer

- ◆ Erik: In this scenario when you have the end use for the baseline, it's based on the database from the climate zone and building parameters, but not necessarily system type or WWR or other specifics?
 - ◆ Ryan: The way a designer would use it would be to identify opportunities to make improvements, you're able to see by end use where the prototype is, and how your design compares
- ◆ Greg: I really like the whole concept, similar to an LBNL tool energyIQ. I would suggest if there's an easy way to pull the data out into something like excel so we can work with the data, I would use it.
 - ◆ Ryan: Yes, the plan is to have the data downloadable for all the models.
- ◆ Ted: How easy is this to integrate with other entities benchmarking efforts, cities, etc?
 - ◆ Ryan: I envision it as expandable, so it wouldn't be limited. It could include other information as well.

Zero Code - Charles Eley

- ◆ Steve K: Has there been any adoption or interest so far?
 - ◆ Charles: The California version was just released at the Global Climate Action Summit, so no one has adopted it yet, but there is interest from Palo Alto, State of Oregon, etc. There is a lot of interest. The website is pretty cool. We got a lot of help on developing this.
- ◆ Erik: How would on site natural gas work in this system?

- ◆ Charles: This wouldn't prohibit gas use, but you have to install or procure enough renewables to offset it, which is pretty hard given the TDS metric. So it encourages electrification without mandating it. TDS makes the electric equipment look a lot better than natural gas.
- ◆ Mazi: So if you switch to electric resistance you have less CO2, but then what is impact of the utility bill?
 - ◆ Charles: We haven't looked at that, we were just looking at CO2.
 - ◆ Mazi: So that's a consequence we have to consider.
 - ◆ Charles: Until we start putting a price on carbon.
 - ◆ Luke: You still have to meet 2019 T24.
- ◆ Charles: We also looked at batteries with the various metrics, and this does provide an incentive for storage.
- ◆ Jeff: Have you tried to figure out what the incremental cost is to implement Zero Code in different building types?
 - ◆ Charles: The way we look at it, the CEC has already shown that T24 2019 is cost effective, and if you can then show that renewables are cost effective, then you've solved it. And off site renewable production is generally more cost effective than on site. We think it will be relative easy to jump through the cost effectiveness hoops, but we still have to do it.

Practitioner Perspective - Ted Tiffany

- ◆ Mike R.: If the baseline always follows the proposed building, how do you encourage electrification, if the proposed design is gas?
 - ◆ Ted: At this point I want to remove the disincentive to go to electric, because the baseline is fossil fuel and the TDV metric favors fossil fuel.
 - ◆ Mike R.: So maybe it's the metric and not the baseline.
 - ◆ Charles: TDV really comes back to cost.
- ◆ Mike R.: Is there a metric that gets to what we want that doesn't incentivize the wrong thing?

Practitioner Perspective - Greg Collins

- ◆ Gina: How are your clients taking on the fact that the cost associated with compliance is going up?
 - ◆ Greg: I'm definitely not getting paid 10 times more for compliance work. It's something that gets brought up during negotiation, but no one is willing to pay the full cost of the extra effort.
- ◆ Erik: Do you end up doing prescriptive, and find that more projects get pushed to prescriptive?
 - ◆ Greg: I try to encourage more prescriptive, and bring up prescriptive approaches at the beginning of the process. It's usually the envelope that doesn't comply.
- ◆ Ruby: When you're doing these simulations, are you having that conversation about cost in the DD phase when you start working on compliance? Do you bring in a GC to work on the costs of the EE measures?

- ◆ Greg: I usually start modeling in DD phase, some projects that are using a design-build approach and have contractors already involved make it easier. There's no reason we couldn't start thinking about that at SD phase, and maybe just thinking about envelope measures at that phase.
- ◆ Andres: Have you noticed more stability in new versions of CBECC, or is it mostly the same?
 - ◆ Greg: I'm not sure I can answer that very well. One project I had was trying to submit under 2013 code, and the schedule slipped and we had to update it into 2016 CBECC. We were expecting to have to eliminate a lot of glass, but when we ran the model we ended up better than code, rather than worse.
- ◆ Dimitri: In regard to the 10 times more effort, one of the considerations at the beginning of development of CBECC was to shift to more detailed energy modeling rather than data entry, which requires modelers to understand building physics more in order to achieve ZNE. It was a conscious effort to make it a more detailed energy analysis exercise.
 - ◆ Gina: It's not just the amount of skill or effort, sometimes it's actually the amount of time because of the time it takes to run models.

Practitioner Perspective - Neil Bulger

Original presentation included separately.

Practitioner Perspective - Gina Rodda

Original presentation included separately.

Prioritization and Planning Discussion

- ◆ Gina: I love the idea of establishing some written workarounds for alternative methods. Both so they are established, and so we can discuss them. We need some standards when we go outside the box.
- ◆ Dimitri: There's a split workflow that diverges and never meets up again. We had this idea that third party models could hand off to compliance, but that hasn't happened. Achieving that model is important, and we haven't gotten there yet.
- ◆ Abhijeet: A lot of the efforts from SCE came out of previous discussions like this. Are there concrete projects or actionable items that can build on what we've discussed today? For example if we take these exceptional methods approach, there's always going to be a conflict.
- ◆ Gina: One of the big questions is where does that need to live, it can't be in the commission, and it could be on energy code ace.
- ◆ Kelly: It can also live on EnergyCodeStakeholders.com.
- ◆ Gina: There needs to be a process, and it needs to be a replicable and documented process.
- ◆ Erik: Practitioners will freely criticize and complain about the tools, but it's our responsibility to take the lead and support each other. We know how to come up with the workarounds, but we need to share them, and support others. There's already the Unmet Hours forum where people have discussions about how to achieve these strategies. It's already out there, how do we collect them and get them blessed?

- ◆ Gina: And sharing that with AHJ's, and getting them posted to the website Kelly is talking about can be that location.
- ◆ Kelly: It almost sounds like someone needs to come up with a whitepaper to outline all the options and determine the best strategies.
- ◆ Gina: Having this go through a CASE report could make it an open process that we can all support.
- ◆ Kelly: Maybe not a CASE report, but a CASE-esque process.
- ◆ Luke: Can we lower the stakes on some of the policy questions to make them actionable?
- ◆ Abhijeet: We need a vehicle to get the options out there, but who vets that the options are reliable?
- ◆ Gina: This is where software vendors can get involved, checking to make sure that the workarounds are viable and valid uses of the software. It requires people who know the software best.
- ◆ Bach: For software developers, what is the value proposition or business case for some of the ideas that have been discussed so far? How do these things get on your radar to support or develop? Something like proper VRF modeling, for example? Without funding or framework, how do we get these things moving forward? If theoretically you do it, everyone flocks to your tool, but how do we make it happen?
 - ◆ Liam: That one's easy, we have a VRF model ready to go, it's going through the exceptional design process. We have a database of exceptional processes, so we know what people are doing, it's just not approved.
 - ◆ Bach: Beyond just the VRF, how do these things get approved? There needs to be a process.
- ◆ Mike W.: We keep talking about this "there's no process for that" problem, which is my number one problem. We need a process for prioritizing, there are 1000 people in CA who have something to say about this. How do we get more of those voices. Can we publicize what we did today, can we reach out to more people through a survey? What process can we use to show that we're working on this, and keep it transparent? There needs to be a process.
 - ◆ Gina: A process and a vehicle.
 - ◆ Mike R.: Some states have a process for alternative methods that are documented. Can we model the approach here on any of those? Does CA already have an alternative process?
 - ◆ Charles: There is a process, but it takes too long.
 - ◆ Bruce: For those of us who work on the software, we spend a vast amount of time responding to complaints. It's a question of resources and a bueracratic process. But certainly come together and come lobby.
 - ◆ Ted: There are definitely roadblocks, how do we get beyond these roadblocks to get these things done?
 - ◆ Bruce: It's a political world.
 - ◆ Erik: That's why as shallow-pocketed industry we're trying to get together to get these things done. At least we need to come up with an informal process that could somehow get blessed. Maybe there's a volunteer committee that can come together to validate these ideas.
 - ◆ Mike R.: Jurisdictions do have the flexibility to do this, so that's one potential pathway.

- ◆ Erik: In one way or another the models do not represent the building, it's just something to get past compliance. We're not modeling the buildings now anyway. If we make it easier, yes some people will start gaming.
- ◆ Mike W.: Is there a customer who is not in the room? Building departments? That seems like an avenue to provide support.
 - ◆ Abhijeet: Greg from City of Davis couldn't be here today, but CALBO is engaged in this conversation.
 - ◆ Gina: Modeling is still a black box to AHJs and if we can help demystify that black box that helps them.
 - ◆ Greg: Uploading the modeling results into a database could be an opportunity as well. Simple checks to start, and add to it as we go.
- ◆ Abhijeet: Can we go back to the metrics vs baseline conversation?
 - ◆ Dimitri: In my opinion, a fixed baseline has no bearing on the efficiency, it's just about the modeling approach. If we had a fixed baseline we could spend the limited resources focusing on implementing innovative measures for the 2019 standards.
 - ◆ Mike R.: This way we can also start planning for net zero 2030 now and layout a roadmap for how to get there. It's very difficult to see how we get there now.
 - ◆ Gina: I think it helps with enforcement A LOT because your teaching to the same baseline every time, and how the goal posts are moving to improve efficiency.
 - ◆ Ted: If we have a fossil fuel baseline, and we get all renewable, our only problem left is natural gas. If our static baseline is a fossil fuel baseline we will still have the natural gas problem.
 - ◆ Mike R.: Isn't it just a metric issue? Change the costs to fix the metric. If what you want to do is incent electric over gas, you just have to fix the metric.
 - ◆ Bruce: We've taken a lot steps on the residential side to address some of these issues. I don't see how you can add all these measures and not change the baseline. Things like the loading order can't be addressed with the fixed baseline.
 - ◆ Charles E.: Standard 189.1 addressed this issue, without consideration of renewables we say you have to meet a performance cost index. With consideration of renewables you have another target you have to meet. It's the same baseline, just different targets.
 - ◆ Bruce: If you're going to have dual criteria you can't do that without changing the rules.
 - ◆ Charles E.: But rules changes are pretty simple.
 - ◆ Mike R.: In 90.1 those rulesets sit somewhere else where they can be adjusted.
- ◆ Will: One stakeholder missing from this conversation is real estate valuation. They have to mainstream whatever we come up with. Why can't we move toward an absolute metrics that are more easily translatable?
 - ◆ Mazi: It's so complex we could talk for hours. The problem with an absolute metric approach, you could run into a lot of federal preemption issues if you set the threshold too low. There are all sorts of intricacies involved. We looked at 18 different metrics last week. Variations on TDV, source, GHG, and combined, and we haven't found one metric that meets all our criteria: to cause electrification, preserve grid harmonization, and protect envelope measures.

- ◆ Will: Compliance is the biggest piece in CA, but it's hamstrung us in thinking about metrics as a whole. Absolute metrics doesn't mean you can't have other metrics for things like compliance. These other things can be on top of those absolute metrics. If we want to translate this to the real estate industry in dollars and cents, we need to simplify.
- ◆ Charles E.: If your metric is zero carbon or zero energy you already have an absolute metric. What we're talking about is also having some sort of minimum energy efficiency standards.
- ◆ Charles K.: My biggest challenge right now is time. I just want to reiterate Mazi's point: we have a very aggressive goal, and our traditional way of doing efficiency isn't going to get us there. So how do we balance all of it? My biggest fear is that there may be no single answer. What can we do that is reasonable and meets the state targets for 2030 and 2050, and has to be cost effective.
- ◆ Mazi: For it to be sustainable it has to reduce GHG, it has to be cost effective, and it has to work for grid harmonization.
- ◆ Ted: For real estate perspective, some of the biggest commercial real estate developers just switched to time dependent source/carbon metrics. We have to evolve with the market, and they are changing their metrics.
- ◆ Randall: T24 was meant in the beginning to be part of the design process, it veered away in the early 80s. It's like CAD. Back in the beginning of CAD you did all your design by hand and then put it into CAD at the very end. That morphed into CAD being a design tool. T24 compliance should be part of the design process, and how do we achieve that? We need to change that mindset. How do we do that?

Day Two – Discussion Notes

Attendees

- ◆ Martha Brook, Larry Froess, Mazi Shirakh (California Energy Commission)
- ◆ Bach Tsan, William Vicent, Dallen Coulter, Andres Fergadiotti, Randall Higa, Charles Kim, Christopher Kuch, Ryan McFadyen, Ruby Yopez (Southern California Edison)
- ◆ Kelly Cunningham (Pacific Gas and Electric)
- ◆ Dimitri Contoyannis (Noresco)
- ◆ Roger Baker (California Technical Forum)
- ◆ Mike Rosenberg (Pacific Northwest National Laboratory)
- ◆ Neil Bulger (Red Car Analytics)
- ◆ Greg Collins (Zero Envy)
- ◆ Scott Criswell (SAC)
- ◆ Mike Hodgson (ConSol)
- ◆ Erik Kolderup (Kolderup Consulting)
- ◆ Neal Krus (Big Ladder Software)

- ◆ Lucas Morton (Morton Green Building Services)
- ◆ Leslie Nelson (Energy Solutions)
- ◆ Gina Rodda (Gabel Energy)
- ◆ Bruce Wilcox
- ◆ Mike Wilson (IBPSA)
- ◆ Abhijeet Pande, David Douglass-Jaimes (TRC)

Introductions – Prioritization Exercises

For each of the following questions, participants submitted responses, and then were able to “upvote” or “downvote” ideas to result in a prioritized ranking. The following presents priority-ranked (determined by taking the total number of upvotes minus the number of downvotes) results for each question. If a proposed item did not receive any additional votes (other than the original submission), it has a priority score of zero. Note that there is some overlap or commonality between items on these lists; all results are presented as they were collected.

- ◆ Goal 1: Educate Users – What should we prioritize?

Priority	Priority Score (upvotes minus downvotes)
Advanced systems, work-arounds, special cases	5
Making education materials modular, short elements on specific topics	5
Robust online forum, ala unmethours.com	5
On-demand training	2
Modeling rules and common practices	2
Integrated Design Process	2
QC procedures for modelers	2
Educational Materials supported by CEC and Software	1
Offering a range of courses varying in depth (from introduction to under-the-hood with the engines)	1
More public facing online tools for practitioners	1
Understand market that needs to be trained	1
Informing architects and owners about how much time we need.	1
A moderated support forum funded either privately or from IOUs, but with support of the CEC's validation process	1
Integrate training modules/tips/work-arounds into the simulation software	1
Library on Video	1

Priority	Priority Score (upvotes minus downvotes)
Mentorship Program	1
Support development of college courses	1
Community College Training Programs	1
Understanding interaction between PV, Battery Storage and EDR in CBECC-Res	1
Low-carbon design strategies	1
Streamlined reporting and better review of modeling quality	0
Onsite Training	0
Further broaden audience: architects, builders, MEP subs, etc.	0
Construction Industry (BITA) training events at universities	0
Educational programs to bring up younger generations and align with development of BEM software	0
Builder and Contractor Training	0

- ◆ Goal 2: Increase Capability and Accuracy – What should we prioritize? (No items on this question received any upvotes or downvotes)

Priority	Priority Score (upvotes minus downvotes)
Dual-fan, dual duct systems	0
Multifamily Modeling	0
Multifamily Enhancements	0
Accommodate the 10% of projects that use technologies that aren't included in software (The software will never catch up to technology used)	0
Revisit ACM assumptions	0
Greatest source of inaccuracy is user error, encouraged by lack of enforcement (not necessarily lack of education)	0
Workshops at IBSPA chapter meetings	0

◆ Goal 3: Streamline Processes – What should we prioritize?

Priority	Priority Score (upvotes minus downvotes)
Nonresidential Registry	4
Data model	3
Common baseline for performance, compliance, and incentive programs	3
Standardization of Outputs	2
National collaborative group	2
Smarter software, good defaults, only ask important information and not make-work stuff	2
Simplify process	1
Integration between CBECC-Com and CBECC-Res for multifamily	1
Measure development to collaborate with Engine developers	1
Make compliance software as easy to use as Turbo Tax	1
Forms just point to relevant sheets in plans, like the mechanical prescriptive forms	1
Revisit purpose of compliance forms	1
A workflow that doesn't require several different programs. Figure out why this has not happened. It's theoretically possible. Do we know barriers? Can we reduce the barriers?	1
Interoperability with design tools	1
Robust libraries of equipment, constructions, etc.	1
Faster run time	1
Working Group on data model coordination across tools	1
Simple building = simpler workflow	0
Multifamily Software Process Flow	0
Forms	0
Compliance plug-in to BEM Tools	0
Track performance vs prescriptive compliance	0
Process for approving alternative modeling (technologies, engines, etc.)	0

SCE Recap

- ◆ Bach's Recap
 - ◆ How do we adapt this forum to continue to best address software needs?
- ◆ Discussion

- ◆ Gina: Is the PV battery study going to be available for review? We are concerned about how batteries can be modeled for compliance.
 - Neal: We looked at a variety of control strategies.
 - Gina: How do we make sure our clients are actually employing the control schemes we're modeling and getting credit for?
 - Neal: Compliance is definitely a big issue.
 - Bach: The study is software specific, we can share that. It just explains what's in the software.
 - Kelly: There's a lot of discussion at PG&E on batteries, but it's a different team than codes and standards, so there is an opportunity to connect those: things like batteries and heat pump water heaters with demand shifting option.
 - Gina: With different control options, people will choose the one with the most credit, but that may not be what they implement.
 - Martha: There is a joint appendix to address this, but if there is a problem we need to know that.
 - Gina: It's not very clear at the moment.
 - Mazi: The credit that can be used against building efficiency is independent of the control strategy, it's about 3 EDR points. For compliance with Part 6 it doesn't really matter. It only comes into play with reach codes, with whether you're tier 1 or tier 2. All batteries installed must be JA12 compliant. The only difference between basic control and time of use control is when the battery starts discharging. The main thing is to make sure that the local utility supports time of use control if that is what is being used.
- ◆ Goals Recap – Will Vicent
- ◆ Education
 - ◆ Kelly: We need to look at relationships between battery programming, code, utility relationships.
 - ◆ Gina: And how that effects your PV sizing.
 - ◆ Ruby: Coming from a background in the industry really helps us inform what industry needs and how to make that work with software tools, and how to speak the language to the customers to help them achieve what they need. If we are lacking something in our education efforts, please bring it to our attention.
 - ◆ Will: We try our best to be technology agnostic, but we also try to respond to demand from customers for different software tools.
 - ◆ Ruby: We're getting pretty even demand between CBECC and Energy Pro.
 - ◆ Greg: Is CEA required for anything?
 - ◆ Ruby: Yes, there are many building certifications LEED, CAHP, etc., that require it.
 - ◆ Gina: City of Santa Ana also requires CEA for some things.
 - ◆ Ruby: We're pushing on CEA requirements for reach codes.
 - ◆ Martha: I think it would be useful to have some training on how to use CBECC and how to find all the features that are available to solve problems.

- ◆ Gina: Yes, I've done trainings like this.
- ◆ Ruby: Most of these courses are done through Energy Code Ace, some of the software specific trainings are through the software vendors themselves.
- ◆ Emissions value
 - ◆ Greg: How universal are these carbon costs? Is this just limited to CA, or does it correlate to a larger scale?
 - Will: This is very CA specific. SCE is working with the UC system to encourage reduced carbon emissions, and these are the values we're using for that. Similarly, IOUs are working on avoided electric grid costs.
- ◆ Clean Energy Homes – Will Vicent
 - ◆ Will: Performance incentive portion is the big challenge with this. The feedback from this group really helps to develop strategies that could work
 - ◆ Mike H.: Current "carbon price" is \$15 [cap and trade], so how does the CPUC allow \$60, when the market price is very different (and volatile).
 - Will: My understanding is that this is meant to be a market signal. Like solar, there used to be a large incentive and then it tapered off.
 - Martha: What I've heard is that this is the cost of meeting our renewable portfolio standard, which is why it differs from the market cost.
 - Mike H.: So the CPUC has told the IOUs that these numbers are good for planning programs, but for how long?
 - Erik: So if this is an incentive rate, there's some sort of present value baked in?
 - Abhijeet: Yes, think of it as avoided cost, which is what Martha was getting at.
 - ◆ Mike R.: Charles did a paper on how to predict user performance, there are some challenges related to the workflow, but there could be a tool that helps with that.
 - ◆ Abhijeet: We did a study on multifamily energy use, and there are other demographic factors that you can consider to help predict performance.
 - ◆ Will: We do have access to a lot of really good data that can be used to inform a calibration or baselining process that can support that.
 - ◆ Luke: Thinking about the next iteration of TDV or TDS metric, especially in relation to grid location benefits and demographic weighting which can generate more granular data than climate zones to align incentives to more local needs.
 - ◆ Will: There are definitely a lot of similarities between this process and things like Zero Code.
- ◆ Multifamily – Cathy Chappell
 - ◆ Mike H.: What is the source of the multifamily unit/building data?
 - Elizabeth: It's US Census data, permitted units, not actually units built.
 - ◆ Martha: Users wants a single tool, but I think the CEC would be hard pressed to deliver that as part of 2022, and as a policy perspective, I think it's not the right place for CEC to focus. I think we should

share the system modeling. Even single family has systems that can't be modeled. Sharing modeling databases could solve a lot of these problems. All staff efforts should be in clarifying multifamily code, rather than having a software solution because the code is so complicated.

- ◆ Mike H.: Mid-rise and high-rise are basically commercial buildings in the code, do we know how many of those buildings are prescriptive vs performance?
 - Ruby: Like what Ted was mentioning yesterday, it becomes both, some measures are prescriptive, some are performance.
 - Martha: That's a non-optimal solution that people are forced into now.
 - Elizabeth: We haven't looked at compliance approach, but that's an interesting idea and we'd be interested in looking into it.
 - Kelly: That's a data gap that we can look into for 2022, but maybe we should be asking what the best way is? Rather than how people are doing it now.
 - Cathy: If it's going into prescriptive, it needs to be able to be modeled in performance.
- ◆ Martha: The commission will always be constrained. Why not focus with the utilities' help on getting a modeling framework established that we are all happy with, and then let the vendors develop a single tool interface.
 - Gina: The concern with that is the form, multifamily is our specialty and the amount of forms required, especially for low rise, is just crazy. Are we really expecting our enforcement agencies to be reviewing 400 pages of forms? We still have to think about how compliance works.
 - Martha: Yes, that is the commission's job. Anything like that is a problem.
 - Dimitri: To Martha's point, creating a single tool would be a huge lift, but there are interim steps that could do some of those pieces, like consolidating the submission package.
 - Abhijeet: This could be one of the first examples of an exceptional methods approach to combine residential and nonresidential uses.
 - Martha: As long as we're not locking in dysfunctional codes, but I think that would be great.
 - Gina: I love the idea of consolidating the workflow.
 - Kelly: We are gathering that information and will be presenting to the CEC.
- ◆ Gina: These software questions are the issues we deal with daily. How we deal with fans in high res is extremely difficult, we're concerned with how the industry is going to model this.
 - Cathy: If you have specific details on that please send them our way.
 - Gina: Yes, it's time to share resources.
- ◆ Cathy: Any strong feelings one way or the other on a combined tool?
 - Gina: I want combined documentation.
 - Erik: For projects outside CA, or for complying with LEED, can we coordinate with what the rest of the country is doing?
 - Gina: Many of these programs already require segmentation of the residential and nonresidential portions, but they also bring it back to one document.

- Ruby: Adding another software tool is not the best strategy if we're talking about simplifying. Having the proper baselines to compare to is maybe the higher priority.
- Cathy: Another option could be enhancing the existing software tool rather than creating a new tool.
- ◆ Abhijeet: How hard is it to implement the shared modeling approach? That takes some work. What is that level of effort? If there are resource constraints, is that where we should be putting our resources?
 - Bruce: On of the things we've moved to is having a whole bunch of complicated stuff under the hood so the user doesn't have to deal with it. In principle I don't see why you couldn't do the same thing for residential and nonresidential, just figure out which program to run for which measure.
- ◆ Martha: Will the user community tolerate the slow HVAC system modeling that would come with Energy Plus simulation?
 - Gina: It's not like it's that fast now. Typically energy modelers aren't going to be modeling both multifamily and single family.
 - Luke: For the users that I've talked to, you don't dabble in CBECC-Com, you either jump in or you don't.
 - Ruby: Coming from my background, we similarly focused entirely on multifamily, dealing mostly with CBECC-Com.
 - Greg: It's easier to go from Com to Res, not the other way.
 - Gina: The industry has already absorbed the fact that it takes a long time to model. But we have to be smarter in how we model too.
- ◆ Dimitri: Beyond the merging of the forms, there are already shared resources between Com and Res, so we could extend those interactions to expand on that, rather than developing a whole new tool. There are different data models between the two, so maybe creating a shared data model could be a first step that would help enable some more of the interactions.
 - Scott: As soon as you start talking about shared data models, it creates a pain point for Res users because of the difference in the data inputs required.
 - Martha: Maybe focus on the system side.
 - Greg: Why is resolving geometry such a difficult thing?
 - Scott: There's no 3D input in CBECC-Res. It's a different group of users.
 - Greg: It seems like a shared data model would be something the whole industry would benefit from, so that should be something we're able to accomplish.
 - Dimitri: If we decide to go down this road, we will have to think about the different experience and skill of different user groups.
 - Greg: Change is hard, but often once we adopt newer better tools people rarely want to go back. Are we allowing modeling error because we're not pushing for better tools?
 - Gina: There is definitely a difference in skill sets but that's a training issue.

- ◆ Cathy: If you align the requirements and get the rulesets locked in, and have those capabilities in the Res and the Com, you would be working with the same basis. Maybe it's just aligning the requirements in both software rather than creating a separate tool.
- ◆ Mike H.: are the results of this study available?
 - Cathy: To clarify, we're not looking at compliance, we're looking at how the tools are modeling the same buildings differently
 - Elizabeth: We are looking at it both in terms of compliance outcomes and energy outcomes.
- ◆ Bruce: It seems like the study would be much stronger if you had energy usage data from real buildings that you're using as prototypes, and SCE should be able to get that data from a real building.
 - Kelly: Look for a building that matches the prototype? Rather than using data from many buildings
 - Bruce: Yes, it would take some additional investment in monitoring, but it adds another dimension to the outcomes rather than just showing discrepancies between the tool. It has exposed some weaknesses in the Res model already.
- ◆ Neal: Going back to what Dimitri was saying about the engines, CSE the residential engine was previously the CA Nonresidential engine, there are a lot of commercial functionality that is lying dormant in that system that could be resurrected in that tool.
 - Martha: That's definitely worth evaluating. Its' always a question as to where these engines should play a role.
- ◆ Greg: It seems like a good opportunity to look at the ACM tests between the tools. ACM tests as currently written maybe aren't sufficient, so could there be a single test to get results within a given margin.
 - Martha: I think we need to wait for a proposal for a new engine before we determine how to test it.
 - Greg: Right, if it ever does happen.
- ◆ Kelly: 2019 is the year to be testing prototypes, 2020 will be too late for CASE deadlines.

Residential Modeling - Bruce Wilcox

- ◆ Mike H.: With EDR, what is the difference between EDR and Energy Rating Index (ERI)? Is it just TDV?
 - ◆ Martha: TDV is the biggest difference, but also we don't switch fuels in the denominator.
 - ◆ Bruce: All the crazy stuff that goes on in adjusting for gas is what I think we need to fix.
 - ◆ Bruce: The ResNet base case is all electric, so when it came to EDR with a mixed fuel base case we had to come up with adjustments for that.
 - ◆ Mike H.: The difference in metrics is posing a challenge with the mortgage industry.
- ◆ Gina: We need to make the CF1R form look as elegant as the visuals shown here.
 - ◆ Mazi: It's a work in progress, so we can work on making it better.
- ◆ Ruby: how does this work for certifications that require a compliance percentage?
 - ◆ Bruce: The forms can still reflect that compliance percentage.

- ◆ Mike R.: Is there a standalone efficiency rating for PV, batteries, etc?
 - ◆ Bruce: There are end use breakdowns that show efficiency EDR factors and the additional factors that are included in the final EDR.
- ◆ Randall: There are some factors that are missing (pool pumps, EV charging, etc.) that could make it look like you're over-generating?
 - ◆ Bruce: You can ignore the built-in limits in the software, but you can't get credit for that over-generation.
 - ◆ Mazi: If you do that it tells you to check with the local utility to make sure it's okay.
 - ◆ Luke: Is there a way to input some of those assumptions so they're included in the final EDR? It would be valuable to have those included.
 - ◆ Mazi: We need things like EV charging schedules to include those in the modeling accurately.
 - ◆ Mike H.: Most PV installing companies use an interconnection calculator that is approved by the utility to determine the loads and includes those additional factors. SCE has an approved spreadsheet that Solar City and other installers use to determine their sizing.
 - ◆ Randall: But is it confusing to anyone if CBECC inputs are different from those spreadsheets?
 - ◆ Mike H.: As long as the solar company is following the approved spreadsheet, you can avoid the limits, and the utility can just approve it to make sure it's correct.
 - ◆ Bruce: I think it make sense to think about how we can improve these forms and things before they hit the street.
- ◆ Will: In the calculation for TDV, with non-efficiency factors like PV, are we still using regular TDV values?
 - ◆ Bruce: Yes, we're following the NEM rules.
 - ◆ Will: That could be another area for improvement since TDV is the cost effectiveness of efficiency, not for two-way flows like PV.
- ◆ Ruby: Can this model thermal storage (like heat pump water heater)?
 - ◆ Bruce: It's not in the system yet.
 - ◆ Mazi: There is a small credit for thermal storage. The battery system effects the full load of the home. Thermal storage from HPWH only effects the water heating load, which is a smaller load.
- ◆ Luke: Hot water distribution is not connected to heating/cooling, correct?
 - ◆ Bruce: It's going to change soon, but it hasn't changed yet.
- ◆ Martha: When is the ACM manual update?
 - ◆ Bruce: It's part of the agenda for the workshop.
 - ◆ Martha: There's always the tug-of-war between meeting the deadline of software six months before code goes into effect. So is this the shortlist to meet that deadline?
 - ◆ Larry: Yes, our instructions are to get it done to meet the new standards deadline.
 - ◆ Bruce: All the hard stuff we've put off, but this is what's going to get done for the standards. There are additional improvements that we're continuing to work on for the future.

- ◆ Erik: Do we not trust some of the models that already exist in DOE2 for some of these factors?
 - ◆ Bruce: As far as we can tell, there aren't any models for these type of systems that are actually in use. If you look at the models for heat recovery chillers, for example, there is no data to support those models.
 - ◆ Mike R.: I think there's a new standard for heat recovery chillers that just got approved for 90.1.

CEC Updates – Mazi Shirakh

- ◆ Vast majority of customers will be on time of use rates by the deadline.
- ◆ Virtual net metering – allows remote PV to be treated as if it's on the customer's roof, and calculate the benefits as such. The homeowner gets the energy credit, and they pay a generation charge as part of their utility bill.

Standard 205P - Neal Kruis

- ◆ Getting software developers involved early on in the codes and standards process is important so that we're not shocked when we see what's coming out.
- ◆ Mike H.: What manufacturers are participating on the committee?
 - ◆ Neal: Daikin, Trane, Carrier, JCI, most of the major manufacturers, including residential, like Goodman. As we work through the various technologies we have to work to make sure we have adequate representation on the committee.
- ◆ Randall: Part of the vision of this was that you could take different components, and come up with a subsystem efficiency if you get the component performance curves, is that still part of this?
 - ◆ Neal: It's a potential output of 205, but not part of the specific scope.
- ◆ Mike R.: How will the manufacturers be publishing and making this information available?
 - ◆ Neal: I think it will be a case by case basis. Some will have a directory to download these files. But providing a repository for this information is not part of this process. I would like to imagine a future where this information is offered more freely. It's a lot of work to provide this data, so the hope is that automating the process makes it easier.
- ◆ Randall: Is this intended for design and/or compliance?
 - ◆ Neal: I think the users and developers who were originally involved were more in a design mindset, but it became clear that part of the question was what are the implications for 90.1?
- ◆ Mike R.: So you import the map into the software, and would it be readable to anyone, and could you then download the map out of the software?
 - ◆ Neal: The committee is intentionally not defining a file format. File formats come and go. Rather than pigeon holing the process, let's just define the data format, but the ASHRAE toolkit part of this will provide for human readability so that people can actually understand them.
- ◆ Will: Is there any plan to include DHW equipment?

- ◆ Neal: The challenge with water heater and tank is based on how you model it, not the characteristics of the heating elements, so we're thinking through how that would work out.
- ◆ Dimitri: So this data presumably give a better representation of design performance, so how do we define the baseline once we transition? Do we still rely on the old data, or do manufacturers provide some sort of baseline?
- ◆ Neal: One strategy is that we could populate the tables with the curves that we have and then develop from there.
- ◆ Greg: There's also the possibility of going the other way, exporting from the tools.

Ideation Discussion

- ◆ Education
 - ◆ Gina: Education is only as good as the material and how it's done. It has to be supported by the commission, and has to have consistent messaging.
 - Will: What would a project to support that funding look like?
 - Gina: I keep coming back to a way to state what are acceptable modeling possibilities that are approved so we can educate to that. A method to communicate modeling requirements. Here's an example: modeling a VRF system, how do you do it? What is the acceptable way to model it?
 - Martha: Is this the same as advanced systems cases?
 - Gina: Yes.
 - Will: Is it best practices, or beyond best practices?
 - Gina: "Best" worries me more than "practices."
 - Ruby: Maybe "common practices"?
 - ◆ Will: Are there opportunities to get education to the users, rather than getting the users to come to training?
 - ◆ Will: What about web-based tools? Anything California-centric?
 - Gina: Beyond Energy Code Ace?
 - Will: It's not just about compliance. Also workarounds, etc.
 - Gina: Something that could be more reactive to the industry.
 - Will: For example, IBPSA hosts a comparative rating system for various tools, would something similar for California be useful?
 - Erik: It used to be the DOE's online directory, but we're managing it now. I'm not sure how much voting is actually happening there. IBPSA also has online videos on simulation programs, as an education on demand tool.
 - Bach: What about the IBPSA mentorship program?
 - Erik: Yes, we just kicked off a mentorship program, especially targeted toward underrepresented groups to get into simulation.

- ◆ Will: Are there other suggestions for bringing future generations into the industry?
 - Mike H.: We need good training programs that go into the Cal States system, to provide visibility, and really looking at the construction industry.
 - Luke: Community College districts haven't had any interactions from the big players in the marketplace that could provide visibility. They would love to train the next generation of this workforce, but there hasn't been much discussion about energy modeling at that level.
 - Gina: The big players need to come to the table with Community Colleges to get those workforce training systems started. There is a hierarchy to the system in the state, there are regional organizations.
 - Ruby: Colleges of the Desert has a program, could that be replicated elsewhere?
 - Mike R.: There are also similar programs in the Northwest, but it has been very cyclical depending on the market.
 - Luke: There are monies out there to support this, but the energy modeling piece hasn't been emphasized yet.
 - Kelly: When I investigated this a few years ago, it seemed there was no direct path. There's no logical model of how to get things implemented in the Cal State or Community College systems. There is resistance to pedagogical changes, and these efforts would have to go through review committee. There is no one answer, maybe just starting with local instructors who are offering things like this, but also working with the Chancellor's office to start that conversation.
 - Gina: CABEC is working very hard on this.
 - Ruby: USGBC LA is also working with LA Trade Tech.
 - Luke: The sausage making of this process is intensive. It's slow, but if this can lead directly to employment, it meets the state's mission, so we just have to do the work.
 - Will: So there's a lot of interest in this, but there's a lot of legwork that has to be put in to support it.
 - Luke: The large organizations like the utilities really get the attention of these people.
- ◆ Will: What about things like building departments, building officials, etc?
- ◆ Luke: How do we help people like subcontractors who are looking entirely to energy modelers for answers on how to do things? There needs to be more outreach to those groups.
- ◆ Ruby: One of the groups where there hasn't been enough outreach is builders and subcontractors. It's a sector we need to address
 - Gina: That's another group that's hard to get in a room.
 - Greg: It's a two way street, because we also don't understand the way they're doing the work.

Increased Capabilities and Accuracies of the Tools

- ◆ Gina: We've had so much discussion about this, we've already accomplished this. The question is really about how do we make it happen?

- ◆ Will: We can skip this if people are okay with that, but priorities can change, so we want to provide a chance to update that.
- ◆ Abhijeet: So what are the next steps, how do we clear the bottlenecks and move forward?
- ◆ Gina: The multifamily discussion needs to go on the list.
- ◆ Kelly: I want to thank Gina for recommending measure improvements to provide recommendations to the Commission.
- ◆ Gina: The groups I work with really feel like they are being listened to.

Workflow Improvement, Process Improvement, Streamline the Process

- ◆ Will: Some of the things I heard: support standardization of outputs, standardization of data models.
- ◆ Abhijeet: Unified single tool, process workflows to get information between softwares. Maybe we don't want a single tool.
- ◆ Luke: Forms. It's a whole separate topic, coming from the reviewer perspective, what would make it much easier for them to do? Is it more visual content? Streamlining the process?
 - ◆ Martha: The philosophical debate we're not having is the purpose of the forms? 400 pages of forms was never the goal of the Standards. How did we get here, and is this the right path? Is there really a need to regurgitate every item of the standards on the forms? It's a bigger discussion of what we need the forms to do.
 - ◆ Gina: Or do we even need the forms?
 - ◆ Martha: We're not challenging ourselves to do the hard work.
 - ◆ Gina: It should be integrated into the design documents.
 - ◆ Martha: No other part of the building standard requires forms. There's no reason the energy Standards have to have forms. We should fix the problem not incrementally try to make it better.
 - ◆ Kelly: Similarly, this ties to a multifamily registry. In that case some forms or entry fields may make sense. These things are related. But how do we envision the compliance process?
 - ◆ Greg: It's a different perspectives because if we don't meet the energy code the building won't fall down.
 - ◆ Gina: It's about assigning liability.
 - ◆ Greg: If there's an actual operational incentive compared to design phase performance, it could make people care more about the design phase and design process for energy efficiency.
 - ◆ Dimitri: For the performance approach, a form makes sense to validate the models. For prescriptive compliance, you're just saying what's on the plan is what's on the form. It just regurgitates the plans. The forms don't necessarily make that any easier. Perhaps for prescriptive there could be a tool that does the checks that would serve the same purpose as the forms.
 - ◆ Mike R.: Design documents are supposed to show compliance, but it's hard to expect the building officials to find all the details in the design documents.

- ◆ Mike H.: Does anyone have a feel for how many people in nonresidential do prescriptive versus performance? How much of the market are we impacting?
- ◆ Larry: Anecdotally the number has always been less than 50%
- ◆ Mike R.: That sounds really high, I've always heard it as less than 5%.
- ◆ Greg: New construction is probably higher.
- ◆ Larry: When I was an engineer, everything was performance.
- ◆ Bach: If there was a registry, would it capture prescriptive vs performance?
 - Larry: Yes.
- ◆ Greg: That data would be really valuable for this conversation.
- ◆ Mike H.: Even at the high level, knowing what kind of building it is and how it's being modeled would be extremely useful.
- ◆ Gina: A nonresidential registry is an essential part to any streamlining we're talking about.
- ◆ Martha: Don't take a "no" from the commission as a persistent no, just keep asking us until we change our mind.
- ◆ Ruby: Who QCs the residential registry?
- ◆ Martha: We don't really do that until we start looking at it.
- ◆ Ruby: So how do we get started with that?
- ◆ Martha: Utilities should ask us for the capability to do it.
- ◆ Kelly: Without confirmation that this will be worthwhile it's hard to convince our management.
- ◆ Martha: Talk directly with the Commissioners.
- ◆ Will: Is there anything we should pursue with the compliance engines?
 - ◆ Martha: A collaborative entity that could work on the compliance engines would have a lot of benefit. I don't know how to form it, but it would be more beneficial if we formalized it. Make it more formal and more transparent.
- ◆ Luke: On running times, would a cloud processor help with that?
 - ◆ Larry: We've talked about that, the question is who would pay for it?
 - ◆ Neal: Energy Plus runs on one thread so you can't really parallelize it.

Closing

- ◆ Will: We genuinely want your input. We want to air out positive solutions. If there's anything we can do to make these symposiums better, we genuinely value that input, so please provide us with that feedback.
- ◆ Bach: We want to know how we could adjust the format to make this more constructive and actually get things done. Some have suggested smaller more frequent discussions to work through specific items. Specific working groups to tackle specific items, or nuances that we need to improve, and then reporting back when we regroup as a larger forum. We recognize that this is a major time commitment, and we recognize that it's a major ask. We'll be sharing notes from the event.

- ◆ Mike H.: Will presentations be made available?
- ◆ Bach: Yes, the IOUs need to develop a place to put all of this information, which we'll be determining over the next few months.
- ◆ Abhijeet: One of the first ideas we had when we started two years ago was going to be focused working areas, but we decided that we need to start with these larger group meetings. We know there are things we need to follow-up on. We'll be sending out the notes, but also determining what the next steps are, what are the working groups we need. We need your feedback if those are the right working groups? We need to make sure we're capturing the needs of the user groups. We want your input on that. We'll then work with you to set up the appropriate forums for those working groups.