

Comments to the California Energy Commission by Mike Gabel on the 1st Draft 2013 ACM Approval Manuals per the 11/7/11 Workshop

Modeling Capabilities

As the standards become more stringent, it's crucial that state-approved software have better capabilities to handle a variety of energy design features and compliance scenarios. Specifically, the ACM Approval Manual and Technical Manual, in combination, need to address the following issues:

Existing + Alteration + Addition Analysis. Currently, compliance software is limited in that it doesn't allow the complete and detailed specification of certain existing conditions (HVAC system, duct characteristics, DHW system, DHW distribution) as separate and distinct from Altered or New conditions for those features. The 2013 ACM Manuals should specify that under the E+A+A calculation, "the compliance software shall ensure that a full and detailed specification of all Existing conditions are available as inputs and can be analyzed separately and distinctly from all Altered components and systems."

ACM vendors may not like this, since it means, in some instances, having to modify their interfaces to provide this level of detail. But as we move toward protocols for energy codes and building asset ratings that give credit for improving the energy performance of existing buildings, it's really important to create a platform where we're better able to quantify all improvements that can be tracked.

DHW System Model. We need the CSE to use an hourly performance model with heat pump water heaters (and heat pump boilers). As the Standards begin to push toward Zero Net Energy, building owners will look to solar PV and all electric HVAC and DHW systems; and the ACMs need to be able to model those reasonably well, perhaps using efficiencies at 47° F. with standard performance curves, at least as a starting point plus the supplementary or backup electric resistance heating which some of this equipment uses.

Special Modeling Procedures. There was a hint at one of the earlier public meetings that the ACM Manuals might have a category of something like "special modeling procedures" that would require that a Documentation Author of the performance Certificate of Compliance "be certified by the Executive Director". Also, Tier 1 and Tier 2 performance requirements (see *Reach Codes* below) would also require that the Documentation Author hold the same credential. I think this is a great idea, and the Commission should include this sort of language as a placeholder for certain regular code compliance modeling techniques (which can be determined later in the Technical Manuals), and include it for Reach Codes. CABEC's new CEA program can work with the Commission to ensure that 2013 CEAs are worthy of this distinction, but the CEC would also have the freedom to authorize other energy modeling certifications as sufficient to meet the requirement.

ACM Modeling Assumptions

In general, looking at current research and our own work for the City of Hayward, the annual site energy reported by the compliance software – especially for existing buildings – does not appear to track typical utility data for those occupancies in those climate zones very well in many instances. The ACM modeling assumptions as applied to existing homes should track the 2009 Residential Appliance Saturation Study (RASS) data much better than our work has indicated. For example, while residential water heating energy use predicted by the compliance software appears only around 20% above average utility data, space heating predicted by the model was on the order of 80% to 90% higher than is easily extrapolated from utility data and the RASS study. While we did not study air conditioning for the Hayward work (e.g., Climate Zone 3 homes have very little cooling), a similar review of comparing the energy model results to existing homes in severe cooling climates may illustrate a significant discrepancy as well.

To whatever extent possible, CEC Staff and Contractors working on 2013 ACM modeling assumptions should make an effort to find appropriate and meaningful ways to compare models of typical building prototypes and results to average utility data in order to better calibrate the Title 24 model with average operational data for the same building type and climate zone. This is an important area of research in which even some modest progress might be made in the next year. We strongly recommend funding for a much more in-depth approach to this issue before the 2017 standards.

TDV energy and TDV energy savings is dependent on a reasonably accurate accounting of hourly site energy. As the Commission begins to move toward credit for TDV energy offsets such as solar PV, it needs to consider carefully the relative accuracy of the models in establishing annual energy loads. If getting to ZNE in the real world for existing buildings does not require as large a solar PV system as compliance software models suggest (since the total TDV energy use estimate may be too high), the real cost of reaching ZNE may be less than the compliance software indicates. While historically Title 24 software has been concerned only with the relative performance of different energy efficiency measures and the asset rating that reflects that approach, it's important now to focus on having compliance software generate an asset rating for both residential and nonresidential buildings which does a better in predicting typical absolute site energy use values.

On-Screen Reporting

An issue that emerged during of the CEC workshops on the 2013 standards was the ability of compliance software users to always show the component-by-component basis of the Standard Design for any specific project. The ACM Manuals should require that all compliance software provide an on-screen listing of all the various components that make up the Standard Design that sets the energy budget for that project. In addition, the same information should be available as an optional compliance report print-out (see Standardized Reports next).

This feature is especially important for the Nonresidential / High-rise Residential performance method, where current software users seem to be uncertain as to how the ACM rules for the Standard Design set the energy budget based for the project based on the proposed building occupancy type(s), system type(s), and so forth. This capability would also help software vendors and CEC staff review the ACM test runs as to the accuracy of the software's ability to correctly set the energy budget.

Standardized Reports

First: All ACM proposed building inputs that affect compliance of the project must appear somewhere in the compliance reports submitted for permit. Under the 2008 standards, and historically, this has not been the case. The CABEC Standards Committee would like the opportunity to work with CEC Staff and Consultants to determine the best way to accomplish this.

Second: Per the above comments on On-Screen Reporting, the compliance software must provide an option to print out a component-by-component listing of the Standard Design.

Third: Because of all the projects going to the new registries, compliance software must provide a way in which Documentation Authors and others can make notes and comments on the compliance forms. We propose:

- The software should provide input fields that allow inputting text that must be inserted regarding, for example, nonresidential mandatory lighting controls.
- Without changing the text of the Certificate of Compliance and other compliance forms, there should be an additional open-ended form in which any of the parties involved (designers, documentation author, plan checker, installers, acceptance testers) can make notes and comments. This extra form could be added and revised after compliance forms have been already filed in the registry.

Reach Codes: Title 24, Part 11 Green Building Standards

As discussed under *Special Modeling Procedures* above, we strongly recommend that Tier 1 and Tier 2 language for Part 11 includes language for the performance standard as follows (red underlined language to be added):

Appendix A4 – RESIDENTIAL VOLUNTARY MEASURES DIVISION A4.2 ENERGY EFFICIENCY

2. Performance Standard. One of the following advanced efficiency levels shall be met by a Documentation Author who has met the certification requirements authorized and approved by the Executive Director.

The Commission should formally set the precedent in Part 11 that only a qualified energy analyst can perform the performance analysis for reach codes. The CEC can take it's time reviewing one or more certification program(s) that meet this requirement, and establish whatever certifications that seem appropriate.

Compliance Manager

In Section 1, Overview, we propose adding the following to the existing draft language:

... The ACM tests submitted by the vendor will confirm that the Compliance Manager has been successfully integrated into the vendor software. If the Commission has not released a well tested and fully functioning version of the Compliance Manager at least 365 days prior to effective date of the new standards, the vendor may submit ACM tests which demonstrate that the entire functional equivalent of the Compliance Manager has been fully and successfully incorporated into the compliance software version submitted for approval.

In order that the 2013 Standards not be delayed, it is critical that the Commission have a "Plan B" in case the Compliance Manager is not completed and working properly in time; and allow ACM vendors to "hard wire" the 2013 Standards compliance rules and forms into their software. Subsequently, when the Compliance Manager is ready for prime-time, the Commission could require that all compliance software integrate the Compliance Manager into new versions and then de-certify "interim-approved" versions by July, 2014 or January, 2015. From that point on, there would probably be no need under future code cycles to provide this alternative certification approval path.

Other Specific Comments –

Section 2.2.2 Energy Use Summary

Include CO2e emissions for annual site energy, including the conversion factors used for Therms and KWh.

Residential ACM Appendix A and Nonresidential ACM Appendix A

Develop and add a number of new ACM tests for Existing + Alteration + Addition calculations. These tests should include fenestration alterations with proposed replacement glazing having several different U-factors and SHGC values with and without existing fixed shading; alterations (various levels of insulation upgrades) to roofs, walls and raised floors. If the Gabel Assoc. proposal is included in the 2013 standards which establishes an alternative E+A+A calculation that considers the total percent TDV energy reduction of the existing building, that new calculation should be validated with a new ACM test.