CEC Compliance Software PAC Meeting Minutes December 14, 2011

Attendees:

Attendee	Company	Remote Attendee	Company
Avery Kintner	Empowered Energy Solutions	Amir Roth	DOE
Cathy Chappell	HMG	Bruce Wilcox	consultant
David Vasnaik	PG&E	Cassie Cuaresma	SCE
Diane Pepetone	L'Monte	Dru Crawley	Bentley Systems
Dimitri Contoyannis	AEC	Jeff Gleeson	PG&E
Elaine Hale	NREL	Jennifer Roberts	freelance writer and editor
Jose Torre-Bueno	Empowered Energy Solutions	Jill Marver	PG&E
Justin Regnier	CEC	Kent Peterson	P2S Engineering
Martha Brook	CEC	Kym Carey	DOE
Michael Rosenberg	PNNL	Marlissa Collier	SoCalGas
Philip Haves	LBNL	Matt Biesterveld	Trane
Randall Higa	SCE	Maurya McClintock	consultant to AIA
Rob Hitchcock	consultant	Peter Ellis	Big Ladder Software
Roger Hedrick	AEC	Phylroy Lopez	NR Canada
Ron Yasny	CEC	Richard See	Digital Alchemy
Scott Criswell	Wrightsoft	Ron Gorman	Sempra
Smita Gupta	iTron		
Stephen Roth	Carmel Software		
William Worthen	AIA		
Zulfikar Cumali	consultant		

Overview of Comments

Topic	Commenter(s)	Issue
Project Overview	Jon McHugh	Do you have to use EnergyPlus for new compliance software? Answer: No, you just have to pass the reference tests
	Martha Brook	The focus is on compliance rules; it is not the intent to compete with vendors of compliance software programs
	Martha Brook	July 2013 deadline applies to providing public domain software
Compliance Software Overview	Mike Rosenberg, Jose Torre-Bueno, William Worthen, Dimitri Contoyannis	Is the goal to develop software to accurately predict energy use? Is the goal consistency or accuracy? Points raised: 1. We are adding modeling features such as schedules based on building type, to move closer to a performance based code. We are also moving closer towards ASHRAE 90.1 Appendix G. 2. Reporting: would it be possible to include both compliance results (possibly a pass/fail) and an as-designed EUI that more closely reflects actual conditions? 3. Current code may inhibit the use of innovative systems. 4. Could you take a similar enforcement as the fire code? 5. Will Beyond Code programs be supported by the software? Will Reach codes? 6. Many people use one tool for design and another for compliance, so it will be useful to integrate the two.
Compliance Engine Software Architecture	Phylroy Lopez	Support for multiple languages and multiple unit systems (SI)
Data Model Overview	Jose Torre-Bueno, John Kennedy, Maurya McClintock	Naming Convention: could use a delimiter; names are long and will result in unnecessarily large file sizes. Names aren't intuitive for designers. Scott mentioned that the names are defined in part to be consistent with other schemas, such as gbXML.
HVAC Data Model	Mike Rosenberg	Will SDD be used to populate compliance forms but those terms won't actually be used to fill out compliance forms, correct?

		The team confirmed that this is correct.
Software Functional Requirements	Scott Criswell, Dimitri	Text based rules: it was asked why the rule set is text based. It is both (1) to leverage existing rule set work for Title 24 and (2) to keep the rules in a format that is easily readable by humans.
	David, PG&E	Existing Buildings (Additions and Alterations): will there be a capability to model existing buildings? This is needed for deep retrofits. Yes.
Rule Set Overview	Jose Torre-Bueno, Scott Criswell	Modification of rule set for local jurisdictions: Scott mentioned that this is a possibility, and confirmed that a local authority can create a rule set and have it digitally stamped.
	Scott Criswell	Transformation definition: perhaps a reference can be provided to the "user model" (as built conditions) as a reference, so that when a transformation is made for compliance, it would not be difficult to apply a separate rule set (such as a Beyond Code program) to that user model.
	Phillip Haves	Autosizing: mentioned that the autosizing doesn't work well for dynamic systems such as radiant slab cooling. However, this may not be an issue for the baseline systems.
Simulation Engine Interaction	Stephen Roth	gbXML: Revit 2009 created the file.
	Jose Torre-Bueno	SDD definitions: some reference BCL objects.
User Interface Requirements		Geometry model: is there a requirement to specify 3D geometry for the model? The answer was that the 3D geometry is required to interface with Energy Plus.
	Jose Torre-Bueno, Scott Criswell	Mandatory requirements: it was asked if the software will support mandatory requirements. There is a need to support them. It was also asked if the software could abort the compliance run before the simulation is run if a mandatory feature is not met. The tracking of dependencies and evaluation order can be changed to accommodate this requirement.
	William Worthen	Print out of inputs: a suggestion was made to print out key building inputs used in the compliance simulation run
		Simulation progress: add a progress display and display of compliance results to UI

		requirements
	Multiple	Concern about directly reporting EUI in output
Pilot Projects	Jose Torre-Bueno	Geometry Requirements: without a geometry plug-in the compliance engine is of limited usefulness.
	Mike Rosenberg	Incentives: What is the incentive for vendors to take the first step?
Reference Method	Phillip Haves, Dimitri Contoyannis	Role of ASHRAE 140 and BESTEST: what is the plan for including these tests or tests for innovative low energy systems?

Detailed Discussion Notes

Project Overview

Martha: hopefully this will facilitate national and int'l collaboration for code programs and beyond code programs

Focus is on compliance rules; not intent of competing with vendors of compliance software programs

EnergyPlus as Reference Software: publicly supported, work done over last decade

Jon: you don't have to use EnergyPlus, but you have to match the results, correct? Dimitri: yes, we will spend some time later on this issue

Is the CEC compliance software open source? Scott: yes, the language is primarily C++.

Key Milestones: March 2012 – ACM Reference Method, Draft ACM Reference Manual, Oct 2012-Final Compliance Engine

Martha – can certify private vendor software at any time; July 2013 applies to public domain software (requirement to provide software 6 months in advance of adoption of the Standards)

Compliance Software Overview:

Target Audience: Building Designers, 3rd party vendors, C&S regulators

Discussion:

Mike Rosenberg: is goal to develop software to accurately predict energy use?

Jose: what is designer intends to use automated building features? Is the issue building operational features that may or may not be implemented? Martha: as we go towards low energy bldgs, we need to design for specific occupancies. Cathy C: how difficult would it be to allow for both answers in your input (compliance run, beyond code). Jose: concern is that it would inhibit innovative designs. I assume you could take the same position as the fire code – systems required (active and passive) to maintain safety conditions. Martha: we could do something like that, as long as there is an inspection and acceptance test.

Dimitri: one of the things that we are reviewing is default schedules; plan is to expand to greater range of building types. Looking at plug load assumptions.

Bill W.: is the goal consistency or accuracy (comparison to utility bills)? With the current compliance process there is consistency but not accuracy.

Mike R: maybe just report a pass/fail for compliance and not an EUI. Bruce W: we do have a compliance option for exceptional systems.

Jose: you're saying that the machine readable version is the legally operable version – new concept. Martha: On the residential project we're requiring the use of the rule set and the simulation engine.

Randall: for Beyond Code is it up to the third party to develop? What about Reach codes? Martha: we would hope that we could support it. Bill: potential for disconnect between municipal requirement and state requirement if there is a locally adopted regulation that isn't consistent with compliance code. Cathy: Part 11 is designed to make regs more consistent. Martha: as we move closer to zero net energy we will have to loosen up the rule set. Smita: will rule set address distributed generation? Martha: plans to incorporate CECPV module, but we're focusing on minimum requirements for public domain software.

Jose: in terms of code requirement, can someone trade renewable energy for building efficiency? Martha: to a limited extent for this round of the Standards. Not yet for commercial. Bill: not attached to outcome based.

Randall: are we going to do a rule set for 2008, to compare to 2013? Dimitri/Martha: we are using the DOE library of buildings and have modified them to T24 2008 & 2013 assumptions to perform the comparison analysis. Mike: prototypes used for 90.1 and 189 are a little different than DOE reference building models. Dimitri: we are using the prototype models. Avery: will there be more climate zone specific requirements? Martha: we already do that where there are different requirements by zone. Jose: can you enter local weather code for a station? Martha: no, just CEC files. Jose: in your list of owners, building owner didn't appear. Maybe in your design, you could include the best possible energy use for your local design conditions. Bill, AIA: maybe specify, +/- 5%

Dimitri: many people use one tool for design, and another to compliance, so there is a benefit to integrate the two.

Zulfi: at what point does this relate to a pure performance standard? Martha: figuring out how to have performance when the building compliance is tied to a permit is a difficult thing to do.

Compliance Engine Software Architecture

SDD XML: Standards Data Dictionary XML

Phylroy: Canada, requirements for multi-language, and multi-unit system friendly. Comment: it would also be a knock on third-party programs that are not supporting multiple languages. Scott: the rule set structure and data set will be similar to CanQuest; there will be fewer situations where there is language-specific text within the source code itself; should be able to port over rule sets in a straight forward manner. Elaine: E+ is metric so support will be there on the back end. Scott: the metric capabilities of CanQuest are implemented at the top interface level.

Data Model Overview

Standards Data Model: bldg. parameter needed to represent and trigger compliance rules

Building Energy Model: Energy simulation engine I/O parameters

Rob: There is no publicly available schema developed from the Standards perspective.

Diane: PAC will have ReadAccess to SDD on Sharepoint site.

Jose: could have delimiter of "." Or "_" for ProjectName (Project.Name) to allow software to delineate objects with hierarchy.

Martha: we are trying to make some effort to be more consistent with national efforts; our subject matter experts recommended closer alignment with Appendix G; it is fortuitous that COMNET is based in part on Appendix G rules. However, CA will still need to have a separate process for drafting and adopting EE regulations.

John K: names are verbose and redundant; files will be large when they don't need to be.

Maurya: names don't seem very intuitive to architects and designers. Do you have interest in gathering a group of architects to vet the names (i.e., type A, type B occupancy definition)?

Scott: the terminology is set in part to be consistent with other schemas, such as the geometry terms from gbXML. The user interfaces are more important than the underlying SDD structure. Rob: SDD is huge improvement over just free-form text.

Data Model: HVAC

Component based: air systems and fluid systems

Mike: SDD will be used to populate compliance forms but those terms won't actually be used to fill out compliance forms, correct? Diane: Yes.

Related data models: gbXML, IFC, simModel, OpenStudio model, EnergyPlus IDD

Relationships with: OpenStudio, Simergy, DOE Interoperability Project, BESM, COMNET

Incorporating existing structure and elements where applicable

Software Functional Requirements

Purpose: describe component functionality; ensure that components work together

Managing compliance rule sets: text/CSV-based rule set source → binary

Passing SDD building models to OS

OpenStudio: SDD→OSM→E+

Use of building component library (BCL) objects

Discussion:

Jon M: is the purpose of the User Interface to prove to the Commission that we have software ready by a certain date? Scott: Yes, but there will be no representations of building, but it will be a fully functional building model.

Matt B: why is [the rule set] text based? Why not XML? Scott: We have implemented rule sets in this context before; it is not something that the user sees or something that third-party developers need to deal with. It was done this way primarily for efficiency. Dimitri: one of the guiding principles is that it can be easily read by humans, that don't necessarily need to be schooled in software development. Jose: in the absence of something like the OpenStudio plug-in, that will essentially be unusable. Scott: part of this effort is to develop third-party pilots that take advantage of the compliance engine. Mike: could you import an idf file or (Bill) a Revit file? Scott: not necessarily. Dimitri: numerous platforms can export gbXML files for building geometry that are very similar to SDD geometry representation.

Martha: it is not the Commission's function to provide publicly available design tools. Elaine: our first priority is to take an SDD and develop a model in OpenStudio, but not go the other way. It is possible to go the other way, but would depend on available resources.

David, PG&E: when can a developer come in and develop a user interface for this engine? Ans: July 2012, but they can come in before this date.

Bill: is there a percentage factor for things not working? Martha: that is handled in some cases, where there is a means to provide credit for proper operation, such as with fault detection and diagnostics. Jose: EnergyPlus has the concept of availability schedules?

David, PG&E: will there also be a capability to model existing buildings, with this program? Martha: yes, to the extent that it is covered in the Standards. David: we need to get something out in the marketplace for deep retrofits; there may be a compliance component. Martha: that's an example of

where we would want to collaborate. Martha: the software needs to cover alterations that are covered in the Standards.

Ruleset Overview

Important to maintain integrity of ruleset, since it is open source

Scott: there is a capability for local jurisdictions to modify the rule set files to create transformations of the building for a different baseline. Jose: so anyone can create a digitally stamped ruleset? Scott: Yes.

Martha: it will be easier to make translation from T24 to 90.1 in the future, since up to 80% of the T24 rule set will be consistent with ASHRAE 90.1 Appendix G.

Bill: right now there are a lot of features that you can get credit for in 90.1 but not Title 24, such as automatic shade controls. Martha: we are moving to adopt many of ASHRAE Standards.

Phillip: is there a reason to check the HVAC equipment that the equipment isn't undersized. Dimitri: the sizing run would be performed by EnergyPlus. The autosizing is relatively good for conventional systems, but for dynamic systems such as radiant slab cooling the autosizing isn't so good. But if radiant slab cooling doesn't appear in the baseline, then this may not be an issue. Phillip: we should make sure that the sizing criteria in EnergyPlus meets UMLH in proposed design.

Jose: does the user interface "know" the rule set? In other words, is the error captured prior to an input file being built? Since this is all open source, how much of your software can be copied in a piece of proprietary software (and be modified)? Scott: rules for the open source are very liberal.

Phylroy: looks very similar to eQUEST rule set. We had a problem where we had to change the density of the construction, and we had to change one of the layers of the materials to get the density to match, which was cumbersome. Scott: He recommends an approach to do more simply, but may not be within the scope of this project. To define logic in rule expressions isn't practical. The solution is to add functions within the compliance engine that can be called.

Dimitri: there will be a syntax within the rule set to add expressions that may handle issues like the one Phylroy posed.

Avery: how much impact is adding the capability to add XML? Does it add greatly to the scope of a project? Scott: not at all; one of the key advantages is the interoperability of data. The rule set source isn't intended to be transmitted to different modules of the program. Converting the rule set to XML doesn't add any value.

Simulation Engine Interaction

Stephen: what tool created the gbXML file? Elaine: Revit 2009.

Elaine showed an example of OpenStudio with Google Sketchup.

Loads associated with space types, not spaces.

Proof of concept policy analysis tool available in 060 release. Shows compliance pass/fail results for up to 3 perturbations; some limited construction cost data is included.

Discussion:

Jose: Is the building component library described in EnergyPlus or OpenStudio terms? Elaine: yes, they are. Jose: some SDD objects are references to BCL objects? Elaine: yes, that is the intent.

User Interface Requirements

SDD XML

Will not include wizards, mouse-driven geometry creation, graphical HVAC representation

Jose: is this tool going to be based on OpenStudio model editor? Dimitri: it is similar to model editor. Elaine: ongoing work is going to be done this winter, and won't necessarily be incorporated in version 6.

Jon: is there a requirement to be geometric? Or can it be specified similar to EnergyPro. Dimitri: there is a specification for 3D geometry in the SDD, so that it can accommodate EnergyPlus.

Elaine: The plug in for translation from OSM to IDF builds upon code in the EnergyPlus SDK, and is available for download. This is intended to be written in C++. A member asked if this could be written in XSLT. Elaine: harder to debug.

Timothy Moore: is there a plan for certifying vendor software that uses the rule set but not EnergyPlus or gbXML? Ans: Yes, there is.

Jose: is there a plan to check for mandatory measures prior to running a simulation? Scott: this is something that we can check.

Bill: is there a way to print out a list of input assumptions with the model results, so that there are no changes after the design compliance model is completed. Dimitri: perhaps a next step is to review the compliance forms to see if they can provide a summary of building inputs that would be useful to building inspectors.

Compliance Forms

Intent is to use a residential plug-in for this project, developed by Robert Scott.

BEES Report Processing – building energy efficiency software

No significant comments

Pilot Projects

Interested in feedback from third-party vendors

Jose: you've shown a third party plugging into compliance software directly; it seems to me that you would want a geometry plug-in at a minimum. There was some discussion to have OpenStudio develop something comparable to SDD? Dimitri: not a part of this project. Martha: multiple tools export gbXML, and this would allow other tools to interface with the CEC compliance software. Rob: the tools that currently generate a gbXML would not have a difficult time to generate SDD XML that encompasses the needed geometry.

Jose: if someone developed a geometry engine that uses the CEC compliance software, then that engine doesn't need to be necessarily qualified? Martha: that's correct. He would like the subset of SDD that describes geometry as soon as possible, so that vendors can integrate it into their tools. No one is going to be able to build a building by calculating every vertex, Jose says.

Mike: is the intent that their tools could become more marketable by using CEC compliance engine and producing geometry XML? What is the incentive for vendors to take the first step? Jose: this can be added value to any drafting package, to create XML in this format. Jose: is it conceivable that you could convince Google to add this to Sketchup.

Dimitri: there may be a follow-up conference to address questions from those online that had trouble connecting.

Zulfi: there was a tool he did about 25 years ago, that created geometry from simple shapes, did the zoning and created the BDL automatically.

Avery: will slides be distributed to the PAC? Ans: Yes.

ACM Reference Method

Dimitri: test models will be posted online after they have been completed

To be considered: how to judge alternate simulation engines

% variance metric may be more critical than absolute energy consumption metrics

Zulfi Cumali will aid us in determining which algorithms we need to pay special attention to (based on his work with DOE and E+ simulation engines), and how to define passing criteria. LBNL is helping define tests and criteria.

Jose: has there been an interest in developing a software engine?

Dimitri: we are trying to allow the use of both the use of innovative front ends and multiple simulation engines

Phillip: with the reference method, what is the use of ASHRAE 140, BESTEST, and including innovative low energy systems in the reference tests? Dimitri: building models are somewhat more realistic than 140 tests.

Martha: we are really trying to test the standard design, and the deltas between the standard and proposed.

Bill: align space types with building types in code: Type 1 in construction. Mike: tied to building area types in 90.1. Bill: put in your use, occupancies, and ft2 for each use, to be able to match with utility bills.