American Chemistry Council

California Energy Commission
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California Energy Commission
Dockets Office, MS-4
1516 Ninth Street
Sacramento CA 95814-5512
Attn: Mazi Shirakh

RE: Docket No. 14-BSTD-01
2016 California Title 24 Update Process
Energy Modeling Software (CBECC) and Unvented Attic Construction

To Whom it May Concern,

The American Chemistry Council's Center for the Polyurethanes Industry's Spray Foam Coalition[1] ("SFC") is pleased to submit this letter regarding California Energy Commission's ("Commission") 2016 Title 24 Update Process and the related CBECC-Res 2013 v3 software ("CBECC"). We appreciate the opportunity to present our questions and concerns to the Commission, and we look forward to a continued dialogue on the issues.

Our primary concerns focus on the operation of the CBECC software used by the Commission for Title 24 compliance and, more specifically, the ability of the software to accurately model the performance of unvented attics constructed with spray polyurethane foam ("SPF"). SPF is a popular insulation material used in high-performance attic ("HPA") construction.

Although HPAs are not presently included in the California Title 24-2013 building code as a requirement, it is important that early adopters of HPAs receive the appropriate compliance credit for implementing HPA designs under the 2013 code, including unvented attics sealed and insulated with SPF. As HPAs are going to become a requirement of the 2016 code, it will be even more critical that the models accurately represent the energy performance of these technologies and designs. Although the engine of building simulation software is by its very

[1] The Spray Foam Coalition (SFC) champions the use of spray polyurethane foam in U.S. building and construction applications and promotes its economic, environmental and societal benefits while supporting the safe manufacture, transport, and application of spray polyurethane foam. SFC consists of manufacturers of spray polyurethane foam systems as well as suppliers of raw materials and machinery used to apply the foam.

nature both complex and inexact, it should be the aim of those involved with the development of these models to achieve the highest level of precision possible with respect to various performance-based approaches to meeting Title 24 compliance. Modeling inaccuracies that may in isolation seem small and inconsequential can collectively amount to a misrepresentation of a particular product or design strategy, thereby skewing the market and possibly causing irreparable harm to specific industries.

It is our understanding that the CBECC modeling software includes three thermodynamic processes that attempt to represent the thermal and air-sealing properties of SPF in sealed attic applications which, in turn, affect the space-conditioning demands of the home being modeled. These three main processes are:

1. Air Infiltration Rates for the Attic and Occupied Spaces within the Home;
2. Attic Air Temperature and Conductive Gains and Losses to Ducts and Occupied Spaces (which is in part a function of air infiltration rates); and
3. Radiant Heat Gains and Losses from/to Ducts and Occupied Spaces.

Due to the complexity of the modeling software and the lack of a clear resource for understanding the function of the compliance engine, the SFC does not have a clear understanding of how these three primary thermodynamic processes are simulated within CBECC, nor do we have a complete picture of the differences in the way various HPA strategies and materials are represented by these models. However, based on the limited information we have about the thermodynamic processes and parameters of the model, as well as the results of several modeling runs with CBECC, it appears that there are several parameters and algorithms which do not adequately credit the air sealing and insulation properties of SPF in sealed-attic applications, as illustrated in Table 1.

The following compliance values were generated by CBECC-res v3 beta software. The values illustrate the compliance margins achievable through various approaches to constructing and modeling HPAs. The modeled home is a 2,123 square foot two-story single-family home.

Model #	Ceiling Insulation	Below Roof Deck	Attic Ventilation	Special Feature(s)	Air Infiltration Rate (ACH50)	Climate Zone 7-- % Savings (Increase)	Climate Zone 12-- % Savings (Increase)
1	R-30/38	Radiant Barrier	Vented	None	Default (5.0)	0.0	0.0
2	R-30/38	None	Vented	None	Default (5.0)	(3.1)	(3.4)
3	R-30/38	R-13	Vented	None	Default (5.0)	6.2	10.9
4	R-30/38	R-6 (above)	Vented	None	Default (5.0)	6.3	8.7
5	None	R-30	Vented	None	Default (5.0)	(2.3)	1.5
6	None	R-38	Vented	None	Default (5.0)	0.3	4.1
7	None	R-30	Vented	None	3.0	(1.7)	3.1
8	None	R-38	Vented	None	3.0	0.9	5.7
9	None	R-38	Unvented	None	Default (5.0)	2.5	6.7
10	None	R-38	Unvented (2016 ruleset)	None	Default (5.0)	1.4	7.1
11	None	R-38	Unvented	Ducts in CS	Default (5.0)	4.1	8.7
12	R-30/38	Radiant Barrier	Vented	WH Fan	Default (5.0)	(0.2)	9.1
13	None	R-38	Vented	WH Fan	Default (5.0)	(2.2)	6.4
14	None	R-38	Unvented	WH Fan	Default (5.0)	N/A	N/A
15	R-30/38	Radiant Barrier	Vented	15 SEER AC	Default (5.0)	1.3	1.0
16	None	R-38	Unvented	Ducts in CS	3.0	5.0	10.8
17	R-13	R-38	Vented	None	Default (5.0)	6.8	13.1
18	R-13	R-38	Unvented	None	Default (5.0)	7.7	13.8
19	None	R-38	Unvented (modeled as conditioned living space)	Cathedral Clg (no "attic"), Ducts in CS	Default (5.0)	8.7	14.8

Table 1: Modeling Results for Unvented Spray Foam Attics as Compared to Minimally Compliant Title 24 2013 Baseline Model and Various other HPA Strategies. Savings are shown as a percent of the standard design budget.

The models were run in the beta version of v3 to allow modeling of both vented and unvented attics, a feature which has since been disabled in the official v3 release. Model #9 represents a logical, simple approach to representing an unvented SPF attic HPA design. However, when compared to other HPA designs presented in the Draft Codes and Standards Enhancement ("CASE") report (represented by models #3 and #4) the unvented attic design produces a considerably lower compliance margin.

An alternate approach to modeling an unvented attic is show in model #19. In this model, the attic space was defined as conditioned living space with a cathedral ceiling rather than as an unvented. All other parameters, dimensions, and total home volume (inclusive of the attic) are the same as modeled under scenario #9. The only physical differences between these two approaches to constructing HPAs are:

1. The presence of sheet rock below the roof deck insulation layer in model #19;
2. The fact that model #19 would provide direct conditioned air to the attic volume; and
3. The continuity (or lack of continuity) of the surface between the attic space and the rest of the livings space.

None of these factors appear to account for the fact that compliance margins are 2-3 times greater in model #19 than model #9.

We therefore respectfully request an opportunity to meet with the Commission so that the SPF industry may gain a better understanding of the operation of the modeling software that will enable us to more accurately interpret our modeling results. Further, we believe this dialogue will enable the SPF industry to work with the Commission and constructively address any areas in need of improvement within the modeling software. Ideally, our request for a meeting would be granted prior to the feature that allows for the modeling of both vented and unvented attics being reinstated in the CBECC-res v3 modeling software.

If you have questions regarding this request, please contact our consultant Garth Torvestad at (209) 473-5000, gtorvestad@ConSol.ws, ConSol, or Justin Koscher, Director, at (202) 249-6617, Justin_Koscher@americanchemistry.com.

Kind regards,

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