State of California **California Natural Resources Agency**

M e m o r a n d u m

To: Commissioners **Date :** December 23, 2015

Telephone: 916-654-5013

From: **California Energy Commission**
1516 Ninth Street
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Efficiency Division

Subject: **ENERGYPRO 7 SUMMARY OF RESIDENTIAL ACM TESTS**

EnergyPro Version 7 is a residential alternative calculation method (ACM) for complying with the 2016 Building Energy Efficiency Standards.

The 2016 Residential ACM Approval Manual (CEC 400-2015-039-CMF), specifies the requirements for approving vendor software. Appendix A contains the details of the certification tests required. The purpose of ACM testing is to demonstrate that software successfully integrates the compliance manager into the software. A test data set with specific description and details of the tests, inputs, and a spreadsheet of compliance results is attached as back-up materials for this business meeting item. For example, page 1 identifies Test U07 as “common measures” which are spelled out on subsequent pages as a 92 percent furnace, a 16 SEER/14 EER cooling system, a two percent duct leakage testing, and so on.

Staff evaluated the input files and compared the test results as documented in the test data set to ensure compliance with all applicable requirements. All required items in the checklist were provided.

Staff reviewed and tested EnergyPro7 to ensure it meets the requirements, specifications, and criteria for building energy models set forth in the 2016 ACM Approval Manual.

Summary of Residential ACM Tests

Comparison Date:	12/10/2015
Comparison Author:	Martyn Dodd
Candidate Software:	EnergyPro V7.0
Reference Software:	2016 CBECC-Res 2016 797r395
Type of Software:	Reference
Type of Construction:	Both
Tolerance:	0.04

Test	Pass	Description
U01	Pass	Standard Design in All Zones for Prototype S2100ft2
U02	Pass	Standard Design in All Zones for Prototype S2700ft2
U03	Pass	Standard Design in All Zones for Prototype S6960ft2
U04	Pass	Proposed Design in All Zones for Prototype P2100ft2
U05	Pass	Proposed Design in All Zones for Prototype P2700ft2
U06	Pass	Proposed Design in All Zones for Prototype P6960ft2
U07	Pass	Common Measures in Zone 12 for Prototype P2100ft2
U08	Pass	Water Heating in Zone 12 for Prototype P2100ft2
U09	Pass	Multiple Orientation in Zone 12 for Prototype S2100ft2/P2100ft2
U10	Pass	Multi Family Water Heating in Zone 12 for Prototype P6960ft2
U11	Pass	Source Energy in Zone 12 for Prototype P2100ft2
U12	Pass	E+A+A Base & Windows in Zone 12 for Prototype P1665ft2
U13	Pass	E+A+A Walls & HVAC in Zone 12 for Prototype P1665ft2

Test #	Run #	# of Runs	Description	Proto-type
			Standard Design Tests	
			Following tests all 16 climate zones	
			Following tests standard design = proposed design	
U01	R01-R16	16	Standard Design Test	S2100
U02	R01-R16	16	Standard Design Test	S2700
U03	R01-R16	16	Standard Design Test	S6960
			Proposed Design Tests	
			Following tests should have standard = standard from tests U04, U02, and U03	
U04	R01-R16	16	Proposed Design Test	P2100
U05	R01-R16	16	Proposed Design Test	P2700
U06	R01-R16	16	Proposed Design Test	P6960
U07			**Common Measures**	
			Following tests for Climate Zone 12 only	
			Following tests should have the same standard design as U01R12	
U07	R01	1	Package	
U07	R02	1	Fenestration U 0.40/S 0.40	U04R12
U07	R03	1	Wall R13/Roof Deck Above R6	U04R12
U07	R04	1	Ceiling R49 /Roof Deck Below R0/Radiant Barrier	U04R12
U07	R05	1	Furnace AFUE 92	U04R12
U07	R06	1	Air Conditioner SEER 16/EER 14	U04R12
U07	R07	1	No Cool Vent	U04R12
U07	R08	1	Ducts 2% Leakage	U04R12
U07	R09	1	Insulation Construction Quality Improved	U04R12
U07	R10	1	Air Leakage ACH50 2.0	U04R12
U08			**Water Heating**	
			Following tests for Climate Zone 12 only	
			Some standard designs are different than U01R12	
U08	R01	1	Package	U04R12
U08	R02	1	Parallel Piping	U04R12
U08	R03	1	Small Tankless EF 0.80/Input 195000/0 gal	U04R12
U08	R04	1	Large Tankless RE 0.76/Input 300000/0 gal	U04R12
U08	R05	1	Large Storage RE 0.77/Input 100000/75gal/Stby 0.01	U04R12
U08	R06	1	Large Storage RE 0.77/Input 100000/75gal/Stby 0.03	U04R12
U08	R07	1	Electric Resistance EF 0.92/Input 4500	U04R12
U08	R08	1	Heat Pump EF 2.4/Input 4500	U04R12
U08	R09	1	2 Water Heaters using Multiplier	U04R12
U08	R10	1	2 Water Heaters Using 2 entries	U04R12

Test #	Run #	# of Runs	Description	Proto-type
U09			**Multiple Orientation**	
			Following tests for Climate Zone 12 only	
U09	R01	1	Single Standard Front 45	U01R12
U09	R02	1	East Standard	U01R12
U09	R03	1	South Standard	U01R12
U09	R04	1	West Standard	U01R12
U09	R05	1	North Standard	U01R12
U09	R06	1	Single Proposed front 45	U04R12
U09	R07	1	East Proposed	U04R12
U09	R08	1	South Proposed	U04R12
U09	R09	1	West Proposed	U04R12
U09	R10	1	North Proposed	U04R12
U10			**Multi Family Water Heating**	
			Following tests for Climate Zone 12 only	
			Some standard designs are different than U03R12	
U10	R01	1	8 Storage	U06R12
U10	R02	1	8 Storage 2 Systems	U06R12
U10	R03	1	8 LgStor	U06R12
U10	R04	1	2 LgStor Central Solar	U06R12
U10	R05	1	2 LgStor Central Solar Recirc	U06R12
U10	R06	1	2 LgStor Central Recirc	U06R12
U10	R07	1	2 SmInstantant Central Solar	U06R12
U10	R08	1	2 SmInstantant Central Solar Recirc	U06R12
U10	R09	1	1 Indirect Central Solar	U06R12
U10	R10	1	1 Indirect Central Solar Recirc	U06R12
U11			**Source Energy**	
			Following tests for Climate Zone 12 only	
			Some standard designs are different than U01R12	
U11	R01	1	Package	U04R12
U11	R02	1	Package No Natural Gas	U04R12
U11	R03	1	Electric DHW	U04R12
U11	R04	1	Electric DHW no Natural Gas	U04R12
U11	R05	1	Heatpump DHW	U04R12
U11	R06	1	Heatpump DHW no Natural Gas	U04R12
U11	R07	1	Heatpump HVAC	U04R12
U11	R08	1	Heatpump HVAC no Natural Gas	U04R12
U11	R09	1	Heatpump HVAC & DHW	U04R12
U11	R10	1	Heatpump HVAC & DHW no Natural Gas	U04R12
U12			**E+A+A Base & Windows**	
			Following tests for Climate Zone 12 only	
			Standard Design Varies with features and verification	
U12	R01	1	E 1440ft2 as New Construction	P1665

Test #	Run #	# of Runs	Description	Proto-type
U12	R02	1	E 1440ft2 as Addition/Alteration	P1665
U12	R03	1	EA 1665ft2	P1665
U12	R04	1	EAA Ceiling R38 Verified	P1665
U12	R05	1	EAA Ceiling R38 Verified Wind U0.41/S0.36	P1665
U12	R06	1	EAA Ceiling R38 Verified Wind U0.41/S0.36 Verified	P1665
U12	R07	1	EAA Ceiling R38 Verified Wind U0.40/S0.35	P1665
U12	R08	1	EAA Ceiling R38 Verified Wind U0.40/S0.35 Verified	P1665
U12	R09	1	EAA Ceiling R38 Verified Wind U0.39/S0.34	P1665
U12	R10	1	EAA Ceiling R38 Verified Wind U0.39/S0.34 Verified	P1665
U13			**E+A+A Walls & HVAC**	
			Following tests for Climate Zone 12 only	
			Standard Design Varies with features and verification	
U13	R01	1	EAA Ceiling R38 Verified Wall R11	P1665
U13	R02	1	EAA Ceiling R38 Verified Wall R11 Verified	P1665
U13	R03	1	EAA Ceiling R38 Verified Wall R13	P1665
U13	R04	1	EAA Ceiling R38 Verified Wall R13 Verified	P1665
U13	R05	1	EAA Ceiling R38 Verified HVAC Worse	P1665
U13	R06	1	EAA Ceiling R38 Verified HVAC Worse Verified	P1665
U13	R07	1	EAA Ceiling R38 Verified HVAC Equal	P1665
U13	R08	1	EAA Ceiling R38 Verified HVAC Equal Verified	P1665
U13	R09	1	EAA Ceiling R38 Verified HVAC Better	P1665
U13	R10	1	EAA Ceiling R38 Verified HVAC Better Verified	P1665