

Summary of Residential ACM Tests (kTDV/ft2)

Comparison Date: 9/1/2016
 Comparison Author: Ken Nittler
 Candidate Software: CBEC-Res 2016 670
 Reference Software: CBEC-Res 2016 667
 Type of Software: Reference
 Type of Construction: Both
 Units for Summary: kTDV/ft2
 Tolerance: 0.04

Test	Pass/ Fail	Average Proposed kTDV/ft2	Average Standard kTDV/ft2	Description
U01	Pass	41.24	41.24	Standard Design in All Zones for Prototype S2100ft2
U02	Pass	39.04	39.04	Standard Design in All Zones for Prototype S2700ft2
U03	Pass	48.67	48.67	Standard Design in All Zones for Prototype S6960ft2
U04	Pass	37.82	41.24	Proposed Design in All Zones for Prototype P2100ft2
U05	Pass	35.30	39.04	Proposed Design in All Zones for Prototype P2700ft2
U06	Pass	44.80	48.67	Proposed Design in All Zones for Prototype P6960ft2
U07	Pass	37.70	41.44	Common Measures in Zone 12 for Prototype P2100ft2
U08	Pass	40.99	41.44	Water Heating in Zone 12 for Prototype P2100ft2
U09	Pass	41.35	41.44	Multiple Orientation in Zone 12 for Prototype S2100ft2/P2100ft2
U10	Pass	60.88	62.35	Multi Family Water Heating in Zone 12 for Prototype P6960ft2
U11	Pass	47.85	50.43	Source Energy in Zone 12 for Prototype P2100ft2
U12	Pass	177.35	181.19	E+A+A Base & Windows in Zone 12 for Prototype P1665ft2
U13	Pass	131.82	165.71	E+A+A Walls & HVAC in Zone 12 for Prototype P1665ft2

Comparison between Reference & Candidate Software (kTDV/ft2)

Comparison Date: 9/1/2016
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 Candidate Software: CBECC-Res 2016 670

Test	Run	Description	Pass/Fail	Reference	Candidate	Percent	Within	Standard	Reference	Candidate	Percent	Within	Standard	Margin	
				Proposed	Proposed	Difference	Tolerance	Equals	Standard	Standard	Difference	Tolerance	Looks Up		
Standard Design in All Zones for Prototype S2100ft2													Standard = Proposed for this test		
U01	R01	Zone 01	Pass	45.44	45.44	0.00%	Yes	45.44	45.44	45.44	0.00%	Yes	U01R01	0.00	
U01	R02	Zone 02	Pass	34.52	34.52	0.00%	Yes	34.52	34.52	34.52	0.00%	Yes	U01R02	0.00	
U01	R03	Zone 03	Pass	25.13	25.13	0.00%	Yes	25.13	25.13	25.13	0.00%	Yes	U01R03	0.00	
U01	R04	Zone 04	Pass	28.46	28.46	0.00%	Yes	28.46	28.46	28.46	0.00%	Yes	U01R04	0.00	
U01	R05	Zone 05	Pass	22.68	22.68	0.00%	Yes	22.68	22.68	22.68	0.00%	Yes	U01R05	0.00	
U01	R06	Zone 06	Pass	19.49	19.49	0.00%	Yes	19.49	19.49	19.49	0.00%	Yes	U01R06	0.00	
U01	R07	Zone 07	Pass	12.42	12.42	0.00%	Yes	12.42	12.42	12.42	0.00%	Yes	U01R07	0.00	
U01	R08	Zone 08	Pass	19.53	19.53	0.00%	Yes	19.53	19.53	19.53	0.00%	Yes	U01R08	0.00	
U01	R09	Zone 09	Pass	32.30	32.30	0.00%	Yes	32.30	32.30	32.30	0.00%	Yes	U01R09	0.00	
U01	R10	Zone 10	Pass	32.73	32.73	0.00%	Yes	32.73	32.73	32.73	0.00%	Yes	U01R10	0.00	
U01	R11	Zone 11	Pass	64.21	64.21	0.00%	Yes	64.21	64.21	64.21	0.00%	Yes	U01R11	0.00	
U01	R12	Zone 12	Pass	41.44	41.44	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	0.00	
U01	R13	Zone 13	Pass	65.47	65.47	0.00%	Yes	65.47	65.47	65.47	0.00%	Yes	U01R13	0.00	
U01	R14	Zone 14	Pass	61.45	61.45	0.00%	Yes	61.45	61.45	61.45	0.00%	Yes	U01R14	0.00	
U01	R15	Zone 15	Pass	96.09	96.09	0.00%	Yes	96.09	96.09	96.09	0.00%	Yes	U01R15	0.00	
U01	R16	Zone 16	Pass	58.52	58.52	0.00%	Yes	58.52	58.52	58.52	0.00%	Yes	U01R16	0.00	
Result U01			Pass	41.24	41.24	0.00%		41.24	41.24	41.24	0.00%	Ave	Min Max	0.00% 0.00%	
Standard Design in All Zones for Prototype S2700ft2													Standard = Proposed for this test		
U02	R01	Zone 01	Pass	35.67	35.67	0.00%	Yes	35.67	35.67	35.67	0.00%	Yes	U02R01	0.00	
U02	R02	Zone 02	Pass	31.06	31.06	0.00%	Yes	31.06	31.06	31.06	0.00%	Yes	U02R02	0.00	
U02	R03	Zone 03	Pass	20.44	20.44	0.00%	Yes	20.44	20.44	20.44	0.00%	Yes	U02R03	0.00	
U02	R04	Zone 04	Pass	26.47	26.47	0.00%	Yes	26.47	26.47	26.47	0.00%	Yes	U02R04	0.00	
U02	R05	Zone 05	Pass	17.94	17.94	0.00%	Yes	17.94	17.94	17.94	0.00%	Yes	U02R05	0.00	
U02	R06	Zone 06	Pass	18.38	18.38	0.00%	Yes	18.38	18.38	18.38	0.00%	Yes	U02R06	0.00	
U02	R07	Zone 07	Pass	11.25	11.25	0.00%	Yes	11.25	11.25	11.25	0.00%	Yes	U02R07	0.00	
U02	R08	Zone 08	Pass	20.12	20.12	0.00%	Yes	20.12	20.12	20.12	0.00%	Yes	U02R08	0.00	
U02	R09	Zone 09	Pass	32.69	32.69	0.00%	Yes	32.69	32.69	32.69	0.00%	Yes	U02R09	0.00	
U02	R10	Zone 10	Pass	33.59	33.59	0.00%	Yes	33.59	33.59	33.59	0.00%	Yes	U02R10	0.00	
U02	R11	Zone 11	Pass	63.44	63.44	0.00%	Yes	63.44	63.44	63.44	0.00%	Yes	U02R11	0.00	
U02	R12	Zone 12	Pass	42.52	42.52	0.00%	Yes	42.52	42.52	42.52	0.00%	Yes	U02R12	0.00	
U02	R13	Zone 13	Pass	64.69	64.69	0.00%	Yes	64.69	64.69	64.69	0.00%	Yes	U02R13	0.00	
U02	R14	Zone 14	Pass	60.79	60.79	0.00%	Yes	60.79	60.79	60.79	0.00%	Yes	U02R14	0.00	
U02	R15	Zone 15	Pass	90.36	90.36	0.00%	Yes	90.36	90.36	90.36	0.00%	Yes	U02R15	0.00	
U02	R16	Zone 16	Pass	55.28	55.28	0.00%	Yes	55.28	55.28	55.28	0.00%	Yes	U02R16	0.00	
Result U02			Pass	39.04	39.04	0.00%		39.04	39.04	39.04	0.00%	Ave	Min Max	0.00% 0.00%	

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Test	Run	Description	Pass/Fail	Reference Proposed	Candidate Proposed	Percent Difference	Within Tolerance	Standard Equals	Reference Standard	Candidate Standard	Percent Difference	Within Tolerance	Standard Equals Lookup	Margin
Standard = Proposed for this test														
U03	Standard Design in All Zones for Prototype S6960ft2													
U03	R01	Zone 01	Pass	36.82	36.82	0.00%	Yes	36.82	36.82	36.82	0.00%	Yes	U03R01	0.00
U03	R02	Zone 02	Pass	38.03	38.03	0.00%	Yes	38.04	38.04	38.04	0.00%	Yes	U03R02	0.01
U03	R03	Zone 03	Pass	26.19	26.19	0.00%	Yes	26.19	26.19	26.19	0.00%	Yes	U03R03	0.00
U03	R04	Zone 04	Pass	34.96	34.96	0.00%	Yes	34.96	34.96	34.96	0.00%	Yes	U03R04	0.00
U03	R05	Zone 05	Pass	24.89	24.89	0.00%	Yes	24.89	24.89	24.89	0.00%	Yes	U03R05	0.00
U03	R06	Zone 06	Pass	26.79	26.79	0.00%	Yes	26.79	26.79	26.79	0.00%	Yes	U03R06	0.00
U03	R07	Zone 07	Pass	23.64	23.64	0.00%	Yes	23.64	23.64	23.64	0.00%	Yes	U03R07	0.00
U03	R08	Zone 08	Pass	35.08	35.08	0.00%	Yes	35.09	35.09	35.09	0.00%	Yes	U03R08	0.01
U03	R09	Zone 09	Pass	46.09	46.09	0.00%	Yes	46.09	46.09	46.09	0.00%	Yes	U03R09	0.00
U03	R10	Zone 10	Pass	46.99	46.99	0.00%	Yes	46.99	46.99	46.99	0.00%	Yes	U03R10	0.00
U03	R11	Zone 11	Pass	73.34	73.34	0.00%	Yes	73.34	73.34	73.34	0.00%	Yes	U03R11	0.00
U03	R12	Zone 12	Pass	56.87	56.87	0.00%	Yes	56.87	56.87	56.87	0.00%	Yes	U03R12	0.00
U03	R13	Zone 13	Pass	74.84	74.84	0.00%	Yes	74.84	74.84	74.84	0.00%	Yes	U03R13	0.00
U03	R14	Zone 14	Pass	69.54	69.54	0.00%	Yes	69.54	69.54	69.54	0.00%	Yes	U03R14	0.00
U03	R15	Zone 15	Pass	105.23	105.23	0.00%	Yes	105.23	105.23	105.23	0.00%	Yes	U03R15	0.00
U03	R16	Zone 16	Pass	59.46	59.46	0.00%	Yes	59.46	59.46	59.46	0.00%	Yes	U03R16	0.00
Result U03			Pass	48.67	48.67	0.00%		48.67	48.67	48.67	0.00%	Ave	Min Max	0.00% 0.00%
Standard = T01 Standard for this test														
U04	Proposed Design in All Zones for Prototype P2100ft2													
U04	R01	Zone 01	Pass	43.64	43.64	0.00%	Yes	45.44	45.44	45.44	0.00%	Yes	U01R01	1.80
U04	R02	Zone 02	Pass	32.87	32.87	0.00%	Yes	34.52	34.52	34.52	0.00%	Yes	U01R02	1.65
U04	R03	Zone 03	Pass	22.94	22.94	0.00%	Yes	25.13	25.13	25.13	0.00%	Yes	U01R03	2.19
U04	R04	Zone 04	Pass	25.67	25.67	0.00%	Yes	28.46	28.46	28.46	0.00%	Yes	U01R04	2.79
U04	R05	Zone 05	Pass	20.38	20.38	0.00%	Yes	22.68	22.68	22.68	0.00%	Yes	U01R05	2.30
U04	R06	Zone 06	Pass	17.82	17.82	0.00%	Yes	19.49	19.49	19.49	0.00%	Yes	U01R06	1.67
U04	R07	Zone 07	Pass	11.54	11.54	0.00%	Yes	12.42	12.42	12.42	0.00%	Yes	U01R07	0.88
U04	R08	Zone 08	Pass	17.52	17.52	0.00%	Yes	19.53	19.53	19.53	0.00%	Yes	U01R08	2.01
U04	R09	Zone 09	Pass	28.35	28.35	0.00%	Yes	32.30	32.30	32.30	0.00%	Yes	U01R09	3.95
U04	R10	Zone 10	Pass	29.04	29.04	0.00%	Yes	32.73	32.73	32.73	0.00%	Yes	U01R10	3.69
U04	R11	Zone 11	Pass	58.69	58.69	0.00%	Yes	64.21	64.21	64.21	0.00%	Yes	U01R11	5.52
U04	R12	Zone 12	Pass	37.40	37.40	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	4.04
U04	R13	Zone 13	Pass	59.80	59.80	0.00%	Yes	65.47	65.47	65.47	0.00%	Yes	U01R13	5.67
U04	R14	Zone 14	Pass	54.60	54.60	0.00%	Yes	61.45	61.45	61.45	0.00%	Yes	U01R14	6.85
U04	R15	Zone 15	Pass	89.60	89.60	0.00%	Yes	96.09	96.09	96.09	0.00%	Yes	U01R15	6.49
U04	R16	Zone 16	Pass	55.22	55.22	0.00%	Yes	58.52	58.52	58.52	0.00%	Yes	U01R16	3.30
Result U04			Pass	37.82	37.82	0.00%		41.24	41.24	41.24	0.00%	Ave	Min Max	0.00% 0.00%

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Test	Run	Description	Pass/Fail	Reference Proposed	Candidate Proposed	Percent Difference	Within Tolerance	Standard Equals	Reference Standard	Candidate Standard	Percent Difference	Within Tolerance	Standard Equals Lookup	Margin
								Standard = T02 Standard for this test						
U05	Proposed Design in All Zones for Prototype P2700ft2													
U05	R01	Zone 01	Pass	33.76	33.76	0.00%	Yes	35.67	35.67	35.67	0.00%	Yes	U02R01	1.91
U05	R02	Zone 02	Pass	28.59	28.59	0.00%	Yes	31.06	31.06	31.06	0.00%	Yes	U02R02	2.47
U05	R03	Zone 03	Pass	18.26	18.26	0.00%	Yes	20.44	20.44	20.44	0.00%	Yes	U02R03	2.18
U05	R04	Zone 04	Pass	24.13	24.13	0.00%	Yes	26.47	26.47	26.47	0.00%	Yes	U02R04	2.34
U05	R05	Zone 05	Pass	15.76	15.76	0.00%	Yes	17.94	17.94	17.94	0.00%	Yes	U02R05	2.18
U05	R06	Zone 06	Pass	16.62	16.62	0.00%	Yes	18.38	18.38	18.38	0.00%	Yes	U02R06	1.76
U05	R07	Zone 07	Pass	10.43	10.43	0.00%	Yes	11.25	11.25	11.25	0.00%	Yes	U02R07	0.82
U05	R08	Zone 08	Pass	17.92	17.92	0.00%	Yes	20.12	20.12	20.12	0.00%	Yes	U02R08	2.20
U05	R09	Zone 09	Pass	28.83	28.83	0.00%	Yes	32.69	32.69	32.69	0.00%	Yes	U02R09	3.86
U05	R10	Zone 10	Pass	29.51	29.51	0.00%	Yes	33.59	33.59	33.59	0.00%	Yes	U02R10	4.08
U05	R11	Zone 11	Pass	57.16	57.16	0.00%	Yes	63.44	63.44	63.44	0.00%	Yes	U02R11	6.28
U05	R12	Zone 12	Pass	37.64	37.64	0.00%	Yes	42.52	42.52	42.52	0.00%	Yes	U02R12	4.88
U05	R13	Zone 13	Pass	58.34	58.34	0.00%	Yes	64.69	64.69	64.69	0.00%	Yes	U02R13	6.35
U05	R14	Zone 14	Pass	53.41	53.41	0.00%	Yes	60.79	60.79	60.79	0.00%	Yes	U02R14	7.38
U05	R15	Zone 15	Pass	83.44	83.44	0.00%	Yes	90.36	90.36	90.36	0.00%	Yes	U02R15	6.92
U05	R16	Zone 16	Pass	51.02	51.02	0.00%	Yes	55.28	55.28	55.28	0.00%	Yes	U02R16	4.26
Result U05			Pass	35.30	35.30	0.00%		39.04	39.04	39.04	0.00%	Ave	Min Max	0.00% 0.00%
								Standard = T03 Standard for this test						
U06	Proposed Design in All Zones for Prototype P6960ft2													
U06	R01	Zone 01	Pass	37.63	37.63	0.00%	Yes	36.82	36.82	36.82	0.00%	Yes	U03R01	-0.81
U06	R02	Zone 02	Pass	35.72	35.72	0.00%	Yes	38.04	38.04	38.04	0.00%	Yes	U03R02	2.32
U06	R03	Zone 03	Pass	25.16	25.16	0.00%	Yes	26.19	26.19	26.19	0.00%	Yes	U03R03	1.03
U06	R04	Zone 04	Pass	31.55	31.55	0.00%	Yes	34.96	34.96	34.96	0.00%	Yes	U03R04	3.41
U06	R05	Zone 05	Pass	24.03	24.03	0.00%	Yes	24.89	24.89	24.89	0.00%	Yes	U03R05	0.86
U06	R06	Zone 06	Pass	24.80	24.80	0.00%	Yes	26.79	26.79	26.79	0.00%	Yes	U03R06	1.99
U06	R07	Zone 07	Pass	21.16	21.16	0.00%	Yes	23.64	23.64	23.64	0.00%	Yes	U03R07	2.48
U06	R08	Zone 08	Pass	31.72	31.72	0.00%	Yes	35.09	35.09	35.09	0.00%	Yes	U03R08	3.37
U06	R09	Zone 09	Pass	40.78	40.78	0.00%	Yes	46.09	46.09	46.09	0.00%	Yes	U03R09	5.31
U06	R10	Zone 10	Pass	41.81	41.81	0.00%	Yes	46.99	46.99	46.99	0.00%	Yes	U03R10	5.18
U06	R11	Zone 11	Pass	67.28	67.28	0.00%	Yes	73.34	73.34	73.34	0.00%	Yes	U03R11	6.06
U06	R12	Zone 12	Pass	51.03	51.03	0.00%	Yes	56.87	56.87	56.87	0.00%	Yes	U03R12	5.84
U06	R13	Zone 13	Pass	67.85	67.85	0.00%	Yes	74.84	74.84	74.84	0.00%	Yes	U03R13	6.99
U06	R14	Zone 14	Pass	63.25	63.25	0.00%	Yes	69.54	69.54	69.54	0.00%	Yes	U03R14	6.29
U06	R15	Zone 15	Pass	96.48	96.48	0.00%	Yes	105.23	105.23	105.23	0.00%	Yes	U03R15	8.75
U06	R16	Zone 16	Pass	56.57	56.57	0.00%	Yes	59.46	59.46	59.46	0.00%	Yes	U03R16	2.89
Result U06			Pass	44.80	44.80	0.00%		48.67	48.67	48.67	0.00%	Ave	Min Max	0.00% 0.00%

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Test	Run	Description	Pass/Fail	Reference Proposed	Candidate Proposed	Percent Difference	Within Tolerance	Standard Equals	Reference Standard	Candidate Standard	Percent Difference	Within Tolerance	Standard Equals Lookup	Margin
								Standard = T01 Standard for this test						
U07	Common Measures in Zone 12 for Prototype P2100ft2													
U07	R01	Package	Pass	37.40	37.40	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	4.04
U07	R02	Fenestration U 0.40/S 0.40	Pass	42.89	42.89	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	-1.45
U07	R03	Wall R13/Roof Deck Above R6	Pass	36.47	36.47	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	4.97
U07	R04	Ceiling R49 /Roof Deck Below R0/Radiant Barrier	Pass	41.68	41.68	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	-0.24
U07	R05	Furnace AFUE 92	Pass	34.58	34.58	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	6.86
U07	R06	Air Conditioner SEER 16/EER 14	Pass	36.39	36.39	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	5.05
U07	R07	No Cool Vent	Pass	41.84	41.84	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	-0.40
U07	R08	Ducts 2% Leakage	Pass	36.82	36.82	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	4.62
U07	R09	Insulation Construction Quality Improved	Pass	33.03	33.03	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	8.41
U07	R10	Air Leakage ACH50 2.0	Pass	35.86	35.86	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	5.58
Result U07			Pass	37.70	37.70	0.00%		41.44	41.44	41.44	0.00%		Min 0.00% Ave Max 0.00%	3.74
								Standard = T01 Standard for this test						
U08	Water Heating in Zone 12 for Prototype P2100ft2													
U08	R01	Package	Pass	37.40	37.40	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	4.04
U08	R02	Parallel Piping	Pass	37.46	37.46	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	3.98
U08	R03	Small Tankless EF 0.80/Input 195000/0 gal	Pass	37.62	37.62	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	3.82
U08	R04	Large Tankless RE 0.76/Input 300000/0 gal	Pass	38.08	38.08	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	3.36
U08	R05	Large Storage RE 0.77/Input 100000/75gal/Stby 0.01	Pass	40.21	40.21	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	1.23
U08	R06	Large Storage RE 0.77/Input 100000/75gal/Stby 0.03	Pass	46.17	46.17	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	-4.73
U08	R07	Electric Resistance EF 0.92/Input 4500	Pass	58.35	58.35	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	-16.91
U08	R08	Heat Pump EF 2.4/Input 4500	Pass	39.83	39.83	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	1.61
U08	R09	2 Water Heaters using Multiplier	Pass	37.40	37.40	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	4.04
U08	R10	2 Water Heaters Using 2 entries	Pass	37.40	37.40	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	4.04
Result U08			Pass	40.99	40.99	0.00%		41.44	41.44	41.44	0.00%		Min 0.00% Ave Max 0.00%	0.45
								Standard = T01 Standard for this test						
U09	Multiple Orientation in Zone 12 for Prototype S2100ft2/P2100ft2													
U09	R01	Single Standard Front 45	Pass	42.65	42.65	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	-1.21
U09	R02	East Standard	Pass	41.44	41.44	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	0.00
U09	R03	South Standard	Pass	41.44	41.44	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	0.00
U09	R04	West Standard	Pass	41.44	41.44	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	0.00
U09	R05	North Standard	Pass	41.44	41.44	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	0.00
U09	R06	Single Proposed front 45	Pass	42.50	42.50	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	-1.06
U09	R07	East Proposed	Pass	44.13	44.13	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	-2.69
U09	R08	South Proposed	Pass	38.02	38.02	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	3.42
U09	R09	West Proposed	Pass	43.05	43.05	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	-1.61
U09	R10	North Proposed	Pass	37.40	37.40	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U01R12	4.04
Result U09			Pass	41.35	41.35	0.00%		41.44	41.44	41.44	0.00%		Min 0.00% Ave Max 0.00%	0.09

Comparison between Reference & Candidate Software (kTDV/ft2)

Comparison Date: 9/1/2016
 Comparison Author: Ken Nittler
 Candidate Software: CBECC-Res 2016 670

Test	Run	Description	Pass/Fail	Reference Proposed	Candidate Proposed	Percent Difference	Within Tolerance	Standard Equals	Reference Standard	Candidate Standard	Percent Difference	Within Tolerance	Standard Equals Lookup	Margin
								Standard = Varies for this test						
U10	Multi Family Water Heating in Zone 12 for Prototype P6960ft2													
U10	R01	8 Storage	Pass	61.31	61.31	0.00%	Yes	56.87	56.87	56.87	0.00%	Yes	U06R12	-4.44
U10	R02	8 Storage 2 Systems	Pass	61.31	61.31	0.00%	Yes	56.87	56.87	56.87	0.00%	Yes	U06R12	-4.44
U10	R03	8 LgStor	Pass	68.06	68.06	0.00%	Yes	56.87	56.87	56.87	0.00%	Yes	U06R12	-11.19
U10	R04	2 LgStor Central Solar	Pass	55.36	55.36	0.00%	Yes	61.20	61.20	61.20	0.00%	Yes	U10R04	5.84
U10	R05	2 LgStor Central Solar Recirc	Pass	62.02	62.02	0.00%	Yes	67.86	67.86	67.86	0.00%	Yes	U10R05	5.84
U10	R06	2 LgStor Central Recirc	Pass	66.77	66.77	0.00%	Yes	67.86	67.86	67.86	0.00%	Yes	U10R05	1.09
U10	R07	2 SmlInstantant Central Solar	Pass	51.82	51.82	0.00%	Yes	57.66	57.66	57.66	0.00%	Yes	U10R07	5.84
U10	R08	2 SmlInstantant Central Solar Recirc	Pass	58.76	58.76	0.00%	Yes	64.60	64.60	64.60	0.00%	Yes	U10R08	5.84
U10	R09	1 Indirect Central Solar	Pass	58.14	58.14	0.00%	Yes	63.30	63.30	63.30	0.00%	Yes	U10R09	5.16
U10	R10	1 Indirect Central Solar Recirc	Pass	65.21	65.21	0.00%	Yes	70.38	70.38	70.38	0.00%	Yes	U10R10	5.17
Result U10			Pass	60.88	60.88	0.00%		62.35	62.35	62.35	0.00%		Min Ave Max	0.00% 0.00% 0.00%
								Standard = Varies for this test						
U11	Source Energy in Zone 12 for Prototype P2100ft2													
U11	R01	Package	Pass	37.40	37.40	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U04R12	4.04
U11	R02	Package No Natural Gas	Pass	62.88	62.88	0.00%	Yes	67.83	67.83	67.83	0.00%	Yes	U11R02	4.95
U11	R03	Electric DHW	Pass	55.00	55.00	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U04R12	-13.56
U11	R04	Electric DHW no Natural Gas	Pass	72.15	72.15	0.00%	Yes	67.83	67.83	67.83	0.00%	Yes	U11R02	-4.32
U11	R05	Heatpump DHW	Pass	39.83	39.83	0.00%	Yes	41.44	41.44	41.44	0.00%	Yes	U04R12	1.61
U11	R06	Heatpump DHW no Natural Gas	Pass	57.20	57.20	0.00%	Yes	67.83	67.83	67.83	0.00%	Yes	U11R02	10.63
U11	R07	Heatpump HVAC	Pass	35.28	35.28	0.00%	Yes	40.03	40.03	40.03	0.00%	Yes	U11R07	4.75
U11	R08	Heatpump HVAC no Natural Gas	Pass	43.48	43.48	0.00%	Yes	48.23	48.23	48.23	0.00%	Yes	U11R08	4.75
U11	R09	Heatpump HVAC & DHW	Pass	37.67	37.67	0.00%	Yes	40.03	40.03	40.03	0.00%	Yes	U11R07	2.36
U11	R10	Heatpump HVAC & DHW no Natural Gas	Pass	37.60	37.60	0.00%	Yes	48.23	48.23	48.23	0.00%	Yes	U11R08	10.63
Result U11			Pass	47.85	47.85	0.00%		50.43	50.43	50.43	0.00%		Min Ave Max	0.00% 0.00% 0.00%
								Standard = Varies for this test						
U12	E+A+A Base & Windows in Zone 12 for Prototype P1665ft2													
U12	R01	E 1440ft2 as New Construction	Pass	238.29	238.29	0.00%	Yes	46.72	46.72	46.72	0.00%	Yes	U12R01	-191.57
U12	R02	E 1440ft2 as Addition/Alteration	Pass	240.98	240.98	0.00%	Yes	240.98	240.98	240.98	0.00%	Yes	U12R02	0.00
U12	R03	EA 1665ft2	Pass	210.32	210.32	0.00%	Yes	206.96	206.96	206.96	0.00%	Yes	U12R03	-3.36
U12	R04	EAA Ceiling R38 Verified	Pass	184.64	184.64	0.00%	Yes	206.96	206.96	206.96	0.00%	Yes	U12R03	22.32
U12	R05	EAA Ceiling R38 Verified Wind U0.41/S0.36	Pass	150.64	150.64	0.00%	Yes	174.10	174.10	174.10	0.00%	Yes	U12R05	23.46
U12	R06	EAA Ceiling R38 Verified Wind U0.41/S0.36 Verified	Pass	150.64	150.64	0.00%	Yes	174.10	174.10	174.10	0.00%	Yes	U12R05	23.46
U12	R07	EAA Ceiling R38 Verified Wind U0.40/S0.35	Pass	149.90	149.90	0.00%	Yes	174.10	174.10	174.10	0.00%	Yes	U12R05	24.20
U12	R08	EAA Ceiling R38 Verified Wind U0.40/S0.35 Verified	Pass	149.90	149.90	0.00%	Yes	206.96	206.96	206.96	0.00%	Yes	U12R03	57.06
U12	R09	EAA Ceiling R38 Verified Wind U0.39/S0.34	Pass	149.09	149.09	0.00%	Yes	174.10	174.10	174.10	0.00%	Yes	U12R05	25.01
U12	R10	EAA Ceiling R38 Verified Wind U0.39/S0.34 Verified	Pass	149.09	149.09	0.00%	Yes	206.96	206.96	206.96	0.00%	Yes	U12R03	57.87
Result U12			Pass	177.35	177.35	0.00%		181.19	181.19	181.19	0.00%		Min Ave Max	0.00% 0.00% 0.00%

Comparison between Reference & Candidate Software (kTDV/ft2)

Comparison Date: 9/1/2016
 Comparison Author: Ken Nittler
 Candidate Software: CBECC-Res 2016 670

Test	Run	Description	Pass/Fail	Reference Proposed	Candidate Proposed	Percent Difference	Within Tolerance	Standard Equals	Reference Standard	Candidate Standard	Percent Difference	Within Tolerance	Standard Equals Lookup	Margin
U13	E+A+A Walls & HVAC in Zone 12 for Prototype P1665ft2							Standard = Varies for this test						
U13	R01	EAA Ceiling R38 Verified Wall R11	Pass	148.42	148.42	0.00%	Yes	170.48	170.48	170.48	0.00%	Yes	U13R01	22.06
U13	R02	EAA Ceiling R38 Verified Wall R11 Verified	Pass	148.42	148.42	0.00%	Yes	170.48	170.48	170.48	0.00%	Yes	U13R01	22.06
U13	R03	EAA Ceiling R38 Verified Wall R13	Pass	146.17	146.17	0.00%	Yes	170.48	170.48	170.48	0.00%	Yes	U13R01	24.31
U13	R04	EAA Ceiling R38 Verified Wall R13 Verified	Pass	146.17	146.17	0.00%	Yes	206.96	206.96	206.96	0.00%	Yes	U12R03	60.79
U13	R05	EAA Ceiling R38 Verified HVAC Worse	Pass	145.52	145.52	0.00%	Yes	131.19	131.19	131.19	0.00%	Yes	U13R05	-14.33
U13	R06	EAA Ceiling R38 Verified HVAC Worse Verified	Pass	145.52	145.52	0.00%	Yes	131.19	131.19	131.19	0.00%	Yes	U13R05	-14.33
U13	R07	EAA Ceiling R38 Verified HVAC Equal	Pass	118.74	118.74	0.00%	Yes	131.19	131.19	131.19	0.00%	Yes	U13R05	12.45
U13	R08	EAA Ceiling R38 Verified HVAC Equal Verified	Pass	118.74	118.74	0.00%	Yes	206.96	206.96	206.96	0.00%	Yes	U12R03	88.22
U13	R09	EAA Ceiling R38 Verified HVAC Better	Pass	100.23	100.23	0.00%	Yes	131.19	131.19	131.19	0.00%	Yes	U13R05	30.96
U13	R10	EAA Ceiling R38 Verified HVAC Better Verified	Pass	100.23	100.23	0.00%	Yes	206.96	206.96	206.96	0.00%	Yes	U12R03	106.73
Result U13			Pass	131.82	131.82	0.00%		165.71	165.71	165.71	0.00%		Min Max	0.00% 0.00%

Summary of Residential ACM Tests (EDR)

Comparison Date: 9/1/2016
 Comparison Author: Ken Nittler
 Candidate Software: CBEC-Res 2016 670
 Reference Software: CBEC-Res 2016 667
 Type of Software: Reference
 Type of Construction: Both
 Units for Summary: EDR
 Tolerance: 0.04

Test	Pass/ Fail	Average Proposed EDR	Average Standard EDR	Description
U01	Pass	49.68	49.68	Standard Design in All Zones for Prototype S2100ft2
U02	Pass	47.13	47.13	Standard Design in All Zones for Prototype S2700ft2
U03	Pass	57.20	57.20	Standard Design in All Zones for Prototype S6960ft2
U04	Pass	47.70	49.68	Proposed Design in All Zones for Prototype P2100ft2
U05	Pass	44.91	47.13	Proposed Design in All Zones for Prototype P2700ft2
U06	Pass	55.41	57.20	Proposed Design in All Zones for Prototype P6960ft2
U07	Pass	43.54	45.61	Common Measures in Zone 12 for Prototype P2100ft2
U08	Pass	45.48	45.75	Water Heating in Zone 12 for Prototype P2100ft2
U09	Pass	46.32	45.61	Multiple Orientation in Zone 12 for Prototype S2100ft2/P2100ft2
U10	Pass	55.98	56.60	Multi Family Water Heating in Zone 12 for Prototype P6960ft2
U11	Pass	47.66	48.96	Source Energy in Zone 12 for Prototype P2100ft2
U12	Pass	n/a	n/a	E+A+A Base & Windows in Zone 12 for Prototype P1665ft2
U13	Pass	n/a	n/a	E+A+A Walls & HVAC in Zone 12 for Prototype P1665ft2

Comparison between Reference & Candidate Software (EDR)

Comparison Date: 9/1/2016
 Comparison Author: Ken Nittler
 Candidate Software: CBECC-Res 2016 670

Test	Run	Description	Pass/Fail	Reference Proposed	Candidate Proposed	Percent Difference	Within Tolerance	Standard Equals	Reference Standard	Candidate Standard	Percent Difference	Within Tolerance	Standard Equals Lookup	Margin
Standard = Proposed for this test														
U01	Standard Design in All Zones for Prototype S2100ft2													
U01	R01	Zone 01	Pass	57.26	57.26	0.00%	Yes	57.26	57.26	57.26	0.00%	Yes	U01R01	0.00
U01	R02	Zone 02	Pass	50.61	50.61	0.00%	Yes	50.61	50.61	50.61	0.00%	Yes	U01R02	0.00
U01	R03	Zone 03	Pass	47.81	47.81	0.00%	Yes	47.81	47.81	47.81	0.00%	Yes	U01R03	0.00
U01	R04	Zone 04	Pass	48.24	48.24	0.00%	Yes	48.24	48.24	48.24	0.00%	Yes	U01R04	0.00
U01	R05	Zone 05	Pass	44.63	44.63	0.00%	Yes	44.63	44.63	44.63	0.00%	Yes	U01R05	0.00
U01	R06	Zone 06	Pass	51.02	51.02	0.00%	Yes	51.02	51.02	51.02	0.00%	Yes	U01R06	0.00
U01	R07	Zone 07	Pass	49.80	49.80	0.00%	Yes	49.80	49.80	49.80	0.00%	Yes	U01R07	0.00
U01	R08	Zone 08	Pass	46.76	46.76	0.00%	Yes	46.76	46.76	46.76	0.00%	Yes	U01R08	0.00
U01	R09	Zone 09	Pass	47.56	47.56	0.00%	Yes	47.56	47.56	47.56	0.00%	Yes	U01R09	0.00
U01	R10	Zone 10	Pass	45.83	45.83	0.00%	Yes	45.83	45.83	45.83	0.00%	Yes	U01R10	0.00
U01	R11	Zone 11	Pass	49.29	49.29	0.00%	Yes	49.29	49.29	49.29	0.00%	Yes	U01R11	0.00
U01	R12	Zone 12	Pass	45.61	45.61	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	0.00
U01	R13	Zone 13	Pass	50.94	50.94	0.00%	Yes	50.94	50.94	50.94	0.00%	Yes	U01R13	0.00
U01	R14	Zone 14	Pass	49.97	49.97	0.00%	Yes	49.97	49.97	49.97	0.00%	Yes	U01R14	0.00
U01	R15	Zone 15	Pass	56.33	56.33	0.00%	Yes	56.33	56.33	56.33	0.00%	Yes	U01R15	0.00
U01	R16	Zone 16	Pass	53.25	53.25	0.00%	Yes	53.25	53.25	53.25	0.00%	Yes	U01R16	0.00
Result U01			Pass	49.68	49.68	0.00%		49.68	49.68	49.68	0.00%		Min Ave	0.00%
Standard = Proposed for this test														
U02	Standard Design in All Zones for Prototype S2700ft2													
U02	R01	Zone 01	Pass	52.84	52.84	0.00%	Yes	52.84	52.84	52.84	0.00%	Yes	U02R01	0.00
U02	R02	Zone 02	Pass	47.04	47.04	0.00%	Yes	47.04	47.04	47.04	0.00%	Yes	U02R02	0.00
U02	R03	Zone 03	Pass	44.71	44.71	0.00%	Yes	44.71	44.71	44.71	0.00%	Yes	U02R03	0.00
U02	R04	Zone 04	Pass	45.47	45.47	0.00%	Yes	45.47	45.47	45.47	0.00%	Yes	U02R04	0.00
U02	R05	Zone 05	Pass	41.55	41.55	0.00%	Yes	41.55	41.55	41.55	0.00%	Yes	U02R05	0.00
U02	R06	Zone 06	Pass	49.18	49.18	0.00%	Yes	49.18	49.18	49.18	0.00%	Yes	U02R06	0.00
U02	R07	Zone 07	Pass	47.86	47.86	0.00%	Yes	47.86	47.86	47.86	0.00%	Yes	U02R07	0.00
U02	R08	Zone 08	Pass	45.51	45.51	0.00%	Yes	45.51	45.51	45.51	0.00%	Yes	U02R08	0.00
U02	R09	Zone 09	Pass	45.63	45.63	0.00%	Yes	45.63	45.63	45.63	0.00%	Yes	U02R09	0.00
U02	R10	Zone 10	Pass	44.00	44.00	0.00%	Yes	44.00	44.00	44.00	0.00%	Yes	U02R10	0.00
U02	R11	Zone 11	Pass	46.90	46.90	0.00%	Yes	46.90	46.90	46.90	0.00%	Yes	U02R11	0.00
U02	R12	Zone 12	Pass	44.00	44.00	0.00%	Yes	44.00	44.00	44.00	0.00%	Yes	U02R12	0.00
U02	R13	Zone 13	Pass	48.56	48.56	0.00%	Yes	48.56	48.56	48.56	0.00%	Yes	U02R13	0.00
U02	R14	Zone 14	Pass	47.64	47.64	0.00%	Yes	47.64	47.64	47.64	0.00%	Yes	U02R14	0.00
U02	R15	Zone 15	Pass	52.72	52.72	0.00%	Yes	52.72	52.72	52.72	0.00%	Yes	U02R15	0.00
U02	R16	Zone 16	Pass	50.48	50.48	0.00%	Yes	50.48	50.48	50.48	0.00%	Yes	U02R16	0.00
Result U02			Pass	47.13	47.13	0.00%		47.13	47.13	47.13	0.00%		Min Ave	0.00%

Comparison between Reference & Candidate Software (EDR)

Comparison Date: 9/1/2016
 Comparison Author: Ken Nittler
 Candidate Software: CBECC-Res 2016 670

Test	Run	Description	Pass/Fail	Reference Proposed	Candidate Proposed	Percent Difference	Within Tolerance	Standard Equals	Reference Standard	Candidate Standard	Percent Difference	Within Tolerance	Standard Equals Lookup	Margin
Standard = Proposed for this test														
U03	Standard Design in All Zones for Prototype S6960ft2													
U03	R01	Zone 01	Pass	57.84	57.84	0.00%	Yes	57.84	57.84	57.84	0.00%	Yes	U03R01	0.00
U03	R02	Zone 02	Pass	55.94	55.94	0.00%	Yes	55.95	55.95	55.95	0.00%	Yes	U03R02	0.01
U03	R03	Zone 03	Pass	55.44	55.44	0.00%	Yes	55.44	55.44	55.44	0.00%	Yes	U03R03	0.00
U03	R04	Zone 04	Pass	54.76	54.76	0.00%	Yes	54.76	54.76	54.76	0.00%	Yes	U03R04	0.00
U03	R05	Zone 05	Pass	53.90	53.90	0.00%	Yes	53.90	53.90	53.90	0.00%	Yes	U03R05	0.00
U03	R06	Zone 06	Pass	59.49	59.49	0.00%	Yes	59.49	59.49	59.49	0.00%	Yes	U03R06	0.00
U03	R07	Zone 07	Pass	60.45	60.45	0.00%	Yes	60.45	60.45	60.45	0.00%	Yes	U03R07	0.00
U03	R08	Zone 08	Pass	59.01	59.01	0.00%	Yes	59.02	59.02	59.02	0.00%	Yes	U03R08	0.01
U03	R09	Zone 09	Pass	57.58	57.58	0.00%	Yes	57.58	57.58	57.58	0.00%	Yes	U03R09	0.00
U03	R10	Zone 10	Pass	56.03	56.03	0.00%	Yes	56.03	56.03	56.03	0.00%	Yes	U03R10	0.00
U03	R11	Zone 11	Pass	56.16	56.16	0.00%	Yes	56.16	56.16	56.16	0.00%	Yes	U03R11	0.00
U03	R12	Zone 12	Pass	55.64	55.64	0.00%	Yes	55.64	55.64	55.64	0.00%	Yes	U03R12	0.00
U03	R13	Zone 13	Pass	56.85	56.85	0.00%	Yes	56.85	56.85	56.85	0.00%	Yes	U03R13	0.00
U03	R14	Zone 14	Pass	56.90	56.90	0.00%	Yes	56.90	56.90	56.90	0.00%	Yes	U03R14	0.00
U03	R15	Zone 15	Pass	62.32	62.32	0.00%	Yes	62.32	62.32	62.32	0.00%	Yes	U03R15	0.00
U03	R16	Zone 16	Pass	56.91	56.91	0.00%	Yes	56.91	56.91	56.91	0.00%	Yes	U03R16	0.00
Result U03			Pass	57.20	57.20	0.00%		57.20	57.20	57.20	0.00%		Min Ave Max	0.00% 0.00% 0.00%
Standard = T01 Standard for this test														
U04	Proposed Design in All Zones for Prototype P2100ft2													
U04	R01	Zone 01	Pass	56.04	56.04	0.00%	Yes	57.26	57.26	57.26	0.00%	Yes	U01R01	1.22
U04	R02	Zone 02	Pass	49.47	49.47	0.00%	Yes	50.61	50.61	50.61	0.00%	Yes	U01R02	1.14
U04	R03	Zone 03	Pass	46.20	46.20	0.00%	Yes	47.81	47.81	47.81	0.00%	Yes	U01R03	1.61
U04	R04	Zone 04	Pass	46.29	46.29	0.00%	Yes	48.24	48.24	48.24	0.00%	Yes	U01R04	1.95
U04	R05	Zone 05	Pass	42.99	42.99	0.00%	Yes	44.63	44.63	44.63	0.00%	Yes	U01R05	1.65
U04	R06	Zone 06	Pass	49.57	49.57	0.00%	Yes	51.02	51.02	51.02	0.00%	Yes	U01R06	1.45
U04	R07	Zone 07	Pass	48.95	48.95	0.00%	Yes	49.80	49.80	49.80	0.00%	Yes	U01R07	0.85
U04	R08	Zone 08	Pass	45.17	45.17	0.00%	Yes	46.76	46.76	46.76	0.00%	Yes	U01R08	1.59
U04	R09	Zone 09	Pass	44.96	44.96	0.00%	Yes	47.56	47.56	47.56	0.00%	Yes	U01R09	2.60
U04	R10	Zone 10	Pass	43.49	43.49	0.00%	Yes	45.83	45.83	45.83	0.00%	Yes	U01R10	2.34
U04	R11	Zone 11	Pass	46.72	46.72	0.00%	Yes	49.29	49.29	49.29	0.00%	Yes	U01R11	2.57
U04	R12	Zone 12	Pass	43.38	43.38	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	2.23
U04	R13	Zone 13	Pass	48.24	48.24	0.00%	Yes	50.94	50.94	50.94	0.00%	Yes	U01R13	2.70
U04	R14	Zone 14	Pass	46.59	46.59	0.00%	Yes	49.97	49.97	49.97	0.00%	Yes	U01R14	3.38
U04	R15	Zone 15	Pass	53.66	53.66	0.00%	Yes	56.33	56.33	56.33	0.00%	Yes	U01R15	2.67
U04	R16	Zone 16	Pass	51.43	51.43	0.00%	Yes	53.25	53.25	53.25	0.00%	Yes	U01R16	1.83
Result U04			Pass	47.70	47.70	0.00%		49.68	49.68	49.68	0.00%		Min Ave Max	0.00% 0.00% 1.99

Comparison between Reference & Candidate Software (EDR)

Comparison Date: 9/1/2016
 Comparison Author: Ken Nittler
 Candidate Software: CBECC-Res 2016 670

Test	Run	Description	Pass/Fail	Reference Proposed	Candidate Proposed	Percent Difference	Within Tolerance	Standard Equals	Reference Standard	Candidate Standard	Percent Difference	Within Tolerance	Standard Equals Lookup	Margin
								Standard = T02 Standard for this test						
U05	Proposed Design in All Zones for Prototype P2700ft2													
U05	R01	Zone 01	Pass	51.40	51.40	0.00%	Yes	52.84	52.84	52.84	0.00%	Yes	U02R01	1.44
U05	R02	Zone 02	Pass	45.28	45.28	0.00%	Yes	47.04	47.04	47.04	0.00%	Yes	U02R02	1.75
U05	R03	Zone 03	Pass	42.97	42.97	0.00%	Yes	44.71	44.71	44.71	0.00%	Yes	U02R03	1.74
U05	R04	Zone 04	Pass	43.75	43.75	0.00%	Yes	45.47	45.47	45.47	0.00%	Yes	U02R04	1.72
U05	R05	Zone 05	Pass	39.84	39.84	0.00%	Yes	41.55	41.55	41.55	0.00%	Yes	U02R05	1.71
U05	R06	Zone 06	Pass	47.56	47.56	0.00%	Yes	49.18	49.18	49.18	0.00%	Yes	U02R06	1.62
U05	R07	Zone 07	Pass	47.01	47.01	0.00%	Yes	47.86	47.86	47.86	0.00%	Yes	U02R07	0.85
U05	R08	Zone 08	Pass	43.70	43.70	0.00%	Yes	45.51	45.51	45.51	0.00%	Yes	U02R08	1.81
U05	R09	Zone 09	Pass	43.04	43.04	0.00%	Yes	45.63	45.63	45.63	0.00%	Yes	U02R09	2.60
U05	R10	Zone 10	Pass	41.39	41.39	0.00%	Yes	44.00	44.00	44.00	0.00%	Yes	U02R10	2.61
U05	R11	Zone 11	Pass	43.97	43.97	0.00%	Yes	46.90	46.90	46.90	0.00%	Yes	U02R11	2.93
U05	R12	Zone 12	Pass	41.29	41.29	0.00%	Yes	44.00	44.00	44.00	0.00%	Yes	U02R12	2.71
U05	R13	Zone 13	Pass	45.53	45.53	0.00%	Yes	48.56	48.56	48.56	0.00%	Yes	U02R13	3.03
U05	R14	Zone 14	Pass	43.99	43.99	0.00%	Yes	47.64	47.64	47.64	0.00%	Yes	U02R14	3.65
U05	R15	Zone 15	Pass	49.84	49.84	0.00%	Yes	52.72	52.72	52.72	0.00%	Yes	U02R15	2.88
U05	R16	Zone 16	Pass	48.06	48.06	0.00%	Yes	50.48	50.48	50.48	0.00%	Yes	U02R16	2.42
Result U05			Pass	44.91	44.91	0.00%		47.13	47.13	47.13	0.00%		Min Ave Max	0.00% 0.00% 0.00%
								Standard = T03 Standard for this test						
U06	Proposed Design in All Zones for Prototype P6960ft2													
U06	R01	Zone 01	Pass	58.22	58.22	0.00%	Yes	57.84	57.84	57.84	0.00%	Yes	U03R01	-0.37
U06	R02	Zone 02	Pass	54.70	54.70	0.00%	Yes	55.95	55.95	55.95	0.00%	Yes	U03R02	1.24
U06	R03	Zone 03	Pass	54.77	54.77	0.00%	Yes	55.44	55.44	55.44	0.00%	Yes	U03R03	0.67
U06	R04	Zone 04	Pass	52.94	52.94	0.00%	Yes	54.76	54.76	54.76	0.00%	Yes	U03R04	1.81
U06	R05	Zone 05	Pass	53.31	53.31	0.00%	Yes	53.90	53.90	53.90	0.00%	Yes	U03R05	0.58
U06	R06	Zone 06	Pass	58.21	58.21	0.00%	Yes	59.49	59.49	59.49	0.00%	Yes	U03R06	1.28
U06	R07	Zone 07	Pass	58.81	58.81	0.00%	Yes	60.45	60.45	60.45	0.00%	Yes	U03R07	1.64
U06	R08	Zone 08	Pass	57.09	57.09	0.00%	Yes	59.02	59.02	59.02	0.00%	Yes	U03R08	1.93
U06	R09	Zone 09	Pass	54.90	54.90	0.00%	Yes	57.58	57.58	57.58	0.00%	Yes	U03R09	2.68
U06	R10	Zone 10	Pass	53.49	53.49	0.00%	Yes	56.03	56.03	56.03	0.00%	Yes	U03R10	2.54
U06	R11	Zone 11	Pass	53.80	53.80	0.00%	Yes	56.16	56.16	56.16	0.00%	Yes	U03R11	2.36
U06	R12	Zone 12	Pass	53.09	53.09	0.00%	Yes	55.64	55.64	55.64	0.00%	Yes	U03R12	2.55
U06	R13	Zone 13	Pass	54.12	54.12	0.00%	Yes	56.85	56.85	56.85	0.00%	Yes	U03R13	2.73
U06	R14	Zone 14	Pass	54.29	54.29	0.00%	Yes	56.90	56.90	56.90	0.00%	Yes	U03R14	2.61
U06	R15	Zone 15	Pass	59.19	59.19	0.00%	Yes	62.32	62.32	62.32	0.00%	Yes	U03R15	3.13
U06	R16	Zone 16	Pass	55.58	55.58	0.00%	Yes	56.91	56.91	56.91	0.00%	Yes	U03R16	1.33
Result U06			Pass	55.41	55.41	0.00%		57.20	57.20	57.20	0.00%		Min Ave Max	0.00% 0.00% 0.00%

Comparison between Reference & Candidate Software (EDR)

Comparison Date: 9/1/2016
 Comparison Author: Ken Nittler
 Candidate Software: CBECC-Res 2016 670

Test	Run	Description	Pass/Fail	Reference Proposed	Candidate Proposed	Percent Difference	Within Tolerance	Standard Equals	Reference Standard	Candidate Standard	Percent Difference	Within Tolerance	Standard Equals Lookup	Margin
								Standard = T01 Standard for this test						
U07	Common Measures in Zone 12 for Prototype P2100ft2													
U07	R01	Package	Pass	43.38	43.38	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	2.23
U07	R02	Fenestration U 0.40/S 0.40	Pass	46.40	46.40	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	-0.79
U07	R03	Wall R13/Roof Deck Above R6	Pass	42.87	42.87	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	2.74
U07	R04	Ceiling R49 /Roof Deck Below R0/Radiant Barrier	Pass	45.71	45.71	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	-0.10
U07	R05	Furnace AFUE 92	Pass	41.84	41.84	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	3.77
U07	R06	Air Conditioner SEER 16/EER 14	Pass	42.83	42.83	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	2.78
U07	R07	No Cool Vent	Pass	45.82	45.82	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	-0.21
U07	R08	Ducts 2% Leakage	Pass	43.06	43.06	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	2.55
U07	R09	Insulation Construction Quality Improved	Pass	40.99	40.99	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	4.61
U07	R10	Air Leakage ACH50 2.0	Pass	42.54	42.54	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	3.07
Result U07			Pass	43.54	43.54	0.00%		45.61	45.61	45.61	0.00%		Min Ave Max	0.00% 0.00% 2.07
								Standard = T01 Standard for this test						
U08	Water Heating in Zone 12 for Prototype P2100ft2													
U08	R01	Package	Pass	43.38	43.38	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	2.23
U08	R02	Parallel Piping	Pass	43.41	43.41	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	2.20
U08	R03	Small Tankless EF 0.80/Input 195000/0 gal	Pass	43.50	43.50	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	2.11
U08	R04	Large Tankless RE 0.76/Input 300000/0 gal	Pass	43.75	43.75	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	1.86
U08	R05	Large Storage RE 0.77/Input 100000/75gal/Stby 0.01	Pass	44.91	44.91	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	0.70
U08	R06	Large Storage RE 0.77/Input 100000/75gal/Stby 0.03	Pass	48.15	48.15	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	-2.54
U08	R07	Electric Resistance EF 0.92/Input 4500	Pass	55.63	55.63	0.00%	Yes	46.32	46.32	46.32	0.00%	Yes	U01R12	-9.31
U08	R08	Heat Pump EF 2.4/Input 4500	Pass	45.36	45.36	0.00%	Yes	46.32	46.32	46.32	0.00%	Yes	U01R12	0.96
U08	R09	2 Water Heaters using Multiplier	Pass	43.38	43.38	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	2.23
U08	R10	2 Water Heaters Using 2 entries	Pass	43.38	43.38	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	2.23
Result U08			Pass	45.48	45.48	0.00%		45.75	45.75	45.75	0.00%		Min Ave Max	0.00% 0.00% 0.27
								Standard = T01 Standard for this test						
U09	Multiple Orientation in Zone 12 for Prototype S2100ft2/P2100ft2													
U09	R01	Single Standard Front 45	Pass	46.27	46.27	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	-0.66
U09	R02	East Standard	Pass	45.61	45.61	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	0.00
U09	R03	South Standard	Pass	45.61	45.61	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	0.00
U09	R04	West Standard	Pass	45.61	45.61	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	0.00
U09	R05	North Standard	Pass	45.61	45.61	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	0.00
U09	R06	Single Proposed front 45	Pass	46.18	46.18	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	-0.57
U09	R07	East Proposed	Pass	47.08	47.08	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	-1.47
U09	R08	South Proposed	Pass	47.08	47.08	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	-1.47
U09	R09	West Proposed	Pass	47.08	47.08	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	-1.47
U09	R10	North Proposed	Pass	47.08	47.08	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U01R12	-1.47
Result U09			Pass	46.32	46.32	0.00%		45.61	45.61	45.61	0.00%		Min Ave Max	0.00% 0.00% -0.71

Comparison between Reference & Candidate Software (EDR)

Comparison Date: 9/1/2016
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 Candidate Software: CBECC-Res 2016 670

Test	Run	Description	Pass/Fail	Reference Proposed	Candidate Proposed	Percent Difference	Within Tolerance	Standard Equals	Reference Standard	Candidate Standard	Percent Difference	Within Tolerance	Standard Equals Lookup	Margin
								Standard = Varies for this test						
U10	Multi Family Water Heating in Zone 12 for Prototype P6960ft2													
U10	R01	8 Storage	Pass	57.54	57.54	0.00%	Yes	55.64	55.64	55.64	0.00%	Yes	U06R12	-1.90
U10	R02	8 Storage 2 Systems	Pass	57.54	57.54	0.00%	Yes	55.64	55.64	55.64	0.00%	Yes	U06R12	-1.90
U10	R03	8 LgStor	Pass	60.46	60.46	0.00%	Yes	55.64	55.64	55.64	0.00%	Yes	U06R12	-4.82
U10	R04	2 LgStor Central Solar	Pass	55.47	55.47	0.00%	Yes	58.05	58.05	58.05	0.00%	Yes	U10R04	2.58
U10	R05	2 LgStor Central Solar Recirc	Pass	54.60	54.60	0.00%	Yes	57.01	57.01	57.01	0.00%	Yes	U10R05	2.41
U10	R06	2 LgStor Central Recirc	Pass	56.54	56.54	0.00%	Yes	57.01	57.01	57.01	0.00%	Yes	U10R05	0.47
U10	R07	2 SmlInstantant Central Solar	Pass	54.66	54.66	0.00%	Yes	57.27	57.27	57.27	0.00%	Yes	U10R07	2.61
U10	R08	2 SmlInstantant Central Solar Recirc	Pass	53.67	53.67	0.00%	Yes	56.09	56.09	56.09	0.00%	Yes	U10R08	2.43
U10	R09	1 Indirect Central Solar	Pass	55.13	55.13	0.00%	Yes	57.35	57.35	57.35	0.00%	Yes	U10R09	2.22
U10	R10	1 Indirect Central Solar Recirc	Pass	54.20	54.20	0.00%	Yes	56.27	56.27	56.27	0.00%	Yes	U10R10	2.07
Result U10			Pass	55.98	55.98	0.00%		56.60	56.60	56.60	0.00%		Min Ave Max	0.00% 0.00% 0.62
								Standard = Varies for this test						
U11	Source Energy in Zone 12 for Prototype P2100ft2													
U11	R01	Package	Pass	43.38	43.38	0.00%	Yes	45.61	45.61	45.61	0.00%	Yes	U04R12	2.23
U11	R02	Package No Natural Gas	Pass	45.77	45.77	0.00%	Yes	47.78	47.78	47.78	0.00%	Yes	U11R02	2.01
U11	R03	Electric DHW	Pass	53.78	53.78	0.00%	Yes	46.32	46.32	46.32	0.00%	Yes	U04R12	-7.46
U11	R04	Electric DHW no Natural Gas	Pass	56.76	56.76	0.00%	Yes	54.79	54.79	54.79	0.00%	Yes	U11R02	-1.97
U11	R05	Heatpump DHW	Pass	45.36	45.36	0.00%	Yes	46.32	46.32	46.32	0.00%	Yes	U04R12	0.96
U11	R06	Heatpump DHW no Natural Gas	Pass	49.83	49.83	0.00%	Yes	54.79	54.79	54.79	0.00%	Yes	U11R02	4.96
U11	R07	Heatpump HVAC	Pass	43.26	43.26	0.00%	Yes	45.94	45.94	45.94	0.00%	Yes	U11R07	2.68
U11	R08	Heatpump HVAC no Natural Gas	Pass	44.36	44.36	0.00%	Yes	46.62	46.62	46.62	0.00%	Yes	U11R08	2.26
U11	R09	Heatpump HVAC & DHW	Pass	45.27	45.27	0.00%	Yes	46.67	46.67	46.67	0.00%	Yes	U11R07	1.40
U11	R10	Heatpump HVAC & DHW no Natural Gas	Pass	48.86	48.86	0.00%	Yes	54.79	54.79	54.79	0.00%	Yes	U11R08	5.93
Result U11			Pass	47.66	47.66	0.00%		48.96	48.96	48.96	0.00%		Min Ave Max	0.00% 0.00% 1.30
								Standard = Varies for this test						
U12	E+A+A Base & Windows in Zone 12 for Prototype P1665ft2													
U12	R01	E 1440ft2 as New Construction	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R01	0.00
U12	R02	E 1440ft2 as Addition/Alteration	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R02	0.00
U12	R03	EA 1665ft2	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R03	0.00
U12	R04	EAA Ceiling R38 Verified	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R03	0.00
U12	R05	EAA Ceiling R38 Verified Wind U0.41/S0.36	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R05	0.00
U12	R06	EAA Ceiling R38 Verified Wind U0.41/S0.36 Verified	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R05	0.00
U12	R07	EAA Ceiling R38 Verified Wind U0.40/S0.35	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R05	0.00
U12	R08	EAA Ceiling R38 Verified Wind U0.40/S0.35 Verified	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R03	0.00
U12	R09	EAA Ceiling R38 Verified Wind U0.39/S0.34	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R05	0.00
U12	R10	EAA Ceiling R38 Verified Wind U0.39/S0.34 Verified	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R03	0.00
Result U12			Pass	n/a	n/a	n/a		n/a	n/a	n/a	n/a		Min Ave Max	0.00% 0.00% 0.00

Comparison between Reference & Candidate Software (EDR)

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Test	Run	Description	Pass/Fail	Reference Proposed	Candidate Proposed	Percent Difference	Within Tolerance	Standard Equals	Reference Standard	Candidate Standard	Percent Difference	Within Tolerance	Standard Equals Lookup	Margin
U13	E+A+A Walls & HVAC in Zone 12 for Prototype P1665ft2							Standard = Varies for this test						
U13	R01	EAA Ceiling R38 Verified Wall R11	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U13R01	0.00
U13	R02	EAA Ceiling R38 Verified Wall R11 Verified	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U13R01	0.00
U13	R03	EAA Ceiling R38 Verified Wall R13	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U13R01	0.00
U13	R04	EAA Ceiling R38 Verified Wall R13 Verified	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R03	0.00
U13	R05	EAA Ceiling R38 Verified HVAC Worse	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U13R05	0.00
U13	R06	EAA Ceiling R38 Verified HVAC Worse Verified	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U13R05	0.00
U13	R07	EAA Ceiling R38 Verified HVAC Equal	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U13R05	0.00
U13	R08	EAA Ceiling R38 Verified HVAC Equal Verified	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R03	0.00
U13	R09	EAA Ceiling R38 Verified HVAC Better	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U13R05	0.00
U13	R10	EAA Ceiling R38 Verified HVAC Better Verified	Pass	0.00	0.00	0.00%	Yes	0.00	0.00	0.00	0.00%	Yes	U12R03	0.00
Result U13			Pass	n/a	n/a	n/a		n/a	n/a	n/a	n/a		Min Max	0.00% 0.00%
												Ave		