

## Summary of Residential ACM Tests (kTDV/ft2)

Comparison Date: 6/21/2018  
 Comparison Author: Ken Nittler  
 Candidate Software: CBECC-Res 2016\_3\_1\_RC3  
 Reference Software: CBECC-Res 2016\_3\_0\_SP2

### Approvals

Type of Software: Reference  
 Single Family: Yes  
 Multi Family: Yes  
 Newly Constructed: Yes  
 Additions Alterations: Yes  
 Units for Summary: kTDV/ft2  
 Tolerance: 0.04

Test	Pass/ Fail	Average Proposed kTDV/ft2	Average Standard kTDV/ft2	Description
U01	Pass	40.90	40.90	Standard Design in All Zones for Prototype S2100ft2
U02	Pass	38.79	38.79	Standard Design in All Zones for Prototype S2700ft2
U03	Pass	46.79	46.79	Standard Design in All Zones for Prototype S6960ft2
U04	Pass	37.54	40.90	Proposed Design in All Zones for Prototype P2100ft2
U05	Pass	35.09	38.79	Proposed Design in All Zones for Prototype P2700ft2
U06	Pass	43.06	46.79	Proposed Design in All Zones for Prototype P6960ft2
U07	Pass	37.28	41.01	Common Measures in Zone 12 for Prototype P2100ft2
U08	Pass	40.94	41.01	Water Heating in Zone 12 for Prototype P2100ft2
U09	Pass	40.90	41.01	Multiple Orientation in Zone 12 for Prototype S2100ft2/P2100ft2
U10	Pass	58.78	59.85	Multi Family Water Heating in Zone 12 for Prototype P6960ft2
U11	Pass	47.30	50.03	Source Energy in Zone 12 for Prototype P2100ft2
U12	Pass	178.09	181.45	E+A+A Base & Windows in Zone 12 for Prototype P1665ft2
U13	Pass	132.82	166.49	E+A+A Walls & HVAC in Zone 12 for Prototype P1665ft2

## Comparison between Reference & Candidate Software (kTDV/ft2)

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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
U01	Standard Design in All Zones for Prototype S2100ft2							Standard = Proposed for this test						
U01	R01	Zone 01	Pass	44.68	44.68	0.00%	Yes	44.68	44.68	44.68	0.00%	Yes	U01R01	0.00
U01	R02	Zone 02	Pass	33.99	33.99	0.00%	Yes	33.99	33.99	33.99	0.00%	Yes	U01R02	0.00
U01	R03	Zone 03	Pass	24.78	24.78	0.00%	Yes	24.78	24.78	24.78	0.00%	Yes	U01R03	0.00
U01	R04	Zone 04	Pass	28.07	28.07	0.00%	Yes	28.07	28.07	28.07	0.00%	Yes	U01R04	0.00
U01	R05	Zone 05	Pass	22.40	22.40	0.00%	Yes	22.40	22.40	22.40	0.00%	Yes	U01R05	0.00
U01	R06	Zone 06	Pass	19.18	19.18	0.00%	Yes	19.18	19.18	19.18	0.00%	Yes	U01R06	0.00
U01	R07	Zone 07	Pass	12.24	12.24	0.00%	Yes	12.24	12.24	12.24	0.00%	Yes	U01R07	0.00
U01	R08	Zone 08	Pass	19.40	19.40	0.00%	Yes	19.40	19.40	19.40	0.00%	Yes	U01R08	0.00
U01	R09	Zone 09	Pass	32.18	32.18	0.00%	Yes	32.18	32.18	32.18	0.00%	Yes	U01R09	0.00
U01	R10	Zone 10	Pass	32.55	32.55	0.00%	Yes	32.55	32.55	32.55	0.00%	Yes	U01R10	0.00
U01	R11	Zone 11	Pass	63.84	63.84	0.00%	Yes	63.84	63.84	63.84	0.00%	Yes	U01R11	0.00
U01	R12	Zone 12	Pass	41.01	41.01	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	0.00
U01	R13	Zone 13	Pass	65.16	65.16	0.00%	Yes	65.16	65.16	65.16	0.00%	Yes	U01R13	0.00
U01	R14	Zone 14	Pass	61.08	61.08	0.00%	Yes	61.08	61.08	61.08	0.00%	Yes	U01R14	0.00
U01	R15	Zone 15	Pass	96.23	96.23	0.00%	Yes	96.23	96.23	96.23	0.00%	Yes	U01R15	0.00
U01	R16	Zone 16	Pass	57.53	57.53	0.00%	Yes	57.53	57.53	57.53	0.00%	Yes	U01R16	0.00
Result U01			Pass	40.90	40.90	0.00%		40.90	40.90	40.90	0.00%	Ave	Min Max	0.00% 0.00%
U02	Standard Design in All Zones for Prototype S2700ft2							Standard = Proposed for this test						
U02	R01	Zone 01	Pass	35.21	35.21	0.00%	Yes	35.21	35.21	35.21	0.00%	Yes	U02R01	0.00
U02	R02	Zone 02	Pass	30.64	30.64	0.00%	Yes	30.64	30.64	30.64	0.00%	Yes	U02R02	0.00
U02	R03	Zone 03	Pass	20.21	20.21	0.00%	Yes	20.21	20.21	20.21	0.00%	Yes	U02R03	0.00
U02	R04	Zone 04	Pass	26.16	26.16	0.00%	Yes	26.16	26.16	26.16	0.00%	Yes	U02R04	0.00
U02	R05	Zone 05	Pass	17.79	17.79	0.00%	Yes	17.79	17.79	17.79	0.00%	Yes	U02R05	0.00
U02	R06	Zone 06	Pass	18.06	18.06	0.00%	Yes	18.06	18.06	18.06	0.00%	Yes	U02R06	0.00
U02	R07	Zone 07	Pass	11.07	11.07	0.00%	Yes	11.07	11.07	11.07	0.00%	Yes	U02R07	0.00
U02	R08	Zone 08	Pass	20.01	20.01	0.00%	Yes	20.01	20.01	20.01	0.00%	Yes	U02R08	0.00
U02	R09	Zone 09	Pass	32.59	32.59	0.00%	Yes	32.59	32.59	32.59	0.00%	Yes	U02R09	0.00
U02	R10	Zone 10	Pass	33.47	33.47	0.00%	Yes	33.47	33.47	33.47	0.00%	Yes	U02R10	0.00
U02	R11	Zone 11	Pass	63.20	63.20	0.00%	Yes	63.20	63.20	63.20	0.00%	Yes	U02R11	0.00
U02	R12	Zone 12	Pass	42.19	42.19	0.00%	Yes	42.19	42.19	42.19	0.00%	Yes	U02R12	0.00
U02	R13	Zone 13	Pass	64.46	64.46	0.00%	Yes	64.46	64.46	64.46	0.00%	Yes	U02R13	0.00
U02	R14	Zone 14	Pass	60.55	60.55	0.00%	Yes	60.55	60.55	60.55	0.00%	Yes	U02R14	0.00
U02	R15	Zone 15	Pass	90.57	90.57	0.00%	Yes	90.57	90.57	90.57	0.00%	Yes	U02R15	0.00
U02	R16	Zone 16	Pass	54.48	54.48	0.00%	Yes	54.48	54.48	54.48	0.00%	Yes	U02R16	0.00
Result U02			Pass	38.79	38.79	0.00%		38.79	38.79	38.79	0.00%	Ave	Min Max	0.00% 0.00%

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 Candidate Software: CBECC-Res 2016\_3\_1\_RC3

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
U03	Standard Design in All Zones for Prototype S6960ft2							Standard = Proposed for this test						
U03	R01	Zone 01	Pass	34.73	34.73	0.00%	Yes	34.73	34.73	34.73	0.00%	Yes	U03R01	0.00
U03	R02	Zone 02	Pass	36.27	36.27	0.00%	Yes	36.27	36.27	36.27	0.00%	Yes	U03R02	0.00
U03	R03	Zone 03	Pass	25.14	25.14	0.00%	Yes	25.14	25.14	25.14	0.00%	Yes	U03R03	0.00
U03	R04	Zone 04	Pass	33.52	33.52	0.00%	Yes	33.52	33.52	33.52	0.00%	Yes	U03R04	0.00
U03	R05	Zone 05	Pass	24.13	24.13	0.00%	Yes	24.13	24.13	24.13	0.00%	Yes	U03R05	0.00
U03	R06	Zone 06	Pass	26.15	26.15	0.00%	Yes	26.15	26.15	26.15	0.00%	Yes	U03R06	0.00
U03	R07	Zone 07	Pass	23.37	23.37	0.00%	Yes	23.37	23.37	23.37	0.00%	Yes	U03R07	0.00
U03	R08	Zone 08	Pass	34.31	34.31	0.00%	Yes	34.31	34.31	34.31	0.00%	Yes	U03R08	0.00
U03	R09	Zone 09	Pass	44.63	44.63	0.00%	Yes	44.63	44.63	44.63	0.00%	Yes	U03R09	0.00
U03	R10	Zone 10	Pass	45.22	45.22	0.00%	Yes	45.22	45.22	45.22	0.00%	Yes	U03R10	0.00
U03	R11	Zone 11	Pass	70.21	70.21	0.00%	Yes	70.21	70.21	70.21	0.00%	Yes	U03R11	0.00
U03	R12	Zone 12	Pass	54.37	54.37	0.00%	Yes	54.37	54.37	54.37	0.00%	Yes	U03R12	0.00
U03	R13	Zone 13	Pass	71.77	71.77	0.00%	Yes	71.77	71.77	71.77	0.00%	Yes	U03R13	0.00
U03	R14	Zone 14	Pass	66.50	66.50	0.00%	Yes	66.50	66.50	66.50	0.00%	Yes	U03R14	0.00
U03	R15	Zone 15	Pass	102.02	102.02	0.00%	Yes	102.02	102.02	102.02	0.00%	Yes	U03R15	0.00
U03	R16	Zone 16	Pass	56.23	56.23	0.00%	Yes	56.23	56.23	56.23	0.00%	Yes	U03R16	0.00
Result U03			Pass	46.79	46.79	0.00%		46.79	46.79	46.79	0.00%	Ave	Min Max 0.00%	0.00
U04	Proposed Design in All Zones for Prototype P2100ft2							Standard = T01 Standard for this test						
U04	R01	Zone 01	Pass	43.35	43.35	0.00%	Yes	44.68	44.68	44.68	0.00%	Yes	U01R01	1.33
U04	R02	Zone 02	Pass	32.50	32.50	0.00%	Yes	33.99	33.99	33.99	0.00%	Yes	U01R02	1.49
U04	R03	Zone 03	Pass	22.82	22.82	0.00%	Yes	24.78	24.78	24.78	0.00%	Yes	U01R03	1.96
U04	R04	Zone 04	Pass	25.42	25.42	0.00%	Yes	28.07	28.07	28.07	0.00%	Yes	U01R04	2.65
U04	R05	Zone 05	Pass	20.33	20.33	0.00%	Yes	22.40	22.40	22.40	0.00%	Yes	U01R05	2.07
U04	R06	Zone 06	Pass	17.54	17.54	0.00%	Yes	19.18	19.18	19.18	0.00%	Yes	U01R06	1.64
U04	R07	Zone 07	Pass	11.43	11.43	0.00%	Yes	12.24	12.24	12.24	0.00%	Yes	U01R07	0.81
U04	R08	Zone 08	Pass	17.35	17.35	0.00%	Yes	19.40	19.40	19.40	0.00%	Yes	U01R08	2.05
U04	R09	Zone 09	Pass	28.15	28.15	0.00%	Yes	32.18	32.18	32.18	0.00%	Yes	U01R09	4.03
U04	R10	Zone 10	Pass	28.81	28.81	0.00%	Yes	32.55	32.55	32.55	0.00%	Yes	U01R10	3.74
U04	R11	Zone 11	Pass	58.31	58.31	0.00%	Yes	63.84	63.84	63.84	0.00%	Yes	U01R11	5.53
U04	R12	Zone 12	Pass	36.96	36.96	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	4.05
U04	R13	Zone 13	Pass	59.46	59.46	0.00%	Yes	65.16	65.16	65.16	0.00%	Yes	U01R13	5.70
U04	R14	Zone 14	Pass	54.23	54.23	0.00%	Yes	61.08	61.08	61.08	0.00%	Yes	U01R14	6.85
U04	R15	Zone 15	Pass	89.53	89.53	0.00%	Yes	96.23	96.23	96.23	0.00%	Yes	U01R15	6.70
U04	R16	Zone 16	Pass	54.39	54.39	0.00%	Yes	57.53	57.53	57.53	0.00%	Yes	U01R16	3.14
Result U04			Pass	37.54	37.54	0.00%		40.90	40.90	40.90	0.00%	Ave	Min Max 0.00%	3.36

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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
U05	Proposed Design in All Zones for Prototype P2700ft2							Standard = T02 Standard for this test						
U05	R01	Zone 01	Pass	33.68	33.68	0.00%	Yes	35.21	35.21	35.21	0.00%	Yes	U02R01	1.53
U05	R02	Zone 02	Pass	28.31	28.31	0.00%	Yes	30.64	30.64	30.64	0.00%	Yes	U02R02	2.33
U05	R03	Zone 03	Pass	18.21	18.21	0.00%	Yes	20.21	20.21	20.21	0.00%	Yes	U02R03	2.00
U05	R04	Zone 04	Pass	23.89	23.89	0.00%	Yes	26.16	26.16	26.16	0.00%	Yes	U02R04	2.27
U05	R05	Zone 05	Pass	15.80	15.80	0.00%	Yes	17.79	17.79	17.79	0.00%	Yes	U02R05	1.99
U05	R06	Zone 06	Pass	16.33	16.33	0.00%	Yes	18.06	18.06	18.06	0.00%	Yes	U02R06	1.73
U05	R07	Zone 07	Pass	10.30	10.30	0.00%	Yes	11.07	11.07	11.07	0.00%	Yes	U02R07	0.77
U05	R08	Zone 08	Pass	17.75	17.75	0.00%	Yes	20.01	20.01	20.01	0.00%	Yes	U02R08	2.26
U05	R09	Zone 09	Pass	28.67	28.67	0.00%	Yes	32.59	32.59	32.59	0.00%	Yes	U02R09	3.92
U05	R10	Zone 10	Pass	29.31	29.31	0.00%	Yes	33.47	33.47	33.47	0.00%	Yes	U02R10	4.16
U05	R11	Zone 11	Pass	56.88	56.88	0.00%	Yes	63.20	63.20	63.20	0.00%	Yes	U02R11	6.32
U05	R12	Zone 12	Pass	37.31	37.31	0.00%	Yes	42.19	42.19	42.19	0.00%	Yes	U02R12	4.88
U05	R13	Zone 13	Pass	58.07	58.07	0.00%	Yes	64.46	64.46	64.46	0.00%	Yes	U02R13	6.39
U05	R14	Zone 14	Pass	53.15	53.15	0.00%	Yes	60.55	60.55	60.55	0.00%	Yes	U02R14	7.40
U05	R15	Zone 15	Pass	83.46	83.46	0.00%	Yes	90.57	90.57	90.57	0.00%	Yes	U02R15	7.11
U05	R16	Zone 16	Pass	50.33	50.33	0.00%	Yes	54.48	54.48	54.48	0.00%	Yes	U02R16	4.15
Result U05			Pass	35.09	35.09	0.00%		38.79	38.79	38.79	0.00%	Ave	Min Max 0.00%	3.70
U06	Proposed Design in All Zones for Prototype P6960ft2							Standard = T03 Standard for this test						
U06	R01	Zone 01	Pass	35.28	35.28	0.00%	Yes	34.73	34.73	34.73	0.00%	Yes	U03R01	-0.55
U06	R02	Zone 02	Pass	33.98	33.98	0.00%	Yes	36.27	36.27	36.27	0.00%	Yes	U03R02	2.29
U06	R03	Zone 03	Pass	24.05	24.05	0.00%	Yes	25.14	25.14	25.14	0.00%	Yes	U03R03	1.09
U06	R04	Zone 04	Pass	30.26	30.26	0.00%	Yes	33.52	33.52	33.52	0.00%	Yes	U03R04	3.26
U06	R05	Zone 05	Pass	22.99	22.99	0.00%	Yes	24.13	24.13	24.13	0.00%	Yes	U03R05	1.14
U06	R06	Zone 06	Pass	24.18	24.18	0.00%	Yes	26.15	26.15	26.15	0.00%	Yes	U03R06	1.97
U06	R07	Zone 07	Pass	21.02	21.02	0.00%	Yes	23.37	23.37	23.37	0.00%	Yes	U03R07	2.35
U06	R08	Zone 08	Pass	31.21	31.21	0.00%	Yes	34.31	34.31	34.31	0.00%	Yes	U03R08	3.10
U06	R09	Zone 09	Pass	39.73	39.73	0.00%	Yes	44.63	44.63	44.63	0.00%	Yes	U03R09	4.90
U06	R10	Zone 10	Pass	40.49	40.49	0.00%	Yes	45.22	45.22	45.22	0.00%	Yes	U03R10	4.73
U06	R11	Zone 11	Pass	64.39	64.39	0.00%	Yes	70.21	70.21	70.21	0.00%	Yes	U03R11	5.82
U06	R12	Zone 12	Pass	48.94	48.94	0.00%	Yes	54.37	54.37	54.37	0.00%	Yes	U03R12	5.43
U06	R13	Zone 13	Pass	65.20	65.20	0.00%	Yes	71.77	71.77	71.77	0.00%	Yes	U03R13	6.57
U06	R14	Zone 14	Pass	60.26	60.26	0.00%	Yes	66.50	66.50	66.50	0.00%	Yes	U03R14	6.24
U06	R15	Zone 15	Pass	93.70	93.70	0.00%	Yes	102.02	102.02	102.02	0.00%	Yes	U03R15	8.32
U06	R16	Zone 16	Pass	53.24	53.24	0.00%	Yes	56.23	56.23	56.23	0.00%	Yes	U03R16	2.99
Result U06			Pass	43.06	43.06	0.00%		46.79	46.79	46.79	0.00%	Ave	Min Max 0.00%	3.73

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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
U07	Common Measures in Zone 12 for Prototype P2100ft2							Standard = T01 Standard for this test						
U07	R01	Package	Pass	36.96	36.96	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	4.05
U07	R02	Fenestration U 0.40/S 0.40	Pass	42.44	42.44	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	-1.43
U07	R03	Wall R13/Roof Deck Above R6	Pass	35.77	35.77	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	5.24
U07	R04	Ceiling R49 /Roof Deck Below R0/Radiant Barrier	Pass	41.21	41.21	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	-0.20
U07	R05	Furnace AFUE 92	Pass	34.58	34.58	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	6.43
U07	R06	Air Conditioner SEER 16/EER 14	Pass	35.97	35.97	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	5.04
U07	R07	No Cool Vent	Pass	41.38	41.38	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	-0.37
U07	R08	Ducts 2% Leakage	Pass	36.39	36.39	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	4.62
U07	R09	Insulation Construction Quality Improved	Pass	32.63	32.63	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	8.38
U07	R10	Air Leakage ACH50 2.0	Pass	35.45	35.45	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	5.56
Result U07			Pass	37.28	37.28	0.00%		41.01	41.01	41.01	0.00%		Min Ave Max	0.00% 0.00% 3.73
U08	Water Heating in Zone 12 for Prototype P2100ft2							Standard = T01 Standard for this test						
U08	R01	Package	Pass	36.96	36.96	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	4.05
U08	R02	Parallel Piping	Pass	37.07	37.07	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	3.94
U08	R03	Small Tankless EF 0.80/Input 195000/0 gal	Pass	37.17	37.17	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	3.84
U08	R04	Large Tankless RE 0.76/Input 300000/0 gal	Pass	37.64	37.64	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	3.37
U08	R05	Large Storage RE 0.77/Input 100000/75gal/Stby 0.01	Pass	39.77	39.77	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	1.24
U08	R06	Large Storage RE 0.77/Input 100000/75gal/Stby 0.03	Pass	45.73	45.73	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	-4.72
U08	R07	Electric Resistance EF 0.92/Input 4500	Pass	57.68	57.68	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	-16.67
U08	R08	Heat Pump EF 2.4/Input 4500	Pass	43.43	43.43	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	-2.42
U08	R09	2 Water Heaters using Multiplier	Pass	36.96	36.96	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	4.05
U08	R10	2 Water Heaters Using 2 entries	Pass	36.96	36.96	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	4.05
Result U08			Pass	40.94	40.94	0.00%		41.01	41.01	41.01	0.00%		Min Ave Max	0.00% 0.00% 0.07
U09	Multiple Orientation in Zone 12 for Prototype S2100ft2/P2100ft2							Standard = T01 Standard for this test						
U09	R01	Single Standard Front 45	Pass	42.20	42.20	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	-1.19
U09	R02	East Standard	Pass	41.01	41.01	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	0.00
U09	R03	South Standard	Pass	41.01	41.01	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	0.00
U09	R04	West Standard	Pass	41.01	41.01	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	0.00
U09	R05	North Standard	Pass	41.01	41.01	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	0.00
U09	R06	Single Proposed front 45	Pass	42.04	42.04	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	-1.03
U09	R07	East Proposed	Pass	43.63	43.63	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	-2.62
U09	R08	South Proposed	Pass	37.56	37.56	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	3.45
U09	R09	West Proposed	Pass	42.55	42.55	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	-1.54
U09	R10	North Proposed	Pass	36.96	36.96	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U01R12	4.05
Result U09			Pass	40.90	40.90	0.00%		41.01	41.01	41.01	0.00%		Min Ave Max	0.00% 0.00% 0.11

## Comparison between Reference & Candidate Software (kTDV/ft2)

Comparison Date: 6/21/2018  
 Comparison Author: Ken Nittler  
 Candidate Software: CBECC-Res 2016\_3\_1\_RC3

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
U10	Multi Family Water Heating in Zone 12 for Prototype P6960ft2							Standard = Varies for this test						
U10	R01	8 Storage	Pass	59.22	59.22	0.00%	Yes	54.37	54.37	54.37	0.00%	Yes	U06R12	-4.85
U10	R02	8 Storage 2 Systems	Pass	59.22	59.22	0.00%	Yes	54.37	54.37	54.37	0.00%	Yes	U06R12	-4.85
U10	R03	8 LgStor	Pass	65.97	65.97	0.00%	Yes	54.37	54.37	54.37	0.00%	Yes	U06R12	-11.60
U10	R04	2 LgStor Central Solar	Pass	53.27	53.27	0.00%	Yes	58.70	58.70	58.70	0.00%	Yes	U10R04	5.43
U10	R05	2 LgStor Central Solar Recirc	Pass	59.93	59.93	0.00%	Yes	65.36	65.36	65.36	0.00%	Yes	U10R05	5.43
U10	R06	2 LgStor Central Recirc	Pass	64.68	64.68	0.00%	Yes	65.36	65.36	65.36	0.00%	Yes	U10R05	0.68
U10	R07	2 SmlInstantant Central Solar	Pass	49.72	49.72	0.00%	Yes	55.15	55.15	55.15	0.00%	Yes	U10R07	5.43
U10	R08	2 SmlInstantant Central Solar Recirc	Pass	56.67	56.67	0.00%	Yes	62.10	62.10	62.10	0.00%	Yes	U10R08	5.43
U10	R09	1 Indirect Central Solar	Pass	56.04	56.04	0.00%	Yes	60.80	60.80	60.80	0.00%	Yes	U10R09	4.76
U10	R10	1 Indirect Central Solar Recirc	Pass	63.12	63.12	0.00%	Yes	67.87	67.87	67.87	0.00%	Yes	U10R10	4.75
Result U10			Pass	58.78	58.78	0.00%		59.85	59.85	59.85	0.00%		Min Ave Max	0.00% 0.00% 1.06
U11	Source Energy in Zone 12 for Prototype P2100ft2							Standard = Varies for this test						
U11	R01	Package	Pass	36.96	36.96	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U04R12	4.05
U11	R02	Package No Natural Gas	Pass	62.10	62.10	0.00%	Yes	66.92	66.92	66.92	0.00%	Yes	U11R02	4.82
U11	R03	Electric DHW	Pass	54.73	54.73	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U04R12	-13.72
U11	R04	Electric DHW no Natural Gas	Pass	71.65	71.65	0.00%	Yes	66.92	66.92	66.92	0.00%	Yes	U11R02	-4.73
U11	R05	Heatpump DHW	Pass	38.34	38.34	0.00%	Yes	41.01	41.01	41.01	0.00%	Yes	U04R12	2.67
U11	R06	Heatpump DHW no Natural Gas	Pass	55.49	55.49	0.00%	Yes	66.92	66.92	66.92	0.00%	Yes	U11R02	11.43
U11	R07	Heatpump HVAC	Pass	35.76	35.76	0.00%	Yes	40.08	40.08	40.08	0.00%	Yes	U11R07	4.32
U11	R08	Heatpump HVAC no Natural Gas	Pass	43.86	43.86	0.00%	Yes	48.16	48.16	48.16	0.00%	Yes	U11R08	4.30
U11	R09	Heatpump HVAC & DHW	Pass	37.11	37.11	0.00%	Yes	40.08	40.08	40.08	0.00%	Yes	U11R07	2.97
U11	R10	Heatpump HVAC & DHW no Natural Gas	Pass	37.02	37.02	0.00%	Yes	48.16	48.16	48.16	0.00%	Yes	U11R08	11.14
Result U11			Pass	47.30	47.30	0.00%		50.03	50.03	50.03	0.00%		Min Ave Max	0.00% 0.00% 2.73
U12	E+A+A Base & Windows in Zone 12 for Prototype P1665ft2							Standard = Varies for this test						
U12	R01	E 1440ft2 as New Construction	Pass	238.18	238.18	0.00%	Yes	42.95	42.95	42.95	0.00%	Yes	U12R01	-195.23
U12	R02	E 1440ft2 as Addition/Alteration	Pass	240.87	240.87	0.00%	Yes	240.87	240.87	240.87	0.00%	Yes	U12R02	0.00
U12	R03	EA 1665ft2	Pass	211.74	211.74	0.00%	Yes	207.93	207.93	207.93	0.00%	Yes	U12R03	-3.81
U12	R04	EAA Ceiling R38 Verified	Pass	185.88	185.88	0.00%	Yes	207.93	207.93	207.93	0.00%	Yes	U12R03	22.05
U12	R05	EAA Ceiling R38 Verified Wind U0.41/S0.36	Pass	151.45	151.45	0.00%	Yes	174.74	174.74	174.74	0.00%	Yes	U12R05	23.29
U12	R06	EAA Ceiling R38 Verified Wind U0.41/S0.36 Verified	Pass	151.45	151.45	0.00%	Yes	174.74	174.74	174.74	0.00%	Yes	U12R05	23.29
U12	R07	EAA Ceiling R38 Verified Wind U0.40/S0.35	Pass	150.67	150.67	0.00%	Yes	174.74	174.74	174.74	0.00%	Yes	U12R05	24.07
U12	R08	EAA Ceiling R38 Verified Wind U0.40/S0.35 Verified	Pass	150.67	150.67	0.00%	Yes	207.93	207.93	207.93	0.00%	Yes	U12R03	57.26
U12	R09	EAA Ceiling R38 Verified Wind U0.39/S0.34	Pass	149.99	149.99	0.00%	Yes	174.74	174.74	174.74	0.00%	Yes	U12R05	24.75
U12	R10	EAA Ceiling R38 Verified Wind U0.39/S0.34 Verified	Pass	149.99	149.99	0.00%	Yes	207.93	207.93	207.93	0.00%	Yes	U12R03	57.94
Result U12			Pass	178.09	178.09	0.00%		181.45	181.45	181.45	0.00%		Min Ave Max	0.00% 0.00% 3.36

## Comparison between Reference & Candidate Software (kTDV/ft2)

Comparison Date: 6/21/2018  
 Comparison Author: Ken Nittler  
 Candidate Software: CBECC-Res 2016\_3\_1\_RC3

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	149.01	149.01	0.00%	Yes	171.02	171.02	171.02	0.00%	Yes	U13R01	22.01
U13	R02	EAA Ceiling R38 Verified Wall R11 Verified	Pass	149.01	149.01	0.00%	Yes	171.02	171.02	171.02	0.00%	Yes	U13R01	22.01
U13	R03	EAA Ceiling R38 Verified Wall R13	Pass	146.58	146.58	0.00%	Yes	171.02	171.02	171.02	0.00%	Yes	U13R01	24.44
U13	R04	EAA Ceiling R38 Verified Wall R13 Verified	Pass	146.58	146.58	0.00%	Yes	207.93	207.93	207.93	0.00%	Yes	U12R03	61.35
U13	R05	EAA Ceiling R38 Verified HVAC Worse	Pass	147.34	147.34	0.00%	Yes	132.02	132.02	132.02	0.00%	Yes	U13R05	-15.32
U13	R06	EAA Ceiling R38 Verified HVAC Worse Verified	Pass	147.34	147.34	0.00%	Yes	132.02	132.02	132.02	0.00%	Yes	U13R05	-15.32
U13	R07	EAA Ceiling R38 Verified HVAC Equal	Pass	119.66	119.66	0.00%	Yes	132.02	132.02	132.02	0.00%	Yes	U13R05	12.36
U13	R08	EAA Ceiling R38 Verified HVAC Equal Verified	Pass	119.66	119.66	0.00%	Yes	207.93	207.93	207.93	0.00%	Yes	U12R03	88.27
U13	R09	EAA Ceiling R38 Verified HVAC Better	Pass	101.52	101.52	0.00%	Yes	132.02	132.02	132.02	0.00%	Yes	U13R05	30.50
U13	R10	EAA Ceiling R38 Verified HVAC Better Verified	Pass	101.52	101.52	0.00%	Yes	207.93	207.93	207.93	0.00%	Yes	U12R03	106.41
Result U13			Pass	132.82	132.82	0.00%		166.49	166.49	166.49	0.00%	Ave	Min Max	0.00% 0.00%

## Summary of Residential ACM Tests (EDR)

Comparison Date: 6/21/2018  
 Comparison Author: Ken Nittler  
 Candidate Software: CBECC-Res 2016\_3\_1\_RC3  
 Reference Software: CBECC-Res 2016\_3\_0\_SP2

### Approvals

Type of Software: Reference  
 Single Family: Yes  
 Multi Family: Yes  
 Newly Constructed: Yes  
 Additions Alterations: Yes  
 Units for Summary: EDR  
 Tolerance: 0.04

Test	Pass/ Fail	Average Proposed EDR	Average Standard EDR	Description
U01	Pass	51.92	51.92	Standard Design in All Zones for Prototype S2100ft2
U02	Pass	49.21	49.21	Standard Design in All Zones for Prototype S2700ft2
U03	Pass	59.78	59.78	Standard Design in All Zones for Prototype S6960ft2
U04	Pass	49.91	51.92	Proposed Design in All Zones for Prototype P2100ft2
U05	Pass	46.94	49.21	Proposed Design in All Zones for Prototype P2700ft2
U06	Pass	57.96	59.78	Proposed Design in All Zones for Prototype P6960ft2
U07	Pass	45.03	47.20	Common Measures in Zone 12 for Prototype P2100ft2
U08	Pass	47.10	47.22	Water Heating in Zone 12 for Prototype P2100ft2
U09	Pass	47.09	47.20	Multiple Orientation in Zone 12 for Prototype S2100ft2/P2100ft2
U10	Pass	58.70	59.19	Multi Family Water Heating in Zone 12 for Prototype P6960ft2
U11	Pass	48.71	50.12	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: 6/21/2018  
 Comparison Author: Ken Nittler  
 Candidate Software: CBECC-Res 2016\_3\_1\_RC3

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
U01	Standard Design in All Zones for Prototype S2100ft2							Standard = Proposed for this test						
U01	R01	Zone 01	Pass	61.40	61.40	0.00%	Yes	61.40	61.40	61.40	0.00%	Yes	U01R01	0.00
U01	R02	Zone 02	Pass	52.80	52.80	0.00%	Yes	52.80	52.80	52.80	0.00%	Yes	U01R02	0.00
U01	R03	Zone 03	Pass	50.80	50.80	0.00%	Yes	50.80	50.80	50.80	0.00%	Yes	U01R03	0.00
U01	R04	Zone 04	Pass	50.60	50.60	0.00%	Yes	50.60	50.60	50.60	0.00%	Yes	U01R04	0.00
U01	R05	Zone 05	Pass	47.40	47.40	0.00%	Yes	47.40	47.40	47.40	0.00%	Yes	U01R05	0.00
U01	R06	Zone 06	Pass	53.00	53.00	0.00%	Yes	53.00	53.00	53.00	0.00%	Yes	U01R06	0.00
U01	R07	Zone 07	Pass	50.90	50.90	0.00%	Yes	50.90	50.90	50.90	0.00%	Yes	U01R07	0.00
U01	R08	Zone 08	Pass	47.70	47.70	0.00%	Yes	47.70	47.70	47.70	0.00%	Yes	U01R08	0.00
U01	R09	Zone 09	Pass	48.50	48.50	0.00%	Yes	48.50	48.50	48.50	0.00%	Yes	U01R09	0.00
U01	R10	Zone 10	Pass	46.70	46.70	0.00%	Yes	46.70	46.70	46.70	0.00%	Yes	U01R10	0.00
U01	R11	Zone 11	Pass	50.70	50.70	0.00%	Yes	50.70	50.70	50.70	0.00%	Yes	U01R11	0.00
U01	R12	Zone 12	Pass	47.20	47.20	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	0.00
U01	R13	Zone 13	Pass	52.50	52.50	0.00%	Yes	52.50	52.50	52.50	0.00%	Yes	U01R13	0.00
U01	R14	Zone 14	Pass	51.50	51.50	0.00%	Yes	51.50	51.50	51.50	0.00%	Yes	U01R14	0.00
U01	R15	Zone 15	Pass	57.00	57.00	0.00%	Yes	57.00	57.00	57.00	0.00%	Yes	U01R15	0.00
U01	R16	Zone 16	Pass	62.00	62.00	0.00%	Yes	62.00	62.00	62.00	0.00%	Yes	U01R16	0.00
Result U01			Pass	51.92	51.92	0.00%		51.92	51.92	51.92	0.00%	Ave	Min Max	0.00% 0.00%
U02	Standard Design in All Zones for Prototype S2700ft2							Standard = Proposed for this test						
U02	R01	Zone 01	Pass	56.60	56.60	0.00%	Yes	56.60	56.60	56.60	0.00%	Yes	U02R01	0.00
U02	R02	Zone 02	Pass	49.10	49.10	0.00%	Yes	49.10	49.10	49.10	0.00%	Yes	U02R02	0.00
U02	R03	Zone 03	Pass	47.50	47.50	0.00%	Yes	47.50	47.50	47.50	0.00%	Yes	U02R03	0.00
U02	R04	Zone 04	Pass	47.60	47.60	0.00%	Yes	47.60	47.60	47.60	0.00%	Yes	U02R04	0.00
U02	R05	Zone 05	Pass	44.20	44.20	0.00%	Yes	44.20	44.20	44.20	0.00%	Yes	U02R05	0.00
U02	R06	Zone 06	Pass	51.00	51.00	0.00%	Yes	51.00	51.00	51.00	0.00%	Yes	U02R06	0.00
U02	R07	Zone 07	Pass	48.80	48.80	0.00%	Yes	48.80	48.80	48.80	0.00%	Yes	U02R07	0.00
U02	R08	Zone 08	Pass	46.40	46.40	0.00%	Yes	46.40	46.40	46.40	0.00%	Yes	U02R08	0.00
U02	R09	Zone 09	Pass	46.60	46.60	0.00%	Yes	46.60	46.60	46.60	0.00%	Yes	U02R09	0.00
U02	R10	Zone 10	Pass	44.80	44.80	0.00%	Yes	44.80	44.80	44.80	0.00%	Yes	U02R10	0.00
U02	R11	Zone 11	Pass	48.20	48.20	0.00%	Yes	48.20	48.20	48.20	0.00%	Yes	U02R11	0.00
U02	R12	Zone 12	Pass	45.50	45.50	0.00%	Yes	45.50	45.50	45.50	0.00%	Yes	U02R12	0.00
U02	R13	Zone 13	Pass	50.00	50.00	0.00%	Yes	50.00	50.00	50.00	0.00%	Yes	U02R13	0.00
U02	R14	Zone 14	Pass	49.20	49.20	0.00%	Yes	49.20	49.20	49.20	0.00%	Yes	U02R14	0.00
U02	R15	Zone 15	Pass	53.40	53.40	0.00%	Yes	53.40	53.40	53.40	0.00%	Yes	U02R15	0.00
U02	R16	Zone 16	Pass	58.50	58.50	0.00%	Yes	58.50	58.50	58.50	0.00%	Yes	U02R16	0.00
Result U02			Pass	49.21	49.21	0.00%		49.21	49.21	49.21	0.00%	Ave	Min Max	0.00% 0.00%

## Comparison between Reference & Candidate Software (EDR)

Comparison Date: 6/21/2018  
 Comparison Author: Ken Nittler  
 Candidate Software: CBECC-Res 2016\_3\_1\_RC3

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
U03	Standard Design in All Zones for Prototype S6960ft2							Standard = Proposed for this test						
U03	R01	Zone 01	Pass	62.10	62.10	0.00%	Yes	62.10	62.10	62.10	0.00%	Yes	U03R01	0.00
U03	R02	Zone 02	Pass	58.40	58.40	0.00%	Yes	58.40	58.40	58.40	0.00%	Yes	U03R02	0.00
U03	R03	Zone 03	Pass	58.70	58.70	0.00%	Yes	58.70	58.70	58.70	0.00%	Yes	U03R03	0.00
U03	R04	Zone 04	Pass	57.70	57.70	0.00%	Yes	57.70	57.70	57.70	0.00%	Yes	U03R04	0.00
U03	R05	Zone 05	Pass	58.30	58.30	0.00%	Yes	58.30	58.30	58.30	0.00%	Yes	U03R05	0.00
U03	R06	Zone 06	Pass	62.00	62.00	0.00%	Yes	62.00	62.00	62.00	0.00%	Yes	U03R06	0.00
U03	R07	Zone 07	Pass	62.20	62.20	0.00%	Yes	62.20	62.20	62.20	0.00%	Yes	U03R07	0.00
U03	R08	Zone 08	Pass	60.80	60.80	0.00%	Yes	60.80	60.80	60.80	0.00%	Yes	U03R08	0.00
U03	R09	Zone 09	Pass	59.30	59.30	0.00%	Yes	59.30	59.30	59.30	0.00%	Yes	U03R09	0.00
U03	R10	Zone 10	Pass	57.60	57.60	0.00%	Yes	57.60	57.60	57.60	0.00%	Yes	U03R10	0.00
U03	R11	Zone 11	Pass	57.80	57.80	0.00%	Yes	57.80	57.80	57.80	0.00%	Yes	U03R11	0.00
U03	R12	Zone 12	Pass	57.90	57.90	0.00%	Yes	57.90	57.90	57.90	0.00%	Yes	U03R12	0.00
U03	R13	Zone 13	Pass	59.20	59.20	0.00%	Yes	59.20	59.20	59.20	0.00%	Yes	U03R13	0.00
U03	R14	Zone 14	Pass	58.60	58.60	0.00%	Yes	58.60	58.60	58.60	0.00%	Yes	U03R14	0.00
U03	R15	Zone 15	Pass	62.90	62.90	0.00%	Yes	62.90	62.90	62.90	0.00%	Yes	U03R15	0.00
U03	R16	Zone 16	Pass	62.90	62.90	0.00%	Yes	62.90	62.90	62.90	0.00%	Yes	U03R16	0.00
Result U03			Pass	59.78	59.78	0.00%		59.78	59.78	59.78	0.00%	Ave	Min Max 0.00%	0.00
U04	Proposed Design in All Zones for Prototype P2100ft2							Standard = T01 Standard for this test						
U04	R01	Zone 01	Pass	60.40	60.40	0.00%	Yes	61.40	61.40	61.40	0.00%	Yes	U01R01	1.00
U04	R02	Zone 02	Pass	51.70	51.70	0.00%	Yes	52.80	52.80	52.80	0.00%	Yes	U01R02	1.10
U04	R03	Zone 03	Pass	49.20	49.20	0.00%	Yes	50.80	50.80	50.80	0.00%	Yes	U01R03	1.60
U04	R04	Zone 04	Pass	48.70	48.70	0.00%	Yes	50.60	50.60	50.60	0.00%	Yes	U01R04	1.90
U04	R05	Zone 05	Pass	45.90	45.90	0.00%	Yes	47.40	47.40	47.40	0.00%	Yes	U01R05	1.50
U04	R06	Zone 06	Pass	51.50	51.50	0.00%	Yes	53.00	53.00	53.00	0.00%	Yes	U01R06	1.50
U04	R07	Zone 07	Pass	50.10	50.10	0.00%	Yes	50.90	50.90	50.90	0.00%	Yes	U01R07	0.80
U04	R08	Zone 08	Pass	46.10	46.10	0.00%	Yes	47.70	47.70	47.70	0.00%	Yes	U01R08	1.60
U04	R09	Zone 09	Pass	45.80	45.80	0.00%	Yes	48.50	48.50	48.50	0.00%	Yes	U01R09	2.70
U04	R10	Zone 10	Pass	44.20	44.20	0.00%	Yes	46.70	46.70	46.70	0.00%	Yes	U01R10	2.50
U04	R11	Zone 11	Pass	48.00	48.00	0.00%	Yes	50.70	50.70	50.70	0.00%	Yes	U01R11	2.70
U04	R12	Zone 12	Pass	44.80	44.80	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	2.40
U04	R13	Zone 13	Pass	49.70	49.70	0.00%	Yes	52.50	52.50	52.50	0.00%	Yes	U01R13	2.80
U04	R14	Zone 14	Pass	48.10	48.10	0.00%	Yes	51.50	51.50	51.50	0.00%	Yes	U01R14	3.40
U04	R15	Zone 15	Pass	54.30	54.30	0.00%	Yes	57.00	57.00	57.00	0.00%	Yes	U01R15	2.70
U04	R16	Zone 16	Pass	60.00	60.00	0.00%	Yes	62.00	62.00	62.00	0.00%	Yes	U01R16	2.00
Result U04			Pass	49.91	49.91	0.00%		51.92	51.92	51.92	0.00%	Ave	Min Max 0.00%	2.01

## Comparison between Reference & Candidate Software (EDR)

Comparison Date: 6/21/2018  
 Comparison Author: Ken Nittler  
 Candidate Software: CBECC-Res 2016\_3\_1\_RC3

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
U05	Proposed Design in All Zones for Prototype P2700ft2							Standard = T02 Standard for this test						
U05	R01	Zone 01	Pass	55.40	55.40	0.00%	Yes	56.60	56.60	56.60	0.00%	Yes	U02R01	1.20
U05	R02	Zone 02	Pass	47.30	47.30	0.00%	Yes	49.10	49.10	49.10	0.00%	Yes	U02R02	1.80
U05	R03	Zone 03	Pass	45.80	45.80	0.00%	Yes	47.50	47.50	47.50	0.00%	Yes	U02R03	1.70
U05	R04	Zone 04	Pass	45.90	45.90	0.00%	Yes	47.60	47.60	47.60	0.00%	Yes	U02R04	1.70
U05	R05	Zone 05	Pass	42.50	42.50	0.00%	Yes	44.20	44.20	44.20	0.00%	Yes	U02R05	1.70
U05	R06	Zone 06	Pass	49.30	49.30	0.00%	Yes	51.00	51.00	51.00	0.00%	Yes	U02R06	1.70
U05	R07	Zone 07	Pass	48.00	48.00	0.00%	Yes	48.80	48.80	48.80	0.00%	Yes	U02R07	0.80
U05	R08	Zone 08	Pass	44.50	44.50	0.00%	Yes	46.40	46.40	46.40	0.00%	Yes	U02R08	1.90
U05	R09	Zone 09	Pass	43.90	43.90	0.00%	Yes	46.60	46.60	46.60	0.00%	Yes	U02R09	2.70
U05	R10	Zone 10	Pass	42.10	42.10	0.00%	Yes	44.80	44.80	44.80	0.00%	Yes	U02R10	2.70
U05	R11	Zone 11	Pass	45.20	45.20	0.00%	Yes	48.20	48.20	48.20	0.00%	Yes	U02R11	3.00
U05	R12	Zone 12	Pass	42.70	42.70	0.00%	Yes	45.50	45.50	45.50	0.00%	Yes	U02R12	2.80
U05	R13	Zone 13	Pass	46.90	46.90	0.00%	Yes	50.00	50.00	50.00	0.00%	Yes	U02R13	3.10
U05	R14	Zone 14	Pass	45.40	45.40	0.00%	Yes	49.20	49.20	49.20	0.00%	Yes	U02R14	3.80
U05	R15	Zone 15	Pass	50.40	50.40	0.00%	Yes	53.40	53.40	53.40	0.00%	Yes	U02R15	3.00
U05	R16	Zone 16	Pass	55.70	55.70	0.00%	Yes	58.50	58.50	58.50	0.00%	Yes	U02R16	2.80
Result U05			Pass	46.94	46.94	0.00%		49.21	49.21	49.21	0.00%	Ave	Min Max 0.00%	2.28
U06	Proposed Design in All Zones for Prototype P6960ft2							Standard = T03 Standard for this test						
U06	R01	Zone 01	Pass	62.40	62.40	0.00%	Yes	62.10	62.10	62.10	0.00%	Yes	U03R01	-0.30
U06	R02	Zone 02	Pass	57.10	57.10	0.00%	Yes	58.40	58.40	58.40	0.00%	Yes	U03R02	1.30
U06	R03	Zone 03	Pass	58.00	58.00	0.00%	Yes	58.70	58.70	58.70	0.00%	Yes	U03R03	0.70
U06	R04	Zone 04	Pass	55.80	55.80	0.00%	Yes	57.70	57.70	57.70	0.00%	Yes	U03R04	1.90
U06	R05	Zone 05	Pass	57.50	57.50	0.00%	Yes	58.30	58.30	58.30	0.00%	Yes	U03R05	0.80
U06	R06	Zone 06	Pass	60.70	60.70	0.00%	Yes	62.00	62.00	62.00	0.00%	Yes	U03R06	1.30
U06	R07	Zone 07	Pass	60.70	60.70	0.00%	Yes	62.20	62.20	62.20	0.00%	Yes	U03R07	1.50
U06	R08	Zone 08	Pass	58.90	58.90	0.00%	Yes	60.80	60.80	60.80	0.00%	Yes	U03R08	1.90
U06	R09	Zone 09	Pass	56.70	56.70	0.00%	Yes	59.30	59.30	59.30	0.00%	Yes	U03R09	2.60
U06	R10	Zone 10	Pass	55.20	55.20	0.00%	Yes	57.60	57.60	57.60	0.00%	Yes	U03R10	2.40
U06	R11	Zone 11	Pass	55.40	55.40	0.00%	Yes	57.80	57.80	57.80	0.00%	Yes	U03R11	2.40
U06	R12	Zone 12	Pass	55.40	55.40	0.00%	Yes	57.90	57.90	57.90	0.00%	Yes	U03R12	2.50
U06	R13	Zone 13	Pass	56.50	56.50	0.00%	Yes	59.20	59.20	59.20	0.00%	Yes	U03R13	2.70
U06	R14	Zone 14	Pass	55.80	55.80	0.00%	Yes	58.60	58.60	58.60	0.00%	Yes	U03R14	2.80
U06	R15	Zone 15	Pass	59.90	59.90	0.00%	Yes	62.90	62.90	62.90	0.00%	Yes	U03R15	3.00
U06	R16	Zone 16	Pass	61.40	61.40	0.00%	Yes	62.90	62.90	62.90	0.00%	Yes	U03R16	1.50
Result U06			Pass	57.96	57.96	0.00%		59.78	59.78	59.78	0.00%	Ave	Min Max 0.00%	1.81

## Comparison between Reference & Candidate Software (EDR)

Comparison Date: 6/21/2018  
 Comparison Author: Ken Nittler  
 Candidate Software: CBECC-Res 2016\_3\_1\_RC3

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
U07	Common Measures in Zone 12 for Prototype P2100ft2							Standard = T01 Standard for this test						
U07	R01	Package	Pass	44.80	44.80	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	2.40
U07	R02	Fenestration U 0.40/S 0.40	Pass	48.00	48.00	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	-0.80
U07	R03	Wall R13/Roof Deck Above R6	Pass	44.20	44.20	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	3.00
U07	R04	Ceiling R49 /Roof Deck Below R0/Radiant Barrier	Pass	47.20	47.20	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	0.00
U07	R05	Furnace AFUE 92	Pass	43.50	43.50	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	3.70
U07	R06	Air Conditioner SEER 16/EER 14	Pass	44.30	44.30	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	2.90
U07	R07	No Cool Vent	Pass	47.40	47.40	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	-0.20
U07	R08	Ducts 2% Leakage	Pass	44.50	44.50	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	2.70
U07	R09	Insulation Construction Quality Improved	Pass	42.40	42.40	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	4.80
U07	R10	Air Leakage ACH50 2.0	Pass	44.00	44.00	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	3.20
Result U07			Pass	45.03	45.03	0.00%		47.20	47.20	47.20	0.00%		Min Ave Max	0.00% 0.00% 2.17
U08	Water Heating in Zone 12 for Prototype P2100ft2							Standard = T01 Standard for this test						
U08	R01	Package	Pass	44.80	44.80	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	2.40
U08	R02	Parallel Piping	Pass	44.90	44.90	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	2.30
U08	R03	Small Tankless EF 0.80/Input 195000/0 gal	Pass	44.90	44.90	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	2.30
U08	R04	Large Tankless RE 0.76/Input 300000/0 gal	Pass	45.20	45.20	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	2.00
U08	R05	Large Storage RE 0.77/Input 100000/75gal/Stby 0.01	Pass	46.40	46.40	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	0.80
U08	R06	Large Storage RE 0.77/Input 100000/75gal/Stby 0.03	Pass	49.80	49.80	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	-2.60
U08	R07	Electric Resistance EF 0.92/Input 4500	Pass	56.80	56.80	0.00%	Yes	47.30	47.30	47.30	0.00%	Yes	U01R12	-9.50
U08	R08	Heat Pump EF 2.4/Input 4500	Pass	48.60	48.60	0.00%	Yes	47.30	47.30	47.30	0.00%	Yes	U01R12	-1.30
U08	R09	2 Water Heaters using Multiplier	Pass	44.80	44.80	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	2.40
U08	R10	2 Water Heaters Using 2 entries	Pass	44.80	44.80	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	2.40
Result U08			Pass	47.10	47.10	0.00%		47.22	47.22	47.22	0.00%		Min Ave Max	0.00% 0.00% 0.12
U09	Multiple Orientation in Zone 12 for Prototype S2100ft2/P2100ft2							Standard = T01 Standard for this test						
U09	R01	Single Standard Front 45	Pass	47.80	47.80	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	-0.60
U09	R02	East Standard	Pass	47.20	47.20	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	0.00
U09	R03	South Standard	Pass	47.20	47.20	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	0.00
U09	R04	West Standard	Pass	47.20	47.20	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	0.00
U09	R05	North Standard	Pass	47.20	47.20	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	0.00
U09	R06	Single Proposed front 45	Pass	47.70	47.70	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	-0.50
U09	R07	East Proposed	Pass	48.60	48.60	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	-1.40
U09	R08	South Proposed	Pass	45.20	45.20	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	2.00
U09	R09	West Proposed	Pass	48.00	48.00	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	-0.80
U09	R10	North Proposed	Pass	44.80	44.80	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U01R12	2.40
Result U09			Pass	47.09	47.09	0.00%		47.20	47.20	47.20	0.00%		Min Ave Max	0.00% 0.00% 0.11

## Comparison between Reference & Candidate Software (EDR)

Comparison Date: 6/21/2018  
 Comparison Author: Ken Nittler  
 Candidate Software: CBECC-Res 2016\_3\_1\_RC3

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
U10	Multi Family Water Heating in Zone 12 for Prototype P6960ft2							Standard = Varies for this test						
U10	R01	8 Storage	Pass	60.10	60.10	0.00%	Yes	57.90	57.90	57.90	0.00%	Yes	U06R12	-2.20
U10	R02	8 Storage 2 Systems	Pass	60.10	60.10	0.00%	Yes	57.90	57.90	57.90	0.00%	Yes	U06R12	-2.20
U10	R03	8 LgStor	Pass	63.20	63.20	0.00%	Yes	57.90	57.90	57.90	0.00%	Yes	U06R12	-5.30
U10	R04	2 LgStor Central Solar	Pass	57.90	57.90	0.00%	Yes	60.40	60.40	60.40	0.00%	Yes	U10R04	2.50
U10	R05	2 LgStor Central Solar Recirc	Pass	57.30	57.30	0.00%	Yes	59.70	59.70	59.70	0.00%	Yes	U10R05	2.40
U10	R06	2 LgStor Central Recirc	Pass	59.30	59.30	0.00%	Yes	59.70	59.70	59.70	0.00%	Yes	U10R05	0.40
U10	R07	2 SmlInstantant Central Solar	Pass	57.60	57.60	0.00%	Yes	60.20	60.20	60.20	0.00%	Yes	U10R07	2.60
U10	R08	2 SmlInstantant Central Solar Recirc	Pass	56.80	56.80	0.00%	Yes	59.30	59.30	59.30	0.00%	Yes	U10R08	2.50
U10	R09	1 Indirect Central Solar	Pass	57.70	57.70	0.00%	Yes	59.90	59.90	59.90	0.00%	Yes	U10R09	2.20
U10	R10	1 Indirect Central Solar Recirc	Pass	57.00	57.00	0.00%	Yes	59.00	59.00	59.00	0.00%	Yes	U10R10	2.00
Result U10			Pass	58.70	58.70	0.00%		59.19	59.19	59.19	0.00%		Min Ave Max	0.00% 0.00% 0.49
U11	Source Energy in Zone 12 for Prototype P2100ft2							Standard = Varies for this test						
U11	R01	Package	Pass	44.80	44.80	0.00%	Yes	47.20	47.20	47.20	0.00%	Yes	U04R12	2.40
U11	R02	Package No Natural Gas	Pass	47.90	47.90	0.00%	Yes	50.00	50.00	50.00	0.00%	Yes	U11R02	2.10
U11	R03	Electric DHW	Pass	55.10	55.10	0.00%	Yes	47.30	47.30	47.30	0.00%	Yes	U04R12	-7.80
U11	R04	Electric DHW no Natural Gas	Pass	58.70	58.70	0.00%	Yes	56.50	56.50	56.50	0.00%	Yes	U11R02	-2.20
U11	R05	Heatpump DHW	Pass	45.70	45.70	0.00%	Yes	47.30	47.30	47.30	0.00%	Yes	U04R12	1.60
U11	R06	Heatpump DHW no Natural Gas	Pass	51.00	51.00	0.00%	Yes	56.50	56.50	56.50	0.00%	Yes	U11R02	5.50
U11	R07	Heatpump HVAC	Pass	44.30	44.30	0.00%	Yes	46.80	46.80	46.80	0.00%	Yes	U11R07	2.50
U11	R08	Heatpump HVAC no Natural Gas	Pass	45.70	45.70	0.00%	Yes	47.80	47.80	47.80	0.00%	Yes	U11R08	2.10
U11	R09	Heatpump HVAC & DHW	Pass	45.20	45.20	0.00%	Yes	46.90	46.90	46.90	0.00%	Yes	U11R07	1.70
U11	R10	Heatpump HVAC & DHW no Natural Gas	Pass	48.70	48.70	0.00%	Yes	54.90	54.90	54.90	0.00%	Yes	U11R08	6.20
Result U11			Pass	48.71	48.71	0.00%		50.12	50.12	50.12	0.00%		Min Ave Max	0.00% 0.00% 1.41
U12	E+A+A Base & Windows in Zone 12 for Prototype P1665ft2							Standard = Varies for this test						
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)

Comparison Date: 6/21/2018

Comparison Author: Ken Nittler

Candidate Software: CBECC-Res 2016\_3\_1\_RC3

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 Ave	0.00% 0.00%	0.00