



## Memorandum

**To:** Angela Long, PacifiCorp/Rocky Mountain Power  
**From:** David Basak, Navigant  
**Date:** October 24, 2016  
**Re:** Cost-Effectiveness Results for the Utah Home Energy Savings Program  
– High (+10%) Participation Scenario

This memo presents the cost effectiveness findings for Navigant's analysis of the Utah Home Energy Savings (HES) Program. Each scenario is analyzed using a high (+10%), expected, and low (-10%) participation with modeled assumptions provided by PacifiCorp. This memo will provide results for the high (+10%) participation with the other scenario results found in supplemental memos.

All scenarios utilize the following assumptions:

- **Avoided Costs:** Navigant performed a custom analysis of calculating avoided costs by using the *Residential Lighting, Residential Cooling, Residential Whole House, Plug Load, and Water Heating* decrements cost and the corresponding load shape based on measure type. The decrements values were populated using the 2015 PacifiCorp Integrated Resource Plan.
- **Modeling Inputs:** Navigant utilized individual measure savings and administration costs provided by PacifiCorp in the file *HES\_UT\_SSS\_2016-09-28\_v18.xlsx*.
- **Benefit/Cost Tests:** Multiple benefit/cost tests are reported including; PacifiCorp Total Resource Cost Test (PTRC), Total Resource Cost Test (TRC), Utility Cost Test (UCT), Rate Impact Test (RIM), and Participant Cost Test (PCT).
- **Status:** Navigant ran the benefit/cost tests at the measure level for every measure status ("Existing", "Revised", "New", "To be Retired") but included only "Existing", "Revised", and "New" measures in the Measure Category and Program Level summaries.

This memo will begin by addressing the program level results which include the complete list of measure categories (existing/revised/new) included in the Utah HES program. The cost-effectiveness inputs are as follows:

**Table 1 - Home Energy Savings Inputs**

Parameter	Value
Discount Rate	6.66%
Residential Line Loss	9.32%
Residential Energy Rate (\$/kWh)(base year 2015)	\$0.1147
Inflation Rate <sup>1</sup>	1.9%

<sup>1</sup> Future rates determined using a 1.9% annual escalator.

**Table 2 – Home Energy Savings Annual Program Costs - High (+10%) Participation**

Measure Group	Program Delivery Costs	RMP Internal Costs	Incentives	Total Utility Costs	Gross Customer Costs
Building Shell	\$12,000	\$1,040	\$176,000	\$189,040	\$960,080
Energy Savings Kits	\$55,000	\$1,878	\$59,676	\$116,554	\$72,607
HVAC	\$2,368,883	\$53,498	\$3,153,277	\$5,575,657	\$7,389,700
Lighting	\$1,100,000	\$237,896	\$5,974,110	\$7,312,005	\$13,507,800
Water Heating	\$1,117	\$25	\$2,490	\$3,632	\$4,116
Whole Home	\$195,000	\$5,663	\$691,119	\$891,782	\$3,073,499
<b>All</b>	<b>\$3,732,000</b>	<b>\$300,000</b>	<b>\$10,056,672</b>	<b>\$14,088,672</b>	<b>\$25,007,801</b>

**Table 3 – Home Energy Savings – Savings by Measure Category - High (+10%) Participation**

Measure Group	Gross kWh Savings	Realization Rate	Adjusted Gross kWh Savings	Net to Gross Ratio	Net kWh Savings	Measure Life
Building Shell	252,560	80%	202,048	100%	202,048	30
Energy Savings Kits	455,961	100%	455,961	72%	328,914	12
HVAC	12,989,762	99%	12,919,184	83%	10,683,491	11
Lighting	57,763,207	100%	57,763,207	61%	35,235,556	12
Water Heating	6,125	100%	6,125	83%	5,083	13
Whole Home	1,375,132	100%	1,375,132	81%	1,107,037	28
<b>All</b>	<b>72,842,747</b>	<b>100%</b>	<b>72,721,657</b>	<b>65%</b>	<b>47,562,129</b>	<b>19</b>

**Table 4 - Benefit/Cost Ratios by Measure Category - High (+10%) Participation**

Measure Group	PTRC	TRC	UCT	RIM	PCT
Building Shell	0.34	0.31	1.61	0.52	0.59
Energy Savings Kits	1.84	1.68	1.55	0.34	8.66
HVAC	0.85	0.77	1.18	0.36	2.47
Lighting	2.49	2.26	2.96	0.47	5.17
Water Heating	0.72	0.65	0.82	0.31	2.35
Whole Home	0.65	0.59	1.77	0.53	1.06
<b>All</b>	<b>1.52</b>	<b>1.38</b>	<b>2.15</b>	<b>0.44</b>	<b>3.70</b>

**Table 5 – HES Program Level Cost-Effectiveness Results - High (+10%) Participation**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0496	\$21,879,162	\$33,324,243	\$11,445,081	1.52
Total Resource Cost Test (TRC) No Adder	\$0.0496	\$21,879,162	\$30,294,767	\$8,415,604	1.38
Utility Cost Test (UCT)	\$0.0319	\$14,088,672	\$30,294,767	\$16,206,095	2.15
Rate Impact Test (RIM)		\$68,417,652	\$30,294,767	-\$38,122,885	0.44
Participant Cost Test (PCT)		\$25,007,801	\$92,565,407	\$67,557,605	3.70
Lifecycle Revenue Impacts (\$/kWh)					\$0.0001490523
Discounted Participant Payback (years)					2.81

Table 6 through Table 11 provides cost-effectiveness results with administration costs for all 6 measure categories followed by Tables 12-14 showing measure level results without administration costs.

**Table 6 - HES Building Shell Cost-Effectiveness Results - High (+10%) Participation  
 (Decrement - East Residential Whole House - 31%, Load Shape – Cooling)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.3048	\$973,120	\$334,563	-\$638,557	0.34
Total Resource Cost Test (TRC) No Adder	\$0.3048	\$973,120	\$304,148	-\$668,972	0.31
Utility Cost Test (UCT)	\$0.0592	\$189,040	\$304,148	\$115,108	1.61
Rate Impact Test (RIM)		\$583,820	\$304,148	-\$279,672	0.52
Participant Cost Test (PCT)		\$960,080	\$570,780	-\$389,300	0.59
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000003992
Discounted Participant Payback (years)					n/a

**Table 7 - HES Energy Kits Cost-Effectiveness Results - High (+10%) Participation  
(Decrement - East Residential Lighting - 47%, Load Shape – Lighting)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0319	\$107,578	\$198,366	\$90,787	1.84
Total Resource Cost Test (TRC) No Adder	\$0.0319	\$107,578	\$180,332	\$72,754	1.68
Utility Cost Test (UCT)	\$0.0345	\$116,554	\$180,332	\$63,778	1.55
Rate Impact Test (RIM)		\$532,004	\$180,332	-\$351,672	0.34
Participant Cost Test (PCT)		\$72,607	\$628,518	\$555,911	8.66
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000013750
Discounted Participant Payback (years)					0.34

\*Water heating measures utilized the water heating decrement with the water heating load shape.

**Table 8 - HES HVAC Cost-Effectiveness Results - High (+10%) Participation  
(Decrement - East Residential Whole House - 31%, Load Shape – Heat Pump)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0841	\$8,546,006	\$7,236,166	-\$1,309,841	0.85
Total Resource Cost Test (TRC) No Adder	\$0.0841	\$8,546,006	\$6,578,332	-\$1,967,674	0.77
Utility Cost Test (UCT)	\$0.0549	\$5,575,657	\$6,578,332	\$1,002,675	1.18
Rate Impact Test (RIM)		\$18,081,897	\$6,578,332	-\$11,503,564	0.36
Participant Cost Test (PCT)		\$7,389,700	\$18,285,281	\$10,895,581	2.47
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000499083
Discounted Participant Payback (years)					3.60

**Table 9 - HES Lighting Cost-Effectiveness Results - High (+10%) Participation  
(Decrement - East Residential Lighting - 47%, Load Shape – Lighting)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0303	\$9,577,654	\$23,812,561	\$14,234,908	2.49
Total Resource Cost Test (TRC) No Adder	\$0.0303	\$9,577,654	\$21,647,783	\$12,070,129	2.26
Utility Cost Test (UCT)	\$0.0231	\$7,312,005	\$21,647,783	\$14,335,777	2.96
Rate Impact Test (RIM)		\$46,250,264	\$21,647,783	-\$24,602,481	0.47
Participant Cost Test (PCT)		\$13,507,800	\$69,807,321	\$56,299,521	5.17
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000961904
Discounted Participant Payback (years)					1.87

**Table 10 - HES Water Heating Cost-Effectiveness Results - High (+10%) Participation  
 (Decrement - East Water Heating - 53%, Load Shape – Water Heating)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.0941	\$4,558	\$3,282	-\$1,276	0.72
Total Resource Cost Test (TRC) No Adder	\$0.0941	\$4,558	\$2,984	-\$1,574	0.65
Utility Cost Test (UCT)	\$0.0750	\$3,632	\$2,984	-\$648	0.82
Rate Impact Test (RIM)		\$9,593	\$2,984	-\$6,609	0.31
Participant Cost Test (PCT)		\$4,116	\$9,672	\$5,557	2.35
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000000235
Discounted Participant Payback (years)					2.86

**Table 11 - HES Whole Home Cost-Effectiveness Results - High (+10%) Participation  
 (Decrement - East Residential Whole House - 31%, Load Shape – Residential Whole House)**

Cost-Effectiveness Test	Levelized \$/kWh	Costs	Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	\$0.1596	\$2,670,246	\$1,739,306	-\$930,940	0.65
Total Resource Cost Test (TRC) No Adder	\$0.1596	\$2,670,246	\$1,581,187	-\$1,089,059	0.59
Utility Cost Test (UCT)	\$0.0533	\$891,782	\$1,581,187	\$689,405	1.77
Rate Impact Test (RIM)		\$2,960,073	\$1,581,187	-\$1,378,886	0.53
Participant Cost Test (PCT)		\$3,073,499	\$3,263,834	\$190,335	1.06
Lifecycle Revenue Impacts (\$/kWh)					\$0.0000021170
Discounted Participant Payback (years)					32.34

**Table 12 - HES Measure Level Cost-Effectiveness Results - Prior to Participation**

Cost-Effectiveness Test	Status	P-TRC Benefits (\$)	P-TRC Costs (\$)	P-TRC Test	TRC Benefits (\$)	TRC Costs (\$)	TRC Test	Utility PV Benefits (\$)	Utility PV Costs (\$)	Utility Cost Test	Ratepayer PV Benefits (\$)	Ratepayer PV Costs (\$)	RIM Test	Participant PV Benefits (\$)	Participant PV Cost (\$)	Participant Cost Test
95% Gas Furnace with ECM Blower - UT	Revised	\$320	\$320	1.00	\$291	\$320	0.91	\$291	\$150	1.94	\$291	\$660	0.44	\$787	\$400	1.97
Advanced Power Strip - Infrared Sensing - Owner Installed - UT	Revised	\$38	\$29	1.30	\$35	\$29	1.18	\$35	\$32	1.09	\$35	\$124	0.28	\$147	\$37	4.00
Advanced Power Strip - Load Sensing - Owner Installed - UT	Revised	\$5	\$22	0.24	\$5	\$22	0.22	\$5	\$10	0.48	\$5	\$23	0.21	\$26	\$28	0.95
Advanced Power Strip - Occupancy Sensing - Owner Installed - UT	Revised	\$12	\$28	0.44	\$11	\$28	0.40	\$11	\$32	0.35	\$11	\$62	0.18	\$69	\$35	1.99
Air Sealing - Electric Heat - UT	To be retired	\$1	\$0	2.24	\$0	\$0	2.03	\$0	\$0	2.44	\$0	\$1	0.47	\$1	\$0	4.29
CAC Proper Install & Sizing	To be retired	\$532	\$0	0.00	\$484	\$0	0.00	\$484	\$150	3.22	\$484	\$404	1.20	\$456	\$0	0.00
Central Air Conditioner - Tier 1 - 15 to 16.9 SEER - UT	Revised	\$755	\$251	3.01	\$686	\$251	2.74	\$686	\$125	5.49	\$686	\$493	1.39	\$568	\$302	1.88
Central Air Conditioner - Tier 2 - 17 to 19.9 SEER - UT	Revised	\$1,173	\$1,299	0.90	\$1,066	\$1,299	0.82	\$1,066	\$200	5.33	\$1,066	\$771	1.38	\$888	\$1,565	0.57
Central Air Conditioner - Tier 3 - 20 SEER or greater - UT	Revised	\$1,642	\$2,905	0.57	\$1,493	\$2,905	0.51	\$1,493	\$300	4.98	\$1,493	\$1,100	1.36	\$1,264	\$3,500	0.36
Clothes Washers - 3.2 MEF or Higher	To be retired	\$62	\$190	0.33	\$56	\$190	0.30	\$56	\$50	1.13	\$56	\$179	0.32	\$209	\$235	0.89
Duct Sealing & Insulation - Electric Cooling - UT	To be retired	\$771	\$671	1.15	\$701	\$671	1.05	\$701	\$120	5.84	\$701	\$490	1.43	\$565	\$808	0.70
Duct Sealing & Insulation - Electric Heat - UT	To be retired	\$6,689	\$671	9.97	\$6,081	\$671	9.07	\$6,081	\$800	7.60	\$6,081	\$4,008	1.52	\$4,665	\$808	5.77
Duct Sealing Only - Electric Heat - UT	To be retired	\$3,004	\$447	6.73	\$2,731	\$447	6.12	\$2,731	\$400	6.83	\$2,731	\$1,841	1.48	\$2,136	\$538	3.97
Ductless Heat Pump - Multi-Head - UT	Revised	\$12,512	\$5,130	2.44	\$11,374	\$5,130	2.22	\$11,374	\$1,800	6.32	\$11,374	\$7,896	1.44	\$9,144	\$6,181	1.48
Ductless Heat Pump - Single-Head - UT	Revised	\$6,249	\$2,788	2.24	\$5,681	\$2,788	2.04	\$5,681	\$1,000	5.68	\$5,681	\$4,045	1.40	\$4,668	\$3,359	1.39
Ductless Heat Pump - Supplemental Heat - UT	Revised	\$2,091	\$2,321	0.90	\$1,901	\$2,321	0.82	\$1,901	\$350	5.43	\$1,901	\$1,369	1.39	\$1,578	\$2,796	0.56
ECM on Existing Furnace - UT	Revised	\$690	\$332	2.08	\$628	\$332	1.89	\$628	\$150	4.18	\$628	\$486	1.29	\$555	\$400	1.39
Evaporative Cooler - >= 2,000 CFM - Portable - UT	Revised	\$1,343	\$120	11.18	\$1,221	\$120	10.16	\$1,221	\$200	6.11	\$1,221	\$838	1.46	\$969	\$145	6.69
Evaporative Cooler - Min 3,500 CFM - New - Self Install - UT	Revised	\$978	-\$919	0.00	\$889	-\$919	0.00	\$889	\$300	2.96	\$889	\$1,884	0.47	\$2,280	-\$1,149	0.00
Evaporative Cooler - Min 3,500 CFM - New - UT	Revised	\$3,372	-\$954	0.00	\$3,066	-\$954	0.00	\$3,066	\$400	7.66	\$3,066	\$2,043	1.50	\$2,380	-\$1,149	0.00
Evaporative Cooler - Min 3,500 CFM - Premium Only - Self Install - UT	Revised	\$3,372	-\$954	0.00	\$3,066	-\$954	0.00	\$3,066	\$400	7.66	\$3,066	\$2,043	1.50	\$2,380	-\$1,149	0.00
Evaporative Cooler - Min 3,500 CFM - Premium Only - UT	Revised	\$3,372	-\$954	0.00	\$3,066	-\$954	0.00	\$3,066	\$450	6.81	\$3,066	\$2,093	1.46	\$2,430	-\$1,149	0.00
Evaporative Cooler - Min 3,500 CFM - Premium Whole-House Ducted - Self Install - UT	To be retired	\$0	-\$1,353	0.00	\$0	-\$1,353	0.00	\$0	\$0	0.00	\$0	\$0	0.00	\$0	-\$1,630	0.00
Evaporative Cooler - Min 3,500 CFM - Premium Whole-House Ducted - UT	To be retired	\$0	-\$1,353	0.00	\$0	-\$1,353	0.00	\$0	\$0	0.00	\$0	\$0	0.00	\$0	-\$1,630	0.00
Evaporative Cooler - Min 3,500 CFM - Replacement - Self Install - UT	Revised	\$3,372	-\$954	0.00	\$3,066	-\$954	0.00	\$3,066	\$300	10.22	\$3,066	\$1,943	1.58	\$2,280	-\$1,149	0.00
Evaporative Cooler - Min 3,500 CFM - Replacement - UT	Revised	\$3,372	-\$954	0.00	\$3,066	-\$954	0.00	\$3,066	\$400	7.66	\$3,066	\$2,043	1.50	\$2,380	-\$1,149	0.00
Freezer - ENERGY STAR - Any Style - UT	To be retired	\$52	\$18	2.90	\$47	\$18	2.64	\$47	\$50	0.94	\$47	\$150	0.31	\$174	\$22	7.89
Heat Pump Conversion - Tier 1 - 9.0 HSPF and 15 SEER - UT	Revised	\$20,478	\$2,810	7.29	\$18,616	\$2,810	6.63	\$18,616	\$750	24.82	\$18,616	\$10,727	1.74	\$12,771	\$3,385	3.77
Heat Pump Conversion - Tier 2 - 9.5 HSPF and 16 SEER - UT	Revised	\$19,505	\$3,434	5.68	\$17,732	\$3,434	5.16	\$17,732	\$850	20.86	\$17,732	\$10,353	1.71	\$12,299	\$4,137	2.97
Heat Pump Upgrade - Tier 1 - 9.0 HSPF and 15 SEER - UT	Revised	\$1,755	\$515	3.41	\$1,595	\$515	3.10	\$1,595	\$250	6.38	\$1,595	\$1,105	1.44	\$1,280	\$620	2.06
Heat Pump Upgrade - Tier 2 - 9.5 HSPF and 16 SEER - UT	Revised	\$2,711	\$1,139	2.38	\$2,464	\$1,139	2.16	\$2,464	\$450	5.48	\$2,464	\$1,771	1.39	\$2,041	\$1,372	1.49
HPWH - Tier 1 - 0-55 Gallons	New	\$615	\$640	0.96	\$559	\$640	0.87	\$559	\$575	0.97	\$559	\$1,692	0.33	\$1,921	\$771	2.49
HPWH - Tier 1 - 0-55 Gallons - Self Install	New	\$615	\$640	0.96	\$559	\$640	0.87	\$559	\$400	1.40	\$559	\$1,517	0.37	\$1,746	\$771	2.26
HPWH - Tier 2 and above - 0-55 Gallons	New	\$793	\$652	1.22	\$721	\$652	1.10	\$721	\$700	1.03	\$721	\$2,140	0.34	\$2,435	\$786	3.10
HPWH - Tier 2 and above - 0-55 Gallons - Self Install	New	\$793	\$652	1.22	\$721	\$652	1.10	\$721	\$550	1.31	\$721	\$1,990	0.36	\$2,285	\$786	2.91
Insulation - Attic - Electric Cooling - UT	To be retired	\$0	\$1	0.16	\$0	\$1	0.14	\$0	\$0	1.20	\$0	\$0	0.39	\$0	\$1	0.36
Insulation - Attic - Electric Heat - UT	To be retired	\$1	\$1	1.45	\$1	\$1	1.32	\$1	\$1	1.70	\$1	\$3	0.44	\$3	\$1	3.01
Insulation - Attic - Self Install - Electric Cooling - UT	To be retired	\$0	\$0	0.31	\$0	\$0	0.28	\$0	\$0	1.20	\$0	\$0	0.39	\$0	\$0	0.72
Insulation - Attic - Self Install - Electric Heat - UT	To be retired	\$1	\$0	2.89	\$1	\$0	2.63	\$1	\$0	2.76	\$1	\$2	0.49	\$2	\$0	5.42
Insulation - Floor - Electric Heat - UT	To be retired	\$4	\$1	2.62	\$3	\$1	2.38	\$3	\$1	5.01	\$3	\$6	0.53	\$6	\$1	4.51
Insulation - Floor - Self Install - Electric Heat - UT	To be retired	\$4	\$1	2.62	\$3	\$1	2.38	\$3	\$0	13.04	\$3	\$6	0.56	\$6	\$1	4.22
Insulation - Wall - Electric Cooling - UT	To be retired	\$0	\$1	0.48	\$0	\$1	0.44	\$0	\$0	1.69	\$0	\$1	0.44	\$1	\$1	1.00
Insulation - Wall - Electric Heat - UT	To be retired	\$5	\$1	5.04	\$4	\$1	4.58	\$4	\$1	6.84	\$4	\$8	0.54	\$8	\$1	8.45
Insulation - Wall - Self Install - Electric Cooling - UT	To be retired	\$0	\$0	0.95	\$0	\$0	0.86	\$0	\$0	2.12	\$0	\$1	0.46	\$1	\$0	1.88
Insulation - Wall - Self Install - Electric Heat - UT	To be retired	\$5	\$0	9.98	\$4	\$0	9.07	\$4	\$0	9.88	\$4	\$8	0.56	\$8	\$0	16.33

**Table 13 - HES Measure Level Cost-Effectiveness Results - Prior to Participation**

Cost-Effectiveness Test	Status	P-TRC Benefits (\$)	P-TRC Costs (\$)	P-TRC Test	TRC Benefits (\$)	TRC Costs (\$)	TRC Test	Utility PV Benefits (\$)	Utility PV Costs (\$)	Utility Cost Test	Ratepayer PV Benefits (\$)	Ratepayer PV Costs (\$)	RIM Test	Participant PV Benefits (\$)	Participant PV Cost (\$)	Participant Cost Test
LED Downlight - All Channels	Revised	\$14	\$2	6.14	\$12	\$2	5.58	\$12	\$3	4.16	\$12	\$25	0.49	\$40	\$4	10.85
LED Fixture - ENERGY STAR - Upstream	New	\$12	\$6	1.97	\$11	\$6	1.79	\$11	\$5	2.18	\$11	\$25	0.44	\$37	\$10	3.72
LED General Purpose - All Channels	Revised	\$8	\$3	2.33	\$7	\$3	2.12	\$7	\$2	3.65	\$7	\$15	0.48	\$24	\$6	4.17
LED Specialty - All Channels	Revised	\$9	\$3	3.46	\$8	\$3	3.15	\$8	\$3	2.63	\$8	\$17	0.46	\$26	\$4	6.39
Manufactured Home Duct Sealing - Direct Install - Electric Heat - UT	Revised	\$2,601	\$378	6.89	\$2,364	\$378	6.26	\$2,364	\$500	4.73	\$2,364	\$1,753	1.35	\$2,010	\$455	4.42
Manufactured Home Ductless Heat Pump - Multi-Head - UT	Revised	\$12,512	\$5,130	2.44	\$11,374	\$5,130	2.22	\$11,374	\$1,800	6.32	\$11,374	\$7,896	1.44	\$9,144	\$6,181	1.48
Manufactured Home Ductless Heat Pump - Single-Head - UT	Revised	\$6,249	\$2,788	2.24	\$5,681	\$2,788	2.04	\$5,681	\$1,300	4.37	\$5,681	\$4,345	1.31	\$4,968	\$3,359	1.48
Manufactured Home Ductless Heat Pump - Supplemental Heat - UT	Revised	\$2,091	\$2,321	0.90	\$1,901	\$2,321	0.82	\$1,901	\$350	5.43	\$1,901	\$1,369	1.39	\$1,578	\$2,796	0.56
Manufactured Home Heat Pump Conversion - 9.0 HSPF and 15 SEER - UT	To be retired	\$8,787	\$2,810	3.13	\$7,988	\$2,810	2.84	\$7,988	\$500	15.98	\$7,988	\$4,781	1.67	\$5,658	\$3,385	1.67
Manufactured Home Heat Pump Conversion - Tier 2 - 9.5 HSPF and 16 SEER	To be retired	\$9,197	\$3,434	2.68	\$8,361	\$3,434	2.43	\$8,361	\$400	20.90	\$8,361	\$4,881	1.71	\$5,799	\$4,137	1.40
Manufactured Home Heat Pump Upgrade - 9.0 HSPF and 15 SEER - UT	To be retired	\$1,078	\$515	2.09	\$980	\$515	1.90	\$980	\$250	3.92	\$980	\$775	1.26	\$883	\$620	1.42
Manufactured Home Heat Pump Upgrade - Tier 2 - 9.5 HSPF and 16 SEER	To be retired	\$1,902	\$1,139	1.67	\$1,729	\$1,139	1.52	\$1,729	\$400	4.32	\$1,729	\$1,316	1.31	\$1,504	\$1,372	1.10
Multifamily - Ductless Heat Pump - UT	New	\$2,779	\$2,788	1.00	\$2,527	\$2,788	0.91	\$2,527	\$400	6.32	\$2,527	\$1,754	1.44	\$2,032	\$3,359	0.60
Multifamily - Evaporative Cooler - >= 2,000 CFM - UT	New	\$103	\$116	0.89	\$94	\$116	0.81	\$94	\$100	0.94	\$94	\$274	0.34	\$318	\$145	2.20
Multifamily Air Sealing - Electric Heat - UT	To be retired	\$0	\$0	1.94	\$0	\$0	1.76	\$0	\$0	2.12	\$0	\$1	0.46	\$1	\$0	3.83
Multifamily New Homes - 95% AFUE or higher Gas Furnace with ECM	New	\$655	\$332	1.97	\$596	\$332	1.79	\$596	\$100	5.96	\$596	\$416	1.43	\$480	\$400	1.20
Multifamily New Homes - Central Air Conditioner 15 SEER or higher	New	\$235	\$186	1.26	\$213	\$186	1.15	\$213	\$75	2.84	\$213	\$189	1.13	\$213	\$224	0.95
Multifamily New Homes - ENERGY STAR 3.0 Certification	New	\$151	\$125	1.20	\$137	\$125	1.09	\$137	\$20	6.85	\$137	\$91	1.50	\$106	\$151	0.70
Multifamily New Homes - HERS Index 48 or lower - Gas Heat	New	\$662	\$817	0.81	\$602	\$817	0.74	\$602	\$300	2.01	\$602	\$1,322	0.46	\$1,578	\$1,021	1.55
Multifamily New Homes - HERS Index 48 or lower - Electric Heat	New	\$1,759	\$817	2.15	\$1,599	\$817	1.96	\$1,599	\$600	2.67	\$1,599	\$3,315	0.48	\$3,994	\$1,021	3.91
Multifamily New Homes - HERS Index 55 or lower - Electric Heat	New	\$1,173	\$545	2.15	\$1,066	\$545	1.96	\$1,066	\$400	2.67	\$1,066	\$2,210	0.48	\$2,663	\$681	3.91
Multifamily New Homes - HERS Index 55 or lower - Gas Heat	New	\$442	\$545	0.81	\$401	\$545	0.74	\$401	\$200	2.01	\$401	\$882	0.46	\$1,052	\$681	1.54
Multifamily New Homes - HERS Index 62 or lower - Electric Heat	New	\$586	\$272	2.16	\$533	\$272	1.96	\$533	\$200	2.67	\$533	\$1,105	0.48	\$1,331	\$340	3.92
Multifamily New Homes - HERS Index 62 or lower - Gas Heat	New	\$221	\$272	0.81	\$201	\$272	0.74	\$201	\$100	2.01	\$201	\$441	0.46	\$526	\$340	1.55
New Homes - 95% Gas Furnace with ECM Blower - UT	New	\$680	\$332	2.05	\$618	\$332	1.86	\$618	\$150	4.12	\$618	\$478	1.29	\$545	\$400	1.36
New Homes - Central Air Conditioner 15 SEER or higher	New	\$396	\$251	1.58	\$360	\$251	1.44	\$360	\$100	3.60	\$360	\$293	1.23	\$333	\$302	1.10
New Homes - ENERGY STAR 3.0 Certification	New	\$81	\$121	0.67	\$74	\$121	0.61	\$74	\$25	2.95	\$74	\$150	0.49	\$181	\$151	1.20
New Homes - HERS Index 48 or lower - Electric Heat	New	\$3,122	\$2,058	1.52	\$2,838	\$2,058	1.38	\$2,838	\$1,000	2.84	\$2,838	\$5,819	0.49	\$7,024	\$2,573	2.73
New Homes - HERS Index 48 or lower - Gas Heat	New	\$1,024	\$2,058	0.50	\$931	\$2,058	0.45	\$931	\$500	1.86	\$931	\$2,080	0.45	\$2,475	\$2,573	0.96
New Homes - HERS Index 55 or lower - Electric Heat	New	\$2,081	\$1,372	1.52	\$1,892	\$1,372	1.38	\$1,892	\$600	3.15	\$1,892	\$3,812	0.50	\$4,615	\$1,715	2.69
New Homes - HERS Index 55 or lower - Gas Heat	New	\$683	\$1,372	0.50	\$620	\$1,372	0.45	\$620	\$300	2.07	\$620	\$1,354	0.46	\$1,617	\$1,715	0.94
New Homes - HERS Index 62 or lower - Electric Heat	New	\$1,041	\$686	1.52	\$946	\$686	1.38	\$946	\$350	2.70	\$946	\$1,957	0.48	\$2,359	\$858	2.75
New Homes - HERS Index 62 or lower - Gas Heat	New	\$341	\$686	0.50	\$310	\$686	0.45	\$310	\$175	1.77	\$310	\$702	0.44	\$833	\$858	0.97
New Manufactured Home - Energy Star - Gas Furnace - UT	To be retired	\$1,462	\$1,143	1.28	\$1,329	\$1,143	1.16	\$1,329	\$500	2.66	\$1,329	\$1,194	1.11	\$1,336	\$1,377	0.97
New Manufactured Home - ENERGY Star Electric Heat	To be retired	\$13,792	\$1,143	12.07	\$12,538	\$1,143	10.97	\$12,538	\$1,000	12.54	\$12,538	\$7,553	1.66	\$8,895	\$1,377	6.46

**Table 14 - HES Measure Level Cost-Effectiveness Results – Prior to Participation**

Cost-Effectiveness Test	Status	P-TRC Benefits (\$)	P-TRC Costs (\$)	P-TRC Test	TRC Benefits (\$)	TRC Costs (\$)	TRC Test	Utility PV Benefits (\$)	Utility PV Costs (\$)	Utility Cost Test	Ratepayer PV Benefits (\$)	Ratepayer PV Costs (\$)	RIM Test	Participant PV Benefits (\$)	Participant PV Cost (\$)	Participant Cost Test
Refrigerator - CEE Tier 3 - Any Style - UT	To be retired	\$101	\$62	1.64	\$92	\$62	1.49	\$92	\$100	0.92	\$92	\$305	0.30	\$353	\$77	4.61
Room Air Conditioner - ENERGY STAR - UT	Existing	\$38	\$42	0.91	\$34	\$42	0.83	\$34	\$20	1.72	\$34	\$88	0.39	\$101	\$50	2.03
Smart T-stat - Electric Cooling	New	\$44	\$208	0.21	\$40	\$208	0.19	\$40	\$25	1.60	\$40	\$103	0.39	\$119	\$250	0.48
Smart T-stat - Electric Heat	New	\$488	\$208	2.35	\$444	\$208	2.14	\$444	\$100	4.44	\$444	\$966	0.46	\$1,143	\$250	4.57
Whole Home Upgrade Package - Ductless Heat Pump - UT	To be retired	\$0	\$0	0.00	\$0	\$0	0.00	\$0	\$1,000	0.00	\$0	\$1,000	0.00	\$1,000	\$0	0.00
Whole Home Upgrade Package - Electric Cooling	To be retired	\$0	\$0	0.00	\$0	\$0	0.00	\$0	\$1,000	0.00	\$0	\$1,000	0.00	\$1,000	\$0	0.00
Whole Home Upgrade Package - Heat Pump Conversion - UT	To be retired	\$0	\$0	0.00	\$0	\$0	0.00	\$0	\$1,000	0.00	\$0	\$1,000	0.00	\$1,000	\$0	0.00
Whole Home Upgrade Package - Heat Pump Upgrade - UT	To be retired	\$0	\$0	0.00	\$0	\$0	0.00	\$0	\$1,000	0.00	\$0	\$1,000	0.00	\$1,000	\$0	0.00
Windows - Tier 1 - U-0.30 - Electric Cooling - UT	To be retired	\$1	\$1	1.21	\$1	\$1	1.10	\$1	\$1	1.95	\$1	\$2	0.45	\$2	\$1	2.42
Windows - Tier 2 - U-0.22 - Electric Cooling - UT	To be retired	\$1	\$2	0.50	\$1	\$2	0.45	\$1	\$1	1.02	\$1	\$3	0.37	\$3	\$2	1.22
Windows - Tier 2 - U-0.22 - Electric Heat - UT	To be retired	\$2	\$2	1.08	\$2	\$2	0.98	\$2	\$2	1.10	\$2	\$6	0.38	\$6	\$2	2.55
Attic Insulation - Questar	New	\$0	\$1	0.27	\$0	\$1	0.25	\$0	\$0	1.57	\$0	\$0	0.52	\$0	\$1	0.48
Wall Insulation - Questar	New	\$1	\$1	0.83	\$1	\$1	0.76	\$1	\$0	2.22	\$1	\$1	0.57	\$1	\$1	1.33
10 W LED	Existing	\$42	\$16	2.61	\$38	\$16	2.38	\$38	\$13	2.86	\$38	\$82	0.46	\$99	\$20	4.98
1.5 GPM Kitchen Aerator	Existing	\$11	\$2	6.81	\$10	\$2	6.19	\$10	\$1	7.45	\$10	\$23	0.46	\$28	\$2	13.36
.5 GPM Bathroom Aerator	Existing	\$28	\$0	63.15	\$25	\$0	57.41	\$25	\$0	69.06	\$25	\$52	0.48	\$65	\$1	118.37
1.5 GPM Showerhead	Existing	\$104	\$19	5.41	\$94	\$19	4.92	\$94	\$16	5.92	\$94	\$210	0.45	\$258	\$24	10.75
<b>Best Kit 1 - Multi-Family</b>	<b>Existing</b>	<b>\$185</b>	<b>\$37</b>	<b>4.96</b>	<b>\$168</b>	<b>\$37</b>	<b>4.51</b>	<b>\$168</b>	<b>\$31</b>	<b>5.42</b>	<b>\$168</b>	<b>\$204</b>	<b>0.82</b>	<b>\$248</b>	<b>\$47</b>	<b>5.32</b>
10 W LED	Existing	\$42	\$16	2.61	\$38	\$16	2.38	\$38	\$13	2.86	\$38	\$82	0.46	\$99	\$20	4.98
1.5 GPM Kitchen Aerator	Existing	\$11	\$2	6.81	\$10	\$2	6.19	\$10	\$1	7.45	\$10	\$23	0.46	\$28	\$2	13.36
.5 GPM Bathroom Aerator	Existing	\$28	\$0	63.15	\$25	\$0	57.41	\$25	\$0	69.06	\$25	\$52	0.48	\$65	\$1	118.37
1.5 GPM Showerhead	Existing	\$104	\$19	5.41	\$94	\$19	4.92	\$94	\$16	5.92	\$94	\$210	0.45	\$258	\$24	10.75
<b>Best Kit 1 - Single Family</b>	<b>Existing</b>	<b>\$185</b>	<b>\$47</b>	<b>3.97</b>	<b>\$168</b>	<b>\$47</b>	<b>3.61</b>	<b>\$168</b>	<b>\$31</b>	<b>5.42</b>	<b>\$168</b>	<b>\$665</b>	<b>0.25</b>	<b>\$823</b>	<b>\$47</b>	<b>17.67</b>
10 W LED	Existing	\$42	\$16	2.61	\$38	\$16	2.38	\$38	\$11	3.34	\$38	\$80	0.47	\$97	\$20	4.88
1.5 GPM Kitchen Aerator	Existing	\$11	\$2	6.81	\$10	\$2	6.19	\$10	\$1	8.69	\$10	\$23	0.46	\$28	\$2	13.26
.5 GPM Bathroom Aerator	Existing	\$56	\$1	63.15	\$51	\$1	57.41	\$51	\$1	80.60	\$51	\$104	0.48	\$130	\$1	118.28
1.5 GPM Showerhead	Existing	\$208	\$38	5.41	\$189	\$38	4.92	\$189	\$27	6.91	\$189	\$415	0.46	\$511	\$48	10.65
<b>Best Kit 2 - Multi-Family</b>	<b>Existing</b>	<b>\$317</b>	<b>\$59</b>	<b>5.36</b>	<b>\$288</b>	<b>\$59</b>	<b>4.87</b>	<b>\$288</b>	<b>\$41</b>	<b>7.10</b>	<b>\$288</b>	<b>\$580</b>	<b>0.50</b>	<b>\$715</b>	<b>\$71</b>	<b>10.05</b>
10 W LED	Existing	\$42	\$16	2.61	\$38	\$16	2.38	\$38	\$11	3.34	\$38	\$80	0.47	\$97	\$20	4.88
1.5 GPM Kitchen Aerator	Existing	\$11	\$2	6.81	\$10	\$2	6.19	\$10	\$1	8.69	\$10	\$23	0.46	\$28	\$2	13.26
.5 GPM Bathroom Aerator	Existing	\$56	\$1	63.15	\$51	\$1	57.41	\$51	\$1	80.60	\$51	\$104	0.48	\$130	\$1	118.28
1.5 GPM Showerhead	Existing	\$208	\$38	5.41	\$189	\$38	4.92	\$189	\$27	6.91	\$189	\$415	0.46	\$511	\$48	10.65
<b>Best Kit 2 - Single Family</b>	<b>Existing</b>	<b>\$317</b>	<b>\$59</b>	<b>5.36</b>	<b>\$288</b>	<b>\$59</b>	<b>4.87</b>	<b>\$288</b>	<b>\$41</b>	<b>7.10</b>	<b>\$288</b>	<b>\$770</b>	<b>0.37</b>	<b>\$953</b>	<b>\$71</b>	<b>13.39</b>
Energy Savings Kit - LED - Multifamily	Revised	\$34	\$12	2.82	\$31	\$12	2.56	\$31	\$19	1.61	\$31	\$75	0.41	\$111	\$20	5.58
Energy Savings Kit - LED - Single Family	Revised	\$34	\$12	2.82	\$31	\$12	2.56	\$31	\$19	1.61	\$31	\$75	0.41	\$111	\$20	5.58