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Tucson Electric Power Company

One South Church, Post Office Box 711
Tucson, Arizona 85702

June 13, 2011

Mr. Steve Olea
Director, Utilities Division
Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007

Arizona Corporation Commission

DOCKETED

JUN 15 2011

DOCKETED BY *[Signature]*

Re: Docket Nos. E-01933A-07-0402 and E-01933A-05-0650,
Commission Decision No. 70628 (December 1, 2008)

Mr. Olea,

Pursuant to Decision No. 70628 and Section 9.6 of the Tucson Electric Power Company Proposed Rate Settlement Agreement, dated May 29, 2008, Tucson Electric Power Company ("TEP") submitted its semi-annual Demand-Side Management ("DSM") program progress report on March 1, 2011, wherein TEP stated that the measurement, evaluation, and research ("MER") report was in the process of being finalized and would be submitted to Commission Staff upon completion.

On June 3, 2011, TEP received final MER results for its 2010 Energy Efficiency Portfolio. The results show increased savings from those previously reported. For this reason TEP is submitting a supplement that contains only the updated tables. TEP also submits a copy of the MER report for 2010.

If you have any questions, please contact me at (520) 884-3680.

Sincerely,

Jessica Bryne
Regulatory Services

Enclosures: Supplement Report and MER Report

cc: Docket Control, ACC
Barbara Keene, ACC

ARIZONA CORPORATION COMMISSION
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Tucson Electric Power Company

Supplement to Semi-Annual Demand-Side Management Programs Progress Report

July through December 2010

Tucson Electric Power Company

SUPPLEMENT TO SEMI-ANNUAL DSM PROGRESS REPORT FOR THE PERIOD: July through December 2010

In addition to the verified savings update, Tucson Electric Power Company ("TEP") has also updated savings to reflect line losses of 9.5% for both kWh and KW savings.

The following tables replace the corresponding tables on pages 3 through 5 of the 2010 Year-end Report filed March 1, 2011. These tables reflect the savings as verified by Navigant Consulting, the inclusion of line losses, and updated Societal Benefits and Costs.

Table 4

DSM ENERGY SAVINGS: JANUARY – DECEMBER 2010

DSM Program	Capacity Savings MW	Annual MWh Savings	Annual Therm Savings	Lifetime MWh Savings	Lifetime Therm Savings
Low-Income Weatherization	0.00	710	7,776	12,419	136,080
Guarantee Home	1.65	2,520	25,080	75,591	752,389
Shade Tree Program	0.26	764	0	22,921	0
ENERGY STAR® Lighting (CFL)	13.85	76,761	0	589,954	0
Efficient Home Cooling	1.04	2,138	0	32,073	0
Non-Residential Existing Facilities	3.77	37,627	0	551,988	0
Small Business	4.37	18,117	0	240,886	0
Efficient Commercial Building Design	0.06	283	0	4,620	0
Portfolio Totals	25.00	138,921	32,856	1,530,453	888,469

Table 5

DSM SOCIETAL BENEFITS & PERFORMANCE INCENTIVE: JANUARY – DECEMBER 2010

DSM Program	Program Cost	Societal Benefits	Societal Costs	Net Benefits
Residential				
Low-Income Weatherization ¹	\$ 315,405	\$ 397,094	\$ 397,094	\$ -
Guarantee Home Program	\$ 1,965,352	\$ 10,508,433	\$ 2,793,768	\$ 7,714,665
Shade Tree Program	\$ 160,887	\$ 1,024,021	\$ 210,832	\$ 813,189
ENERGY STAR® Lighting (CFL)	\$ 1,751,541	\$ 41,196,965	\$ 2,383,602	\$ 38,813,363
Efficient Home Cooling	\$ 1,585,705	\$ 2,482,347	\$ 5,341,594	\$ (2,859,247)
Total for Residential	\$ 5,778,890	\$ 55,608,861	\$ 11,126,890	\$ 44,481,971
Non-Residential				
Non-Residential Existing Facilities	\$ 2,282,468	\$ 27,437,801	\$ 5,036,507	\$ 22,401,294
Small Business	\$ 2,308,890	\$ 18,624,141	\$ 4,028,403	\$ 14,595,738
Efficient Commercial Building Design	\$ 153,655	\$ 246,743	\$ 171,369	\$ 75,374
Total for Non-Residential	\$ 4,745,012	\$ 46,308,685	\$ 9,236,278	\$ 37,072,407
Portfolio Totals	\$ 10,523,902	\$ 101,917,546	\$ 20,363,168	\$ 81,554,377
Program Development, Analysis & Reporting Software	\$ 677,114	\$ -	\$ 677,114	\$ (677,114)
Baseline Study	\$ 260,864	\$ -	\$ 260,864	\$ (260,864)
TOTAL	\$ 11,461,881	\$ 101,917,546	\$ 21,301,147	\$ 80,616,399
Performance Incentive Calculation:				
Total Spending ² / Total Net Benefits	\$ 11,146,476			\$ 80,616,399
10% of Spending / Net Benefits	\$ 1,114,648			\$ 8,061,640
Performance Incentive for 2010	\$ 1,114,648			

1. Consistent with Commission Staff's analysis in Commission Decision No. 70456 (August 6, 2008), the societal benefits for low-income weatherization are equal to or greater than the societal costs when taking the environmental benefits into account.

2. Total spending does not include Low-Income Weatherization per Commission Decision No. 70628 (December 1, 2008), which approved the TEP Performance incentive calculation. The Performance Incentive allowed is capped at 10% of Net Benefits or 10% of total spending, whichever is less.

Tucson Electric Power Company

SUPPLEMENT TO SEMI-ANNUAL DSM PROGRESS REPORT FOR THE PERIOD:
July through December 2010

Table 6

DSM LIFETIME ENVIRONMENTAL SAVINGS: JANUARY – DECEMBER 2010

DSM Program	Lifetime SO _x Reduction (lbs)	Lifetime NO _x Reduction (lbs)	Lifetime CO ₂ Reduction (lbs)	Lifetime Water Reduction (gallons)
Low-Income Weatherization	24,420	29,465	23,322,404	5,217,052
Guarantee Home	148,642	179,348	132,999,647	31,755,175
Shade Tree Program	45,071	54,381	40,080,841	9,628,729
ENERGY STAR® Lighting (CFL)	1,160,081	1,399,727	1,031,643,803	247,834,589
Efficient Home Cooling	63,069	76,098	56,086,437	13,473,797
Non-Residential Existing Facilities	1,085,426	1,309,649	965,253,775	231,885,532
Small Business	473,677	571,527	421,233,813	101,194,141
Efficient Commercial Building Design	9,085	10,962	8,079,040	1,940,850
Portfolio Totals	3,009,471	3,631,156	2,678,699,759	642,929,866

Tucson Electric Power Company

SUPPLEMENT TO SEMI-ANNUAL DSM PROGRESS REPORT FOR THE PERIOD: July through December 2010

Table 7

DSM SAVINGS & EXPENSES SINCE PROGRAM INCEPTION: JANUARY 1992 – DECEMBER 2010¹

PROGRAM	Start Date	Program Participants/Units		Program Expenses		MW Savings		MWh Savings		Therm Savings	
		Jan - Dec	Program Inception to Date	Jan - Dec	Program Inception to Date	Jan - Dec	Total Annual ^a	Jan - Dec	Total Annual ^a	Jan - Dec	Total Annual ^a
Commercial											
Lighting	1992	0	1,118	\$ -	\$ 5,619,523	0.00	3.76	0	16,461	N/A	N/A
Motors	1993	0	228	\$ -	\$ 168,275	0.00	0.02	0	210	N/A	N/A
HVAC	1994	0	625	\$ -	\$ 917,246	0.00	0.52	0	873	N/A	N/A
Energy Services	1995	0	11	\$ -	\$ 854,603	0.00	1.35	0	4,455	N/A	N/A
Non-Residential Existing Facilities	2008	96	153	\$ 2,282,468	\$ 3,468,949	3.77	6.81	37,627	49,231	N/A	N/A
Small Business	2008	333	475	\$ 2,308,890	\$ 3,855,979	4.37	6.45	18,117	26,972	N/A	N/A
Efficient Commercial Building Design	2008	10	12	\$ 153,655	\$ 341,117	0.06	0.08	283	325	N/A	N/A
C&I Demand Response - Direct Load Control	2010	4	4	\$ 35,254	\$ 35,254	N/A	N/A	N/A	N/A	N/A	N/A
Residential											
Good Cents	1994	0	1,462	\$ -	\$ 2,511,042	0.00	1.57	0	2,287	N/A	N/A
Eff. Allowance	1993	0	2,917	\$ -	\$ 3,825,566	0.00	1.94	0	2,119	N/A	N/A
Guarantee Home Program	1999	1,740	12,159	\$ 1,965,352	\$ 18,839,267	1.65	24.08	2,520	28,450	23,493	867,055
Shade Tree Program*	1992	3,942	69,582	\$ 160,887	\$ 2,248,062	0.25	0.25	764	7,781	N/A	N/A
ENERGY STAR® Lighting (CFL)	2008	1,282,668	2,467,129	\$ 1,751,541	\$ 3,242,949	13.85	24.11	76,761	137,440	N/A	N/A
Efficient Home Cooling	2008	4,617	7,338	\$ 1,585,705	\$ 2,419,607	1.04	2.24	2,138	5,145	N/A	N/A
Res. & Small Bus. Direct Load Control	2010	0	0	\$ 915,626	\$ 915,626	N/A	N/A	N/A	N/A	N/A	N/A
<i>*No energy savings reported prior to 2005</i>											
Support Programs											
Education & Outreach	1993	52,552	483,721	\$ 559,783	\$ 8,879,117	N/A	N/A	N/A	N/A	N/A	N/A
Low-Income Weatherization**	1993	243	2,175	\$ 315,405	\$ 3,389,757	N/A	N/A	710	756	7,776	28,993
<i>**No energy savings reported prior to 2007</i>											
Program Development, Analysis, & Reporting Software	NA	NA	NA	\$ 677,114	\$ 1,681,749	NA	NA	NA	NA	NA	NA
Baseline Study	2009	NA	NA	\$ 260,864	\$ 280,861	NA	NA	NA	NA	NA	NA
TOTAL		1,326,205	3,049,109	\$ 12,972,544	\$ 63,494,549	25	73	138,921	282,503	1,912,615	896,048
											5,121,200

a. Accumulated savings for one year for all energy efficiency measures installed since program inception.
b. Accumulated savings for all years for all energy efficiency measures installed since program inception.

¹ Historical DSM Program annual savings will decrease as the measure lifetimes expire. Programs with fully expired lifetimes will no longer be reported. Historical programs include Lighting, Motors, HVAC, and Energy Services for commercial participants, and Good Cents and Eff. Allowance for residential participants.

Tucson Electric Power Company

Measurement, Evaluation, and
Research (“MER”) Report

FINAL

**TEP Demand Side Management 2010
Savings Verification Report**

January 1, 2010-December 31, 2010

**Presented to:
Tucson Electric Power
Randy Altergott and Denise Smith**

June 3, 2011

Presented by:

**Floyd Keneipp
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Section 1. Summary

This report presents proposed changes and adjustments to the 2010 energy and demand savings calculations for the Tucson Electric Power (TEP) residential and commercial DSM programs after completing a savings verification review of reported savings. Benefit-Cost calculations were outside the scope of this task and were not updated.

Navigant Consulting reviewed the following files as provided by Randy Altergott which summarized 2010 savings for TEP:

- 2010 EOY TEP Portfolio Savings-Cost-Benefits & Performance Incentive with Residential Savings-Costs-Benefits-lookup.xls
- 2010 EOY Savings-Cost-Benefits-lookup TEP Commercial New Construction.xlsx
- 2010 EOY Savings-Cost-Benefits-lookup TEP Large Commercial.xlsx
- 2010 EOY Savings-Cost-Benefits-lookup TEP Small Business.xlsx

For details on algorithms or assumptions, see the Navigant reviewed workbooks.

Overall, Navigant suggest the reported savings at generator should be adjusted higher for demand (144% realization rate), higher for annual energy savings (133% realization), and higher for lifetime energy savings (117% realization rate).

TEP has reported values at meter. NCI presents values both at meter and at generator. A line-loss factor (LLF) of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter. The following algorithm is used to calculate at generator values:

$$\text{At generator} = \text{At meter value} * (1 + \text{Line Loss Factor (LLF)})$$

Ex-Ante utility reported Capacity Savings (kW) were detailed as Non-coincident Demand Savings; however, Navigant reports these values as Coincident Demand Savings (including the Coincident Factor). This reduces the realization rate. The utility reported savings for the ES Lighting Program using the Coincidence Factor to calculate the reported Demand Savings; thus, the realization rate is not affected for this program.

Table 1-1, Table 1-2, and Table 1-3 present summary findings and adjustments for energy savings.

Table 1-1. TEP 2010 Portfolio Demand & Energy Savings Summary at Generator

Utility	Program	Demand Savings (MBW)			Annual Energy Savings (MMWh)			Lifetime Energy Savings (MWh)		
		Reported Non-Coincident Demand @ Meter	NCI Verified Coincident Demand @ Generator***	Realization Rate	Reported @ Meter	NCI Verified @ Generator***	Realization Rate	Reported @ Meter	NCI Verified @ Generator***	Realization Rate
TEP	Residential Programs									
	Low-Income Weatherization	-	-	-	648	710	110%	11,341	12,419	110%
	Guarantee Home	2.09	1.65	79%	2511	2520	100%	75,323	75,591	100%
	Shade Tree	0.24	0.25	105%	698	764	110%	13,955	22,921	164%
	ENERGY STAR® Lighting (CFL)**	5.26	13.85	263%	57,893	76,761	133%	546,506	589,954	108%
	Efficient Home Cooling	0.96	1.04	108%	1,953	2,138	109%	29,291	32,073	109%
	Commercial Programs									
	Small Business	3.70	4.37	118%	13,447	18,117	135%	224,926	240,886	107%
	Non-Residential Existing Facilities****	4.78	3.77	79%	27,314	37,627	138%	399,516	551,988	138%
	Commercial New Construction	0.32	0.06	20%	260	283	109%	4,246	4,620	109%
Utility Totals	17.35	25.00	144%	104,725	138,921	133%	1,305,104	1,530,453	117%	

* The ES Lighting Programs have used a Coincidence Factor to calculate the reported Demand Savings; therefore, these reported values are Coincident Deemed Savings at Meter.

** For the Energy Star Lighting (CFL) Program, 10% of CFL bulbs are assumed to be installed in commercial applications. Thus commercial factors are used to calculate savings for these bulbs.

*** At generator values are calculated by the following algorithm: at meter*(1+LLF).

****Custom Measures were not verified this reporting cycle.

Table 1-2. TEP 2010 Portfolio Demand & Energy Savings Summary at Meter

Utility	Program	Demand Savings (MW)			Annual Energy Savings (MWh)			Lifetime Energy Savings (MWh)		
		Reported Non-Coincident Demand @ Meter	NCI Verified Coincident Demand @ Meter	Realization Rate	Reported @ Meter	NCI Verified @ Meter	Realization Rate	Reported @ Meter	NCI Verified @ Meter	Realization Rate
Residential Programs										
TEP	Low-Income Weatherization	0	0	-	648	648	100%	11,341	11,341	100%
	Guarantee Home	2.09	1.51	72%	2,511	2,301	92%	75,323	69,033	92%
	Shade Tree	0.24	0.23	96%	698	698	100%	13,955	20,932	150%
	ENERGY STAR® Lighting (CFL)**	5.26	12.64	240%	57,893	70,101	121%	546,506	538,771	99%
	Efficient Home Cooling	0.96	0.95	99%	1,953	1,953	100%	29,291	29,291	100%
Commercial Programs										
TEP	Small Business	3.70	3.99	108%	13,447	16,546	123%	224,926	219,987	98%
	Non-Residential Existing Facilities***	4.78	3.45	72%	27,314	34,363	126%	399,516	504,099	126%
	Commercial New Construction	0.32	0.06	18%	260	259	99%	4,246	4,219	99%
	Utility Totals	17.35	22.83	132%	104,725	126,868	121%	1,305,104	1,397,674	107%

* The ES Lighting Programs have used a Coincidence Factor to calculate the reported Demand Savings; therefore, these reported values are Coincident Deemed Savings at Meter.

** For the Energy Star Lighting (CFL) Program, 10% of CFL bulbs are assumed to be installed in commercial applications. Thus commercial factors are used to calculate savings for these bulbs.

*** Custom Measures were not verified this reporting cycle.

Table 1-3. TEP 2010 Therm Savings Summary

Utility	Program	Annual Therm Savings		Lifetime Therm Savings		
		Reported	NCI Verified	Reported	NCI Verified	
				Realization Rate	Realization Rate	
Residential Programs						
TEP	Low-Income Weatherization	7,776	7,776	136,080	136,080	100%
	Guarantee Home	23,493	25,080	23,493	752,390	3203%
	Shade Tree	-	-	-	-	-
	ENERGY STAR® Lighting (CFL)	-	-	-	-	-
	Efficient Home Cooling	-	-	-	-	-
Commercial Programs						
	Small Business	-	-	-	-	-
	Large Business	-	-	-	-	-
	Commercial New Construction	-	-	-	-	-
	Utility Totals	31,269	32,856	159,573	888,470	557%

The following sections present a summary of major findings of proposed changes and/or confirmation that no changes are required to reported savings.

Section 2. Residential Programs

2.1 Low Income Weatherization

Savings are derived per AZ Energy Office report. All deemed savings values are consistent with 2010 deemed savings values.

The Total kW column was re-titled "Total Non-Coincident Demand kW" and a new column was added "Total Coincident Demand kW" to include the coincidence factor.

There are no demand savings for this program, so the inclusion of the coincident factor does not change savings. A line-loss factor (LLF) of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter. This increases the realization rate.

2.2 Guaranteed Homes

NCI adjusted savings for the Guaranteed Homes Program based on a tested sample of homes. Table 2-1 shows the results of the analysis.

Table 2-1. Original Deemed and Rated/Adjusted Savings Values for GHP Homes

	House Size	Average Tons	SEER	KW	kWh			Therm		Total	
				Coincident Demand KW Savings	Cool kWh Savings	Heat kWh Savings	Hot Water kWh Savings	Heat Therm Savings	Hot Water Therm Savings	Total kWh	Total Therm
Original GHP Deemed Electric	1850	3.5	14	1.20	1,074	776	-	-	-	1,850	-
Rated/Adjusted All Electric Homes	1134	2.4	14	1.02	811	268	176	-	-	1,255	-
Original GHP Deemed Gas/Electric Homes	1850	3.5	14	1.20	614	-	-	41	-	614	41
Rated/Adjusted Gas/Electric Homes	1964	2.6	14	1.34	1,134	326	-	32	12	1,460	44

Total KW column was re-titled "Total Non-Coincident Demand kW" and a new column ("Total Coincident Demand KW") was added which updates the algorithm with the coincidence factor. This reduces the realization rate.

A line-loss factor (LLF) of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter. This increases the realization rate.

Lifetime Therm calculation was also updated to include lifetime measure life (30 years). Because this factor was missing from this calculation, the current realization rate is over 3000%.

2.3 *Shade Trees*

Savings per tree are derived per ACC Staff analysis from Decision No. 70455 and need not be changed.

Navigant added the lifetime factor to the Lifetime algorithm (which it previously did not include), as well as adjusted measure life from 20 years to 30 years. This yields higher lifetime savings.

Total KW column was re-titled "Total Non-Coincident Demand" and a new column ("Total Coincident Demand KW") was added which updates the algorithm with the coincidence factor. This reduces the realization rate.

A line-loss factor (LLF) of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter. This increases the realization rate.

2.4 *ENERGY STAR® Lighting (CFL)*

Navigant's review of the CFL program reported savings identified several areas in need of adjustment, which overall results in a proposed increase in program savings. Overall, Navigant believes savings should be increased due to savings calculation corrections and other adjustments as detailed below.

The following is an itemization of identified issues and proposed corrections.

2.4.1 *Line Loss Factor*

A line-loss factor (LLF) of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter. This increases the realization rate.

2.4.2 *Bulb Wattage Replacements*

Bulb Wattage Replacements should be changed to reflect the values provided in the PY 2009 MER report. The deemed bulb wattage replacement values were first provided to TEP in October, 2010 with an agreed upon expectation that these values would serve as the basis for 2010 deemed savings estimates. This change increases savings. (See Table 2-2 below).

Table 2-2. Bulb Wattage Replacement Changes

Measure	Replacement	
	TEP Reported	NCI Verified
11W R20	45	50
15W R30	60/75	65
20W R40 Dimmable	75	85
20W R40	75	85
23W R40 2-pack	100	120

All 15W R30 bulbs should use a 65W replacement bulb assumption (some were reported as 60W and some as 75W).

2.4.3 Commercial Adjustment

Based on evaluations from California¹, Illinois² and Vermont³, Navigant estimates that 10% of bulbs purchased are used in commercial applications (small businesses).

Table 2-3 presents the different factors which the team assumed for residential and commercial customers respectively in the analysis. This change significantly increases savings. Note - this adjustment is not currently reflected in 2011 deemed savings estimates; however, we propose to add this factor retro-active to January 1, 2011, and would need to discuss how best to inform the ACC of this proposed change in savings.

¹ The CPUC's evaluation of the Statewide Upstream Lighting used store intercepts and on-site visits to estimate the percent of bulbs which go into nonresidential settings. Their findings yielded a 94%/6% residential/nonresidential split. Source: **Final Evaluation Report: Upstream Lighting Program, Volume 1**. KEMA. 2010.

http://www.energydataweb.com/cpucFiles/18/FinalUpstreamLightingEvaluationReport_2.pdf

² ComEd's Plan Year 2 Residential ES Lighting program evaluation uses a 90%/10% residential/nonresidential split. Source: **Energy Efficiency/ Demand Response Plan: Plan Year 2 (6/1/2009-5/31/2010) – Evaluation Report: Residential Energy Star® Lighting**. Navigant Consulting, Inc. December, 2010.

http://ilsag.org/yahoo_site_admin/assets/docs/ComEd_Res_Lighting_PY2_Evaluation_Report_2010-12-21_Final.12113928.pdf

³ "Vermont assumes currently that 10.5% of CFLs rebated via the buy-down program are installed in commercial facilities." Source: Personal communication. TJ Poor, Energy Programs Specialist. Vermont Department of Public Service. March 23, 2010."

Table 2-3. Residential and Commercial Factors

Factors	Residential	Commercial
Ratio of Bulbs Sold	0.9	0.1
Operation Hours:	852	2,990
HVAC interaction Energy Factor:	0.13	0.14
HVAC interaction Demand Factor:	0.41	0.25
Coincidence Factor:	0.08	0.93
<i>Measure Life (years):</i>		
8000 hr rated bulb	9.44	2.69
10000 hr rated bulb	9.44	3.36
12000 hr rated bulb	9.44	4.03

The commercial adjustment requires a few changes in the analysis. These steps are discussed below.

- Two new columns were added:
 - Commercial kWh:
The formula for this column is:
 $KW * Install Rate * Customer Rate * Operation Hours * (1 + Commercial energy interaction factor) = KW * 1.00 * 0.9 * 0.98 * 2,990 * 1.14$
 - Commercial Measure Life: This factor is calculated by dividing the Actual life hours (manufacturer reported measure life) by the operation hours.
- Total KW column formula was re-titled to "Total Coincident Demand KW".
 - The "Total Coincident Demand KW" formula was updated to include the following factors:
 - Install Rate = 90%
 - Customer Rate (Leakage) = (100-2%)
 - Residential Demand Interaction Factor = 0.41
 - Commercial Demand Interaction Factor = 0.25
 - Commercial KW
 - Commercial Coincidence Factor = 0.93

Original Equation:

$$KW * Number Installed * Coincidence Factor$$

Updated Equation:

$$\begin{aligned} & ((KW * Number\ Installed * Res.\ Coincidence\ Factor * Install\ Rate * Customer\ Rate * \\ & (1+Residential\ Demand\ Interaction\ Factor) * Res.\ Ratio) + \\ & (KW * Number\ Installed * Comm.\ Coincidence\ Factor * Install\ Rate * Customer\ Rate * \\ & (1+Commercial\ Demand\ Interaction\ Factor) * Comm.\ Ratio) = \end{aligned}$$

$$\begin{aligned} & ((KW * \# * 0.08 * 0.9 * 0.98 * 1.41 * 0.9) + \\ & (KW * \# * 0.93 * 0.9 * 0.98 * 1.25 * 0.1)) \end{aligned}$$

- New column, "Total Non-Coincident Demand KW" column was added. This column contains the same formula as the "Total Coincident Demand KW" column, except it does not include the residential and commercial coincidence factors.

$$\begin{aligned} & ((KW * Number\ Installed * Install\ Rate * Customer\ Rate * (1+Residential\ Demand \\ & Interaction\ Factor) * Res.\ Ratio) + \\ & (KW * Number\ Installed * Install\ Rate * Customer\ Rate * (1+Commercial\ Demand \\ & Interaction\ Factor) * Comm.\ Ratio)) = \end{aligned}$$

$$\begin{aligned} & ((KW * \# * 0.9 * 0.98 * 1.41 * 0.9) + \\ & (KW * \# * 0.9 * 0.98 * 1.25 * 0.1)) \end{aligned}$$

- The annual kWh algorithm changed to reflect commercial bulbs.
Updated equation:

$$((RES\ on\text{-}peak\ kWh + RES\ off\text{-}peak\ kWh) * Res\ ratio\ [0.9]) + (commercial\ annual\ kWh * comm.\ Ratio\ [0.1]) * \#\ of\ bulbs$$

- The lifetime MWh algorithm changed to reflect commercial bulbs.
Updated equation:

$$\begin{aligned} & ((RES\ on\text{-}peak\ kWh + RES\ off\text{-}peak\ kWh) * Res\ ratio\ [0.9] * res\ Measure\ Life) + \\ & (commercial\ annual\ kWh * comm.\ Ratio\ [0.1] * comm.\ Measure\ life)) * \#\ of\ bulbs \end{aligned}$$

2.4.4 HVAC Interaction Factors (Demand and Energy)

HVAC interaction factors should be used for both the demand and energy calculation. There are different residential and commercial factors.

- Residential Demand: 0.41
- Residential Energy: 0.13
- Commercial Demand: 0.25
- Commercial Energy: 0.14

- The updated equation above for total KW includes these factors.

As for Annual Energy, because “On-Peak and Off-Peak (kWh) Annual” already includes the HVAC energy interaction factor, the line adding a 5kWh/lamp indirect cooling savings to the total annual savings should be deleted. This row double counts the credit.

The changes in the CFL program savings methodology resulted in substantial increase in savings, largely due to the 10% commercial adjustment: a 266% realization rate for demand savings, a 134% realization rate for energy savings, and a 109% realization rate for lifetime energy for the TEP 2010 CFL Program at the Generator.

2.5 Efficient Home Cooling

Total KW column was re-titled to “Total Non-Coincident Demand KW” and a new column was added, which multiplies the non-coincident demand KW with the Coincidence Factor. This new column is titled “Total Coincident Demand KW”. This reduces the realization rate slightly.

A line-loss factor (LLF) of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter. This increases the realization rate.

2.6 Residential Summary

Overall, Navigant’s savings verification of TEP’s residential programs resulted in realization rates of 196% for demand savings, 130% for annual electric energy savings, 108% for lifetime electric energy savings, 105% for annual therm savings, and 557% for lifetime therm savings at the Generator.

Table 2-4 below presents Reported at Meter (as provided by TEP to Navigant for review) and Verified Savings at Generator (adjusted savings post Navigant review accounted for Line Loss, and for demand savings, coincidence factor), as well as the Realization Rate (Verified Savings/Reported Savings).

Table 2-4. Residential Program Summary

	Coincident* Demand Savings (MW)	Annual Energy Savings (MWh)	Lifetime Energy Savings	Annual Therm Savings	Lifetime Therm Savings
Reported at Meter	8.55	63,703	676,416	31,269	159,573
Verified at Generator	16.79	82,893	732,958	32,856	888,470
Realization Rate	196%	130%	108%	105%	557%

Section 3. Small Business Program

3.1 Air Conditioning and Heat Pumps

Air Conditioning and Heat Pump measures had an overall energy realization rate of 110% and a coincident demand realization rate of 110%. A line-loss factor (LLF) of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter.

3.2 Refrigeration

Refrigeration measures had an overall annual energy realization rate of 183%, lifetime energy realization rate of 174%, and a coincident demand realization rate of 95%. The increase in energy savings is largely contributed to evaporative fan motors. The implementation contractor used incorrect energy savings values, resulting in an underestimation of energy savings. The IC has corrected these values for future use.

The decrease in demand savings is a result of including a coincident factor in the calculation of savings. A line-loss factor (LLF) of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter.

3.3 Variable Speed Drives (VSD)

Variable speed drives have an energy realization rate of 1,226% and a demand realization rate of 104%. The large energy realization rate is due to a difference in the IC estimated annual savings and the MER deemed estimated savings. Navigant is currently reviewing this discrepancy and will update TEP upon resolution.

A line-loss factor (LLF) of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter. Demand savings were also calculated using a coincident factor.

3.4 Lighting

Navigant's review of the Commercial Lighting program reported savings identified several areas in need of adjustment, which overall results in an increase in annual energy savings with a 133% realization rate.

Navigant reviewed the implementation contractor's reported hours of operation for lighting measures per building type. In comparing the weighted averages of the reported hours of operation for lighting to three different reports (UNS 2010 Baseline Report, DEER 2008, and an Internal Study), it was found that the hours of operation reported by the implementation contractor were within a reasonable range (4% higher) of the combined weighted average of three comparison studies. As such, Navigant believes the currently reported hours of operation are appropriate for 2010 savings verification. However, Navigant does recommend that MER

field metering be conducted in the future to help improve the confidence of reported versus actual hours of operation.

The following adjustments were made to the lighting savings estimates:

- A line-loss factor (LLF) of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter.
- The reported measure lives were based on a previous version of MAS. NCI has adjusted the measure lives to represent the 2010 deemed values.
- NCI has included HVAC Interactive factors (HIF) in the calculation of demand and energy savings. Through the installation of efficient lighting measures, there is an inherent decrease in the HVAC cooling load, effectively increasing the savings attributed to lighting measures. The incorporation of HIF increased the demand savings by 8% and the energy savings by 22%.
- On-Peak and Off-Peak kWh equations were updated to include the following factors:
 - Energy Interaction Factor = 0.14 for CFLs
0.23 for linear fluorescent lighting (LFL)
0.17 for Exit Signs

Original Equation:

$$KW \times \text{Number Installed} \times \text{Op Hours (On-Peak or Off-Peak)}$$

Updated Equation:

$$KW \times \text{Number Installed} \times \text{Op Hours} \times (1 + \text{Energy Interaction Factor}) \times (1 + \text{LLF})$$

- Total KW equation was updated to include the following factors:
 - Demand Interaction Factor = 0.25 for CFLs
0.14 for linear fluorescent lighting (LFL)
0.36 for Exit Signs
 - Coincidence Factor = 0.93 for CFLs and LFL
1.00 for Exit Signs

Original Equation:

$$KW \times \text{Number Installed}$$

Updated Equation:

$$KW \times \text{Number Installed} \times \text{Coincidence Factor} \times (1 + \text{Demand Interaction Factor}) \times (1 + \text{LLF})$$

The above changes resulted in an 8% increase in total MW, 22% increase in Annual MWh and a decrease of 4% for lifetime MWh. The decrease in lifetime MWh is due to the change in measure life, as noted above.

3.5 *Small Business Summary*

Overall, Navigant's savings verification of TEP's small business programs resulted in realization rates of 118% for demand savings, 135% for annual electric energy savings, and 107% for lifetime electric energy savings.

As detailed in Table 3-1, Navigant's savings verification of the Small Business program resulted in an increase in savings. The table below presents Reported (as provided by TEP to Navigant for review) and Verified Savings (adjusted savings post Navigant review), as well as the Realization Rate (Verified Savings / Reported Savings).

Table 3-1. Small Business Program Summary

	Coincident* Demand Savings (MW)	Annual Energy Savings (MWh)	Lifetime Energy Savings (MW)	Annual Therm Savings	Lifetime Therm Savings
Reported at Meter	3.7	13,447	224,926	-	-
Verified at Generator	4.4	18,117	240,886	-	-
Realization Rate	118%	135%	107%	-	-

Section 4. Commercial New Construction

4.1 Custom Design

Custom Design measures had an overall energy realization rate of 109% and a demand realization rate of 20%. A line-loss factor (LLF) of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter. A typographical error in the IC data base resulted in an overestimate of the demand savings for high efficiency split heat pumps by a factor of 1000. This error resulted in the low demand realization rate mentioned above.

4.2 Commercial New Construction Summary

Overall, Navigant's savings verification of TEP's commercial new construction programs resulted in realization rates of 20% for demand savings, 109% for annual electric energy savings, and 109% for lifetime electric energy savings.

As mentioned previously, the 80% decrease in demand savings is a result of an incorrect value being input into the IC database. This error has been reported to the Utility and the IC.

Table 4-1 **Error! Reference source not found.** presents Navigant's savings verification of the Commercial New Construction program resulted in increase in energy savings. The table below presents Reported (as provided by TEP to Navigant for review) and Verified Savings (adjusted savings post Navigant review), as well as the Realization Rate (Reported Savings / Verified Savings).

Table 4-1. Commercial New Construction Summary

	Coincident* Demand Savings (MW)	Annual Energy Savings (MWh)	Lifetime Energy Savings (MW)	Annual Therm Savings	Lifetime Therm Savings
Reported at Meter	0.32	260	4,246	-	-
Verified at Generator	0.06	283	4,620	-	-
Realization Rate	20%	109%	109%	-	-

Section 5. Non-Residential Existing Facilities

5.1 Chillers

Review of IC-provided demand savings estimates using previous year's Measurement, Evaluation, and Research (MER) Report and Measure Analysis Sheets (MAS) resulted in a realization rate of 100% (adjusted). Review of annual and lifetime energy savings resulted in higher energy savings and a realization rate of 117%.

Demand savings are non-coincident demand savings multiplied by a coincidence factor of 0.95. A line-loss factor of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter.

The independent contractor for TEP's large business program provides savings values without any formulae or assumptions. As such, it is difficult for Navigant to identify the differences in final verified savings values, beyond the application of coincidence factors for demand savings and line loss factors for both energy and demand savings.

5.2 Programmable Thermostats, Air Conditioners, and Heat Pumps

Review of IC-provided demand savings estimates using the previous year's Measurement, Evaluation, and Research (MER) Report and Measure Analysis Sheets (MAS) resulted in lower demand savings and a realization rate of 69%. Review of annual energy savings resulted in lower energy savings and a realization rate of 91%. Review of lifetime energy savings resulted in lower energy savings and a realization rate of 88%.

Demand savings are non-coincident demand savings multiplied by a coincidence factor of 1.00. A line-loss factor of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter.

The independent contractor (IC) for TEP's large business program provides savings values without any formulae or assumptions; as such, it is difficult for Navigant to identify exactly what led to differences in demand and energy savings. A factor that contributed to lower verified savings includes the application of coincident factors and line loss factors. Navigant's verified effective full load hours and load factor assumptions are similar to the IC's; therefore, Navigant assumes it is the IC's formulae that created savings discrepancies.

5.1 Refrigeration

TEP provides rebates for the installation of a variety of refrigeration measures such as night covers, high efficiency ice makers and refrigerators, and evaporator fan motors. Review of IC-provided demand savings estimates using the previous year's Measurement, Evaluation, and Research (MER) Report and Measure Analysis Sheets (MAS) resulted in higher demand savings and a realization rate of 178%. Review of annual energy savings resulted in higher energy

savings and a realization rate of 128%. Review of lifetime energy savings resulted in higher energy savings and a realization rate of 141%.

Demand savings are non-coincident demand savings multiplied by a coincidence factor of 0.87. A line-loss factor of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter.

Due to incomplete information provided by the IC, Navigant verified deemed savings by using demand and energy savings values as presented in the appropriate MAS. Demand and energy savings are higher mostly due to the fact that savings for evaporative fan motors were underestimated by the IC.

5.2 Motors

TEP provides rebates for the installation of motors and motor technology such as Variable Speed Drives (VSDs) and Open, Drip-Proof (ODP) motors. Review of IC-provided demand savings estimates using the previous year's Measurement, Evaluation, and Research (MER) Report and Measure Analysis Sheets (MAS) resulted in lower demand savings and a realization rate of 2%. Review of energy savings resulted in higher annual and lifetime energy savings and a realization rate of 191%.

Demand savings are non-coincident demand savings multiplied by a coincidence factor of 0.95. A line-loss factor of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter.

The low realization rate was due to the high number of Variable Screw Drives (VSDs) that were inaccurately deemed to have demand savings. The mechanics of VSDs are such that they do not affect motor demand, thus resulting in zero demand savings per unit. Due to the lack of calculations and assumptions provided by the IC, Navigant is unable to identify what created differences in savings values other than assume that the IC underestimated savings for VSDs.

5.3 Lighting

Navigant's review of the Commercial Lighting program reported savings identified several areas in need of adjustment. Review of demand savings resulted in a 98% realization rate. Review of annual and lifetime energy savings resulted in realization rates of 109% and 106% respectively.

The following adjustments were made to the lighting savings estimates:

- A line-loss factor (LLF) of 9.5% was applied to the demand and energy savings to account for transmission and distribution losses from generator to meter.

CFLs and Linear Fluorescent Lighting

- On-Peak and Off-Peak kWh equations were updated to include the following factors:

Original Equation:

$$KW \times \text{Number Installed} \times \text{Op Hours (On-Peak or Off-Peak)}$$

Updated Equation:

$$KW \times \text{Number Installed} \times \text{Op Hours} \times (1 + \text{Energy Interaction Factor}) \times (1 + \text{LLF})$$

- Total KW equation was updated to include the following factors:

Original Equation:

$$KW \times \text{Number Installed}$$

Updated Equation:

$$KW \times \text{Number Installed} \times \text{Coincidence Factor} \times (1 + \text{Demand Interaction Factor}) \times (1 + \text{LLF})$$

Based on the measure description Navigant calculated average demand and energy savings value for linear fluorescent lighting measures.

Occupancy Sensors

- Navigant made the following changes to the equations for demand and energy savings for occupancy sensors:

Original Equations:

$$Sensor_{i,kw} = Load_{wattage} \times DSF \times (1 + HVACIF_{kw}) \div 1000$$

$$Sensor_{i,pk,kwh} = Load_{wattage} \times ESF \times Hours_{pk} \times (1 + HVACIF_{kwh}) \div 1000$$

Updated Equation:

$$Sensor_{i,kw} = Load_{wattage} \times DSF \times (1 + HVACIF_{kw}) \div 1000 \times \text{Coincidence Factor}$$

$$Sensor_{i,pk,kwh} = Load_{wattage} \times ESF \times Hours_{pk} \times (1 + HVACIF_{kwh}) \div 1000 \times \text{LLF}$$

5.4 Custom

TEP provides rebates for the installation of measures that are not detailed in its prescriptive measure offerings. Due to resource constraints this reporting cycle, Navigant did not conduct a savings review for 2010 custom measures. As such, reported savings were passed through as reported, with adjustments for line loss factor. For the 2011 reporting cycle, Navigant plans to conduct savings verification for custom projects.

5.5 Non-Residential Existing Facilities Summary

All together, these changes resulted in realization rates of 79% for demand savings, 138% for annual energy savings, and 138% for lifetime energy savings.

Table 5-1 below presents Reported at Meter (as provided by TEP to Navigant for review) and Verified Savings at Generator (adjusted savings post Navigant review accounted for Line Loss, and for demand savings, coincidence factor), as well as the Realization Rate (Verified Savings/Reported Savings).

Table 5-1: Non-Residential Existing Facilities Program Summary

	Demand Savings (MW)	Annual Energy Savings (MWh)	Annual Therm Savings	Lifetime Energy Savings (MWh)	Lifetime Therm Savings
Reported at Meter	4.8	27,314	-	399,516	-
Verified at Generator	3.8	37,627	-	551,988	-
Realization Rate	79%	138%	-	138%	-