State Energy Efficiency Embedded in Annual Energy Outlook Forecasts

2013 Update

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1. SUMMARY

In October 2012, Synapse reported our calculations for energy efficiency savings embedded in the Energy Information Administration's Annual Energy Outlook (AEO) forecast, which incorporated data from the EIA *Electric Power Annual (EPA)* 2011 and the American Center for an Energy Efficient Economy (ACEEE) *2011 State Energy Efficiency Scorecard.* In this updated report, we summarize our analysis to estimate the embedded energy efficiency percentages incorporating EIA data for 2012 (made available in 2013) and the ACEEE *2013 State Energy Efficiency Scorecard* data for 2011.[1] Our updated findings are shown in the following table:

Exhibit 1: Summary of Embedded Energy Efficiency Based on 2012 Cumulative Savings[2]

Sectors	Data Year	Cumulative EE Savings [3] (GWh)	Electricity Sales (GWh)	Cumulative Savings as Percentage of Electricity Sales	Embedded Savings Implied by Survey Data Year and Measure Life
		a	b	c=(a/b)	d=c/13 [4]
All Sectors	2012	138,432	3,688,026	3.75%	0.29%

Notes: EIA EE savings data from Form EIA-861 for 2012 available at http://www.eia.gov/electricity/data/eia861/index.html. *EIA electricity sales data from Retail Sales of Electricity by State by Sector by Provider (EIA-861) available at* http://www.eia.gov/electricity/data/state/?scr=email.

The results from our 2012 study estimated that the 2010 national energy efficiency savings embedded in the AEO forecast were 0.18 percent. This update, which incorporates more recent data, found that national embedded energy savings are 0.29 percent. The increased embedded energy efficiency savings in the most recent data reflects increased budgets for energy efficiency in the last few years.

Utilizing both EIA and ACEEE data, our update shows that state-specific embedded EE savings range from 0.01 to 0.99 percent.

[1] As we noted in our 2012 report, there is a lag between the release and availability of historical data. Our update reflects the most current data available at the time. ACEEE data available at http://aceee.org/state-policy/scorecard

[2] The savings we use for this update and the 2012 report are the EIA Annual Effects which are the total changes in energy use caused in the current reporting year resulting from existing and new programs. In other words, the cumulative effects of all EE programs in the current year.

[3] This does not include savings from the transportation sector.

[4] An average measure life of 13 years is used for this study.

2. BACKGROUND

Our 2012 paper details the methodology we developed to estimate embedded energy efficiency savings. The EIA's AEO reference case forecast includes some national energy efficiency (EE) and renewable energy (RE) policies, but does not include: 1) existing state EE policies and 2) future state EE policies. We surmised that the EE savings from existing programs appears to be implicitly included through electricity sales forecasts. Thus, planners and policymakers interested in the emissions impacts from reduced electricity sales associated with energy efficiency policies need to quantify embedded state EE policies to avoid double counting EE savings.[5]

Our methodology to estimate the implicit effects of state energy efficiency embedded in the AEO forecasts is a function of:

1) Reported cumulative energy efficiency savings (GWh-years),[6]
2) Reported electricity sales (GWh),[7]
3) Average energy efficiency lifetime (years).

Since the AEO does not provide state-level analysis and the EIA savings data does not adequately reflect non-utility policies in a number of states, we used and continue to use the ACEEE *State Energy Efficiency Scorecard*, which reflects all EE efforts within a state.[8] The ACEEE data combined with EIA national data allows us to calculate state-specific estimates.

As we noted in our 2012 report, the ACEEE scorecard only reports first-year savings. In this update, we again assume that first-year savings within each state are generally proportional to cumulative savings. We adjust cumulative embedded EE savings at the national level to national first-year EE savings by dividing by our estimate of measure life, then use this data to calculate state-level embedded EE savings using first-year, state-specific EE savings and electricity sales.

As an aside, we note that EIA has conducted recent end-use surveys for residential, commercial, and manufacturing sectors (2009 for residential, 2012 (ongoing) for commercial, and 2010 for manufacturing), but had not incorporated these survey results into its AEO 2013 forecast of electricity sales.[9] The incorporation of end-use survey year data reflects another method for calculating embedded

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[5] To properly calculate net energy savings, total program energy savings need to be reduced by the embedded EE/RE savings reflected in the AEO forecast. Additional information about EPA's goals can be found at: http://www.epa.gov/statelocalclimate/state/statepolicies.html.

[6] 2012 energy efficiency savings available at http://www.eia.gov/electricity/data/eia861/index.html.

[7] Electricity sales information taken from EIA's Retail Sales of Electricity by State by Sector by Provider (EIA-861) available at http://www.eia.gov/electricity/data/state/?scr=email.

[8] For example, ACEEE incorporates non-utility energy efficiency policies, such as those in Vermont and Maine.

[9] AEO 2013 was frozen in October of 2012 so that updates would only include what was available up until that month.

energy efficiency savings that we described in our 2012 report. The AEO 2013 still used end-use survey data reflecting the 2005 residential, 2003 commercial, and 2006 manufacturing surveys in its electricity sales forecast; we believe that the calculation of embedded energy efficiency savings using the most recent EIA data better reflects implicit energy efficiency.[10]

3. CALCULATIONS

In this update, we calculate the national embedded EE savings with 2012 data. This calculation presumes that the EIA makes adjustments in its AEO electricity sales forecast to account for recent historical data. While we do not have knowledge of the exact magnitude and mechanism of those adjustments, those historical sales incorporate EE savings effects. The EIA data indicates a cumulative EE savings of 3.75 percent in 2012, which translates to an annual embedded savings of 0.29 percent across the average EE savings lifetime of 13 years as shown in Exhibit 2 below.

Exhibit 2: Summary of Sector Specific Embedded Energy Efficiency Based on 2012 Cumulative Savings

Sector	Cumulative EE Savings (GWh)	Electricity Sales (GWh)	Cumulative Savings as Fraction of Electricity Sales	Embedded Savings Implied by Survey Data Year and Measure Life
	a	b	c=a/b	d=c/13
Residential	54,516	1,374,516	3.97%	0.31%
Commercial	58,894	1,327,337	4.44%	0.34%
Industrial	25,023	986,173	2.54%	0.20%
Transportation	92.125	7,320	1.26%	0.10%
All Sectors	138,525	3,695,346	3.75%	0.29%
All Sectors Excluding Transportation	138,432	3,688,026	3.75%	0.29%

Notes: We include transportation to sum to reported savings and sales. EIA EE savings data from EIA Form 861 for 2012 available at http://www.eia.gov/electricity/data/eia861/index.html*. 2012 Electricity sales data from Retail Sales of Electricity by State by Sector at http://www.eia.gov/electricity/data/state/?scr=email.*

Exhibit 3 below shows our calculation for state-specific embedded energy efficiency percentages based on EIA data and ACEEE data for 2012 using first-year savings reported by ACEEE for 2011 and applied to the 2012 electricity sales for each state.[11] As noted above, we assume that first-year savings (ACEEE) are proportional to cumulative savings (EIA).

[10] The data from the surveys cannot be incorporated in the EIA AEO projections until the survey results have been processed and are available. Survey status information is available through http://www.eia.gov/consumption/ .

[11] From the ACEEEE *2013 State Energy Efficiency Scorecard*.

Exhibit 3: 2012 State Embedded Energy Efficiency Savings

2012 State Electricity Embedded Savings Based on ACEEE				
State	First-Year Savings	Embedded Savings Level	2012 Sales (GWh)	Embedded Savings (GWh)
	a	b=a*(0.29/0.62)	c	d=b*c
AK	0.02%	0.01%	6,416	0.6
AL	0.08%	0.04%	86,183	32.1
AR	0.13%	0.06%	46,860	28.4
AZ	1.38%	0.64%	75,063	482.4
CA	1.35%	0.63%	259,600	1632.1
CO	0.65%	0.30%	53,692	162.5
CT	1.32%	0.61%	29,533	181.5
DC[12]	0.00%	0.00%	11,259	0.0
DE	0.18%	0.08%	11,530	9.7
FL	0.26%	0.12%	220,674	267.2
GA	0.11%	0.05%	130,979	67.1
HI	1.31%	0.61%	9,639	58.8
IA	1.04%	0.48%	45,709	221.4
ID	0.82%	0.38%	23,732	90.6
IL	0.67%	0.31%	143,540	447.9
IN	0.58%	0.27%	105,173	284.1
KS	0.08%	0.04%	40,293	15.0
KY	0.25%	0.12%	89,048	103.7
LA	0.02%	0.01%	84,731	7.9
MA	1.43%	0.67%	55,313	368.4
MD	0.58%	0.27%	61,836	167.0
ME	1.05%	0.49%	11,561	56.5
MI	1.00%	0.47%	104,818	488.1
MN	1.21%	0.56%	67,989	383.1
MO	0.44%	0.20%	82,435	168.9
MS	0.14%	0.07%	48,388	31.5
MT	0.58%	0.27%	13,863	37.4
NC	0.39%	0.18%	128,085	232.6
ND	0.07%	0.03%	14,717	4.8
NE	0.27%	0.13%	30,828	38.8
NH	0.64%	0.30%	10,870	32.4
NJ	0.69%	0.32%	75,186	241.6
NM	0.47%	0.22%	23,179	50.7
NV	0.74%	0.34%	35,180	121.2
NY	1.25%	0.58%	143,163	833.4
OH	1.22%	0.57%	152,457	866.2
OK	0.20%	0.09%	59,341	55.3
OR	0.99%	0.46%	46,689	215.3
PA	1.04%	0.48%	144,710	700.9
RI	1.25%	0.58%	7,708	44.9

[12] No data was available for DC because the program there is in transition.

2012 State Electricity Embedded Savings Based on ACEEE				
State	First-Year Savings	Embedded Savings Level	2012 Sales (GWh)	Embedded Savings (GWh)
	a	b=a*(0.29/0.62)	c	d=b*c
SC	0.32%	0.15%	77,781	115.9
SD	0.18%	0.08%	11,734	9.8
TN	0.33%	0.15%	96,381	148.1
TX	0.20%	0.09%	365,467	340.4
UT	0.85%	0.40%	29,723	117.7
VA	0.10%	0.05%	107,795	50.2
VT	2.12%	0.99%	5,511	54.4
WA	0.92%	0.43%	92,374	395.8
WI	0.57%	0.27%	68,820	182.7
WV	0.03%	0.01%	30,817	4.3
WY	0.08%	0.04%	16,971	6.3
US	**0.62%**	**0.29%**	**3,695,346**	**10,670**

Column a presents the reported first-year EE savings by state. The ACEEE data indicates that the national first-year EE savings is 0.62 percent.[13] Column b presents the prorated state embedded savings level corresponding to the national level of 0.29 percent from Exhibit 2. The calibration value is the ratio of the first-year savings of 0.62 percent divided by the national embedded savings level of 0.29 percent (0.47 = (0.29/0.62)). Column c shows the reported 2012 electricity sales. Column d, which presents embedded energy savings, is simply the electricity sales multiplied by the embedded savings level from column b.

4. CONCLUSION

As we noted in our 2012 study, state energy efficiency policies are not explicitly included in the AEO forecast, yet state policies have impacted the end usage and intensity levels incorporated in the EIA's modeling. This update presents our calculations of embedded energy efficiency percentages incorporating the most recent year data from EIA and ACEEE.

Our estimate of the 2012 national embedded EE savings level is 0.29 percent of electricity sales per year. This value reflects the most recent EIA data and represents the ongoing energy efficiency efforts likely embedded in the AEO forecast.

We calculate state-level embedded savings from these national values by using state-specific data for first-year EE savings reported in the ACEEE's *2013 State Energy Efficiency Scorecard*. We appropriately scale state savings based on the national embedded EE savings percentages. Our update shows that state-specific embedded EE savings range from 0.01 to 0.99 percent.

[13] This is a little higher than the EIA-861 incremental savings rate of 0.51 percent for 2012 and represents the more complete coverage of ACEEE.

5. BIBLIOGRAPHY

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