

Residential Draft Savings

Conservation Resource Advisory
Committee

November 13, 2014

Measures (hopefully) Covered Today

- Lighting
- Computers
- Microwaves
- Refrigerators
- Showerheads
- Bathroom Aerators
- Dishwashers
- Electric Ovens
- Drain Water Heat Recovery
- Advanced Power Strips
- SF Weatherization

General Service Lighting

- ENERGY STAR LED increase in efficacy/decrease in cost

Year	Efficacy	Cost
2014	76	\$11.40
2015	81	\$8.73
2016	86	\$6.79
2017	90	\$5.34
2018	90	\$5.34
2019	90	\$5.34

What Happens in 2020?

- EISA standard is 45 lumens/watt
- CFLs currently ~60 lumens/watt
- LEDs ~90 lumens/watt
 - There are lower quality CFLs/LEDs at 45 lumens/watt
- Forecast assumes 45 lumens/watt

Proposal: Use 45 lumens/watt in 2020,
assuming cost and EUL of a CFL

Lighting – Scenarios

- 2016 – 2019, zero savings/cost after 2020
- 2016 – 2019, savings persist after 2020 with 45 lumen/watt baseline
- In 2020, with 45 lumen/watt baseline

LED Levelized Costs (\$/MWh)

Post -2020 Baseline	90 lm/W LED		45 lm/W (EISA std)		45 lm/W (EISA std)
	Market Avg	CFL	Market Avg	CFL	NA
2016	\$ 33	\$ 469	\$ (4)	\$ 69	
2017	\$ 16	\$ 343	\$ 6	\$ 30	
2018	\$ 82	\$ 505	\$ (2)	\$ 26	
2019	\$ 160	\$ 990	\$ (3)	\$ 25	
2020					\$ 55

Source of Key Parameters

Parameter	Source(s)
Unit Savings at busbar (kWh)	RTF, DOE TSD, secondary sources
Levelized Cost (\$/MWh)	Incremental cost: RTF, DOE TSD, secondary sources
Baseline EE Saturation	RBSA, ENERGY STAR, secondary sources
Number of Units (20 years)	Load forecast, RBSA, ENERGY STAR, secondary sources
Achievable Technical Potential (aMW over 20 years)	Product of # Units * Unit Savings

Desktop Computers

Parameter	Sixth Plan	Seventh Plan (draft)
Unit Savings at busbar (kWh)	185	72
Levelized Cost (\$/MWh)	\$71	\$49
Baseline EE Saturation	10%	25%
Number of Units (20 years)	8.6M	12M
Achievable Technical Potential (aMW over 20 years)	183	93

Microwaves

Parameter	Sixth Plan	Seventh Plan (draft)
Unit Savings at busbar (kWh)	11	10
Levelized Cost (\$/MWh)	\$784	\$41
Baseline EE Saturation	0%	0%
Number of Units (20 years)	6.6M	5.8M
Achievable Technical Potential (aMW over 20 years)	8	7

Showerheads

Parameter	Sixth Plan	Seventh Plan (draft)
Unit Savings at busbar (kWh)	127 (1.8 GPM) for electric water heater	206 (avg 1.35GPM) for <i>any</i> water heater
Levelized Cost (\$/MWh)	-\$92	-\$149
Baseline EE Saturation	5%	42-66%, varies by bldg type
Number of Units (20 years)	5.8M (electric water heaters, >=2.5 GPM)	5.5M (any water heater, >=2.5 GPM)
Achievable Technical Potential (aMW over 20 years)	85	130

- Although we are now looking at all water heaters, total number of units is ~same, since saturation of low flow showerheads is higher

Dishwashers

Parameter	Sixth Plan	Seventh Plan (draft)
Unit Savings at busbar (kWh)	17 for electric water heater	1.1 for single family, 3.8 for manufactured, any water heater
Levelized Cost (\$/MWh)	\$101	\$99
Baseline EE Saturation	Savings based on market baseline, EF =0.71	Savings based on market baseline, EF = 0.79
Number of Units (20 years)	4.3M	5.6M
Achievable Technical Potential (aMW over 20 years)	46	9.0

Bathroom Aerators (1.0 GPM)

Parameter	Sixth Plan	Seventh Plan (draft)
Unit Savings at busbar (kWh)	Not included	43 for single family, 73 for MH/ME, any water heater
Levelized Cost (\$/MWh)	Not included	\$1.5
Baseline EE Saturation	Not included	65%
Number of Units (20 years)	Not included	3.7M
Achievable Technical Potential (aMW over 20 years)	Not included	20

Advanced Power Strips

Parameter	Sixth Plan	Seventh Plan (draft)
Unit Savings at busbar (kWh)	Not included	34 (load sensing) – 284 (infrared)
Levelized Cost (\$/MWh)	Not included	\$45 (infrared) – \$226 (load sensing)
Baseline EE Saturation	Not included	1%
Number of Units (20 years)	Not included	30M
Achievable Technical Potential (aMW over 20 years)	Not included	185

- Number of units includes all TVs and Computers in homes, 34% feasibility for SF (based on Energy Trust study); 25% for MF/MH (assumption)

Wastewater Heat Recovery

Parameter	Sixth Plan	Seventh Plan (draft)
Unit Savings at busbar (kWh)	407 (electric resistance WH)	239 (ERWH), 115 (HPWH)
Levelized Cost (\$/MWh)	\$100-\$400	\$146-\$388
Baseline EE Saturation	0%	0%
Number of Units (20 years)	2.3M (existing & new)	392k (new only)
Achievable Technical Potential (aMW over 20 years)	106	5.1

Electric Ovens

Parameter	Sixth Plan	Seventh Plan (draft)
Unit Savings at busbar (kWh)	69 (non-self-cleaning) 56 (self cleaning)	73 (non-self-cleaning) 59 (self cleaning)
Levelized Cost (\$/MWh)	\$365 (non-self-cleaning) \$432 (self cleaning)	\$359 (non-self-cleaning) \$423 (self cleaning)
Baseline EE Saturation	0%	10%
Number of Units (20 years)	4.6M	4.8M
Achievable Technical Potential (aMW over 20 years)	33	34

Refrigerators

Parameter	Sixth Plan	Seventh Plan (draft)
Unit Savings at busbar (kWh)	15-70 (ENERGY STAR, depends on config)	95 (CEE Tier 3)
Levelized Cost (\$/MWh)	\$15-\$24 (depends on config)	\$267 (CEE Tier 3)
Baseline EE Saturation	Savings based on market baseline	Savings based on market baseline
Number of Units (20 years)	6.5M	5.7M
Achievable Technical Potential (aMW over 20 years)	41	58

Single-Family Weatherization

Parameter	Sixth Plan	Seventh Plan (draft)
Unit Savings at busbar (kWh)	316-10,190 depending on measure	35 - 2176
Levelized Cost (\$/MWh)	~\$5.63 – 202; ~\$62 weighted avg	\$0 – 280 ~\$94 weighted avg
Baseline EE Saturation	Varies by measure	Varies by measure
Number of Units (20 years)	1.4M	2.3M
Achievable Technical Potential (aMW over 20 years)	219	100

SF Weatherization

- **Includes:**
 - Attic, floor, and wall insulation
 - Windows
 - Infiltration Control (not in 6P)
- Levels of insulation and associated savings & cost taken from recent RTF workbook
- Number of units based on RBSA for 7P
 - For 6P, based on pre-1980 vintage cohort

SF Weatherization

- RTF measures are by climate zone, HVAC system type
 - E.g. *Insulate Attic - R0 to R38 - Heating Zone 1 (Electric FAF)*
 - For 7P, RBSA data are not robust at this level of granularity for baseline saturations
- In 7P, measures are bundled by HVAC system type
 - In 6P, measures are bundled by climate zone

SF Wx Measures

SUPPLY CURVE SAVINGS BY BUNDLE		TNC Net Levelized Cost (Net of All)		ResWx	
kWh per home	\$/kWh	mWh/kWh	\$/mWh	1	2
Bushes Savings				segment	measure
2145	0			Single Family	ATTIC R0 - R18_Electric FAF
2176	0			Single Family	ATTIC R0 - R49_Electric FAF
1480	6			Single Family	ATTIC R0 - R38_Electric Zonal
1422	6			Single Family	ATTIC R0 - R38_DHP
1552	9			Single Family	ATTIC R0 - R49_Electric Zonal
1442	11			Single Family	ATTIC R0 - R49_DHP
1041	14			Single Family	WALL R0 - R11_Electric FAF
1134	18			Single Family	ATTIC R0 - R38_Heat Pump
1149	22			Single Family	ATTIC R0 - R49_Heat Pump
886	37			Single Family	FLOOR R0 - R25_Electric FAF
830	38			Single Family	FLOOR R0 - R25_Electric FAF
712	40			Single Family	FLOOR R0 - R18_Electric FAF
1030	42			Single Family	WALL R0 - R11_Electric Zonal
491	44			Single Family	ATTIC R11 - R38_Electric FAF
1017	45			Single Family	WALL R0 - R11_DHP
1806	46			Single Family	WINDOW CL30 Prime Window Replacement of Single Pane Base_Electric FAF
719	46			Single Family	FLOOR R0 - R38_Electric Zonal
533	49			Single Family	ATTIC R11 - R49_Electric FAF
690	49			Single Family	FLOOR R0 - R25_Electric Zonal
723	50			Single Family	FLOOR R0 - R38_DHP
695	50			Single Family	FLOOR R0 - R25_DHP
1751	51			Single Family	WINDOW CL22 Prime Window Replacement of Single Pane Base_Electric FAF
644	51			Single Family	FLOOR R0 - R19_Electric Zonal
649	53			Single Family	FLOOR R0 - R19_DHP
78	62			Single Family	WINDOW CL25 to CL30 Upgrade_Electric FAF
661	62			Single Family	WALL R0 - R11_Heat Pump
600	74			Single Family	CFM50 in Filtration Reduction_Electric FAF
276	83			Single Family	ATTIC R11 - R38_Electric Zonal
255	84			Single Family	ATTIC R11 - R38_DHP
481	97			Single Family	CFM50 in Filtration Reduction_Electric Zonal
453	100			Single Family	CFM50 in Filtration Reduction_DHP
210	102			Single Family	WINDOW CL35 to CL22 Upgrade_Electric FAF
300	101			Single Family	ATTIC R11 - R49_Electric Zonal
347	103			Single Family	ATTIC R11 - R49_DHP
51	106			Single Family	WINDOW CL35 to CL30 Upgrade_Electric Zonal
51	109			Single Family	WINDOW CL35 to CL30 Upgrade_DHP
827	110			Single Family	WINDOW CL30 Prime Window Replacement of Single Pane Base_Electric Zonal
252	112			Single Family	ATTIC R18 - R49_Electric FAF
289	114			Single Family	ATTIC R18 - R38_Electric FAF
812	117			Single Family	WINDOW CL30 Prime Window Replacement of Single Pane Base_DHP
952	120			Single Family	WINDOW CL22 Prime Window Replacement of Single Pane Base_Electric Zonal
770	123			Single Family	WINDOW CL30 Prime Window Replacement of Single Pane Base_Heat Pump
865	128			Single Family	WINDOW CL22 Prime Window Replacement of Single Pane Base_DHP
843	134			Single Family	WINDOW CL22 Prime Window Replacement of Single Pane Base_Heat Pump
216	131			Single Family	ATTIC R11 - R38_Heat Pump
235	142			Single Family	ATTIC R11 - R49_Heat Pump
676	144			Single Family	WINDOW CL30 Prime Window Replacement of Double Pane Base_Electric FAF
780	147			Single Family	WINDOW CL22 Prime Window Replacement of Double Pane Base_Electric FAF
140	162			Single Family	WINDOW CL35 to CL22 Upgrade_Electric Zonal
142	166			Single Family	WINDOW CL35 to CL22 Upgrade_DHP
35	168			Single Family	WINDOW CL35 to CL30 Upgrade_Heat Pump