

State-Level Benefits from Potential Federal Appliance Standards

California															
Summary of Benefits by Product	Effective Date	Annual Savings in 2020				Annual Savings in 2030				Economics					
		Annual Savings per Unit	Incremental Cost per Unit ¹	Electricity	Primary Energy	Summer Peak Capacity	Value of Bill Savings ²	Electricity	Primary Energy	Summer Peak Capacity	Value of Bill Savings ²	Pay Back Period ³	Benefit / Cost Ratio ⁴	Net Present Value ⁵	Cumulative Energy Savings through 2030
Products	Year	kWh, (gal), or (therms)	\$	GWh	BBtu	MW	\$Million	GWh	BBtu	MW	\$Million	Years		\$Million (2009\$)	TBtu
Residential															
Battery chargers	2014	4	\$ 1	947.2	9,873.8	130.7	\$ 136.5	947.2	9,525.2	130.7	\$ 136.5	1.0	5.0	\$ 822	138.2
Central AC & HP	2016	545	\$ 255	395.2	4,120.0	466.0	\$ 57.0	1,273.6	12,807.0	1,501.6	\$ 183.5	5.0	2.5	\$ 650	103.0
Clothes dryers (total)	2014	-	\$ 50	375.8	4,281.7	55.9	\$ 58.8	954.0	10,517.8	141.8	\$ 149.2	-	2.8	\$ 611	95.2
(electricity)	2014	93	\$ 50	375.8	3,917.5	55.9	\$ 54.2	954.0	9,593.5	141.8	\$ 137.5	3.7	3.2	\$ 607	87.1
(gas)	2014	[3.5]	\$ 50	-	364.1	-	\$ 4.6	-	924.3	-	\$ 11.8	11.2	1.1	\$ 5	8.1
Clothes washers (total) ⁶	2015	244	\$ 96	393.8	6,181.0	58.5	\$ 83.2	787.5	12,072.1	117.1	\$ 166.4	-	4.6	\$ 1,750	129.8
(electricity - machine)	2015	22	\$ 9	77.2	804.8	11.5	\$ 11.1	154.4	1,552.8	23.0	\$ 22.3	1.8	8.4	\$ 92	16.9
(electricity - water heating)	2015	222	\$ 87	316.6	3,299.8	47.1	\$ 45.6	633.1	6,366.6	94.1	\$ 91.2	-	-	\$ 376	69.3
(gas)	2015	[10.1]	\$ 87	-	2,076.4	-	\$ 26.5	-	4,152.7	-	\$ 52.9	2.8	5.5	\$ 61	43.6
(water)	2015	(5233.5)	\$ -	Bil. Gal.-->	28.5	-	\$ -	Bil. Gal.-->	56.9	-	\$ -	-	-	\$ 1,221	-
Direct heaters	2013	48	\$ 326	-	456.3	-	\$ 5.7	-	918.8	-	\$ 11.7	11.1	0.9	\$ (5)	9.6
(gas)	2013	[27.9]	\$ 326	-	545.1	-	\$ 6.9	-	1,090.1	-	\$ 13.9	9.2	1.1	\$ 12	11.4
External power supplies	2013	2	\$ 1	215.3	2,244.3	29.7	\$ 31.0	215.3	2,165.1	29.7	\$ 31.0	3.3	1.6	\$ 86	32.5
Furnaces (gas)	2013	[33.8]	\$ 520	-	5,107.2	-	\$ 65.1	-	11,916.9	-	\$ 151.8	12.1	1.0	\$ (42)	110.3
Furnaces (oil)	2013	[14]	\$ 17	-	138.9	-	\$ 4.1	-	324.2	-	\$ 4.1	1.0	55.1	\$ 59	3.0
Furnace fans	2016	360	\$ 100	439.3	4,579.0	281.5	\$ 63.3	1,415.5	14,233.8	907.0	\$ 204.0	1.9	5.1	\$ 960	114.5
Microwave ovens	2012	16	\$ 2	183.7	1,914.5	27.3	\$ 26.5	194.5	1,955.6	28.9	\$ 28.0	1.0	7.2	\$ 201	29.4
Pool heaters	2013	[20]	\$ 44	-	305.8	-	\$ 3.9	-	305.8	-	\$ 3.9	1.7	3.0	\$ 21	4.6
Refrigerators	2014	130	\$ 52	689.3	7,184.9	103.7	\$ 99.3	1,749.7	17,594.8	263.2	\$ 252.1	2.8	4.3	\$ 1,242	159.7
Room AC	2014	86	\$ 35	176.4	1,838.4	248.3	\$ 25.4	339.1	3,410.5	477.5	\$ 48.9	2.8	3.3	\$ 220	38.0
Water heaters	2013	-	\$ -	801.9	13,302.2	110.7	\$ 178.5	1,496.8	22,961.7	206.5	\$ 316.5	-	5.0	\$ 1,759	266.5
(electricity)	2013	220	\$ 65	801.9	8,358.7	110.7	\$ 115.5	1,496.8	15,052.1	206.5	\$ 215.7	2.1	4.9	\$ 1,173	171.6
(gas)	2013	[14]	\$ 30	-	4,943.5	-	\$ 63.0	-	7,909.6	-	\$ 100.8	1.7	5.3	\$ 585	94.9
Commercial															
Beverage vending machines	2012	682	\$ 157	27.1	282.3	6.3	\$ 3.5	44.6	448.6	10.4	\$ 5.8	1.8	5.7	\$ 36	5.6
Commercial boilers	2013	[513.6]	\$ 2,968	-	440.2	-	\$ 5.2	-	1,027.1	-	\$ 12.0	4.9	3.1	\$ 69	9.5
Clothes washers (total) ⁶	2012	-	\$ 503	32.4	715.3	10.6	\$ 9.0	40.7	882.9	13.3	\$ 10.9	6.4	1.3	\$ 26	12.3
(electricity)	2012	208	\$ 446	32.4	338.0	10.6	\$ 4.2	40.7	409.4	13.3	\$ 5.3	-	-	\$ (43)	5.8
(gas)	2012	[26.8]	\$ 57	-	377.2	-	\$ 4.8	-	473.5	-	\$ 5.5	-	-	\$ 35	6.5
(water)	2012	(5827)	\$ -	Bil. Gal.-->	1.0	-	\$ -	Bil. Gal.-->	1.2	-	\$ -	-	-	\$ 35	-
Fluorescent ballasts	2014	18	\$ 2	190.7	1,987.7	62.4	\$ 24.9	470.5	4,731.5	154.0	\$ 67.8	0.9	12.3	\$ 339	44.0
Fluorescent lamps	2012	11	\$ 2	2,637.6	27,493.9	863.1	\$ 344.2	2,637.6	26,523.3	863.1	\$ 344.2	1.6	2.8	\$ 2,002	449.8
Incandescent reflector lamps	2012	62	\$ 3	779.5	8,125.6	192.3	\$ 101.7	779.5	7,838.8	192.3	\$ 101.7	0.3	4.1	\$ 850	149.4
BR \ exempted reflector lamps	2013	38	\$ 1	353.7	3,686.5	87.3	\$ 46.2	353.7	3,556.4	87.3	\$ 46.2	0.3	3.8	\$ 315	67.8
Liquid-immersed transformers	2016	2	\$ 2	65.8	685.8	9.1	\$ 8.6	212.0	2,131.8	29.3	\$ 27.7	7.3	2.1	\$ 113	17.1
Low-voltage dry type transformers	2016	25	\$ 5	264.3	2,755.4	36.5	\$ 38.1	851.8	8,565.2	117.5	\$ 111.2	1.6	9.3	\$ 771	68.9
Metal halide lamp fixtures	2015	360	\$ 35	473.8	4,938.4	155.0	\$ 68.3	1,335.1	13,426.1	436.9	\$ 174.2	0.7	16.8	\$ 1,054	114.9
Reach-in refrigerators and freezers	2016	1,658	\$ 199	81.7	851.8	19.0	\$ 11.8	217.9	2,191.4	50.7	\$ 28.4	0.9	9.6	\$ 139	20.4
Small electric motors	2015	132	\$ 20	386.2	4,025.7	61.2	\$ 55.7	491.5	4,942.7	77.9	\$ 64.1	1.2	5.0	\$ 344	64.0
Walk-in refrigerators and freezers	2015	2,128	\$ 273	60.9	634.7	14.2	\$ 8.8	132.9	1,336.0	30.9	\$ 17.3	1.0	9.1	\$ 92	13.8
Total				9,971	118,152	3,029	\$ 1,564	16,941	198,311	5,868	\$ 2,699			\$ 14,485	2,272

Product	Emissions Reductions in 2020			Emissions Reductions in 2030 ⁷		
	CO2 1000 MT	NOx Tons	SO2 Tons	CO2 1000 MT	NOx Tons	SO2 Tons
Residential						
Battery chargers	481.6	552.9	2548.7	481.6	552.9	2548.7
Central AC & HP	0.2	323.8	1492.6	647.5	743.4	3426.8
Clothes dryers	210.8	234.6	1011.3	535.1	595.5	2567.2
	(electricity)	191.1	219.4	1011.2	485.0	556.8
	(gas)	19.7	15.2	0.1	50.1	38.6
Clothes washers	312.7	316.6	1060.0	625.4	633.3	2120.1
Direct heaters ⁸	25.2	17.8	-22.8	0.05	35.6	-45.5
External power supplies	109.5	125.7	579.3	109.5	125.7	579.3
Furnaces (gas)	276.7	213.5	1.4	645.7	498.1	3.2
Furnaces (oil)	7.5	5.8	0.037	17.6	13.6	0.1
Furnace fans	223.3	256.4	1182.0	835.7	826.2	3808.5
Microwave ovens	93.4	107.2	494.2	501.6	113.5	523.3
Pool heaters	16.6	12.8	0.1	16.6	12.8	0.1
Refrigerators	350.4	402.3	1854.6	889.5	1021.3	4707.8
Room AC	89.7	102.9	474.5	172.4	198.0	912.5
Water heaters	675.5	676.8	2158.9	1189.6	1204.3	4029.6
	(electricity)	407.7	468.1	2157.6	761.0	873.7
	(gas)	267.8	206.6	1.3	428.6	330.6
Commercial						
Beverage vending machines	13.8	15.8	72.9	22.7	26.0	120.0
Commercial boilers	23.9	18.4	0.1	55.7	42.9	0.3
Clothes washers	36.9	34.7	87.4	46.4	43.6	109.7
Fluorescent ballasts	96.9	111.3	513.1	239.2	274.6	1266.0
Fluorescent lamps	1340.9	1539.5	7096.8	1340.9	1539.5	7096.8
Incandescent reflector lamps	396.3	455.0	2097.4	396.3	455.0	2097.4
BR \ exempted reflector lamps	179.8	206.4	951.6	179.8	206.4	951.6
Liquid-immersed transformers	33.4	38.4	177.0	107.8	123.7	570.4
Low-voltage dry type transformers	134.4	154.3	711.2	433.0	497.2	2291.8
Metal halide lamp fixtures	240.9	276.5	1274.7	678.8	779.3	3592.4
Reach-in refrigerators and freezers	41.5	47.7	219.9	110.8	127.2	586.3
Small electric motors	196.3	225.4	1039.1	249.9	286.9	1322.5
Walk-in refrigerators and freezers	31.0	35.5	163.8	67.5	77.5	357.5
Total	5,639	6,508	27,240	10,596	11,054	45,544

Notes:

- ¹ For purposes of the analyses, incremental costs for residential and commercial clothes washers are apportioned based on the individual components' contribution to overall energy consumption.
- ² Value of bill savings is based on energy savings in 2020 or 2030 and current average state energy prices. This value does not take account of the incremental cost of more efficient products.
- ³ Payback period is the length of time required to recoup any increase in product cost from advances in efficiency.
- ⁴ The benefit / cost ratio is a measure of the annual energy bill savings of an efficient product versus its incremental cost.
- ⁵ Net present value is the total monetary value of bill savings achieved by products sold under the standards between now and 2030 minus the total incremental product cost incurred by purchasers as a result of the standards over the same period expressed in current dollars. Both costs and savings are discounted using a 5% real discount rate.
- ⁶ The payback period and benefit / cost ratios for residential and commercial clothes washers take into account savings from the machine, water heating, and water consumption. For residential clothes washers, the two payback periods were calculated for a clothes washer utilizing electricity vs. natural gas for water heating. Benefit / cost ratios were calculated for total savings and costs (electric, natural gas, and water) as well as for clothes washers utilizing electricity vs. natural gas for water heating. For commercial clothes washers, we assume that only natural gas is used for water heating. Therefore only one payback period and benefit / cost ratio were calculated.
- ⁷ 2030 emissions reductions for NOx and SO2 are calculated using 2020 emission factors.
- ⁸ Negative savings for direct heaters represent the emissions generated from the incorporation of electronic ignition, a technology that is not included in the current federal standard.