

State-Level Benefits from Potential Federal Appliance Standards

| Missouri | | | | | | | | | | | | | | | |
|--------------------------------------|----------------|-------------------------|--|--------------|----------------|----------------------|------------------------------------|------------------------|----------------|----------------------|------------------------------------|------------------------------|-----------------------------------|--------------------------------|--|
| 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 | 188.4 | 1,964.1 | 26.0 | \$ 15.1 | 188.4 | 1,894.8 | 26.0 | \$ 15.1 | 1.8 | 2.8 | \$ 73 | 27.5 |
| Central AC & HP | 2016 | 545 | \$ 255 | 116.3 | 1,211.9 | 128.0 | \$ 9.3 | 374.6 | 3,767.2 | 412.6 | \$ 30.1 | 5.3 | 2.1 | \$ 92 | 30.3 |
| Clothes dryers (total) | 2014 | - | \$ 50 | 74.8 | 851.7 | 11.1 | \$ 7.0 | 189.8 | 2,092.2 | 28.2 | \$ 17.7 | - | 1.7 | \$ 45 | 18.9 |
| (electricity) | 2014 | 93 | \$ 50 | 74.8 | 779.3 | 11.1 | \$ 6.0 | 189.8 | 1,908.3 | 28.2 | \$ 15.2 | 6.7 | 1.8 | \$ 43 | 17.3 |
| (gas) | 2014 | [3.5] | \$ 50 | - | 72.4 | - | \$ 1.0 | - | 183.9 | - | \$ 2.5 | 10.7 | 1.1 | \$ 1.7 | 1.6 |
| Clothes washers (total) ⁶ | 2015 | 244 | \$ 96 | 78.3 | 1,229.5 | 11.6 | \$ 11.8 | 156.7 | 2,401.4 | 23.3 | \$ 23.6 | - | 4.0 | \$ 290 | 25.8 |
| (electricity - machine) | 2015 | 22 | \$ 9 | 15.4 | 160.1 | 2.3 | \$ 1.2 | 30.7 | 308.9 | 4.6 | \$ 2.5 | 2.5 | 7.1 | \$ 6 | 3.4 |
| (electricity - water heating) | 2015 | 222 | \$ 87 | 63.0 | 656.4 | 9.4 | \$ 5.1 | 125.9 | 1,266.4 | 18.7 | \$ 10.1 | - | - | \$ 26 | 13.8 |
| (gas) | 2015 | [10.1] | \$ 87 | - | 413.0 | - | \$ 5.5 | - | 826.1 | - | \$ 11.1 | 2.9 | 5.3 | \$ 15 | 8.7 |
| (water) | 2015 | [5233.5] | \$ - | Bil. Gal.--> | 5.7 | - | \$ - | Bil. Gal.--> | 11.3 | - | \$ - | - | - | \$ 243 | - |
| Direct heaters | 2013 | 48 | \$ 326 | - | 179.8 | - | \$ 2.6 | - | 362.1 | - | \$ 5.3 | 4.9 | 2.2 | \$ 19 | 3.8 |
| (gas) | 2013 | [55.4] | \$ 326 | - | 214.8 | - | \$ 2.9 | - | 429.7 | - | \$ 5.8 | 4.4 | 2.4 | \$ 22 | 4.5 |
| External power supplies | 2013 | 2 | \$ 1 | 42.8 | 446.4 | 5.9 | \$ 3.4 | 42.8 | 430.7 | 5.9 | \$ 3.4 | 5.9 | 0.8 | \$ (5) | 6.5 |
| Furnaces (gas) | 2013 | [66.9] | \$ 520 | - | 576.0 | - | \$ 7.7 | - | 1,343.9 | - | \$ 18.0 | 5.8 | 2.0 | \$ 57 | 12.4 |
| Furnaces (oil) | 2013 | [27.6] | \$ 17 | - | 54.8 | - | \$ 1.1 | - | 127.8 | - | \$ 1.7 | 0.5 | 77.4 | \$ 17 | 1.2 |
| Furnace fans | 2016 | 611 | \$ 100 | 149.3 | 1,556.0 | 77.3 | \$ 12.0 | 481.0 | 4,836.7 | 249.2 | \$ 38.6 | 2.0 | 4.9 | \$ 180 | 38.9 |
| Microwave ovens | 2012 | 16 | \$ 2 | 36.5 | 380.8 | 5.4 | \$ 2.9 | 38.7 | 389.0 | 5.8 | \$ 3.1 | 1.8 | 4.0 | \$ 19 | 5.8 |
| Pool heaters | 2013 | [20] | \$ 44 | - | 60.8 | - | \$ 0.8 | - | 60.8 | - | \$ 0.8 | 1.6 | 3.1 | \$ 5 | 0.9 |
| Refrigerators | 2014 | 130 | \$ 52 | 137.1 | 1,429.2 | 20.6 | \$ 11.0 | 348.0 | 3,500.0 | 52.3 | \$ 27.9 | 5.0 | 2.4 | \$ 105 | 31.8 |
| Room AC | 2014 | 86 | \$ 35 | 35.1 | 365.7 | 49.4 | \$ 2.8 | 67.5 | 678.4 | 95.0 | \$ 5.4 | 5.1 | 1.8 | \$ 16 | 7.6 |
| Water heaters | 2013 | - | \$ - | 159.5 | 2,646.1 | 22.0 | \$ 26.0 | 297.8 | 4,567.6 | 41.1 | \$ 45.0 | - | 3.6 | \$ 227 | 53.0 |
| (electricity) | 2013 | 220 | \$ 65 | 159.5 | 1,662.7 | 22.0 | \$ 12.8 | 297.8 | 2,994.2 | 41.1 | \$ 23.9 | 3.7 | 2.7 | \$ 103 | 34.1 |
| (gas) | 2013 | [14] | \$ 30 | - | 983.4 | - | \$ 13.2 | - | 1,573.4 | - | \$ 21.1 | 1.6 | 5.6 | \$ 124 | 18.9 |
| Commercial | | | | | | | | | | | | | | | |
| Beverage vending machines | 2012 | 682 | \$ 157 | 6.8 | 71.0 | 1.6 | \$ 0.4 | 11.2 | 112.9 | 2.6 | \$ 0.7 | 3.5 | 2.9 | \$ 4 | 1.4 |
| Commercial boilers | 2013 | [513.6] | \$ 2,968 | - | 110.8 | - | \$ 1.4 | - | 258.5 | - | \$ 3.2 | 4.7 | 3.2 | \$ 18 | 2.4 |
| Clothes washers (total) ⁶ | 2012 | - | \$ 503 | 8.2 | 173.9 | 2.7 | \$ 1.7 | 10.2 | 214.6 | 3.4 | \$ 2.0 | 7.5 | 1.1 | \$ 1 | 3.0 |
| (electricity) | 2012 | 208 | \$ 446 | 8.2 | 85.1 | 2.7 | \$ 0.5 | 10.2 | 103.0 | 3.4 | \$ 0.7 | - | - | \$ (16) | 1.5 |
| (gas) | 2012 | [26.8] | \$ 57 | - | 88.9 | - | \$ 1.2 | - | 111.5 | - | \$ 1.4 | - | - | \$ 9 | 1.5 |
| (water) | 2012 | [5827] | \$ - | Bil. Gal.--> | 0.2 | - | \$ - | Bil. Gal.--> | 0.3 | - | \$ - | - | - | \$ 9 | - |
| Fluorescent ballasts | 2014 | 18 | \$ 2 | 48.0 | 500.2 | 15.7 | \$ 3.2 | 118.4 | 1,190.7 | 38.7 | \$ 9.5 | 1.8 | 6.2 | \$ 39 | 11.1 |
| Fluorescent lamps | 2012 | 11 | \$ 2 | 524.7 | 5,469.1 | 171.7 | \$ 34.6 | 524.7 | 5,276.0 | 171.7 | \$ 34.6 | 3.3 | 1.4 | \$ 91 | 89.5 |
| Incandescent reflector lamps | 2012 | 62 | \$ 3 | 155.1 | 1,616.4 | 38.3 | \$ 10.2 | 155.1 | 1,559.3 | 38.3 | \$ 10.2 | 0.7 | 2.3 | \$ 70 | 29.7 |
| BR \ exempted reflector lamps | 2013 | 38 | \$ 1 | 70.4 | 733.3 | 17.4 | \$ 4.6 | 70.4 | 707.4 | 17.4 | \$ 4.6 | 0.6 | 1.9 | \$ 21 | 13.5 |
| Liquid-immersed transformers | 2016 | 2 | \$ 2 | 21.3 | 222.0 | 2.9 | \$ 1.4 | 68.6 | 690.1 | 9.5 | \$ 4.5 | 14.4 | 1.1 | \$ 2 | 5.5 |
| Low-voltage dry type transformers | 2016 | 25 | \$ 5 | 52.6 | 548.1 | 7.3 | \$ 4.2 | 169.4 | 1,703.8 | 23.4 | \$ 11.2 | 3.3 | 4.7 | \$ 68 | 13.7 |
| Metal halide lamp fixtures | 2015 | 360 | \$ 35 | 94.2 | 982.4 | 30.8 | \$ 7.6 | 265.6 | 2,670.7 | 86.9 | \$ 17.5 | 1.5 | 8.5 | \$ 99 | 22.9 |
| Reach-in refrigerators and freezers | 2016 | 1,658 | \$ 199 | 16.3 | 169.4 | 3.8 | \$ 1.3 | 43.3 | 435.9 | 10.1 | \$ 2.9 | 1.8 | 4.9 | \$ 12 | 4.1 |
| Small electric motors | 2015 | 132 | \$ 20 | 76.8 | 800.8 | 12.2 | \$ 6.2 | 97.8 | 983.2 | 15.5 | \$ 6.4 | 2.3 | 2.5 | \$ 26 | 12.7 |
| Walk-in refrigerators and freezers | 2015 | 2,128 | \$ 273 | 12.1 | 126.3 | 2.8 | \$ 1.0 | 26.4 | 265.8 | 6.1 | \$ 1.7 | 1.9 | 4.6 | \$ 8 | 2.8 |
| Total | | | | 2,104 | 24,477 | 665 | \$ 191 | 3,746 | 42,521 | 1,363 | \$ 345 | | | \$ 1,599 | 477 |

| 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 | 161.0 | 110.0 | 507.0 | 161.0 | 110.0 | 507.0 |
| Central AC & HP | 0.1 | 64.4 | 296.9 | 320.2 | 218.7 | 1008.0 |
| Clothes dryers | 67.8 | 46.7 | 201.2 | 172.1 | 118.5 | 510.7 |
| | (electricity) | 63.9 | 43.6 | 201.2 | 162.2 | 110.8 |
| | (gas) | 3.9 | 3.0 | 0.02 | 10.0 | 7.7 |
| Clothes washers | 89.3 | 63.0 | 210.9 | 178.6 | 126.0 | 421.7 |
| Direct heaters ⁸ | 8.8 | 7.0 | -9.0 | 0.02 | 14.0 | -17.9 |
| External power supplies | 36.6 | 25.0 | 115.2 | 36.6 | 25.0 | 115.2 |
| Furnaces (gas) | 31.2 | 24.1 | 0.2 | 72.8 | 56.2 | 0.4 |
| Furnaces (oil) | 3.0 | 2.3 | 0.01 | 6.9 | 5.3 | 0.03 |
| Furnace fans | 127.6 | 87.1 | 401.6 | 477.4 | 280.7 | 1294.1 |
| Microwave ovens | 31.2 | 21.3 | 98.3 | 167.7 | 22.6 | 104.1 |
| Pool heaters | 3.3 | 2.5 | 0.02 | 3.3 | 2.5 | 0.02 |
| Refrigerators | 117.2 | 80.0 | 368.9 | 297.5 | 203.2 | 936.5 |
| Room AC | 30.0 | 20.5 | 94.4 | 57.7 | 39.4 | 181.5 |
| Water heaters | 189.6 | 134.6 | 429.5 | 339.7 | 239.6 | 801.6 |
| | (electricity) | 136.3 | 93.1 | 429.2 | 254.5 | 173.8 |
| | (gas) | 53.3 | 41.1 | 0.3 | 85.2 | 65.8 |
| Commercial | | | | | | |
| Beverage vending machines | 5.8 | 4.0 | 18.3 | 9.6 | 6.6 | 30.2 |
| Commercial boilers | 6.0 | 4.6 | 0.03 | 14.0 | 10.8 | 0.07 |
| Clothes washers | 11.8 | 8.5 | 22.0 | 14.8 | 10.6 | 27.6 |
| Fluorescent ballasts | 41.0 | 28.0 | 129.1 | 101.2 | 69.1 | 318.6 |
| Fluorescent lamps | 448.4 | 306.2 | 1411.7 | 448.4 | 306.2 | 1411.7 |
| Incandescent reflector lamps | 132.5 | 90.5 | 417.2 | 132.5 | 90.5 | 417.2 |
| BR \ exempted reflector lamps | 60.1 | 41.1 | 189.3 | 60.1 | 41.1 | 189.3 |
| Liquid-immersed transformers | 18.2 | 12.4 | 57.3 | 58.6 | 40.1 | 184.6 |
| Low-voltage dry type transformers | 44.9 | 30.7 | 141.5 | 144.8 | 98.9 | 455.9 |
| Metal halide lamp fixtures | 80.5 | 55.0 | 253.6 | 227.0 | 155.0 | 714.6 |
| Reach-in refrigerators and freezers | 13.9 | 9.5 | 43.7 | 37.0 | 25.3 | 116.6 |
| Small electric motors | 65.7 | 44.8 | 206.7 | 83.6 | 57.1 | 263.1 |
| Walk-in refrigerators and freezers | 10.4 | 7.1 | 32.6 | 22.6 | 15.4 | 71.1 |
| Total | 1,836 | 1,331 | 5,638 | 3,646 | 2,388 | 10,064 |

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.