Status Report:
Regulations Establishing Energy Efficiency Standards Pursuant to Article 16 of the Energy Law

This report is submitted Pursuant to Energy Law Section 16-106(4) | March 2021

NEW YORK STATE OF OPPORTUNITY. | NYSERDA | Department of State

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Table of Contents

List of Figures

1 Introduction

In compliance with subdivision four of section 16-106 of the Energy Law, the Secretary of State (the Secretary) and the president of the New York State Energy Research and Development Authority (NYSERDA) respectfully submit the following report on the status of regulations establishing energy efficiency performance standards. This report also sets forth the estimated potential annual reductions in energy use and potential utility bill savings resulting from adopted performance standards for the years 2025 and 2035 as well as the potential cumulative reductions in energy use through the year 2035.

1.1 Background

In Chapter 431 of the Laws of 2005, known as the Appliance and Equipment Energy Efficiency Act of 2005, a new Article 16 was added to the Energy Law for the purpose of establishing energy efficiency performance standards for the following 14 categories of appliances and equipment: automatic commercial ice cube machines; ceiling fan light kits; commercial pre-rinse spray valves; commercial refrigerators, freezers, and refrigerator-freezers; consumer audio and video products; illuminated exit signs; incandescent reflector lamps; large commercial packaged air-conditioning and heating equipment; metal halide lamp fixtures; pedestrian traffic signal modules; power supplies; torchiere lighting fixtures; unit heaters; and vehicular traffic signal modules.

Chapter 222 of the Laws of 2010 amended Article 16 by adding portable light fixtures, bottle-type water dispensers, commercial hot food holding cabinets, portable electric spas, lamps, and residential pool pumps to the list of product categories to be regulated under Article 16.

Paragraphs (a) and (c) of subdivision 2 of Section 16-106 of the Energy Law authorize the Secretary, in consultation with the president of NYSERDA, to adopt regulations establishing: (1) energy efficiency performance standards for new products of the types mentioned above; (2) procedures for testing the energy efficiency of such products; (3) procedures for manufacturers to certify such products meet the energy efficiency standards to be promulgated under Article 16; and (4) such further standards and procedures as are necessary to insure the proper implementation and enforcement of the provisions of Article 16. Section 16-106 also authorizes the Secretary of State to establish energy efficiency performance standards for products subject to Article 16, including standards applicable to the active

mode, the no-load mode, or the standby-passive mode of such products, and to promulgate regulations that impose such standards. In accordance with the directive of section 16-106, the Secretary would establish such standards and promulgate such regulations in consultation with the president of NYSERDA.

Chapter 69 of the Laws of 2020 amended section 16-106 of the Energy Law to require the Secretary of State and the president of NYSERDA to produce a report on the status of regulations establishing energy efficiency performance standards pursuant to Article 16 of the Energy Law. The report is required to set forth the estimated potential annual reductions in energy use and potential utility bill savings resulting from adopted performance standards for the years 2025 and 2035 and the potential cumulative reductions in energy use through the year 2035.

The Department of State and NYSERDA both agree that NYSERDA would be the appropriate entity to promulgate the energy efficiency performance standards for appliances and to ensure compliance with such standards. However, additional legislation would be necessary to address this issue. In addition, NYSERDA recommends amendments to Article 16 of the Energy Law to include additional products based on the results of a study conducted on NYSERDA's behalf and as further set forth in appendix B to this report.

1.2 Context for Appliance Standards in New York State

In 2019, New York State passed the country's most ambitious clean energy and carbon reduction legislation, setting the State's path to decarbonizing its electric grid by 2040 and achieving carbon neutrality by 2050. To enable this clean energy transition, energy efficiency polices that will deliver large-scale economic and environmental benefits must be enacted.

Energy efficiency has long been recognized as the least expensive tool available to states in the fight against climate change.[1] With a national average cost of 3.1 cents per kilowatt-hour saved,[2] utility energy efficiency programs have a lower average cost per kilowatt-hour than other clean energy options. Moreover, energy efficiency standards are even more cost-effective than utility energy efficiency programs. This is because whereas efficiency programs rely heavily on rebates to incentivize efficiency, adopting cost-effective efficiency standards automatically, persistently transforms the entire market as

new products that meet the standards replace old, inefficient products. Because standards are screened to ensure they are cost-effective means that every purchase of a new, efficient product results in not only less energy waste, cleaner air, and less climate pollution but also net economic benefits for consumers.

At the most basic level, appliance standards3 limit wasted energy and water in the products used by households and businesses every day through regulations that keep energy-inefficient products out of the market, while at the same time preserving quality and affordability. Appliance standards can cover any device that uses energy or water, including home appliances, plumbing products, lighting products, and commercial and industrial equipment.[4] Starting with kitchen appliances and expanding to more than 50 categories over the last 30 years, national appliance standards currently save the average New York family more than $500 per year[5] and contribute 11% toward the carbon reductions the United States needs to meet for its 2025 target.[6] Although states cannot set standards for product categories that are already covered by national standards, New York State still has a wide range of options for state-level appliance standards. The Climate Leadership and Community Protection Act (Climate Act) and the 2018 "New Efficiency: New York" white paper identified appliance standards as a key efficiency strategy for New York State in the coming years. By setting efficiency standards that reduce energy and water use for everyday items, appliance standards save New Yorkers money, remove the worst-performing products from the market, and help New York meet its climate goals.

1.3 Status of Appliance Standards in New York State

To date, New York State has not adopted efficiency standards for the products listed in Article 16. However, the federal government has established efficiency standards for certain categories of appliances and equipment, including many of the categories covered by Article 16. In general, the federal standards pre-empt any state-adopted standard, unless the state adopting such standard applies for and obtains a waiver from the federal government. A state can set standards for products that are not subject to federal standards.

Section 16-106(1)(b) of the Energy Law provides that "no standard adopted pursuant to this article shall go into effect if federal government energy efficiency performance standards regarding such product preempt state standards unless preemption has been waived pursuant to federal law."

Article 16 currently identifies 19 product categories that are eligible for New York State efficiency standards. Of those 19 product categories (listed below in Table 1), 14 categories are currently preempted by federal standards, and five categories are not currently preempted by federal standards.

(Note: preemptive federal standards for residential pool pumps are scheduled to take effect on July 19, 2021. For the purposes of this report, residential pool pumps are included in the list of currently preempted categories.)

Table 1. Preemption Status of Product Categories Currently Covered by Article 16

Preempted Categories	Categories Not Preempted
Automatic commercial ice cube machines	Bottle-type water dispensers
Ceiling fan light kits	Portable electric spas
Commercial pre-rinse spray valves	Consumer audio and video products (includes televisions)
Commercial refrigerators, freezers, and refrigerator-freezers	Portable light fixtures
Illuminated exit signs	Commercial hot food holding cabinets
Incandescent reflector lamps	
Very large commercial packaged air-conditioning and heating equipment	
Metal halide lamp fixtures	
Pedestrian traffic signal modules	
Power supplies	
Residential pool pumps	
Torchiere lighting fixtures	
Unit heaters	
Vehicular traffic signal modules	

The study which was commissioned by NYSERDA and which serves, in large part, as the basis for this report indicates that adopting New York State standards for four of the product categories that are not currently subject to federal preemption (bottle-type water dispensers, portable electric spas, consumer audio and video products, and portable light fixtures) would be considered cost-effective for New Yorkers by delivering savings from consumer energy and water bills that more than pay for any incremental first cost (listed below in Table 2). The study also indicates that adopting New York State standards for one of the product categories not currently subject to federal preemption (commercial hot food holding cabinets) would not be cost effective for New Yorkers.

Table 2. Cost-Effectiveness of Adopting New York State Efficiency Standards for Product Categories Not Currently Subject to Federal Preemption

Product Category	Cost-Effective?
Bottle-type water dispensers	Yes
Portable electric spas	Yes
Consumer audio and video products	Yes
Portable light fixtures	Yes
Commercial hot food holding cabinets	No

This report will focus on product categories that are not currently subject to federal preemption. For the currently authorized product categories, the product categories include:

- **Bottle-type water dispensers** (defined in Article 16 as a water dispenser that uses a bottle or reservoir as the source of potable water).
- **Portable electric spa** (defined in Article 16 as a factory-built electric spa or hot tub, supplied with equipment for heating and circulating water.)
- **Consumer audio and video products** (defined in Article 16 as a television, compact audio product, digital versatile disc player, digital versatile disc recorder, and digital television adapter[7]).
- **Portable light fixture** (defined in Article 16 as a light fixture which has a flexible cord and an attachment plug for connection to a nominal one hundred twenty-volt, fifteen- or twenty-ampere branch circuit, which can be relocated by the user without any rewiring, and which is typically controlled with a switch located on the light fixture itself or on the power cord. However, this does not include plug-in nightlights; sun and heat lamps; aquarium lamps; medical and dental lights; portable electric hand lamps; signs and commercial advertising displays; photographic lamps; germicidal lamps; metal halide lamp fixtures; torchiere lighting fixtures; portable lamp fixtures for marine use or for use in hazardous locations as defined in the national electrical code, ANSI/NFPA 70; or decorative lighting outfits or electric candles and candelabras without lampshades that are covered by the standard for safety of seasonal and holiday decorative products, UL 588).
- **Commercial hot food holding cabinet** (defined in Article 16 as a heated, fully enclosed compartment, with one or more solid or partial glass doors, that is designed to maintain the temperature of hot food that has been cooked in a separate appliance, but not including heated glass merchandising cabinets, drawer warmers, or cook-and-hold appliances).

Standards for product categories in Article 16 of the Energy Law for which New York State already has authority to set state standards[8] could achieve 586 GWh of electricity savings and a $35 million reduction in energy bills in 2025 and 1,027 GWh of electricity savings and a $52 million reduction in energy bills in 2035. Standards for those same authorized, non-preempted product categories could achieve 10,960 gigawatt-hours (GWh) of cumulative electricity savings from 2021 through 2035.

In addition to the Article 16 efficiency standards noted above, water efficiency has also been advanced in the 2017 update to the Uniform Fire Prevention and Building Code[9] and enacted legislation, under Chapter 578 of the laws of 2019 (Chapter 578).[10] These changes represent some progress in establishing water efficiency standards, but they do not fully capitalize on the energy, water, and greenhouse gas (GHG) savings potential of water efficiency appliance standards. Future action on appliance standards will allow for the full realization of the remaining water efficiency potential as well as the full efficiency potential of many other state appliance standards opportunities.

1.4 Delivering for New York State Consumers and Businesses

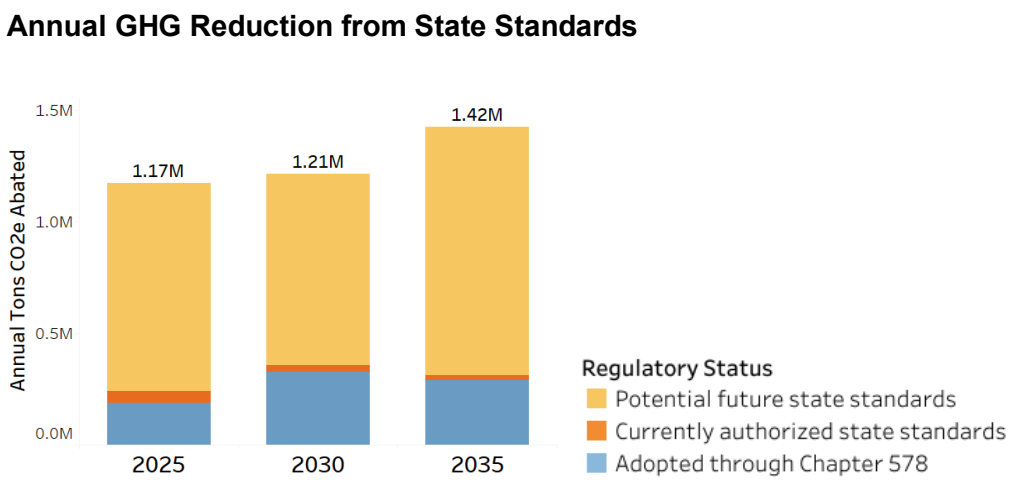
Current and future appliance standards (future standards are identified in Appendix B Benefits from Potential Future Appliance Standards), can have a real and material impact on the bottom line for New York State consumers and businesses. By 2035, products installed in the State that are subject to the current and future appliance standards analyzed for this report could generate $15 billion in net present value for New Yorkers ($3.4 billion from water standards as a result of Chapter 578 and currently authorized energy standards, and $11.6 billion from future standards). Energy savings also result in large-scale carbon reductions, cutting statewide GHG emissions by 1.4 million tons of CO_2e per year by 2035, equivalent to 87% of the annual GHG emissions from all activities in Albany, NY.

State appliance standards can provide outsized benefits to New Yorkers with the greatest economic needs. The annual utility and water bill savings from State standards would outweigh the annual incremental first costs even in the first year that standards went into effect (modeled as 2021). The statewide net economic benefits for low- and moderate-income (LMI) households would steadily increase each year thereafter as more LMI households purchase new products that meet the standards and the total number of efficient products in operation grows. The State appliance standards analyzed in this report can provide an additional $500 million per year in net economic benefits to low- and moderate-income households by 2030 and about $6 billion overall through 2035.[11]

Not only can State appliance standards achieve large net economic benefits over the full product lifetime, but they also have short payback periods. For many product categories analyzed, more efficient products do not have any detectable or systematic incremental first cost.[12] In aggregate, the expanded State standards analyzed have a simple payback period of seven months.

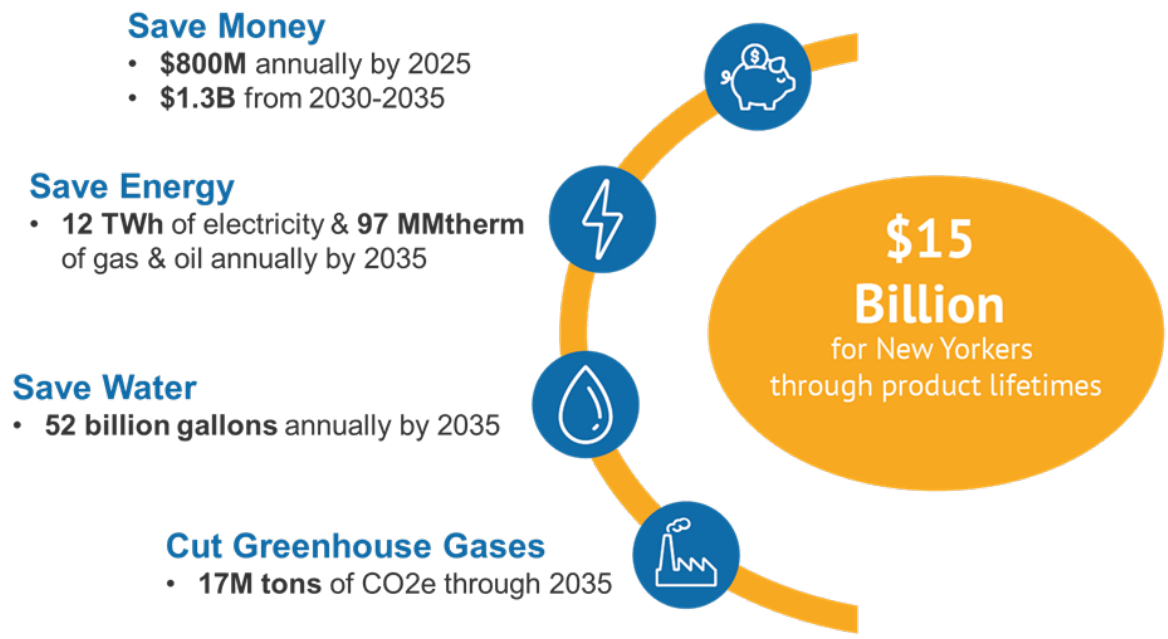
As demonstrated in the Figure 1 below, currently authorized appliance standards only provide a small piece of the savings potential for New Yorkers, leaving significant savings available for New York State with additional standards. By passing and enacting legislation, the State can deliver the full potential for New Yorkers with appliance standards. Figure 1 shows the GHG reduction that will be achieved through the Uniform Fire Prevention and Building Code and Chapter 578, the GHG reduction potential of currently authorized State standards, and the GHG reduction potential for future State appliance standards.

Figure 1. Annual GHG Reduction from State Standards, Including Chapter 578 and Standards Opportunities



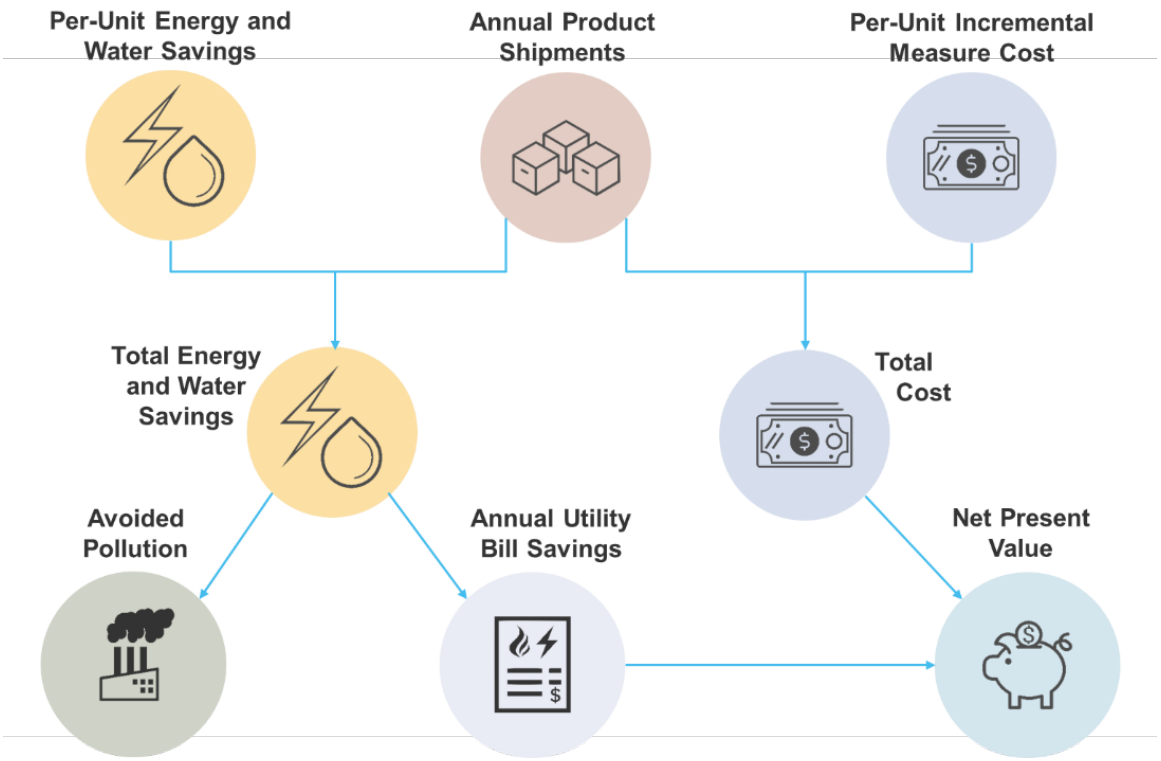
Action now through legislation and regulation can save New Yorkers $15 billion over the product lifetimes. By 2030, the annual net benefits in New York State would be greater than the entire gross domestic product (GDP) of Seneca County. By 2025, the average household could be saving $85/year on utility bills, and by 2030 each household will be saving $135/year. At the same time, the State can make significant strides toward achieving ambitious climate goals, saving 12 trillion watt-hours (TWh) of electricity annually by 2035 (8% of New York's 2018 consumption), and keeping 1.4 million (M) tons of CO_2e out of the atmosphere every year by 2035, which is equivalent to taking 300,000 cars off the road. All told, appliance standards represent one of the most cost-effective, consumer oriented GHG emission reduction strategies available, and now is the time for New York State to act.

Figure 2. Overview of Benefits for the Expanded New York State Appliance Standards



1.5 Methodology for Modeling New York State Impacts

Figure 3. Summary of Modeling Methodology



1.6 Potential Annual Reductions in Energy Use and Utility Bill Savings

The study underlying this report, conducted on behalf of NYSERDA, estimated the annual energy, water, and utility bill savings, as well as avoided pollution, for each appliance standard. The project team also estimated the additional cost to consumers to buy more efficient products that meet each standard (i.e., the "incremental measure cost") as well as assessed the cost-effectiveness of each standard and the net benefits by comparing the incremental measure cost with the consumer energy and water bill savings over the product lifetime. New standards that were not cost-effective were excluded from the analysis.

The project team first compiled data on annual product shipments, per-unit energy and water savings, product lifetime, and per-unit incremental measure costs. The team applied a variety of adjustments to make the analysis specific to New York State (e.g., accounting for the availability of certain products common in the State compared to the nation) and to avoid overclaiming savings (e.g., not claiming savings for the fraction of products that would already meet the efficiency standard level). By combining data on the average lifetime and the annual shipments of each product, the team created a stock turnover model to estimate the total stock of the more efficient products in each year. Multiplying the stock of efficient products by the per-unit energy and water savings estimates, the project team calculated statewide energy and water savings in each year. Similarly, they multiplied the number of annual product shipments by the per-unit incremental cost to estimate the statewide costs of buying more efficient equipment in each year.

To convert the energy and water saving estimates to bill savings, the project team multiplied energy and water savings by a forecast of energy and water prices in New York State from 2022 through 2035 in each sector of the economy. They used average statewide 2019 utility rates and the 2019 Energy Information Administration (EIA) Annual Energy Outlook for the Mid-Atlantic Region to forecast price growth, indexed to 2019 New York State prices.

Similarly, the avoided pollution was determined by multiplying the energy and water savings estimates by the emission intensity of energy—that is, the amount of CO_2e pollution per unit of electricity, natural gas, and fuel oil delivered to a building. Pollution related to water was only included through the energy use associated with heating water. Energy associated with pumping water or with wastewater were not included in these estimates.

Finally, standards are considered to be cost-effective when the consumer energy and water bill savings from the standards outweigh estimates of the cost to make products more efficient to meet those standards. Those future savings were compared to the added cost using a 5% real discount rate to determine the net present value of each standard under the conservative assumption that the real incremental measure cost will be constant.

Further explanations and definitions of these inputs and outputs for the models can be found in Appendix C: Modeling Inputs and Outputs.

The results of the study concerning the Energy Law Article 16 products not currently preempted by federal law (i.e., bottle-type water dispensers, portable electric spas, consumer audio and video products, products, portable light fixtures, and commercial hot food holding cabinets) are set forth in Appendix A. Benefits from Appliance Standards.

The study also included the review of additional products that NYSERDA recommends for consideration by the legislature to be included in an amendment to Article 16 of the Energy Law. The results of this review are set forth in Appendix B. Benefits from Potential Future State Appliance Standards Recommended by NYSERDA.[13]

Appendix A. Benefits from Currently Authorized Energy Law Article 16 Appliance Standards

Table A-1. New York State Standards Market Size Estimates

Product Category	2021 Shipments	2021 Stock
Water dispensers	150,208	1,502,078
Portable electric spas	66,091	618,856
Audio/visual equipment (other than televisions)	1,388,270	7,496,660
Portable light fixtures	926,388	18,527,750
Televisions	2,366,281	14,197,689

Table A-2. Annual Energy Savings from New York State Standards

Product Category	Resource	2025	2030	2035
Bottle-type water dispensers	Electricity (GWh)	13.7	28.8	31.9
Portable electric spas	Electricity (GWh)	42.3	89.2	89.3
Audio/visual equipment (other than televisions)	Electricity (GWh)	47.8	58.5	58.5
Portable light fixtures	Electricity (GWh)	70.5	149.0	227.4
Commercial Hot food holding cabinets	Electricity (GWh)	26.3	52.5	63.0
Televisions	Electricity (GWh)	385.2	557.0	557.0

Table A-3. Annual GHG and Consumer Energy and Water Bill Savings from New York State Standards

Product Category	Utility Bill Savings			Emissions Abated (tons CO_2e)		
	2025	**2030**	**2035**	**2025**	**2030**	**2035**
Bottle-type water dispensers	$1M	$2M	$2M	2,064	1,593	1,762
Portable electric spas	$3M	$6M	$5M	10,664	8,231	12,565
Audio/visual equipment (other than televisions)	$5M	$5M	$4M	7,221	3,229	3,229
Portable light fixtures	$7M	$12M	$14M	78,698	138,479	121,389
Commercial Hot food holding cabinets	-$2M	$1M	$2M	3,570	2,755	3,627
Televisions	$21M	$31M	$25M	58,225	30,772	30,772

Table A-4. Lifetime Savings Potential from New York State Standards

Product Category	Electricity (GWh)	Fuel oil & natural gas (MMtherm)	Water (Bgallons)	Utility Bill
Bottle-type water dispensers	319	0	0	$24M
Portable electric spas	836	0	0	$54M
Audio/visual equipment (other than televisions)	316	0	0	$66M
Portable light fixtures	4,548	0	0	$138M
Televisions	3,342	0	0	$322M

Appendix B. Benefits from Potential Future State Appliance Standards Recommended by NYSERDA

NYSERDA recommends that the following products should be considered by the legislature to be added to section 16-104 of the Energy Law.

The following definitions refer to **air compressors**:

- **Air compressor**: a compressor designed to compress air that has an inlet open to the atmosphere or other source of air and is made up of a compression element (bare compressor), driver or drivers, mechanical equipment to drive the compressor element, and any ancillary equipment.
- **Compressor**: a machine or apparatus that converts different types of energy into the potential energy of gas pressure for displacement and compression of gaseous media to any higher-pressure values above atmospheric pressure and has a pressure ratio at full-load operating pressure greater than 1.3.

The following definitions refer to **air purifiers**:

- **Air purifier**, also known as **room air cleaner**: an electric, cord-connected, portable appliance with the primary function of removing particulate matter from the air and which can be moved from room to room.
- **Industrial air purifier**: an indoor air cleaning device manufactured, advertised, marketed, labeled, and used solely for industrial use that is marketed solely through industrial supply outlets or businesses and is prominently labeled as "Solely for industrial use. Potential health hazard: emits ozone."

Commercial battery charger systems (BCS) or state-regulated BCS: a battery charger (or chargers) coupled with batteries not within the scope of Department of Energy (DOE) efficiency standards for BCS defined in 10 C.F.R. section 430.32(z). “BCS” refers to a battery charger or chargers that are coupled with batteries, which together are referred to as state-regulated battery charger systems. This term covers all rechargeable batteries or devices incorporating a rechargeable battery and the chargers used with them. BCS include, but are not limited to the following:

1. Electronic devices with a battery that are normally charged from AC line voltage or DC input voltage through an internal or external power supply and a dedicated battery charger.
2. The battery and battery charger components of devices that are designed to run on battery power during part or all their operations.
3. Dedicated battery systems primarily designed for electrical or emergency backup.

4. Devices whose primary function is to charge batteries, along with the batteries they are designed to charge.

These units include chargers for power tool batteries and chargers for automotive, AA, AAA, C, D, or 9V rechargeable batteries, as well as chargers for batteries used in larger industrial motive equipment and à la carte chargers.

The charging circuitry of battery charger systems may or may not be located within the housing of the end-use device itself. In many cases, the battery may be charged with a dedicated external charger and power supply combination that is separate from the device that runs on power from the battery.

Commercial dishwasher: a machine designed to clean and sanitize plates, pots, pans, glasses, cups, bowls, utensils, and trays by applying sprays of detergent solution (with or without blasting media granules) and a sanitizing rinse for non-residential use.

Commercial fryer: an appliance for non-residential use, including a cooking vessel, in which oil is placed to such a depth that the cooking food is essentially supported by displacement of the cooking fluid rather than by the bottom of the vessel. Heat is delivered to the cooking fluid by means of an immersed electric element of band-wrapped vessel (electric fryers) or by heat transfer from gas burners through either the walls of the fryer or through tubes passing through the cooking fluid (gas fryers).

Commercial steam cooker, also known as **compartment steamer**: a device for non-residential use with one or more food-steaming compartments in which the energy in the steam is transferred to the food by direct contact. Models may include countertop models, wall-mounted models, and floor models mounted on a stand, pedestal, or cabinet-style base.

Computer: a device that performs logical operations and processes data. A computer includes both stationary and portable units as well as a desktop computer, a portable all-in-one, a notebook computer, a mobile gaming system, a high-expandability computer, a small-scale server, a thin client, and a workstation. Although a computer is capable of using input devices and displays, such devices are not required to be included with the computer when the computer is shipped. A computer is composed of, at a minimum, (a) a central processing unit (CPU) to perform operations or, if no CPU is present, then the device must function as a client gateway to a server, and the server acts as a computational CPU;

(b) the ability to support user input devices such as a keyboard, mouse, or touch pad; and (c) an integrated display screen or the ability to support an external display screen to output information. The term "computer" does not include a tablet, a game console, a television, a device with an integrated and primary display that has a screen size of twenty square inches or less, a server other than a small-scale server, or an industrial computer.

Computer monitor: an analog or digital device of diagonal screen size greater than or equal to seventeen inches and less than or equal to sixty-one inches—that has a pixel density of greater than five thousand pixels per square inch—and is designed primarily for the display of computer-generated signals for viewing by one person in a desk-based environment. A computer monitor is composed of a display screen and associated electronics. A computer monitor does not include (a) displays with integrated or replaceable batteries designed to support primary operation without AC mains or external DC power (e.g., electronic readers, mobile phones, portable tablets, battery-powered digital picture frames); or (b) a television or signage display.

Electric Vehicle Supply Equipment (EVSE): the conductors—including the ungrounded, grounded, and equipment grounding conductors—electric vehicle connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatuses installed specifically for the purpose of delivering energy from the wiring at a specific location to the electric vehicle. Charging cords with NEMA 5-15P and NEMA 5-20P attachment plugs are considered electric vehicle supply equipment. It excludes conductors, connectors, and fittings that are part of a vehicle.

Evaporative coolers (without compressors) or direct evaporative coolers (DEC) cool air by directly evaporating water into an airstream. As the water changes phases from a liquid to a vapor through the heat of vaporization, heat is drawn from the air and the air temperature is reduced. In low-humidity areas, evaporating water into the air provides a natural and energy efficient means of cooling. DECs, also called swamp coolers, rely on this principle, cooling outdoor air by passing it over water-saturated pads, causing the water to evaporate into the air. Unlike central air-conditioning systems that recirculate the same air, DECs provide a steady stream of fresh air into the facility and require an exhaust air (EA) path through the building.

Commercial and Industrial Fans & Blowers: a rotary-bladed machine used to convert power to air power, with a brake horsepower greater than or equal to either 1 kilowatt (kW) or 1 horsepower, and an air horsepower less than or equal to 150, used for commercial and industrial purposes.

The following definitions refer to **General Service Lamps**:

General Service Lamps (GSL)—Original Scope: includes general service incandescent lamps, compact fluorescent lamps, general service light-emitting diode lamps, organic light-emitting diode lamps, and any other lamps used to satisfy lighting applications traditionally served by general service incandescent lamps. However, this definition does not apply to any lighting application or bulb shape excluded from the "general service incandescent lamp" definition, or any general service fluorescent lamp or incandescent reflector lamp.

General service incandescent lamp: a standard incandescent or halogen type lamp that is intended for general service applications, has a medium screw base, a lumen range of not less than 310 lumens and not more than 2,600 lumens or, in the case of a modified spectrum lamp, not less than 232 lumens and not more than 1,950 lumens. It is capable of being operated at a voltage range at least partially within 110 and 130 volts; however, this definition does not apply to the following incandescent lamps:

a) appliance
b) black light
c) bug
d) colored
e) infrared
f) left-hand thread
g) marine
h) marine signal service
i) mine service
j) plant light
k) reflector
l) rough service
m) shatter-resistant lamp (including a shatter-proof lamp and a shatter-protected lamp)
n) sign service
o) silver bowl
p) showcase
q) 3-way incandescent
r) traffic signal
s) vibration service

t) G shape lamp (as defined in ANSI C78.20 and ANSI C79.1-2002) with a diameter of 5 inches or more.
u) T shape lamp (as defined in ANSI C78.20 and ANSI C79.1-2002) and that uses not more than 40 watts or has a length of more than 10 inches.
v) B, BA, CA, F, G16-1/2, G-25, G30, S, or M-14 lamp (as defined in ANSI C79.1-2002 and ANSI C78.20) of 40 watts or less.

General Service Lamps (GSLs)—Expanded Scope: a lamp that has an American national standards institute (ANSI) base; is able to operate at a voltage of 12 volts or 24 volts at or between 100 to 130 volts, at or between 220 to 240 volts, or at 277 volts for integrated lamps, or is able to operate at any voltage for non-integrated lamps; has an initial lumen output of greater than or equal to 310 lumens (or 232 lumens for modified spectrum general service incandescent lamps) and less than or equal to 3,300 lumens; is not a light fixture; is not an LED downlight retrofit kit; and is used in general lighting applications. General service lamps include, but are not limited to, general service incandescent lamps, compact fluorescent lamps, general service light-emitting diode lamps, and general service organic light-emitting diode lamps.General service lamps do not include the following:

a) appliance
b) black light
c) bug lamps
d) colored lamps
e) G shape lamps with a diameter of five inches or more as defined in ANSI C79.1-2002
f) general service fluorescent
g) high-intensity discharge
h) infrared
i) J, JC, JCD, JCS, JCV, JCX, JD, JS, and JT shape lamps that do not have Edison screw bases
j) lamps that have a wedge base or pre-focus base
k) left-hand thread
l) marine
m) marine signal service
n) mine service
o) MR shape lamps that have a first number symbol equal to 16 (diameter equal to 2 inches) as defined in ANSI C79.1-2002, operate at 12 volts, and have a lumen output greater than or equal to 800.

p) other fluorescent
q) plant light
r) R20 short
s) reflector lamps that have a first number symbol less than 16 (diameter less than 2 inches) as defined in ANSI C79.1-2002 and that do not have E26/E24, E26d, E26/50x39, E26/53x39, E29/28, E29/53x39, E39, E39d, EP39, or EX39 bases.
t) S shape or G shape lamps that have a first number symbol less than or equal to 12.5 (diameter less than or equal to 1.5625 inches) as defined in ANSI C79.1-2002.
u) sign service
v) silver bowl
w) showcase
x) specialty MR
y) T shape lamps that have a first number symbol less than or equal to 8 (diameter less than or equal to 1 inch) as defined in ANSI C79.1-2002, nominal overall length less than twelve inches, and that are not compact fluorescent lamps.
z) traffic signal lamps

High-color rendering index (CRI) fluorescent lamp: a fluorescent lamp with a color rendering index of eighty-seven or greater that is not a compact fluorescent lamp.

Imaging equipment includes copiers, printers, scanners, fax machines, and multifunction devices used both in homes and in business.

Landscape irrigation controller: a device intended to remotely control valves to operate an irrigation system for landscapes, which may consist of grass, shrubs, trees and/or other vegetation. This product does not include devices that are typically sold separately and used primarily for other purposes, such as a network router, and may be used incidentally for a landscape irrigation controller. This definition does not include battery powered hose-end timers. This definition does not include devices primarily for use in agricultural applications.

Outdoor lighting: electrical lighting used to illuminate outdoor areas, including parking lot, streetlight, highway, and area luminaires.

Plug-in luminous signs: self-contained, luminous sign units that plug into 120V AC building mains power and is intended for indoor use only. Signs may be intended for use in commercial outlets (business establishments), or in residences.

Residential ventilating fan: a ceiling, wall-mounted, or remotely mounted in-line fan designed to be used in a bathroom or utility room to move objectionable air from inside the building to the outdoors.

Replacement dedicated-purpose pool pump motor: an electric motor that:

a) is single-phase or polyphase.
b) has a dedicated purpose pool pump motor total horsepower of less than or equal to 5 horsepower.
c) is marketed for use as a replacement motor in self-priming pool filter pump, non-self-priming pool filter pump, or in pressure cleaner booster pump applications.
d) excludes polyphase replacement dedicated-purpose pool pump motors capable of operating without a drive and is sold or offered for sale without a drive that converts single-phase power to polyphase power.

Small diameter directional lamp: a directional lamp that meets the following criteria:

a) capable of operating at 12 volts, 24 volts, or 120 volts.
b) has an ANSI ANSLG C81.61-2009 (R2014) compliant pin base or E26 base.
c) is a non-tubular directional lamp with a diameter of less than or equal to 2.25 inches.
d) has a lumen output of less than or equal to 850 lumens or has a wattage of 75 watts or less.
e) has a rated life greater than 300 hours.

Small diameter directional lamp includes incandescent filament, LED, and any other lighting technology that falls within this definition. Small diameter directional lamps do not include directional lamps with an E26 base that utilize light emitting diodes (LEDs) and are covered under the definition of LED lamps.

The following definitions refer to **spray sprinkler bodies**:

- **Pressure regulator**: a device that maintains constant operating pressure immediately downstream from the device, given higher pressure upstream.
- **Spray sprinkler body**: the exterior case or shell of a sprinkler incorporating a means of connection to the piping system designed to convey water to a nozzle or orifice.

Small network equipment: a device whose primary function is to pass Internet Protocol (IP) traffic among various network interfaces/ports intended for use in residential and small business settings.

State-regulated Light Emitting Diode (LED) lamp: a lamp capable of producing light with Duv between -0.012 and 0.012, and that has an E12, E17, E26, or GU-24 base, including LED lamps that are designed for retrofit within existing recessed can housings that contain one of the preceding bases. A LED lamp does not include a lamp with a brightness of more than 2,600 lumens or a lamp that cannot produce light with a correlated color temperature between 2200 K and 7000 K.

The following definitions refer to **faucets** and **showerheads**:

- **Faucet**: a lavatory faucet, kitchen faucet, metering faucet, public lavatory faucet, or replacement aerator for a lavatory, public lavatory, or kitchen faucet.
- **Public lavatory faucet**: a fitting intended to be installed in nonresidential bathrooms that are exposed to walk-in traffic.
- **Metering faucet**: a faucet that, when turned on, will gradually shut itself off over a period of several seconds.
- **Replacement aerator**: an aerator sold as a replacement, separate from the faucet to which it is intended to be attached.
- **Showerhead**: a fitting for spraying water onto a bather, typically from an overhead position.

The following definitions refer to **tub spout diverters:**

- **Tub spout diverter**: a bath and shower diverter whose diverter mechanism is located in the tub spout.
- **Bath and shower diverter**: a device used to direct the flow of water either toward a tub spout or toward a secondary outlet intended for showering purposes (e.g., showerhead, body spray).

The following definitions refer to **urinals** and **water closets**:

- **Plumbing fixture**: an exchangeable device, which connects to a plumbing system to deliver and drain away water and waste.
- **Urinal**: a plumbing fixture that receives only liquid body waste and conveys the waste through a trap into a drainage system.
- **Water closet**: a plumbing fixture having a water-containing receptor that receives liquid and solid body waste through an exposed integral trap into a drainage system.
- **Dual-flush effective flush volume**: the average flush volume of two reduced flushes and one full flush.
- **Dual-flush water closet**: water closet incorporating a feature that allows the user to flush the water closet with either a reduced or a full volume of water.
- **Trough-type urinal:** a urinal designed for simultaneous use by two or more persons.

Table B.1: New York State Standards Market Size Estimates

Product Category	2021 Shipments	2021 Stock
Air purifiers	637,523	5,737,704
Audio/visual equipment (other than televisions)	1,388,270	7,496,660
Commercial battery chargers	890,645	7,276,572
Commercial clothes dryers	17,174	257,606
Commercial dishwashers	9,043	119,361
Commercial fryers	6,008	72,100
Commercial ovens	6,330	75,957
Commercial steam cookers	904	10,851
Computers and monitors	5,407,643	27,038,213
Electric vehicle supply equipment	38,406	614,491
Evaporative coolers	50,075	500,750
C&I fans and blowers	89,884	2,013,409
Faucets	3,051,973	28,993,745
General service lamps expanded scope	36,979,717	298,520,834
General service lamps original scope	13,917,963	455,298,327
High CRI fluorescent lamps	951,684	8,768,227
Imaging equipment (residential and commercial)	2,191,683	11,177,583
Irrigation controllers	155,152	1,706,674
Lawn spray sprinklers	4,600,755	46,007,550
Outdoor lighting	149,489	2,391,822
Plug-in luminous signs	221,320	2,213,200
Pool pump replacement motors	17,432	122,027
Portable electric spas	66,091	618,856
Portable light fixtures	926,388	18,527,750
Showerheads	991,485	9,914,850
Small diameter directional lamps	1,009,357	10,093,568
Small network equipment	2,714,065	13,570,325
State-regulated LED lamps	25,451,667	509,033,333
Televisions	2,366,281	14,197,689
Toilets	1,036,388	21,473,951
Tub spout diverters	526,546	10,530,913
Urinals	72,432	869,184
Ventilation fans	480,720	4,807,200
Water dispensers	150,208	1,502,078

Table B-2. Cumulative Annual Energy and Water Savings from New York State Standards

Product Category	Resource	2025	2030	2035
Air purifiers	Electricity (GWh)	339.0	715.9	716.3
Audio/visual equipment (other than televisions)	Electricity (GWh)	47.8	58.5	58.5
Commercial battery chargers	Electricity (GWh)	88.7	167.8	167.8
Commercial clothes dryers	Electricity (GWh)	0.5	1.1	1.6
	Fuel Oil and Natural Gas (MMtherm)	5.2	10.9	16.6
Commercial dishwashers	Electricity (GWh)	19.6	41.3	58.7
	Fuel Oil and Natural Gas (MMtherm)	4.7	9.8	14.0
	Water (Bgallons)	0.6	1.4	1.9
Commercial fryers	Electricity (GWh)	2.7	5.6	7.4
	Fuel Oil and Natural Gas (MMtherm)	7.5	15.8	20.9
Commercial ovens	Electricity (GWh)	9.1	19.3	25.4
	Fuel Oil and Natural Gas (MMtherm)	0.9	1.8	2.4
Commercial steam cookers	Electricity (GWh)	17.7	37.5	49.3
	Fuel Oil and Natural Gas (MMtherm)	0.6	1.4	1.8
	Water (Bgallons)	0.3	0.6	0.7
Computers and monitors	Electricity (GWh)	211.6	338.1	338.1
Electric vehicle supply equipment	Electricity (GWh)	4.1	8.6	13.2
Evaporative coolers	Electricity (GWh)	18.9	39.9	44.2
C&I fans and blowers	Electricity (GWh)	122.9	259.6	396.3
Faucets (including savings from Chapter 578)	Electricity (GWh)	167.1	428.8	677.9
	Fuel Oil and Natural Gas (MMtherm)	15.9	32.0	27.2
	Water (Bgallons)	6.0	13.3	15.2
General service lamps expanded scope	Electricity (GWh)	1,643.3	2,698.3	3,833.9
General service lamps original scope	Electricity (GWh)	700.0	1,293.2	2,067.9
High CRI fluorescent lamps	Electricity (GWh)	84.8	84.8	0.0
Imaging equipment (res & comm)	Electricity (GWh)	406.7	497.7	497.7
Irrigation controllers	Electricity (GWh)	13.3	28.1	34.0
	Water (Bgallons)	2.5	5.2	6.3
Lawn spray sprinklers	Water (Bgallons)	8.3	17.5	19.4
Outdoor lighting	Electricity (GWh)	50.3	106.2	162.2
Plug-in luminous signs	Electricity (GWh)	58.3	123.1	136.1

Pool pump replacement motors	Electricity (GWh)	166.5	166.7	0.0
Portable electric spas	Electricity (GWh)	42.3	89.2	89.3
Portable light fixtures	Electricity (GWh)	70.5	149.0	227.4
Showerheads (savings from Chapter 578)	Electricity (GWh)	86.0	211.9	327.6
	Fuel Oil and Natural Gas (MMtherm)	8.5	16.4	13.4
	Water (Bgallons)	2.2	4.6	5.1
Small diameter directional lamps	Electricity (GWh)	442.9	973.7	1,164.4
Small network equipment	Electricity (GWh)	168.4	206.1	206.1
State-regulated LED lamps	Electricity (GWh)	134.3	273.4	412.6
Televisions	Electricity (GWh)	385.2	557.0	557.0
Toilets (savings from Chapter 578)	Water (Bgallons)	0.8	1.7	2.6
Tub spout diverters	Electricity (GWh)	8.2	17.4	26.5
	Fuel Oil and Natural Gas (MMtherm)	0.4	0.9	1.4
	Water (Bgallons)	0.1	0.1	0.2
Urinals (savings from Chapter 578)	Water (Bgallons)	0.2	0.3	0.5
Ventilation fans	Electricity (GWh)	2.7	5.6	6.2
Water coolers	Electricity (GWh)	20.1	42.4	46.9
Total	**Electricity (GWh)**	**5,533.2**	**9,645.2**	**12,288.5**
	Fuel Oil and Natural Gas (MMtherm)	**43.6**	**89.0**	**97.4**
	Water (Bgallons)	**20.9**	**44.7**	**51.9**

Table B-3. Annual GHG and Consumer Energy and Water Bill Savings from New York State Standards

Product Category	Utility Bill Savings			Emissions Abated (tons CO_2e)		
	2025	2030	2035	2025	2030	2035
Air purifiers	$38M	$61M	$48M	51,242	39,552	39,575
Audio/visual equipment (other than televisions)	$5M	$5M	$4M	7,221	3,229	3,229
Bottle-type water dispensers	$1M	$2M	$2M	2,064	1,593	1,762
C&I fans and blowers	$7M	$15M	$19M	18,585	14,345	21,898
Commercial battery chargers	$7M	$10M	$8M	13,413	9,269	9,269

Commercial clothes dryers	$3M	$4M	$5M	40,288	84,977	129,714
Commercial dishwashers	$9M	$19M	$24M	38,700	77,826	110,651
Commercial fryers	($1M)	$3M	$4M	58,916	123,880	163,085
Commercial ovens	$1M	$2M	$2M	8,172	15,405	20,280
Commercial steam cookers	$4M	$8M	$9M	7,750	12,772	16,815
Computers and monitors	$9M	$16M	$13M	31,983	18,678	18,678
Electric vehicle supply equipment	$0M	$1M	$1M	619	478	729
Evaporative coolers	$1M	$2M	$2M	2,858	2,206	2,440
Faucets (savings from Chapter 578)	$34M	$73M	$76M	106,059	186,097	163,223
Faucets (savings beyond Chapter 578)	$83M	$154M	$141M	42,327	84,808	84,153
General service lamps expanded scope	$193M	$238M	$255M	248,397	149,082	211,824
General service lamps original scope	$91M	$120M	$143M	105,814	71,452	114,253
High CRI fluorescent lamps	$1M	$1M	$0M	12,812	4,683	
Imaging equipment (residential and commercial)	$12M	$17M	$13M	2,009	1,551	1,878
Irrigation controllers	$23M	$57M	$60M	0	0	0
Lawn spray sprinklers	$104M	$215M	$193M	971	750	829
Non-bottle-type water dispensers	$1M	$1M	$1M	7,605	5,870	8,960
Outdoor lighting	$4M	$7M	$8M	8,810	6,801	7,521
Plug-in luminous signs	$4M	$7M	$6M	25,175	9,213	
Pool pump replacement motors	$16M			6,388	4,931	4,934
Portable electric spas	$3M	$6M	$5M	10,664	8,231	12,565
Portable light fixtures	$7M	$12M	$14M	78,698	138,479	121,389

Showerheads (Chapter 578)	$48M	$89M	$81M	0	0	0
Small diameter directional lamps	$59M	$85M	$77M	66,943	53,798	64,330
Small network equipment	$19M	$18M	$14M	25,459	11,386	11,386
State-regulated LED lamps	$6M	$16M	$21M	20,294	15,107	22,796
Televisions	$21M	$31M	$25M	58,225	30,772	30,772
Toilets (Chapter 578)	$11M	$21M	$29M	0	0	0
Tub spout diverters	$1M	$3M	$5M	4,702	8,262	12,612
Urinals (CHapter 578)	$2M	$4M	$4M	0	0	0
Ventilation fans	$0M	$0M	$0M	402	310	343
Total	**$829M**	**$1,326M**	**$1,312M**	**1.17M**	**1.22M**	**1.44M**

Table B-4. Lifetime Savings Potential from New York State Standards

Product Category	Electricity (GWh)	**Fuel** Oil and Natural Gas (MMtherm)	Water (Bgallons)	Utility Bill
Air purifiers	6,447	0	0	$645M
Audio/visual equipment (other than televisions)	316	0	0	$66M
Bottle-type water dispensers	319	0	0	$24M
C&I fans and blowers	8,878	0	0	$161M
Commercial battery chargers	1,371	0	0	$110M
Commercial clothes dryers	24	249	0	$51M
Commercial dishwashers	763	182	25	$216M
Commercial fryers	89	250	0	$15M
Commercial ovens	305	29	0	$19M
Commercial steam cookers	592	22	9	$94M
Computers and monitors	1,690	0	0	$161M
Electric vehicle supply equipment	211	0	0	$8M
Evaporative coolers	442	0	0	$21M
Faucets (including Chapter 578)	6,440	258	145	$2,408M

General service lamps expanded scope	60,576	0	0	$3,076M
General service lamps original scope	32,673	0	0	$1,516M
High CRI fluorescent lamps	781	0	0	$9M
Imaging equipment (res & comm)	2,538	0	0	$147M
Irrigation controllers	374	0	69	$582M
Lawn spray sprinklers	0	0	194	$2,202M
Outdoor lighting	2,595	0	0	$84M
Non-bottle-type water dispensers	150			$11M
Plug-in luminous signs	1,361	0	0	$78M
Pool pump replacement motors	1,685	0	0	$82M
Portable electric spas	836	0	0	$54M
Portable light fixtures	4,548	0	0	$138M
Showerheads (Chapter 578)	3,276	134	51	$944M
Small diameter directional lamps	11,644	0	0	$992M
Small network equipment	1,030	0	0	$233M
State-regulated LED lamps	8,252	0	0	$151M
Televisions	3,342	0	0	$322M
Toilets (Chapter 578)	0	0	54	$246M
Tub spout diverters	531	29	4	$36M
Urinals (Chapter 578)	0	0	5	$43M
Ventilation fans	62	0	0	$5M
Total	**164,141**	**1,153**	**556**	**$15.0B**

Appendix C. Modeling Inputs and Outputs

New York State Energy and Water Price Forecast

The research team used average statewide 2019 utility rates and the 2019 EIA Annual Energy Outlook for the Mid-Atlantic Region to forecast price growth, indexed to 2019 New York State prices.

Sector Allocation

The fraction of product shipments in each sector of the economy (residential, commercial, industrial and agricultural) was estimated by examining the sector allocations provided in efficiency standards rulemaking documentation or other published analyses. If the sector allocation was not explicitly defined, the research team relied on estimates from product category subject matter experts.

Shipments

The research team collected the national annual product shipments from Department of Energy (DOE) rulemaking documents, such as the National Impacts Analysis (NIA) spreadsheets. The research team collected shipments from state-level standards from California Energy Commission rulemaking documents.

New York State Shipment Adjustment Factor

The research team adjusted shipments to New York State values from national or California shipment data. Product shipments were first allocated to residential, commercial, industrial, and agricultural sectors. Then, depending on the sector, the shipments were scaled down to New York State values using a weighting factor based on population, number of households, GDP, and/or regional product saturation.

Annual New York State Shipments of the Product

For each standard, the research team calculated the New York State shipments of the products as the national shipments multiplied by the state shipment adjustment factor for that product and sector of the economy.

Per-unit Energy and Water Savings

The research team collected incremental annual energy and water savings from resources such as U.S. Department of Energy rulemaking documentations, California Energy Commission rulemakings documents, or other published reports.

Effective Date

For state standards, the research team assumed an effective date of January 1, 2021.

Simple Payback

To calculate the simple payback for each standard, the research team divided the per-unit incremental measure cost by the per-unit, first-year annual consumer energy and water bill savings. The research team calculated the per-unit first-year annual consumer energy and water bill savings by multiplying the per-unit energy and water savings by the energy and water prices during the standard's effective year.

For standards that require a switch to LED lamps, consumers save money because they do not have to replace lamps as often, so the research team accounted for these avoided replacement lamp costs when calculating simple payback. For these standards, the research team annualized avoided replacement lamp costs and added them to first-year annual consumer energy and water bill savings. The annualized avoided replacement costs were calculated as the per-unit cost of a base case product divided by the average lifetime of a base case product. These lamp measures have short base case lifetimes, with base case products on average requiring replacement every two years. The research team implicitly made the assumption that the distribution of lamp replacements in New York could be approximated as a constant annualized rate.

Discount Rate

The research team used a 5% real discount rate to convert future costs and benefits to present value (2019 $). The research team chose the same discount rate that the Appliance Standards Awareness Project used in the 2019 Model Bill Report. The research team also ran the model at 3%, 7% and 13% real discount rates to understand the sensitivity of the results to assumptions about inflation and opportunity cost of investment.

Net Present Value

To calculate the net present value for each standard during the analysis period (2021-2035), the research team subtracted the present value of the annual, statewide, incremental first costs from the present value of the annual statewide consumer energy and water bill savings.

Cost-Effectiveness Screening

Standards are found to be cost-effective when the NPV of consumer energy and water bill savings from the standards outweigh estimates of the cost to make products more efficient to meet those standards, at a 5% real discount rate.

Derivation Annual Consumer Energy and Water Bill Savings ($)

The research team calculated annual, statewide consumer energy and water bill savings by multiplying the fully adjusted annual energy and water savings by the annual prices for energy and water.

Annual, Statewide, Incremental First Costs ($)

The research team calculated the annual, statewide, incremental first costs by multiplying the annual New York State shipments affected by the standard by the per-unit incremental measure cost.

Annual New York State Shipments Affected by the Standard

To calculate the annual shipments affected by the standard, the research team discounted shipments in accordance with naturally occurring market adoption (NOMAD) assumptions.

Incremental Annual Energy and Water Savings

The research team calculated the new, additional energy and water savings that occur in each year by multiplying the annual New York State shipments affected by the standard by the per-unit energy and water savings for that standard.

Internal Double Counting Adjustment

To avoid double counting savings from standards with overlapping scopes the research team developed double-counting coefficients that allowed the research team to avoid double-counting any overlapping savings. For example, because the research team analyzed the federal standard for ceiling fan lights

and a potential state standard for LEDs, the research team subtracted the savings from LED ceiling fan lights from the ceiling fan lights standard.

New York State Building Code Adjustment

Existing statewide and New York City building codes regulate energy efficiency for new construction, so the research team discounted savings estimates for appliances covered in these building codes. For each affected standard, the research team discounted savings based on our estimates of the overlapping scope, stringency of the existing building code level compared to the proposed standard, and the proportion of shipments affected by the existing code.

New York State Heating Fuel Mix

In order to accurately assess the impacts of the heating fuel mix used in New York State for standards that regulate hot water fixtures and oil-fired space and water heating equipment, the research team adjusted for NY-specific distributions of space and water heating equipment. Using data from the EIA Residential Energy Consumption Survey (RECS) and the Commercial Buildings Energy Consumption Survey (CBECS), the research team adjusted energy savings to reflect New York's mix of space and water heating fuels, including projections of how those fuel mixes would change over time given CLCPA goals.

Product Lifetime

The research team determined the product lifetime by analyzing resources such as U.S. Department of Energy rulemaking documentation, California Energy Commission rulemakings documents, or other published reports. If the standard had product subcategories, the research team calculated an overall shipment-weighted lifetime for the standard.

Fully Adjusted Annual Energy and Water Savings

To calculate fully adjusted annual energy and water savings, the research team applied the adjustment factors designed to address double counting with NYC standard baseline, internal double counting, New York's heating fuel mix, and HVAC interactive effects to the incremental annual energy and water savings estimates.

The research team then modeled the evolution of market as new, more efficient products are purchased and products cease operation and the end of their effective useful lifetimes. The effect of this stock turnover modeling is: starting with the effective date and until one product lifetime has passed, the number of operating products that are more efficient because of a given standard grows; after one product lifetime, total savings generally plateau, because the number of old products that are being retired balances the number of shipments. For certain products which are becoming much more common or rare over time, the research team did not assume that savings plateau, but rather modeled a growth or decline in savings commensurate with the changing installed base of the product. The research team modeled the shipments of general service lamps in more depth to account for effect on annual shipments of the large difference in lifetime between the standards case (generally LED) and base case (generally incandescent or halogen).

New York State Electricity Generation Mix Forecast

The research team assumed that New York State meets its 2030 CLPCA goal of 70% renewable generation. To calculate the 2030 generation mix, the research team began with the 2030 New York State load forecast from the Public Service Commission Order Adopting the Clean Energy Standard. Based on the 2030 load, the research team then assumed linear growth of renewables up to 2030, and that renewables remain constant at 70% from 2030-2035. The research team accounted for the Indian Point Nuclear reactors going offline in 2021 and assumed that the missing generation will be made up by fossil fuels.

Emissions Intensity

To determine the amount of pollution emitted per unit of electricity consumption, the research team assumed that New York would meet its clean energy goals (as described above) and then estimated the emission from fossil fuels based on emissions intensity data from U.S. Environmental Protection Agency's 2018 eGRID update. To estimate the amount of CO2 emissions intensity per Btu of fuel oil and natural gas, the research team relied on Energy Information Administration CO2 Emissions Factors.

Avoided Pollution

The research team calculated avoided pollution, including CO2 emissions, by multiplying the fully adjusted annual energy savings by the annual emissions intensity estimates for each fuel type saved.

Per-unit Incremental Cost

The research team determined the per-unit incremental cost of more efficient equipment by analyzing resources such as DOE Technical Support Documents, California Energy Commission Staff Reports, or Title 20 CASE Reports. If the standard had product subcategories, the research team calculated an overall shipment-weighted per-unit incremental cost for the standard.

Endnotes

[1] McKinsey & Company. 2009. "Pathways to a Low-Carbon Economy: Version 2 of the Global Greenhouse Gas Abatement Cost Curve."

[2] American Council for an Energy-Efficient Economy. August 2018. "Does Efficiency Still Deliver the Biggest Bang for Our Buck? A Review of Cost of Saved Energy for US Electric Utilities."

[3] The term "appliance standards" is used throughout this report as shorthand to encompass minimum energy or water efficiency requirements or maximum energy or water use limits that apply to new appliances, equipment, lighting products, and plumbing products.

[4] Appliance Standards Awareness Project and American Council for an Energy-Efficient Economy. 2017. "States Go First: How States Can Save Consumers Money, Reduce Energy and Water Waste, and Protect the Environment with New Appliance Standards."

[5] Appliance Standards Awareness Project and American Council for an Energy-Efficient Economy. February 2017. "Energy-Saving States of America: How Every State Benefits from National Appliance Standards."

[6] See the Appliance Standards Awareness Project's article and infographic titled "Appliance Standards Rank as #2 Energy-Saving Tool in US."

[7] The terms "television," "compact audio product." "digital versatile disc player," "digital versatile disc recorder," and "digital television adopter" are also defined in Article 16.

[8] i.e., bottle-type water dispensers, portable electric spas, consumer audio and video products, portable light fixtures, and commercial hot food holding cabinets.

[9] The Uniform Fire Prevention and Building Code was updated on October 31, 2017 to include the Water Sense efficiency standards which governs the installation and use of such fixtures, while the amendments to Environmental Conservation Law section 15-0314 address the distribution, sale, offer for sale, import, or installation of such fixtures.

[10] S354A/A2286 was signed by Governor Cuomo on December 6, 2019 and S6960/A8966 was signed by Governor Cuomo on April 17, 2020. Both of these bills addressed water efficiency standards and amended section 15-0314 of the Environmental Conservation Law.

[11] The net present value of cumulative annual benefits from standards does not continuously increase because eventually all products in operation would meet the standards. Future benefits have diminishing present value in more distant years due to the use of a 5% real discount rate.

[12] For example, aerators that reduce water waste in showerheads do not have a higher first cost.

[13] The study also includes a review of the additional product categories added to Environmental Conservation Law section 15-0314 by Chapter 578 of the Laws of 2019 and Chapter 65 of the Laws of 2020.

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