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Technologies and Key Policy Trends

TECHNOLOGY OVERVIEW.

Buildings account for roughly three-quarters of U.S. electricity consumption.[1] The $83 billion U.S. energy efficiency industry improves energy productivity by using traditional technologies such insulation; light-emitting diode (LED) light bulbs; ENERGY STAR appliances; and state-of-the-art measures such as data analytics, peak demand management, behavioral efficiency and smart thermostats.[2]

ECONOMICS.

There are more than 2.3 million energy efficiency jobs in the United States.[3] In 2018, the industry grew by 3.4% — faster than overall U.S. employment growth.[4] The cost of energy efficiency measures varies considerably by region and customer class, but the average cost of a kilowatt-hour saved is appropriately 5 cents per kilowatt-hour,[5] which is less than half of the average price of electricity to utility customers in the United States.[6]

KEY POLICY TRENDS

Spending on efficiency continues to increase. Ratepayer-funded utility spending on efficiency programs grew by about 20% between 2011 and 2016,[7] reaching an estimated $7.9 billion in 2017.[8] Similarly, nonutility energy service companies reported industry revenues of approximately $7.6 billion in 2017, which equates to an average annual growth rate of roughly 13% from 2015 to 2017.[9]

More than half of U.S. states have an energy efficiency resource standard (EERS). Currently, 22 states have a mandatory EERS, and four states have a voluntary (nonbinding) EERS. Two states have combined their EERS with their Renewable Portfolio Standards.[10]

Incremental electricity savings continue to grow. In 23 states, utility consumer- or ratepayer-funded efficiency programs offset at least 1% of electricity load for investor-owned utilities, with four states exceeding savings of 2% of sales, resulting in 27.5 terawatt-hours saved in 2016.[11]

"Smart" home devices continue to multiply. Americans are rapidly adopting smart thermostats, light bulbs, home energy controllers and other smart home energy devices in their homes. By 2023, 28% of U.S. homes are expected to have smart thermostats installed, and the home energy management technology sector anticipates $24 billion in hardware sales.[12] Similarly, businesses are deploying building energy management and automation systems that can use real-time data analytics to reduce energy consumption and improve system efficiency.

1 American Counsel for an Energy Efficiency Economy. (2016). Building policies. Retrieved from https://aceee.org/topics/building-policies

2 Advanced Energy Economy. (2019). *Advanced energy now 2019 market report: Global and U.S. market revenue 2011–18 and key trends in advanced energy,* p. 9. Retrieved from https://www.advancedenergynow.org/aen-2019-market-report

3 National Association of State Energy Officials & Energy Futures Initiative. (2019). *The 2019 U.S. energy and employment report.* Retrieved from https://www.usenergyjobs.org

4 Walton, R. (2019, March 7). *Efficiency leads 2019 energy job growth prospects* (Issue Brief). Retrieved from https://www.utilitydive.com/news/efficiency-leads-2019-energy-job-growth-prospects-report-finds/549968/

5 A June 2018 U.S. Department of Energy Lawrence Berkeley National Laboratory study found that the cost of a kilowatt-hour (kWh) saved, including both participant costs and program administrator costs, was appropriately 5 cents per kilowatt-hour ($0.039/kWh for residential, $0.145/kWh for low income and $0.055/kWh for commercial and industrial). Hoffman, I., Goldman, C. A., Murphy, S., Mims, N., Leventis, G., & Schwartz, L. (2018, June). *The cost of saving electricity through energy efficiency programs funded by utility customers: 2009–2015.* Retrieved from http://eta-publications.lbl.gov/sites/default/files/cose_final_report_20180619_1.pdf

6 The average price of electricity to ultimate U.S. consumers (all sectors) was 10.43 cents per kilowatt-hour as of February 2019. U.S. Energy Information Administration. (2019, July). Electric power monthly: Table 5.6.A. Average price of electricity to ultimate customers by end-use sector. Retrieved from https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a

7 Goldman, C. A., Murphy, S., Hoffman, I., Mims Frick, N., Leventis, G., & Schwartz, L. (2018, November). *The future of U.S. electricity efficiency programs funded by utility customers: Program spending and savings projections to 2030.* Retrieved from http://eta-publications.lbl.gov/sites/default/files/future_of_ee_final_report_20181205_final.pdf

8 Bert, W., Nowak, S., Relf, G., Vaidyanathan, S., Junga, E., DiMascio, M., & Cooper, E. (2018, October). *The 2018 state energy efficiency scorecard* (Report No. U1808). Retrieved from https://aceee.org/sites/default/files/publications/researchreports/u1808.pdf

9 Stuart, E., Larsen, P. H., Carvallo, J. P., Goldman, C. A., & Gilligan, D. (2016, October). *U.S. Energy Service Company (ESCO) industry: Recent market trends.* Retrieved from https://www.naesco.org/data/industryreports/esco_recent_market_trends_30sep2016.pdf

10 Center for Climate and Energy Solutions. (2019, March). Energy efficiency standards and targets. Retrieved from https://www.c2es.org/document/energy-efficiency-standards-and-targets/

11 Goldman, C. A., Murphy, S., Hoffman, I., Mims Frick, N., Leventis, G., & Schwartz, L. (2018, November). *The future of U.S. electricity efficiency programs funded by utility customers: Program spending and savings projections to 2030.* Retrieved from http://eta-publications.lbl.gov/sites/default/files/future_of_ee_final_report_20181205_final.pdf

12 Chen, O., (2018, June 20). Connected devices are driving a more grid-responsive home. *GreenTech Media.* Retrieved from https://www.greentechmedia.com/articles/read/connected-devices-driving-a-more-grid-responsive-home#gs.j3ewag

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Opportunities, Challenges and State Solutions

OPPORTUNITIES. The least expensive kilowatt is the one not needed. Improving energy productivity is sometimes considered a no-regrets policy option because efficiency investments reduce bills for residential, commercial and industrial customers; drive domestic job creation; reduce emissions; and improve grid reliability and resiliency.

Despite major investments over the past decade, every state still has a large electric energy efficiency potential that it can use as a cost-effective energy resource.[1] For example, EPRI estimated in 2017 that energy efficiency economic potential will range from 12% in **Missouri** to 21% in **Florida** in 2035 relative to adjusted baseline sales.[2]

CHALLENGES. Despite its numerous benefits, a variety of market barriers hinder optimal deployment of energy efficiency technologies. For example, building owners are often reluctant to invest in efficiency improvements, even when they have a payback period of less than two years.[3] Transaction costs, such as difficulty identifying the best technological solution, hiring and overseeing contractors and completing the paperwork, are frequently cited as factors that discourage implementation of efficiency measures.[4] Other barriers include limited access to capital and the split incentive problem, whereby the costs and benefits of efficiency are split across different parties (such as the owner of rental property not generally realizing the benefits of reduced electric bills).[5]

In addition, energy utilities are traditionally paid based on the volume of kilowatt-hours they sell, creating a powerful disincentive to reduce sales of their product. Similarly, the market has been slow to recognize the benefits of exceeding minimum energy building codes, such as health, environmental and resilience benefits, resulting in underinvestment in appliances, lighting and other building technologies.

STATE SOLUTIONS. States have developed an array of policy interventions, often in partnership with local utilities and others, to overcome these specific challenges. State solutions include the following:

- ***Establish or strengthen EERS.*** Set long-term energy savings targets typically administered by utilities using ratepayer funds.
- ***Implement demand response programs.*** Reduce demand during peak hours, when electricity consumption is highest and most expensive.
- ***Update and enforce state building codes.*** Establish, refresh and enforce minimum energy standards for buildings, which consume 70% of a state's electricity.
- ***Expand state government-led financial incentives.*** Include state-administered energy efficiency rebates, revolving loan funds, loan-loss reserve funds, grants, tax credits and tax holidays.
- ***Lead by example.*** Conduct energy retrofits, and benchmark state government buildings.
- ***Expand weatherization and other low and moderate income (LMI) programs.*** Provide funds to supplement the chronically underfunded U.S. Department of Energy (DOE) Weatherization program or establish specific LMI efficiency targets and programs.
- ***Encourage use of smart energy management devices.*** Promote smart, internet-enabled devices, such as thermostats, light bulbs, home energy controllers and building energy management systems, through ratepayer incentives, tax rebates and similar policies.
- ***Establish and use building benchmarking and disclosure policies.*** Make a building's energy consumption more transparent through benchmarking of commercial buildings, residential home energy ratings or disclosure of annual energy consumption at the time of home listing.
- ***Decouple utility revenues from volumetric sales.*** Pay the utility for services provided rather than kilowatts/therms sold or create a lost revenue adjustment mechanism to prevent efficiency from eroding utility revenue.

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- ***Encourage performance-based utility incentives for energy efficiency initiatives.*** Use performance-based financial incentives to reward utilities for encouraging energy efficiency and peak demand reductions.
- ***Accelerate the evolution of utility business models.*** Transition from the traditional cost-of-service model, where utilities earn revenue based on what they spend, to a new model, such as performance-based ratemaking, which compensates utilities based on their ability to meet or exceed state-established performance metrics.

1 Electric Power Research Institute. (2017, May). *State level electric energy efficiency potential estimates* (Report No. 3002009988). Retrieved from https://www.energy.gov/sites/prod/files/2017/05/f34/epri_state_level_electric_energy_efficiency_potential_estimates_0.pdf

2 Electric Power Research Institute. (2017, May). *State level electric energy efficiency potential estimates* (Report No. 3002009988). Retrieved from https://www.energy.gov/sites/prod/files/2017/05/f34/epri_state_level_electric_energy_efficiency_potential_estimates_0.pdf

3 Siemens. (2010, August). *Economics of energy upgrades.* National League of Cities. Retrieved from www.nlc.org/sites/default/files/The-Economics-of-Energy-Upgrades.pdf

4 Kiss, B., & Mundaca, L. (2013). Transaction costs of energy efficiency in buildings—An overview. *International Association for Energy Economics,* 31–32. Retrieved from www.iaee.org/en/publications/newsletterdl.aspx?id=196

5 Melvin, J. (2018, April). The split incentives energy efficiency problem: Evidence of underinvestment by landlords. *Energy Policy, 115,* 342–352. https://doi.org/10.1016/j.enpol.2017.11.069

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State Solutions Spotlights

Opportunities to enhance energy efficiency exist in every state. Some states describe these opportunities as accelerating energy productivity; others characterize it as ensuring energy optimization or reducing energy waste. Regardless of the nomenclature, governors have successfully pioneered a range of state policies. Those efforts have been driven by objectives such as helping reduce consumer and business utility bills, enhancing grid reliability, deferring infrastructure upgrades and promoting local job creation.

Examples of state policies include the following:

- Establish or strengthening energy efficiency resource standard (EERS).
- Implement demand response programs.
- Update and enforcing state building codes.
- Expand state government-led financial incentives.
- Lead by example using state government buildings.
- Expand weatherization and other low and moderate income (LMI) programs.
- Encouraging use of smart energy management devices.
- Establish and use building benchmarking and disclosure policies.
- Decouple utility revenue from volumetric sales.
- Encourage performance-based utility incentives for energy efficiency initiatives.
- Accelerate the evolution of utility business models.

ESTABLISHING OR STRENGTHEN EERS. Twenty-seven states have created energy efficiency targets. These long-term EERSs are typically binding on the state's utilities, which administer a range of ratepayer-funded incentives and programs to reduce residential, commercial and industrial consumption. Collectively, these programs saved an estimated 242 million megawatt-hours (MWh) in 2017, which is equivalent to 6.4% of overall U.S. electricity consumption.[1]

Traditionally, states have established incremental energy savings targets in the range of 1% to 1.5% annually (e.g., **Nevada** at 1.15%, **Arkansas** at 1.2% and **Colorado** at 1.6%). Recently, however, seven states have raised their annual incremental savings targets to 2% or more (e.g., **Maryland** at 2%, **New Jersey** at 2% electric and 0.75% gas, and **New York** at 3%),[2] while others established requirements that utilities or third-party administrators achieve "all cost-effective" energy efficiency as determined by the state's public utility commission (PUC).[3] Sixteen states also have EERS policies in place for natural gas.[4] Consider the following state spotlights:

State spotlight: Arizona. **Arizona** established incremental savings targets at 1.25% of sales in 2011, ramping up to 2.5% in 2016 through 2020 for cumulative electricity savings of 22% of retail sales, 2% of which may come from peak demand reductions.[5] Co-ops must meet 75% of targets. For natural gas, Arizona established a target of approximately 0.6% incremental savings per year (for cumulative savings of 6% by 2020). Although not quite achieving these ambitious goals to date, Arizona reached more than 1 million MWh of incremental savings in 2017, making it a top 10 state in terms of percentage of retail sales saved.

State spotlight: Nevada. In Nevada, 2017 legislation established utility energy savings goals for NV Energy, allowed program approval if the portfolio of programs is cost-effective, captured nonenergy benefits in a cost-benefit analysis and required a minimum spending level for low-income efficiency programs.[6]

State spotlight: Vermont. **Vermont** is one of nine states to establish an independent implementation entity, a so-called "efficiency utility," to administer their state's programs.[7] Vermont led the nation in net incremental efficiency savings in 2017 of 3.33% of retail electricity sales and was a top-10 state for natural gas and other fuel savings.[8] Vermont also spent more than any other state on efficiency, exceeding 8% of retail electricity expenditures.[9]

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IMPLEMENT DEMAND RESPONSE PROGRAMS. Demand response programs complement energy efficiency by focusing on reducing consumption during peak hours, when demand is highest and most expensive. In addition to the cost savings, demand response programs can help avoid outages and offset the need for aging, inefficient peak power generation. Consider the following state spotlights:

State spotlight: Maryland. As part of the EmPower Maryland law, Maryland investor-owned utilities provide rebates to customers who reduce their energy use during a handful of peak demand events each year. The program reduces summer peak demand, lowers electricity costs, reduces wholesale market prices and enhances the reliability of Maryland's grid. Baltimore Gas and Electric Company, for example, has a program that typically reduces peak demand by more than 300 MW each year — about the size of an average coal-fired power plant — and has provided more than $40 million in customer rebates and $400 million in wholesale market savings.[10]

State spotlight: New Mexico. Public Service Company of **New Mexico**'s Peak Saver program helps large commercial electric customers reduce their electricity consumption during peak demand days, typically the hottest days of the year.[11] Participants receive an annual incentive based on the amount of electricity managed during the program.

UPDATE AND ENFORCE BUILDING ENERGY CODES. Improved technologies and building methods have enabled significantly more effective energy codes, which could save consumers an estimated $126 billion between 2010 and 2040 and avoid the equivalent of 177 million passenger vehicles driven for one year in greenhouse gases (see Figure 1).[12]

To capitalize on these improvements, states need to periodically incorporate the latest version of these codes, which are usually developed by independent groups

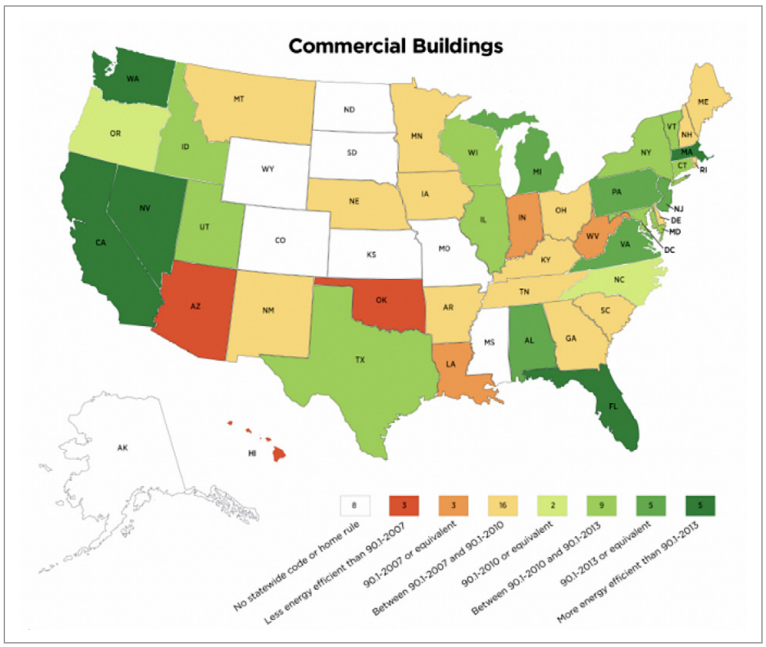

FIGURE 1: Status of state energy code adoption

Source: U.S. Department of Energy. (2018, December). Status of state energy code adoption. Retrieved from https://www.energycodes.gov/status-state-energy-code-adoption

such as the International Energy Conservation Code or the American Society of Heating, Refrigerating and Air-Conditioning Engineers. Tools are available to help states estimate the energy and carbon savings of updating energy codes.[13] Educating builders and ensuring code compliance have also proven to be effective long-term strategies. Consider the following state spotlights:

State spotlight: Massachusetts. In 2016, **Massachusetts** updated its base and stretch energy codes for both commercial and residential buildings. More than 180 Massachusetts towns have adopted the code.[14] Department of Energy (DOE) estimated that the energy cost savings from these updates will be nearly $144 million annually by 2030.[15]

State spotlight: Rhode Island. Gov. Gina Raimondo's Executive Order 15-17 requires, among other things, the **Rhode Island** Office of Energy Resources to establish a voluntary stretch building code.[16] The code is intended to support the sustainable energy goals described in the Resilient Rhode Island Act of 2014 to cut emissions by 45% by 2035 and 80% by 2050. Available in February 2018, the residential stretch

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code was based on DOE's Zero Energy Ready Homes program, and the commercial stretch code was based on the International Green Construction Code.[17]

State spotlight: Texas. Under **Texas** state law, a division of Texas A&M University has six months to compare the stringency of the current Texas Building Energy Performance Standards with newly published codes and provide recommendations to the Texas State Energy Conservation Office, which can adopt the code subject to legislative oversight. Texas currently has adopted the 2015 International Code Council Residential and Commercial Standards.[18]

EXPAND STATE GOVERNMENT-LED FINANCIAL INCENTIVES. Many state governments offer a suite of financial incentives that complement ratepayer-funded utility programs. State energy offices, for example, offer rebates, loans or grants, particularly for low-income, nonprofit and other underserved communities. Some states also offer income tax credits or sales tax holidays for eligible efficiency investments. Consider the following state spotlights:

State spotlight: Colorado. Colorado's Residential Energy Upgrade loan program offers long-term, low-interest loans to homeowners seeking energy efficiency improvements such as air sealing, insulation, windows, lighting and appliances. As the program's sponsor, the Colorado Energy Office authorizes contractors to participate, and the contractors then work directly with the homeowner to install upgrades.[19]

State spotlight: Florida. The Florida Department of Agriculture and Consumer Services offers farmers free energy audits to determine the potential for energy efficiency and other measures. Eligible agricultural producers can receive up to $25,000 for implementing recommended measures.[20]

State spotlight: Mississippi. The **Mississippi** Development Authority operates a leasing program for energy-efficient equipment that public entities and nonprofit hospitals can use to lease efficiency equipment and services for up to 15 years from the authority using a third-party financier. The state also offers an efficiency revolving loan program, an alternative fuel school bus and municipal motor vehicle loan program and a state sales tax exemption for electricity used in manufacturing.[21]

State Spotlight: Tennessee. Tennessee's Pathway Lending Energy Efficiency and Renewable Energy Loan Program issued 29 loans to businesses and nonprofits in 2018, resulting in more than 12,800 MWh of annual energy savings and $1.4 million in estimated monetary savings due to utility reductions. This Program was started in 2010 and is funded through loan capital provided by the Tennessee Department of Environment and Conservation, the Tennessee Valley Authority, and Pathway Lending. The State of Tennessee also launched the Energy Efficient Schools Initiative (EESI) in 2008, leveraging excess lottery funds to support energy savings projects in K-12 schools statewide. In FY2018, EESI approved nine loans expected to achieve more than 17,600 MWh, or $7.2 million, in annual energy savings.[22]

LEAD BY EXAMPLE. Many states have adopted programs to lead by example, conducting energy audits and benchmarking state government buildings to help lower energy use, lower costs and demonstrate new technologies. Energy savings for new and existing state facilities can be regularly tracked and the saving targets periodically reviewed. An increasing number of states are also benchmarking public sector buildings to help prioritize the most cost-effective efficiency projects. Consider the following state spotlights:

State spotlight: Kentucky. The **Kentucky** Division of Facility Efficiency, which is part of the Kentucky Finance and Administration Cabinet, operates an innovative state building dashboard called the Commonwealth Energy Management and Control System Kentucky Energy Savings Dashboard to better track and manage energy consumption in state facilities (see Figure 2). The state tracks energy consumption for 801 buildings in the system, representing more than 16 million square feet and annual utility costs of more than $32 million. Through this tool and a robust lead-by-example program, the state had reduced energy costs by 8.9% as of August 2019 and is on track to meet its goal of a 25% reduction by 2025.[23]

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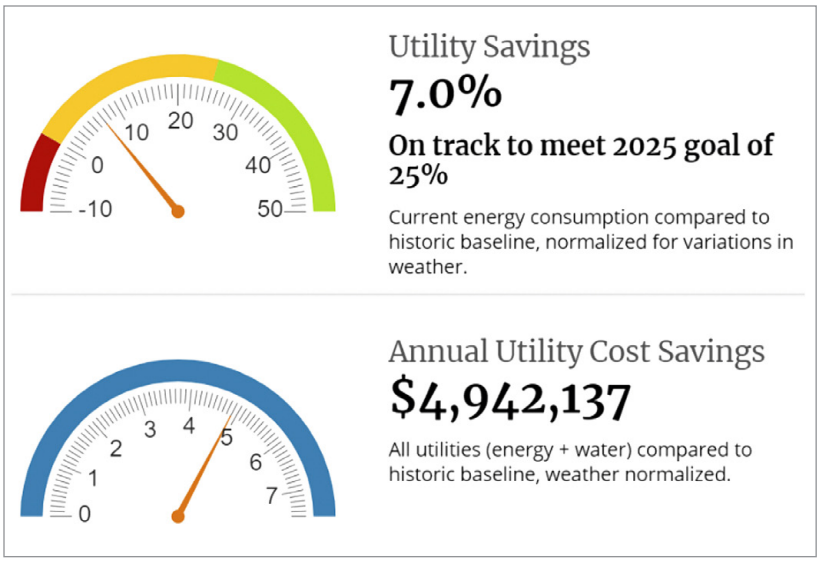

Figure 2: Kentucky Energy Savings Dashboard

Source: Commonwealth Energy Management and Control System. (n.d.). Kentucky Energy Savings Dashboard. Retrieved from http://kyenergydashboard.ky.gov/Home

State spotlight: New Mexico. Legislation championed by Gov. Michelle Lujan Grisham in 2019 provides $20 million in direct spending on energy upgrades at all 29 state buildings in Santa Fe. An additional $12 million was secured from the New Mexico Finance Authority by issuing bonds to pay for building efficiency improvements.[24]

State spotlight: Oregon. Under a 2017 executive order, all **Oregon** state agencies are required to adopt targets to reduce their energy consumption, and all new state buildings permitted after 2021 are required to achieve carbon-neutral operations. The order also directs the Oregon Department of Energy to report and track all state-owned building energy use to guide energy conservation efforts and to follow the most recent energy building standards.[25]

State spotlight: Rhode Island. Since 2017, Rhode Island's Office of Energy Resources has recognized 23 state government agencies, municipalities and state colleges and universities at its annual Lead by Example Energy Awards ceremony. Under a 2015 executive order, state agencies are required to reduce their energy consumption by 10% by fiscal year 2019 from a 2014 baseline.[26]

EXPAND WEATHERIZATION AND OTHER LMI PROGRAMS. Low-income families, on average, spend 7.2% of their income on utilities — nearly three times the amount that higher income households pay (2.3%).[27] To supplement the federally funded DOE Weatherization Assistance Program, some states budget additional taxpayer funds. Others set specific LMI targets for ratepayer-funded utility programs, often applying a more relaxed cost-effectiveness test. Consider the following state spotlights:

State spotlight: Illinois. The 2016 Future Energy Jobs Act effectively doubled the required annual amount of utility investment in low-income energy efficiency programs in **Illinois**.[28] Illinois excludes low-income measures from the requirement to meet the "total resource cost" test in recognition that such programs typically have higher implementation costs and would otherwise be deemed ineligible.[29]

State spotlight: New York. New York established an Energy Affordability Policy intended to limit energy costs for low-income residents to no more than 6% of household income. The effort enables EmPower New York to provide income-eligible customers with a range of no-cost energy efficiency solutions, including home energy assessments and replacement of old appliances, and a Clean Energy Fund to invest in programs that specifically benefit LMI customers.[30]

State spotlight: Pennsylvania. In 2015, the **Pennsylvania** PUC approved Phase III of its Act 129 efficiency program, which, among other things, increased the state's commitment to energy efficiency in low-income households. As a result, the utilities have agreed to increase their spending by almost $200 million over the next five years.

ENCOURAGE USE OF SMART ENERGY MANAGEMENT DEVICES. Consumers have far greater control over their energy consumption than ever before because of the growing adoption of internet-

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enabled smart devices, such as thermostats, light bulbs, home energy controllers and building energy management systems. States can encourage use of these devices through ratepayer incentives, tax rebates and similar policies. For example, Massachusetts and Vermont offer residential customers rebate incentives to purchase smart thermostats, which can help customers reduce energy consumption and enable them to participate in utility demand response programs.[31,32]

ESTABLISH AND USE BUILDING BENCHMARKING AND DISCLOSURE POLICIES. Many states and cities are using the power of the market by requiring energy benchmarking of commercial buildings to help potential tenants consider energy consumption in their decision making. To add similar sunlight to the residential real estate markets, a growing number of local governments are requiring homeowners to disclose their annual energy consumption or home energy rating at the time of listing. Sixteen states have energy benchmarking policies or voluntary programs.[33] **California** and New Jersey have policies in place that mandate energy benchmarking for commercial and public buildings.[34]

DECOUPLE UTILITY REVENUE FROM VOLUMETRIC SALES. Electric and gas utilities traditionally earn their revenue based on the volume of electricity or natural gas they sell, which creates a powerful disincentive to engage in efficiency. Thirty states have addressed this barrier by either decoupling (paying the electricity utility for the services provided rather than the kilowatts sold) or creating a lost revenue adjustment mechanism.[35] Similarly, 28 states have decoupled or created a lost revenue adjustment mechanism for natural gas.[36]

ENCOURAGE PERFORMANCE-BASED UTILITY INCENTIVES FOR ENERGY EFFICIENCY INITIATIVES. Twenty-six states use performance-based incentives to reward utilities for encouraging energy efficiency.[37] For example, utilities in **Georgia** can recover a higher rate on their energy efficiency investments when the program or project achieves at least 50% of projected energy savings.[38]

ACCELERATE THE EVOLUTION OF UTILITY BUSINESS MODELS. Many states and utilities are reevaluating the traditional utility business model in light of higher customer performance expectations, stagnating utility revenues and grid modernization needs.[39] Moving away from the traditional cost-of-service model (where utilities earn revenue based on what they spend), performance-based ratemaking compensates utilities based on their ability to meet or exceed state-established metrics, such as affordability, reliability and low carbon intensity. As of January 2019, at least 10 states had started or completed at least one aspect of a utility business model reform proceeding.[40]

1 Bert, W., Nowak, S., Relf, G., Vaidyanathan, S., Junga, E., DiMascio, M., & Cooper, E. (2018, October). *The 2018 state energy efficiency scorecard* (Report No. U1808). Retrieved from https://aceee.org/sites/default/files/publications/researchreports/u1808.pdf

2 Bert, W., Nowak, S., Relf, G., Vaidyanathan, S., Junga, E., DiMascio, M., & Cooper, E. (2018, October). *The 2018 state energy efficiency scorecard* (Report No. U1808), p. 42, Table 17. Retrieved from https://aceee.org/sites/default/files/publications/researchreports/u1808.pdf

3 The seven states that require all cost-effective efficiency are California, Connecticut, Maine, Massachusetts, Rhode Island, Vermont and Washington. American Council for an Energy-Efficient Economy. (2017, January). *State energy efficiency resource standards (EERS)* (Policy Brief). Retrieved from https://aceee.org/sites/default/files/state-eers-0117.pdf

4 The 16 states are Arizona, Arkansas, California, Colorado, Connecticut, Illinois, Iowa, Maine, Massachusetts, Minnesota, Michigan, New Hampshire, New York, Oregon, Rhode Island and Wisconsin. American Council for an Energy-Efficient Economy. (2017, January). *State energy efficiency resource standards (EERS)* (Policy Brief). Retrieved from https://aceee.org/sites/default/files/state-eers-0117.pdf

5 Arizona Corporation Commission. (2009, December 18). Docket No. RE-00000C-09-0427, Decision No. 71436. Retrieved from https://images.edocket.azcc.gov/docketpdf/0000106428.pdf; Arizona Corporation Commission. (2010, August 10). Docket No. RE-00000C-09-0427, Decision No. 71819. Retrieved from https://images.edocket.azcc.gov/docketpdf/0000116125.pdf

6 Arizona Corporation Commission. (2009, December 18). Docket No. RE-00000C-09-0427, Decision No. 71436. Retrieved from https://images.edocket.azcc.gov/docketpdf/0000106428.pdf; Arizona Corporation Commission. (2010, August 10). Docket No. RE-00000C-09-0427, Decision No. 71819. Retrieved from https://images.edocket.azcc.gov/docketpdf/0000116125.pdf

7 States that have established nonutility administration of efficiency programs include Delaware, the District of Columbia, Hawaii, Maine, New Jersey, New York, Oregon, Vermont and Wisconsin. Bert, W., Nowak, S., Relf, G., Vaidyanathan, S., Junga, E., DiMascio, M., & Cooper, E. (2018, October). *The 2018 state energy efficiency scorecard* (Report No. U1808). Retrieved from https://aceee.org/sites/default/files/publications/researchreports/u1808.pdf

8 Bert, W., Nowak, S., Relf, G., Vaidyanathan, S., Junga, E., DiMascio, M., & Cooper, E. (2018, October). *The 2018 state energy efficiency scorecard* (Report No. U1808), p. 28 Table 8. Retrieved from https://aceee.org/sites/default/files/publications/researchreports/u1808.pdf

9 Bert, W., Nowak, S., Relf, G., Vaidyanathan, S., Junga, E., DiMascio, M., & Cooper, E. (2018, October). *The 2018 state energy efficiency scorecard* (Report No. U1808), p. 34 Table 12. Retrieved from https://aceee.org/sites/default/files/publications/researchreports/u1808.pdf

10 Advanced Energy Economy. (n.d.). Maryland's Behavioral Demand Response Program—BGE's SmartEnergy Rewards case study. In: *Navigating utility business model reform—Case studies.* Retrieved from https://info.aee.net/navigating-utility-business-model-reform-case-studies

11 PNM. (n.d.). PNM Peak Saver. Retrieved from https://www.pnm.com/peaksaver

12 Athalye, R. A., Sivaraman, D., Elliott, D. B., Liu, B., & Bartlett, R. (2016, October). *Impacts of model building energy codes* (Report No. PNNL-25611 Rev. 1). Retrieved from https://www.energycodes.gov/sites/default/files/documents/Impacts_Of_Model_Energy_Codes.pdf

13 Energy-Efficient Codes Coalition. (2019, January 16). EECC codes-carbon calculator. Available at https://energyefficientcodes.org/resources/?_sft_category=resources-page-code-calculator

14 MacLeod, P., & Heeren, A. (2017, January 20). What you need to know about the new Massachusetts energy code. Retrieved from https://www.cetonline.org/need-know-new-massachusetts-energy-code

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15 Letter from Dr. Kathleen Hogan, Deputy Assistant Secretary, Energy Efficiency and Renewable Energy, U.S. Department of Energy, to Gov. Deval Patrick. (2013, May 31). Retrieved from https://www.energycodes.gov/sites/default/files/documents/MassachusettsDOEDeterminationLetter05312013.pdf

16 State of Rhode Island, Office of Energy Resources. (n.d.). Stretch code development. Retrieved from http://www.energy.ri.gov/policies-programs/lead-by-example/case-studies/stretch-code-development.php

17 Building Codes Assistance Project. (2016, November 1). State code status: Texas. Retrieved from http://bcapcodes.org/code-status/state/texas

18 Exec. Order No. 15-17, State of Rhode Island and Providence Plantations (2015, December 8). Retrieved from http://www.governor.ri.gov/documents/orders/ExecOrder15-17.pdf

19 Colorado Energy Office. (n.d.). Colorado RENU loan. Retrieved from https://www.colorado.gov/pacific/energyoffice/colorado-renu-loan

20 Mississippi Development Authority, Mississippi Works. (n.d.). Energy incentives. Retrieved from www.mississippi.org/home-page/our-advantages/incentives/energy-incentives-programs

21 Florida Department of Agriculture and Consumer Services. (n.d.). Energy programs: Farm Renewable and Efficiency Demonstration Program. Retrieved from https://www.freshfromflorida.com/Energy/Energy-Programs

22 Interagency memo, "2018 Pathway Energy Efficiency and Renewable Energy Loan Program," Pathway Lending to Tennessee Department of Environment and Conservation, Office of Energy Programs. Learn more at https://www.pathwaylending.org/.

23 Kentucky Commonwealth Energy Management and Control System. (n.d.). Retrieved from http://kyenergydashboard.ky.gov

24 N.M. looks for savings with state building upgrades. (2019, April 18). E&E News. Retrieved from https://www.eenews.net/greenwire/2019/04/18/stories/1060178149

25 Exec. Order No. 17-20, State of Oregon (2017, November 6). Retrieved from https://www.oregon.gov/gov/Documents/executive_orders/eo_17-20.pdf

26 State of Rhode Island, Office of Energy Resources. (n.d.). Lead by Example Energy Awards. Retrieved from http://www.energy.ri.gov/policies-programs/lead-by-example/lead-by-example-energy-awards.php

27 American Council for an Energy-Efficient Economy. (2016, April 20). *Report: "Energy burden" on low-income, African American, & Latino households up to three times as high as other homes, more energy efficiency needed* [Press release]. Retrieved from https://aceee.org/press/2016/04/report-energy-burden-low-income

28 Energy Efficiency and Demand-Response Measures, 220 I.L.C.S. 5/8-103B(a). Retrieved from http://www.ilga.gov/legislation/ilcs/documents/022000050K8-103B.htm

29 Governor Andrew M. Cuomo. (2017, February 16). *Governor Cuomo announces expansion of financial benefits for low-income utility customers* [Press release]. Retrieved from https://www.governor.ny.gov/news/governor-cuomo-announces-expansion-financial-benefits-low-income-utility-customers

30 P. Act 099-0906, S.B. 2814, I.L.G.A. (n.d.). Retrieved from http://www.ilga.gov/legislation/99/SB/PDF/09900SB2814enr.pdf

31 Efficiency Vermont. (2019, January 1). Smart thermostats. Retrieved from www.efficiencyvermont.com/rebates/list/smart-thermostats.

32 "Wireless Enabled & Programmable Thermostat Rebates." Mass Save, 2019, www.masssave.com/saving/residential-rebates/smart-and-programmable-thermostats/

33 States with benchmarking policies or voluntary programs are Alabama, California, Connecticut, Delaware, Michigan, Minnesota, New Mexico, New Jersey, New York, Ohio, Oklahoma, Oregon, Pennsylvania, Texas, Utah and Washington. ENERGY STAR. (n.d.). Interactive maps for energy benchmarking data, programs, and policies. Retrieved from https://www.energystar.gov/buildings/program-administrators/state-and-local-governments/see-federal-state-and-local-benchmarking-policies

34 Institute for Market Transformation. (2019). Map: U.S. city, county, and state policies for existing buildings: Benchmarking, transparency and beyond. Retrieved from www.imt.org/resources/map-u-s-building-benchmarking-policies

35 American Council for an Energy-Efficient Economy. (2018, October 4). *The 2018 state energy efficiency scorecard* (Report No. U1808), pp. 47–48 Table 19. Retrieved from https://aceee.org/research-report/u1808

36 American Council for an Energy-Efficient Economy. (2018, October 4). *The 2018 state energy efficiency scorecard* (Report No. U1808), pp. 47–48 Table 19. Retrieved from https://aceee.org/research-report/u1808

37 Cross-Call, D., Goldenberg, C., Guccione, L., Gold, R., & O'Boyle, M. (2018). Navigating utility business model reform. Retrieved from https://rmi.org/insight/navigating-utility-business-model-reform

38 O.C.G.A. § 46-3A-9. Retrieved from https://law.justia.com/codes/georgia/2010/title-46/chapter-3a/46-3a-9

39 According to a Utility Dive poll, 68% of utility respondents said that the "most appropriate utility regulation model" for the 21st century was either predominantly performance-based regulation or cost-of-service with performance-based regulation mixed in, compared with just 5% favoring traditional cost-of-service regulation. Utility Dive. (2019). *State of the electric utility: 2019 Survey report*, pp. 9–10. Retrieved from https://resources.industrydive.com/State-of-the-Electric-Utility-2019-Survey-Report

40 The states are Arkansas, California, Hawaii, Illinois, Michigan, Minnesota, New York, Ohio, Oregon and Rhode Island. Cross-Call, D., Goldenberg, C., & Wang, C. (2019). *Process for purpose: Reimagining regulatory approaches for power sector transformation*, p. 11 Exhibit 4. Retrieved from https://rmi.org/insight/process-for-purpose