It’s a Brave New World: Keeping Ratepayer-Funded Energy Efficiency Relevant

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ABSTRACT

We live in extremely exciting times, where there is increasing understanding of and ensuing efforts to transition our energy system towards a climate friendlier system. Renewable energy sources, storage, electric vehicles, and private energy efficiency investments are all in rapid ascendance. At the same time, there is declining interest in traditional ratepayer funded energy efficiency efforts. To stay relevant and help hasten the needed energy transition, ratepayer funded energy efforts need to evolve and break out of their increasingly siloed purviews. Ratepayer funded energy efficiency efforts still have a key role to play. They need to embrace partnerships with other distributed energy offerings to maximize their synergies, accelerate their uptake, and reduce the costs of the energy transition.

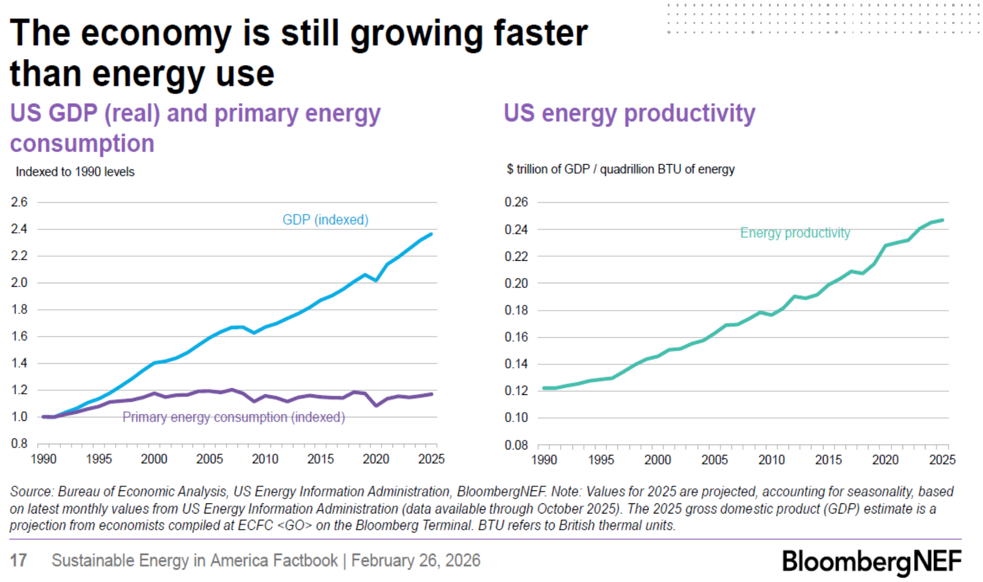
This paper will highlight, via examples, the numerous opportunities that are available by mixing ratepayer funded energy efficiency offerings with other cleaner energy options. These include seldom pursued efforts to promote new social norms around sufficiency, and better land use and urban planning, which can facilitate their integration with more traditional renewable energy and storage technologies, electric vehicles, electrification, and decarbonization.

The paper will be of use to energy system planners, government oversight institutions, distributed energy resources manufacturers and vendors, and academics. It will encourage energy sector professionals to engage others outside their areas of work, to identify, define, and implement sooner, better integrated packages of energy transition options.

Introduction

Ratepayer funded energy efficiency programs have been around since the early 1970s. Over this past half century, these programs have been instrumental in creating a large cadre of expert human capital in energy efficiency across academia, non-profit organizations, companies, and government institutions, and have accelerated the development and market adoption of a multitude of energy efficient technologies and legal and regulatory frameworks and policies to support ongoing work in this field. These ratepayer-funded programs have enhanced the awareness, availability, accessibility, and affordability of both behavioral and technological energy efficiency. The success of these energy efficiency ratepayer-funded programs as shown in Figure 1, is evidenced in the relative decoupling of economic growth and energy in the U.S.A. (BNEF and BCSE 2026). Similar decoupling has happened in other countries as a result of their energy efficiency efforts (Abbas 2025). Though the discussion here focuses on ratepayer-funded energy efficiency efforts, much of it is relevant to any public energy efficiency effort.

Figure 1: The Decoupling of GDP and Energy Use in the U.S.A.



Ratepayer-funded energy efficiency efforts face increasing problems with ensuring that they comply with regulatory cost-effectiveness tests. The “low hanging fruit” appear to have been mostly tapped. Past success with reducing energy end-uses makes it increasingly more difficult to find energy efficiency opportunities with large savings and low incremental and/or transaction costs. Tapping the remaining opportunities of energy efficiency often requires a systems approach that integrates various technical and behavioral options with increased attention to design optimization (Stanford University 2026). This systems and integrated approach can by optimizing synergistic effects, result in lower first and lifetime costs. Amory Lovins has called this “tunneling through the cost barrier” (Hawken, Lovins, and Lovins 1999).

At the same time, utilities are facing an uptick in demand not seen since the 1960s. This is happening in conjunction with increasing infrastructure costs to replace old equipment and ensure adequate and resilient grid capabilities to ensure continued customer service; made more challenging due to extreme weather/ climate change. All this has resulted lately in electric rates outpacing inflation, increased customer complaints about bills, and political pressure to find a way to reduce electric rates. In this context, many customers are opting to self-generate which can lead to increased self-reliance/resilience at the customer-level, but also reduces the rate-base and may exacerbate the problem of higher electric bills.

Political response to citizen pressure to address climate change emissions has resulted in more support and the development of renewable energy and storage technologies, as well as electrification of society; particularly transport and residential and commercial HVAC, with ongoing push to also enable it in industry and agriculture. This is a global phenomenon.

Ratepayer-funded energy efficiency efforts are no longer the only nor the major mechanism behind the ongoing adoption of energy efficiency by society. Indeed, ratepayer-funded energy efficiency is tiny compared with the almost $780 Billion dollars worldwide investment in energy efficiency (IEA 2026). The fact that worldwide and USA investment in energy efficiency by society is so much larger, points to the success of past ratepayer-funded efforts at making society aware that energy efficiency and conservation are well worth promoting and adopting, even beyond ratepayer-funded efforts.

Large gaps remain as society is far from using energy in the most efficient way. How and where do we position ratepayer-funded energy efficiency efforts to make them more relevant and useful? Are energy efficiency information, pilot and demonstration projects, customer/mid/upstream incentives and rebates and/or code advocacy and support still the best use of ratepayer funds? This is the purpose of this paper. To posit some changes that may be warranted that would enhance the relevance and value of ratepayer-funded energy efficiency efforts. The intent is to stir further thinking among readers, and lead our community to make useful adjustments to current practices.

The next section will offer some data on investments in energy efficiency, followed by a discussion of some areas where ratepayer-funded efforts can offer significant value, and then, a discussion of other aspects, such as regulatory process and research and evaluation improvements that can enable these efforts to adjust more continuously and be better aligned with the changing context they operate in.

One Possible Goal: Using Project Drawdown to Prioritize Goals for Energy Efficiency Efforts.

As a society, we must clarify what are the key goals we seek to achieve with our energy efficiency efforts. Is our primary goal mitigating Global Climate Change (henceforth GCC) via a reduction of energy use and associated emissions? Are we seeking to reduce customer bills and particularly those of low-income homes and businesses? Are we trying to mitigate capital investments to enhance the grid's capabilities given expected increases in electric demand from electrification of transport, homes, and businesses, as well as addressing increased data center and AI-driven computing needs? Others?

In this paper, the discussion will center on mitigating GCC first, with the other goals mentioned addressed as well, but as secondary targets. The intent is to showcase how a society can best use ratepayer-funded resources to prioritize efforts to meet the goals they decide to pursue. Every jurisdiction will need to decide its key goals and the portion of total resources allocated toward and the order in which each goal is pursued.

A great source for identifying key activities to mitigate emissions from energy use (besides increasing the generation with renewable energy technologies) can be found in Project Drawdown's "Explorer." (Project Drawdown 2026). Based on each activity's significance as a solution to GCC, the "Explorer" lists over 150 key opportunities to focus on, across 4 categories: 1) Highly Recommended; 2) Worthwhile; 3) Keep Watching; and 4) Not Recommended. Table 1 lists the items that can be addressed via ratepayer-funded resources for the "Highly Recommended" category:

Table 1: Project Drawdown Explorer - List of the highly recommended electric solutions to Global Climate Change

Improve refrigerant management
Deploy Alternative Refrigerants (low GWP)
Mobilize electric transport (bicycles, scooters, cars, trucks, buses, trains, ships) and hybrid cars
Deploy LED lighting

Improve Window/glass and building envelopes
Automate building systems
Increase urban vegetation
Improve district heating of buildings
Boost industrial efficiency
Improve aviation efficiency
Improve ocean shipping efficiency
Improve supply chain efficiency
Improve truck efficiency
Use heat pumps
Improve grid efficiency
Deploy alternative insulation materials
Improve cement production efficiency
Improve other building materials
Increase industrial electrification
Deploy clean cooking
Deploy solar hot water
Deploy distributed solar PV
Increase carpooling, public transport, nonmotorized transportation
Increase high speed rail

Source: Drawdown® Explorer | Project Drawdown®

For situations where societal goals are different than Global Climate Change, appropriate sources of current situation, untapped opportunities, and market and customer dynamics can be used to determine where to focus efforts.

Stop Thinking Only of Ratepayers

We submit the argument that "ratepayers" is a term that is no longer relevant in today's world. It limits both utility and regulatory thinking on what programs funded through rates can are allowed to work on -- and the cost-effectiveness test parameters these efforts must comply with for approval. The term also leads to too much focus on *rates* rather than *bills*, which is what consumers really care about. Consumers would be more likely to embrace energy conservation and efficiency if these were tied to lower bills; instead of discussions of how adding a public purpose charge to pay for energy efficiency programs leads to increased rates. Better terms like "energy consumers" should replace "ratepayers" (Cavanaugh 2012).

Given recent technological and price reduction advancements, energy consumers of centralized electric and other energy source providers, are increasingly becoming "prosumers," and even "prosumagers" meaning customers who cover some or more than the totality of their energy needs by availing themselves of a mix of energy efficiency and conservation actions coupled with self-generation of electricity and fuel switching from fossil fuels to electricity and adding storage, respectively (Sioshansi 2025). These "prosumers" and "prosumagers" can offer multiple benefits to the rest of society. Utilities and regulators should embrace and foster more customers to join current "prosumers" and "prosumagers".

With regards to energy efficiency ratepayer-funded programs, it makes sense to stop thinking only about ratepayers and the size of the rate-base. Instead, regulators and utilities can seek funding from a broader array of energy sources (e.g., carbon and/or fuel taxes), and furthermore, embrace and foster energy users to become "prosumers" or even "prosumagers" and/or flexible demand providers. This would make energy use more of a shared responsibility between energy utility providers and customers using the electric grid. Customers would be helped to adopt energy conservation behaviors and efficient flexible demand technologies. Communication platforms would enable customers to provide demand flexibility as needed to reduce otherwise needed grid enhancements, while tackling other societal goals, such as reduced greenhouse warming emissions and/or equity.

By thinking more broadly and encompassing all energy using customers, energy efficiency can expand the breadth of its efforts to fully embrace fuel substitution via electrification of end-uses, as well as better management and use of all resources. Furthermore, by drawing financial resources from both energy rates and other sources (e.g. a carbon or fuel tax), cost-effectiveness tests are no longer constrained by mostly energy costs and benefits and can include other non-energy benefits such as improved health, equity, reduced pollution, safety, and productivity.

Focus Energy Efficiency Efforts on Those With Most Value-Added to Society

Utilities are currently facing a potential death spiral of increasing customer rates and bills, resulting in a smaller rate-base as more customers, across all market segments and sizes, become prosumers and prosumagers. Climate-change-related extreme weather is only adding to the drivers for higher rates to cover increasing utility costs of replacing old equipment and embracing newer technologies. The resulting increase in rates and bills leads to unpleasant political and regulatory pressure and calls for reduced guaranteed rates of return on utility investments. This makes utility stocks and bonds less attractive and increases their capital borrowing costs, reducing profits, and increasing internal pressure to reduce costs, including energy efficiency programs.

Utility executives, regulators, legislators, and other stakeholders need to realize that energy efficiency programs are one of the few options available that lower costs and customer rates and bills. This is because regulatory bodies typically only approve ratepayer-funded energy efficiency efforts that meet cost-effectiveness tests where energy benefits outweigh costs. This means that for every dollar spent on an energy efficiency program, society saves more than one dollar.

To further improve the beneficial impact of ratepayer-funded energy efficiency interventions, utility efforts must focus on carrying out activities with the highest value-added results (Friedmann 2006, 2011). For example, utility programs should focus on identifying where energy efficiency and/or demand flexibility can reduce capital expenditures. The electrification of homes and businesses, adoption of electric vehicles and/or other large electric loads like new Data Centers and huge distribution warehouses make distribution (or even transmission) circuits areas deserving focus. Utility efforts should address these customers' major load-increasing end-uses via energy conservation and efficiency, coupled with other distributed energy resources and flexible demand options that could be developed on-site. Engaging large consumers may take more time and human resources but will likely result in larger and more reliable energy efficiency power and energy savings and flexible demand resources. Addressing smaller customers requires the aggregation of many smaller unitary results. Tapping these smaller customers' flexible demand is easier to achieve today with advanced communication platforms, "smart" electric appliances and lights, and AI/ML software that can better understand and predict customer behavior. Efforts aggregating smaller users are also warranted for both equity and more immediate results. This geographically and "targeted" customer approach differs from past efforts where utilities provided interventions for all customers. It is important that both utility and regulatory bodies understand that carrying out more targeted efforts focused on reducing utility capital and operating expenses will provide larger benefits to all customers through reduced rates and bills.

Energy efficiency efforts should therefore operate within a broader framework that seeks to integrate them with other DERs (distributed energy resources) and optimize reliable demand flexibility where it offers the most value to society. The paper describes two examples before touching on broader, non-resource-acquisition options.

1. Domestic Hot Water

Consider residential hot water needs. Current technologies rely mostly on natural gas or propane fired water heaters or boilers or electric resistance water heaters. All these can be replaced with heat pump water heaters (henceforth HPWH) who typically use one unit of energy in the form of electricity to move 2.5 to 3 units of energy to heat the water (Hawken, Lovins and Lovins 1999). These HPWHs are seen by many energy folks as both a way to increase the efficiency of water heating and a potential source of flexible demand. Energy efficiency programs typically incentivize 50-gallon or larger HPWHs to garner a larger demand flexibility opportunity while ensuring enough hot water will always be available to users. Manufacturers often add an electric resistance back-up element as well. What is ignored is that more people are living alone, in apartments, i.e., smaller housing units. Ideal HPWHs for these single-occupier housing units would likely be at most 30 gallons, where 120 Volt supply would be more feasible, as well as relying on very low Global Warming Potential (GWP) refrigerant such as propane, to also mitigate GHG emissions should the refrigerant leak. Heating 50 to 80 gallons of water instead of 30 gallons requires more energy, and heat losses are also larger, for most likely, no added customer benefit. Heating the larger volume of water also takes longer, meaning that the system will require electricity for longer periods of time, contributing to a longer energy draw and overall system demand due to higher coincidence factor with other HPWHs. The focus on the potential for these larger HPWHs to be turned off during peak times resulting in significant flexible demand, is not apparent in recent research that is still underway (Fergadiotti 2026, Kim 2026, Liu 2026). Furthermore, the larger HPWHs use more resources in their construction and transport from factory to home. Bottomline, care must be taken to consider what technologies to deploy, their features, and how to entice customers to use them wisely, to garner the societal results we seek.

2. Electric Vehicles

Another major option mentioned by Project Drawdown that both increases energy efficiency and deploys large flexible demand are electric vehicles (henceforth EVs), especially cars, trucks and buses. EVs are about 4 times more efficient at providing energy to move the vehicle than internal combustion engines (Stanford 2026). If EVs rely on renewable electricity, they also mitigate GHG emissions. Besides the increase in energy efficiency, EVs can, once manufacturers allow it, use their batteries to store grid electricity during low societal use times, and provide power and energy to the grid during peak times. Furthermore, EVs can be positioned to provide this flexible power and energy to some degree to meet specific geographic needs by managing their charging/discharging cycles appropriately, while allowing customers to have the final say. Utility programs promoting and supporting EV adoption should be increased and partner with governments and a broader array of vehicle manufacturers to get them to agree to customers using EVs at V2X (vehicle to everything). Utilities can also partner with school districts and other major fleet operators to develop appropriate charging infrastructure and EV adoption by these customers. The expansion of EVs will increase the rate base for utilities and reduce electric rates to all customers and provide significant flexible demand. For example, school buses are mostly idle during the middle of the day—when their batteries could be charged with abundant solar energy. They could then sell power and energy to the grid for evening and nighttime hours. EPRI and NRDC recently examined the EV resource in detail (EPRI 2024).

Other Non-Resource Acquisition Energy Efficiency Opportunities

Utilities can work with cities and municipalities to offer developers faster turnarounds on permits and infrastructure buildouts and interconnection times, via better land use planning, more solar passive architecture, water efficiency, etc., to enable more self-sustaining urban developments.

Utilities need to establish more and stronger alliances and collaborations with the large and quite mature market of energy efficiency experts, institutions (e.g., Consortium for Energy Efficiency, ASHRAE, Advanced Water Heating Initiative), fiscal, finance and regulatory arrangements that have evolved thanks to the more than fifty years of ratepayer-funded energy efficiency efforts.

Based on work by for example "Project Drawdown" some other key areas where ratepayer funded energy-efficiency programs can capture impactful "niche" opportunities are:

- Get manufacturers to bring better products to market sooner. One option is to replicate the SERP (super-energy-efficient-refrigerator-program) model, where utilities and others put together a 30-million-dollar prize that was awarded to the company that produced a refrigerator that was 25% more energy efficient than current models (Eckert 1995).
- Work with manufacturers or retailers to specify more energy efficiency equipment. Two efforts at PG&E exemplify how useful this approach can be. In the first case, a PG&E staffer worked with a major retailer of TVs, offering them a ten-dollar incentive per unit if they included energy efficiency in their product purchase specifications. This incentive doubled the retailer’s profit on each TV sold. TV manufacturers complied and added efficient components in the TVs they made resulting in worldwide LED TVs energy use going down by ½ to 2/3 the following year. In the second case, another PG&E staffer engaged a major manufacturer of two-door refrigerated beverage cases. The manufacturer said he would gladly make the units more efficient if PG&E could convince either Coca Cola or Pepsi to buy them. The PG&E staffer approached both major bottlers. One agreed to purchase the more efficient refrigerated cases. Hundreds of thousands of these refrigerated cases were eventually replaced with these more energy efficiency models worldwide. Similar efforts could be done with other major opportunities such as heat pumps and/or A/Cs as identified by Project Drawdown.
- Offer manufacturers more homogenous international energy efficiency codes and standards. This homogeneity will be welcomed by manufacturers and enable them to develop more energy-efficient products they can sell to more countries. Manufacturers hate to deal with unique local and/or national codes or equipment efficiency standards which may result in over stock due to unsold products and higher compliance and transaction costs.
- Increase current energy efficiency Code and Standards to align with the most energy efficient Codes and Standards, and if possible, with the most efficient equipment

available. Per IEA, there is a large gap between current appliance sales and efficiency standards' average efficiency and best-in-class models and standards. For example, lighting standards could be increased four-fold (IEA 2026). Energy savings from doing this could decrease worldwide energy intensity from the 1.8% achieved in 2025 towards the 4% reduction that 200 countries agreed to achieve yearly at COP28. Governments could ratchet current standards to at least align with the most energy efficient ones and eventually seek to have these align with the most energy efficient equipment models (IEA 2026).

- Push for international accords to phase out high GWP (Global Warming Potential) refrigerants, develop HVAC equipment with CO_2 or other GWP <1 refrigerants (e.g., propane in refrigerators-as has been done for decades in Europe).
- Provide customers with one-stop shop of reliable and trustworthy information that enables customers to easily identify best products and service providers--and continuously monitor their quality to ensure customers are well served. This way they will help reduce transaction costs and customer hesitancy to adopt new products and services.
- Link with apps that offer trustworthy and up-to-date information on products, services (e.g., consumer reports), and incentives (local to national).
- Utilities can also work with more trustworthy institutions to promote "Small is Beautiful" or "less is more" so that customers and social norms shift towards more resource efficiency.

Align Regulatory Policies While Also Carrying Out Process Improvement

Regulatory policies and processes need to be improved so that this broader vision of how to fund energy efficiency (and other DERs development), is easier to achieve. Currently, policies are mostly siloed and focus on regulatory oversight of specific portions of the energy system. Thus, energy efficiency programs tend to be regulated separately from other DERs, generation, self-generation, etc. This results in non-integrated visions, which though called for often by Commissioners in regulatory agencies and Secretaries or Ministers of Energy, are not reflected in the specific regulatory policies and processes. Instead, regulatory body approvals of public and ratepayer funded efforts are often based on limited cost-effectiveness criteria, which do not encompass a full accounting of net benefits to society, nor account for the synergies that result when integrating energy efficiency and other DERs and flexible demand efforts.

Regulators often seek to address immediate concerns, such as equity and affordability of the electric sector. A couple of years ago, there was much more focus on Global Climate Change in the U.S.A. and Europe. This focus on short-term immediate concerns is not ideal. A broader perspective where short-term concerns are addressed while also keeping a focus on longer-term goals will provide a more integrated approach and likely, better societal results.

Regulatory rules at times also impact beneficial and timely outcomes. For example, in the U.S.A., many regulatory bodies have rules that seek to limit the potential for collusion among Commissioners by forbidding a majority of them to meet behind closed doors. This stymies conversations among Commissioners, limiting the information they consider and making it harder to resolve competing goals across their specific and often siloed jurisdictions. The resulting policies they then agree to can often be less than ideal.

Regulatory processes that seek to ensure full stakeholder engagement and participation are too slow, complex, and cumbersome. This results in two less than ideal outcomes: 1) A prevalence of large and longstanding "stakeholders" whose input and feedback on proposed policies and programs ends up providing information that seeks to optimize these policies and programs to their specific needs; not those of society at large; and 2) Policies and programs are not able to adapt to changing contexts in a timely manner. Unintended negative consequences take longer to resolve. Positive opportunities are not tapped quickly, resulting in lessened benefits to all.

There are significant and ongoing efforts to improve policymaking and policies across the world. More interactions and sharing of best practices across the world would be beneficial. Regulatory organizations like NARUP, non-profit organizations like ACEEE, the Regulatory Assistance Project, the Alliance to Save Energy (ASE), Energy Innovation, the National Resources Defense Council, Rocky Mountain institute, and many academics (for example California Institute for Energy and Environment at UC Berkeley and Stanford's Precourt Institute or literature compendiums of international experience (e.g., Sioshansi 2026), all provide useful forums and ideas for consideration by local and national regulatory bodies.

How Research and Evaluation Can Support the Continued Relevance of Ratepayer-Funded Energy Efficiency Efforts via Timelier and Actionable Feedback

Given energy efficiency is "invisible", i.e., savings are calculated as the difference between a baseline using estimated business-as-usual energy use minus the actual observed energy use, regulators add significant evaluation requirements to confirm that ratepayer funding has resulted in actual energy savings. Unfortunately, since the beginning of energy efficiency efforts in the mid-1970s, evaluations tend to bias savings assessments downward, to avoid critics questioning the credited savings. Additionally, significant evaluation resources seek to determine not only gross savings, but more importantly, how much of the savings reported by programs would have happened anyways, due to adoption of energy saving technologies and practices by free riders. The methods used to determine free ridership are fraught with significant uncertainty and evaluation seldom assigns similar resources to determine market effects and spillover savings, resulting in under-estimation of current and future savings by energy efficiency efforts. This further magnifies the downward bias in energy savings credited to program efforts, as previous spillover and market effects then are included as part of the new business-as-usual baseline going forth resulting in an inaccurate and high baseline (Friedmann 2007; Perich-Anderson and Friedmann 2008)

The evaluations of energy efficiency efforts would provide more valuable feedback for program design and implementation if more evaluation resources were destined to carry out developmental and process evaluations as well as ongoing market characterizations (Friedmann 2011, 2019; Patton 2010). Research and evaluation should try to provide guidance on actionable adjustments as soon as possible.

Net-to-gross, Free Ridership and Spillover assessments have significant uncertainty. Instead of seeking to determine "net savings" to credit to an energy efficiency effort, these assessments should be used as indicators of where in the technology adoption curve a technology is (Friedmann 2011; Rogers 1961). In this way, they would inform program designers and implementers whether future interventions in that market need to focus on information (the "early adopters" stage), incentives (the "main market" stage) or code/standards (the "laggards" stage) (Friedmann 2011; Perich-Anderson and Friedmann 2008).

Conclusions

Ratepayer funded programs and policies need an overhaul to stay relevant in today's context and continue to provide significant added value. Per IEA, worldwide investment in energy efficiency was about 780 billion dollars in 2025, up from around 740 billion dollars in 2024. This is at least two orders of magnitude larger than ratepayer funding. Ratepayer-funded energy-efficiency programs will be more successful if they leverage the broader market via strategic collaborations that focus on overcoming market barriers and tapping niche, underdeveloped, and/or underserved markets of highest value to the grid. These ratepayer-funded efforts and policies must become the "oil of the bigger, worldwide energy-efficiency machinery". They also need to stop working in an energy-efficiency only silo and embrace other DERs, prosumers and maximize flexible demand. Research and evaluation efforts should inform program and policy design and implementation through more market characterization and developmental and process work.

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