Shining a Light on Energy Efficiency: The Implications of Solar as an EE Measure

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ABSTRACT

Is customer-sited rooftop solar generation the next big energy efficiency measure? Texas, Pennsylvania, and Massachusetts include rooftop solar as an energy efficiency (EE) measure in limited ways. It is an expanding idea in energy efficiency. In 2025, Illinois electric utilities proposed adding customer-sited rooftop solar to the Illinois Technical Reference Manual, citing examples from other states. Stakeholders, including Illinois Commerce Commission Staff, opposed the measure, arguing that solar photovoltaic panels, which generate electricity, do not meet the definition of energy efficiency in state policy.

Standard definitions of EE focus on reducing energy consumption, irrespective of the generation source. In this new era of rising demand, could rooftop solar and other behind-the-meter distributed energy resources (DERs) be considered EE? This paper will explore this question and the implications of treating DERs as a source of efficiency. It reviews how states are approaching this emerging policy question and the impacts they have seen from adding solar or other DERs as EE measures. The paper assesses the benefits and drawbacks of expanding our definition of EE in this direction to guide policymakers as we chart a path forward for modernizing EE to meet the current moment.

Introduction

It was a routine meeting of the Illinois Energy Efficiency Stakeholders Advisory Group (SAG) in June 2025, when parties convened as part of the annual Technical Reference Manual (TRM) update process. Stakeholders gathered to consider four new measures for the next version of the TRM. While new measures are proposed regularly and without controversy, one of the measures – rooftop solar photovoltaic panels (solar PV) as an energy efficiency measure – immediately received some attention. ComEd, Illinois' largest electric utility, argued that solar PV met the state's statutory definition of energy efficiency (EE) and should be added to the TRM. Most stakeholders did not agree. Without consensus, for the first time in Illinois TRM history, the process proceeded to litigation at the Illinois Commerce Commission (ICC). Illinois Commissioners will soon decide whether solar PV meets the state's statutory definition of EE and could therefore be added to the TRM.

Illinois is far from the only state considering whether solar PV is, or could be, an energy efficiency measure. Pennsylvania and Texas each include solar PV in their TRMs. Other states, like Massachusetts, include solar PV in limited ways in specific EE programs. Solar PV can provide significant grid benefits as peak solar generation often overlaps with peak demand alleviating grid strain during some of the most critical hours. So, it seems like the right time to ask: could solar PV be the next big energy efficiency measure? And if so, what are the implications of adding solar PV to utility EE portfolios? This paper will canvass state policies regarding solar PV as an EE measure, discuss realized and potential implications, and finally offer recommendations for policymakers.

Solar Photovoltaic (PV) Technology

There are several solar technologies in use today. Solar PV cells made of semiconductor material convert sunlight into electricity. Customer-sited residential solar systems can be standalone or grid-connected. In most states, customers with grid-connected solar PV systems can sell excess power back to the grid when their PV system generates more electricity than is consumed on-site, a practice known as net metering. Utilities have begun to explore how distributed energy resources (DERs), including solar PV, can benefit their larger systems. In a presentation to the SAG, ComEd showed that an average residential solar system can reduce load at the meter by roughly 5,500 kWh annually – a potentially significant reduction in the utility's overall load when scaled (ComEd 2025a). DERs on their own offer energy savings at the utility or grid level, but when aggregated they become a powerful resource for enhancing grid reliability and stability. A virtual power plant (VPP) is a system that aggregates and coordinates DERs, including solar PV, to dispatch the distributed power in response to grid conditions. In California, a VPP operated by SunRun provides nearly 1GW of capacity from thousands of solar PV systems (Abdelkader et. al. 2024). Given the significant grid benefits of DERs, particularly solar PV combined with battery storage, utilities are thinking about these assets in new ways in an era of rising energy demand.

In addition to larger solar PV systems traditionally installed on residential rooftops, there is a newer, smaller version of the technology called plug-in or balcony solar. While legalization of plug-in solar is expanding, the technology is novel in the United States and is not actively being contemplated as an EE measure, though that potential exists. There are relevant solar energy technologies in use besides PV that are considered EE measures in several jurisdictions like solar water heaters and solar light tubes. Solar water heaters and solar light tubes, unlike solar PV, do not generate electricity. In its original set of TRM recommendations, ComEd included solar thermal as a proposed measure in the Illinois TRM. Stakeholders largely agreed with this proposal, as this technology does not generate electricity and therefore more concretely fits into the existing statutory definition of energy efficiency. While various technologies fall under the broad umbrella of 'solar,' this paper will focus on customer sited solar PV rather than plug-in solar, solar thermal, or other technologies.

State of Solar as an Energy Efficiency Measure

There is precedent for including solar technologies as energy efficiency measures in state legislation or TRMs. The inclusion of non-PV solar technologies, particularly solar water heaters, as EE measures, is far more widespread than the inclusion of solar PV. Several states include solar PV as an allowable technology in utility EE portfolios directly in their statutory definition of energy efficiency (PL 2008; RIGA 2024; SCGA 2025; Texas Legislature 2019). Most recently, Maryland added solar PV as an allowable EE measure for the upcoming 2027-29 portfolios with the passage of the Utility RELIEF Act in May 2026 (MGA 2026). In practice, including the measure also requires establishing TRM methodology to calculate savings. Some states have done this and include solar PV in the statewide TRM, including Massachusetts, Pennsylvania, and Texas. Massachusetts, however, limits the use of solar PV to specific programs discussed below (PUCT 2025). Table 1 shows which states allow solar PV in legislation, which states include the measure in a statewide TRM, and which states include non-PV measures, like solar water heaters, in their statewide TRM.

Table 1. States with solar EE measures included in their TRM

State	Includes Solar PV in Statutory Definition of EE	Solar PV as EE Measure in TRM	Non-PV Solar Measures in TRM
Arkansas			x
California			x
Connecticut			x
Hawaii			x
Illinois			x
Hawaii			x
Maryland	x		
Massachusetts	x	x	x
Michigan			x
New Mexico			x
New York			x
Pennsylvania	x	x	x
Rhode Island	x		x
South Carolina	x		
Texas	x	x	x

Source: MEEA review of statewide TRMs and legislative definitions of energy efficiency.

State Examples

Texas

In 2007, with the passage of House Bill 3693, Texas began allowing solar PV as part of market transformation initiatives within utility EE portfolios. In 2011, with Senate Bill 1125, the legislature added a peak load reduction goal to the EE framework. SB 1125 also expanded the type of programs that electric utilities in the Electric Reliability Council of Texas (ERCOT) region are eligible to implement in EE programs to include distributed renewable technologies:

> [E]ach electric utility in the ERCOT region shall use its best efforts to encourage and facilitate the involvement of the region's retail electric providers in the delivery of efficiency programs and demand response programs under this section, including programs for demand-side renewable energy systems that:
>
> (A) use distributed renewable generation, as defined by Section 39.916; or
>
> (B) reduce the need for energy consumption by using a renewable energy technology, a geothermal heat pump, a solar water heater, or another natural mechanism of the environment; (Tex. Util. Code 2011, 39.905.a.4)

This portion of statute catalyzed an investment in solar PV across electric IOUs in ERCOT, primarily American Electric Power Texas (AEP), CenterPoint Energy Houston Electric (CenterPoint), and Oncor Electric Delivery Company (Oncor). These three utilities offer solar PV incentives to residential and commercial customers. Table 2 shows the spending and savings achieved from solar PV by these three utilities in 2024.

Table 2. Investor-owned utility 2024 solar-EE spend and save

Utility	Portfolio Segment	Total EE Spend ($)	Solar Spend ($)	% spend solar	EE Savings (kWh)	Solar Savings (kWh)	% savings solar	EE Peak Reduction (kW)	Solar Savings (kW)	% peak savings solar
AEP TX	TOTAL	$19,614,153	$957,919	4.9%	64,571,868	3,765,628	5.8%	69,290	1,034	1.5%
	Commercial	$7,647,502	$218,514	2.9%	36,361,263	642,587	1.8%	23,926	169	0.7%
	Residential	$6,714,416	$739,405	11%	23,146,059	3,123,041	13.5%	7,780	866	11.1%
CenterPoint Energy	TOTAL	$46,247,284	$2,159,484	4.7%	228,948,734	3,384,681	6.6%	235,544	3,947	1.7%
	Commercial	$22,568,099	$1,725,149	7.6%	122,985,798	1,159,780	10.6%	167,903	3,423	2.0%
	Residential	$22,456,586	$416,752	1.9%	153,047,639	2,161,258	1.4%	79,960	508	0.6%
Oncor Energy	TOTAL	$79,838,482	NA*	NA*	196,859,776	4,995,221	2.5%	224,957	1,502	0.7%
	Commercial	$26,766,127	NA*	NA*	87,010,773	3,885,537	4.5%	111,858	299	0.3%
	Residential	$31,335,044	$2,167,127	6.9%	71,646,735	1,109,684	1.5%	88,526	1,202	1.4%

Sources: PUCT 2025b; PUCT 2025c; PUCT 2025d
** Oncor Energy only reported residential solar PV total spend.*

The Texas TRM first included both residential and commercial solar PV measures in 2013. The Texas TRM utilizes the National Laboratory of the Rockies (NLR) PVWatts Calculator[1] to estimate the annual energy production of a solar PV system and calculate the expected annual energy savings for the utility (PUCT 2025). For winter and summer peak demand savings, the Texas TRM provides deemed savings, based on a project's climate zone, that is then multiplied by the size of the installed system. There is no maximum solar system size limit in the Texas TRM.

AEP, CenterPoint, and Oncor all offer solar PV incentives in various program structures, and each utility sets their own program eligibility requirements. AEP does not incentivize systems "that are estimated to produce more energy on an annual basis…that is consumed by the customer at the interconnected meter" (AEP Texas 2026). AEP is able to count all solar PV generation consumed by the customer as EE savings. CenterPoint does not incentivize residential solar systems larger than 15kW, but the utility does not specify a size limit for commercial systems (CenterPoint Energy, 2026). Oncor incentivizes residential solar PV systems up to 20kW and commercial systems up to 450kW. Additionally, Oncor specifies that both commercial and residential systems cannot be sized to exceed 75% of the site's maximum demand over the past 12 months (Oncor Energy 2026).

At each utility, solar PV investment, earned savings, and benefit-cost assessment scores (BCA) have remained consistent over the last three years. The test a state uses to assess the cost-benefit ratio of its EE portfolios matters a great deal as the test determines which costs and which benefits must be weighed. Texas uses the Utility Cost Test BCA test, which only considers the cost to the utility (the incentive level), and not the cost of the customer's investment in their solar PV system. Table 3 provides the BCA scores and measure rank for solar PV for AEP and CenterPoint. Measure-level spending and BCA scores for Oncor were not publicly available. Under the Utility Cost Test solar PV is highly cost effective as evidenced by the BCA scores. A measure's cost-effectiveness relative to other measures in the portfolio will influence its prevalence in the portfolio. As Table 3 shows, there is a correlation between measure rank by

[1] See https://pvwatts.nlr.gov/.

BCA score and measure rank by spend within the portfolios of CenterPoint and AEP. Where the solar PV measure is one of the most cost-effective measures the utility tends to spend more towards incentivizing solar PV.

Table 3. Comparison of TX solar PV measures of measure spend and BCA score

Utility Measure	Spend ($)	Measure Rank by Spend in Customer Sector	BCA Score	Measure Rank by BCA Score in Customer Sector
CenterPoint - Commercial Solar PV	$1,492,812	3	17.87	3
CenterPoint - Residential Solar PV	$412,725	9	11.95	8
AEP TX - Commercial Solar PV	$218,514	14	7.15	42
AEP TX - Residential Solar PV	$739,405	5	10.35	3

Sources: PUCT 2025b; PUCT 2025c; PUCT 2025d

Pennsylvania

Pennsylvania's Act 129, which governs the state's energy efficiency and conservation programs, specifically allows utilities to incentivize solar PV (Pennsylvania General Assembly 2008, § 2806.1(2)). Utilities incentivized solar PV in their Phase IV (2021-25) Plans, often as a custom C&I measure, despite solar PV being absent from Pennsylvania's TRM. After changes to net metering rules in 2022 led to more interest in solar PV in the state, Pennsylvania's Statewide Evaluator (SWE) for its Act 129 programs developed an interim measure protocol for solar PV so that more projects could be incentivized without requiring the additional measurement and verification associated with custom projects. In 2024, the first year the interim measure protocol was in effect, solar PV went from representing a limited percentage of overall portfolio savings to the second biggest energy saving measure accounting for 9.4% of all savings statewide (PPUC 2025a). Table 4 shows the top saving measures for the three years prior to solar PV's inclusion as an interim measure and the first program year, 2025, that it was included.

Table 4. Pennsylvania statewide energy savings by top saving measures

Measure	**PY22**		**PY23**		**PY24**		**PY25**	
	MWh Saved	% of total	MWh Saved	% of total	MWh Saved	% of total	MWh Saved	% of total
Non-Residential Lighting	246,697	41%	534,669	57%	484,666	54%	510,705	44%
Residential Lighting	60,170	10%	65,661	7%	44,677	5%		
Solar							**104,462**	**9%**
Home Energy Reports	36,102	6%	56,281	6%			69,642	6%
Combined Heat and Power (CHP)	78,221	13%	18,760	2%	539	0.06%	81,249	7%
Other	180,510	30%	243,884	26%	359,012	40%	394,636	34%
Total Statewide Savings (Verified Gross MWh)	601,700	100%	938,016	100%	897,530	100%	1,160,694	100%
Total Statewide Spending on Act 129 Programs ($Million)	$134.6		$218.5		$257.2		$268.4	

Source: PPUC 2025a

Overall savings increased in PY25, but combined heat and power (CHP) also increased significantly that year so the increase cannot be attributed to the new solar PV measure alone. Blank cells do not necessarily represent zero savings, but rather that savings for that measure

were not as significant and were captured in ‘other’ that year. The SWE also noted that savings from residential lighting have been declining steadily due to changes in eligibility for certain downstream lighting measures leading to diminished savings potential (PPUC 2025a).

In the 2024 TRM update, solar PV was officially added as both a residential and commercial measure. The new residential solar PV measure applies to systems of 50 kW or less and assumes a 15-year useful life. Only energy used to offset the concurrent building load can be counted towards Act 129 EE savings. Like Texas, Pennsylvania’s TRM uses the NLR PVWatts Calculator to estimate the generation from each solar PV system (PPUC 2024a, measure 2.8.3). The commercial measure is similar but applies to systems generating up to 2,000,000 kW annually. Larger systems require onsite evaluation, measurement, and verification (PPUC 2024b, measure 3.11.6).

In Pennsylvania the PPUC bases utility energy and peak demand savings goals on a statewide potential study conducted by the SWE ahead of each planning cycle. The potential study evaluates achievable savings across five categories: market rate EE, low-income EE, solar PV, CHP, and demand response. The SWE considers the average acquisition cost and corresponding budget allocation for each of the five categories based on the available budget. Utilizing the potential study, the PPUC sets a recommended budget allocation for each category in its implementation order. In the upcoming Phase V Plan (2026-31), the PPUC recommended utilities spend 5% of their EE budgets towards solar PV. The funding recommendations are indeed recommendations and not strict requirements; however, the PPUC does have the authority to approve or reject each utility’s plan (PPUC 2025b).

The solar measure is integrated into various programs for each utility, and exact budgets for each measure are not available. Utilities do, however, report estimated savings for solar PV in the upcoming Phase V (2026-31) Plans. In the recently approved plans, the four major utilities are estimating that solar PV will account for between 5% to 9% of portfolio savings in Phase V (PECO 2025; FirstEnergy 2026; PPL 2025; Duquesne 2026). The highest planned savings from solar PV in a single year is12% in the 2026-27 program year for PECO. PECO’s planned solar PV savings over the course of the entire 5-year plan, however, is only 9% (PECO 2025). Non-residential lighting continues to represent the highest percentage of savings across all four major utilities (PECO 2025; FirstEnergy 2026; PPL 2025; Duquesne 2026).

Massachusetts

In 2022, Massachusetts passed An Act Driving Clean Energy and Offshore Wind (Clean Energy Act), opening the door for ratepayer-funded energy efficiency programs to include a limited amount of solar PV. The Clean Energy Act does not allow market rate residential or commercial solar PV offerings, but utilities may propose solar PV offerings so long as they are only available to “a limited number of participants within the low-and moderate-income customer groups” and offered through a program promoting whole building energy efficiency measures as well as the electrification of heating, cooling, and cooking within the home (Massachusetts Legislature 2022).

Since the passage of the Clean Energy Act, the Massachusetts Department of Public Utilities has approved one demonstration program offering solar PV. The Cape & Vineyard Electrification Offering (CVEO) was approved to serve one hundred low- and moderate-income households in the 2023-24 program year with a budget of just over $6 million (MA DPU 2025). In addition to meeting income qualifications, customers must use oil, propane, or electric

resistance heating and agree to fully electrify their homes. Eligible customers received air-source heat pumps, battery storage, heat pump or electric water heaters, and solar PV, all at no or low-cost, depending on income level.

Due to increases in material costs, the program reduced the number of participants and served 55 customers, providing 20% of those customers with battery storage. Tables 5 and 6 show that CVEO participants experienced a large reduction in overall annual energy bills and net electricity consumption. Customers on average reduced both their annual energy consumption and their total energy bill by 59%. While electricity use increased for households that moved from delivered fuel heating to electric heat pumps, the energy generated by solar PV in the spring, summer, and fall months compensated for this growth in usage. Participants were required to interconnect as a qualifying facility rather than a net metering facility; therefore, participants were compensated for their excess generation using the average monthly clearing price at ISO-NE, which ranged from $0.05 to $0.10/kWh. Net metering facilities receive higher compensation, between $0.25 to $0.30/kWh, for excess generation.

Table 5. Change in weather-normalized gross and net electric consumption

	Spring Average Monthly (kWh)	Summer Average Monthly (kWh)	Fall Average Monthly (kWh)	Winter Average Monthly (kWh)	Annual Average Monthly (kWh)	Annual Average Total (kWh)
Pre-Installation	561	526	561	578	555	6,664
Post Elec. Equipment Installation	790	554	790	1,341	867	10,406
Post Solar PV Installation	165	-476	165	1,050	225	2,702
Net Consumption Change	-395	-1,003	-396	472	-330	-3,961
Net Consumption Change (%)	-71%	-191%	-71%	82%	-59%	-59%

Source: Guidehouse 2025

Table 6. Change in weather-normalized overall energy bill

	Spring Average Monthly ($)	Summer Average Monthly ($)	Fall Average Monthly ($)	Winter Average Monthly ($)	Annual Average Monthly ($)	Annual Average Total ($)
Pre-Installation*	$253	$211	$253	$305	$255	$3,060
Post Equipment Installation**	$79	-$26	$79	$290	$106	$1,267
Net Energy Bill Change	-$174	$237	-$174	-$14	-$149	$1,793
Net Energy Bill Change (%)	-69%	-112%	-69%	-4.7%	-59%	-59%

Source: Guidehouse 2025
**Pre-installation includes delivered fuel bills*
***Post equipment installation includes both electrification and solar PV equipment*

This case study offers a promising opportunity for solar PV to pair with electrification programs and reduce bill impacts for low-income households, especially in a state that has natural gas constraints and high prices. Further research is necessary to investigate the opportunity for programs of this model to effectively reduce the energy bill impacts of electrification on natural gas heated homes, especially in regions where natural gas rates are significantly less expensive than electric rates. This program model may be beneficial in cases where the "spark gap" between natural gas and electric rates can dissuade households from electrifying.

Illinois

Unlike Pennsylvania and Texas which include solar PV in their statutory definition of EE, Illinois defines EE in statute as follows:

> "Energy efficiency" means measures that reduce the amount of electricity or natural gas consumed in order to achieve a given end use. "Energy efficiency" includes voltage optimization measures that optimize the voltage at points on the electric distribution voltage system and thereby reduce electricity consumption by electric customers' end use devices. "Energy efficiency" also includes measures that reduce the total Btus of electricity, natural gas, and other fuels needed to meet the end use or uses (IPA Act 2025, § 1-10).

ComEd's petition to the ICC is, at its core, a question of statutory interpretation rather than a more complex question on the merits of whether solar PV as an EE measure is good policy. Succeeding in the regulatory venue requires the ICC to agree with ComEd that solar PV meets Illinois' statutory definition of energy efficiency. ComEd's proposed measure includes on-site solar PV systems smaller than 25kW, with or without a battery storage system. Only "generated energy used to offset concurrent building loads" would count towards EE savings for the utility, and ComEd's proposed methodology would apply "an adjustment factor to estimated annual solar production to account for simultaneous offset of building loads only." To do this, ComEd proposed "a simulation-based approach for estimating solar array energy production using PVWatts or similar tools, simulated with the actual physical characteristics of each participating PV system." Solar arrays larger than 25kW would require a custom savings analysis (ComEd 2025).

ComEd argues that solar PV meets the Illinois statutory definition of EE because "it reduces the amount of natural gas consumed to achieve end uses and reduces the total Btus required to meet those end uses…on-premises solar generation reduces the amount of grid-supplied electricity required to serve end uses at the host premises and, by doing so, reduces the fossil-fuel inputs needed elsewhere on the system to satisfy that load" (ComEd 2025b, p.34). Several intervening stakeholders argue that customer-sited solar PV merely changes the source of electricity generation rather than reducing the energy needed to achieve a given end use (NRDC 2026; ICC Staff 2026). These competing arguments represent two different visions of energy efficiency: one where upstream reductions in fuel consumption amount to EE and the other where EE is achieved by a reduction in energy needed for behind-the-meter end uses.

On June 1, 2026, the Administrative Law Judge (ALJ) assigned to the docket released a proposed order denying ComEd's petition finding that Illinois' statutory definition of EE fits within the latter and does not include behind the meter solar PV (ICC 2026). ICC Commissioners are expected to make their final ruling in late summer 2026. Should ComEd succeed in its petition, the new measure would still need to be added to the Illinois TRM through a process where stakeholders could once again weigh in on the merits of including solar PV in the TRM. Should the ICC concur with the ALJ's findings and deny the petition, ComEd and other stakeholders could pursue a legislative change to Illinois' Public Utilities Act.

Discussion of Implications and Policy Recommendations

Defining Energy Efficiency

There is no singular accepted definition of energy efficiency at the federal level and state definitions vary, but most statutory and regulatory definitions contain the same key concept: EE involves using less energy to get the same job done.[2] The definition matters as seemingly small variations can lead to very different policy outcomes. Massachusetts, Pennsylvania, and Texas include examples of measures that could be considered EE directly in statute and all three explicitly list solar PV (MGL c. 179 § 87A; P.L. 1592, No. 129; Tex. Util. Code § 39.905).

In Illinois, energy efficiency experts disagree as to whether behind the meter generation like solar PV fits within the current statutory definition. ComEd, ratepayer advocate the Citizens Utility Board, the Illinois Attorney General, and several solar advocates envision an expansive definition of energy efficiency where EE encompasses measures that reduce load for the utility at the grid level regardless of whether behind the meter energy consumption is reduced. Conversely, ICC Staff, the Illinois Power Agency, and the National Resources Defense Council argue that energy efficiency, as defined in Illinois, is a reduction in energy consumption at the end-use, not upstream in front of the meter. Given the expertise of these parties making compelling arguments both for and against solar PV meeting Illinois' statutory definition of EE, policymakers should be explicit in legislation and regulation about what technologies comprise energy efficiency for the purposes of ratepayer funded EE programs.

Some stakeholders in Illinois raised concerns that an expansive definition of EE that includes anything that reduces load at the grid level could open the door to other generating assets, including diesel backup generators, being considered EE (NRDC 2026). While reliance on diesel backup generators that potentially increase overall emissions in demand response events is a real concern,[3] policymakers can prevent fossil generating equipment from being incentivized in utility EE programs through statutory definitions or program goals. States with Energy Efficiency Resource Standards (EERS), including Illinois, often already incorporate legislative language outlining the goals of such a policy that would run contrary to incentivizing additional greenhouse gas emitting equipment. Several states include specific emissions reduction targets within their EERS; others, including Illinois, have statewide decarbonization targets that would create significant legal and administrative hurdles to any attempt to incentivize diesel generators through EE program budgets (Mah, et. al 2025). As such, it may seem unlikely that including

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[2] Energy efficiency is defined for different contexts in multiple federal statutes. The *Energy Policy and Conservation Act,* which provides the statutory authority for the federal government to regulate appliance standards defines energy efficiency as "the ratio of the useful output of services from a consumer product to the energy use of such product" at 42 U.S.C. § 6291(5). ENERGY STAR™ describes energy efficiency as "using less energy to get the same job done." The U.S. Department of Energy uses the following definition on its website "Energy Efficiency improves when a given level of service is provided with reduced amounts of energy inputs or services are enhanced for a given amount of energy input."

[3] The Clean Air Act allows backup generators to operate for up to 50 hours a year. See EPA Factsheet "Use of Backup Generators to Maintain the Reliability of the Electric Grid"; or Data Centers' Use of Diesel Generators for Backup Power Is Commonplace—and Problematic - Inside Climate News.

solar PV as EE would truly open the door to fossil burning backup generators, but it may beg the question of what else could be included.

As EE continues to evolve, policymakers will need to solve complex challenges surrounding how to adequately measure and value EE that are distinct but related to these definitional questions. Both Texas and Pennsylvania have peak demand reduction goals in addition to more traditional annual kWh savings goals. Other states include GHG reduction targets as part of their EERS. The extent to which different kinds of savings targets influence portfolio planning, and whether certain metrics make solar PV more or less attractive, is an area worthy of further research.

Double-counting

There are two immediate areas of concern when it comes to how solar is counted as EE. First is the issue of "double compensation" where the same system could claim compensation under EE programs and renewable energy programs. The second is a broader issue of federal energy tracking reporting and data.

Staff of the ICC raise the double counting issue in testimony, arguing that state law could allow the utility to be compensated for solar both through the EE framework and the state's Renewable Energy Portfolio Standard (RPS) framework, billing ratepayers twice for the same measures (ICC 2026). Staff's position is that even with a construct where EE savings and rebates are limited to energy simultaneously consumed on site and RPS and renewable energy credit (REC) compensation is only available for exported generation, issues may arise with tracking different pricing scenarios for each program depending on whether a project is participating in both EE and RPS programs or just one of them, and could lead to "widespread confusion and significant administrative burdens" (ICC 2026). Issues of double counting can be mitigated by size limits – "[s]ystems estimated to produce more energy on an annual basis…than is consumed by the customer at the interconnected meter are not eligible for incentives" – and customers retain ownership of all RECs associated with projects that are incentivized by the program (AEP Texas 2026). The ICC has yet to rule on how solar PV would be accounted for in EE programs versus RPS programs in Illinois should the measure be approved, but Pennsylvania and Texas demonstrate that it is a resolvable issue.

On the issue of utility reporting to the federal government, the question arises of how solar-as-EE would get reported in annual energy reporting. Nothing in the instructions for reporting energy efficiency in federal Form EIA-861 specifies any technology, suggesting that the form is relying on the definition in the jurisdiction of the reporting utility (EIA 2026). Reporting the same kilowatt in the totals for a utility's EE portfolio and in their generation assets could cause confusion and inflate the true total of solar PV installed each year. In the absence of EIA guidance, as the number of these projects potentially increases, behind-the-meter solar reported on Form EIA-861 as energy efficiency should not also be reported as solar generation.

Cannibalization of Other "Traditional" EE Measures

With finite budgets, adding a new measure to a utility EE portfolio will necessitate spending less elsewhere in the portfolio. Advocates in Illinois argue that with other revenue streams

available within the state to incentivize solar,[4] money from EE budgets should not be syphoned away from traditional measures that reduce end-use consumption behind-the-meter. It is difficult to draw conclusions from the limited data available to what extent the inclusion of solar PV in a utility's EE portfolio results in the displacement of other traditional measures. Savings data from Pennsylvania seem to suggest that both solar PV and CHP took the place of residential and commercial lighting measures in PY25; however, it is impossible to be certain without access to far more granular data on spending and savings per individual measure. In Texas, solar PV has contributed a significant amount of savings to the statewide portfolio, but it has not significantly shrunk the investment in traditional energy efficiency measures. The available data shows utilities spending less than 5% of their total EE budgets on solar PV in Texas. This is likely due to a suite of reasons, including customer interest, incentive level, and technology availability. This result may not hold true in other states, but in the case of Texas, the inclusion of solar PV has resulted in a similar market and portfolio impact as traditional cost-effective energy efficiency measures.

The benefit-cost ratio (BCR) can be a driver for the prevalence of a measure within an EE portfolio, with highly cost-effective measures being included more to enhance overall program/portfolio effectiveness. The BCRs for CenterPoint and AEP solar PV market transformation programs are highly positive—some of the most cost-effective in their portfolios under a Utility Cost Test. Other states may find different results under different benefit-cost tests that include participant impacts or societal non-energy impacts. Future evaluated results and additional research into the cost-effectiveness of solar PV relative to other EE measures are needed for definitive answers on the measure's potential to displace other less cost-effective measures.

Ultimately, EE and solar PV can and should complement each other rather than compete, especially in states where programs to incentivize solar PV outside of utility EE budgets already exist. Combining traditional EE measures with solar PV improves the economics of solar PV as smaller solar systems can offset a larger share of household load in highly efficient homes (Maguire et al. 2024). Furthermore, in states with net metering, any additional generation put back onto the grid is compensated, increasing the benefits of solar PV even more.

Opportunities and Interaction between Solar PV, EE, and Electrification

Data analyzed from the CVEO program in Massachusetts shows that solar PV offset the increase in energy consumption associated with electrification in summer, fall, and spring. Increased electric heating load in the winter combined with less sunlight meant the solar PV was not able to fully offset the increased electric load in the coldest months. Others have found generally promising results combining solar PV with electrification. NLR developed a framework to evaluate the interplay between EE, DERs, and electrification. In doing so, they found that electrification combined with solar PV can offset the additional load needed from building electrification (Maguire et al. 2024). NLR identified the need for more research in this area to understand the interaction between solar PV, other DERs, EE building envelope

[4] See the Illinois Power Agency list of programs incentivizing renewable energy in the state.

measures, and electrification more consistently. This will become even more important as more states develop virtual power plant programs that can provide significant benefits to the grid.

Conclusion

The debate surrounding solar PV as an EE measure in Illinois is illustrative of energy efficiency's ongoing evolution. The success of early lighting measures transformed the residential market, leading utilities and EE advocates in search of other cost-effective methods to generate significant savings. How we define energy efficiency today has a significant impact on its future. Can electricity generation, in certain circumstances, be considered EE? How policymakers answer this question may depend on the problem they are trying to solve. In an era of unprecedented rise in demand from data centers and electrification, it is easy to see distributed generation as a meaningful solution. But is this reduction in the utility's load ultimately a more efficient use of energy?

This paper canvassed state policies about solar PV as an EE measure and examined four states at different stages of considering solar PV within utility EE portfolios. The state policies reviewed informed a discussion of potential implications and policy recommendations. Firstly, definitions of energy efficiency vary, but most describe a reduction in the amount of energy required for a given task or use. Jurisdictions that include solar PV, thus far, have named this technology specifically as an allowable EE measure in legislation suggesting a recognition that solar PV does not obviously fall within the common understanding of what constitutes energy efficiency.

Secondly, there are real, but not insurmountable, challenges to implementing solar PV as EE without double counting, or doubly compensating the utility, for the same solar PV system in both an EE portfolio and an RPS framework. Texas utilities address this issue by not incentivizing solar systems estimated to produce more energy than the home uses. Whereas Pennsylvania uses measurement & verification and advanced metering infrastructure to ensure EE incentives are only offered for generation being consumed on site and not energy put back onto the grid through net metering.

Illinois stakeholders emphasized concerns that solar PV could cannibalize other traditional EE measures. Only two states examined, Texas and Pennsylvania, include residential and commercial TRM measures for solar PV as a general offering without limiting its usage as Massachusetts has done. In the case of these two states, solar PV has been included in utility portfolios at levels comparable to other measures and has not significantly displaced traditional EE measures within these portfolios. The reasons for this have not been studied in detail, but Pennsylvania reduced the amount of solar in Phase V plans after a robust stakeholder process. Determining whether the benefits of solar PV could lead to it significantly cannibalizing traditional EE measures in certain regions is beyond the scope of this paper. In jurisdictions where the door is opened to include solar PV in EE portfolios, policymakers could seek to balance its use with other EE measures as Massachusetts has done by prescribing when and how it can be deployed within utility portfolios. Alternatively, Pennsylvania regulators have sought to balance a host of different measures by incorporating recommended funding levels for different measures based on the statewide potential study used to set utility savings goals.

Finally, pairing solar PV with electrification programs shows obvious promise for offsetting the increased demand associated with electrification. Pairing solar PV with traditional EE measures maximizes the benefits of solar because the solar PV system will offset a larger share

of the building load. As NLR suggested in 2024, more research is needed to better understand the interaction between EE, solar PV, and electrification. For instance, the small sample size in Massachusetts shows that there was not enough solar generation produced in winter to fully offset increased electrification. Regional variation in hours of sunlight per day will affect solar PV's impact as an EE measure or a measure designed to offset increased electrification.

Ultimately, solar PV and EE can and should complement each other rather than compete for the same resources. This could be accomplished by prohibiting solar PV from being incentivized in utility EE portfolios and incentivizing solar through other programs like an RPS. Texas, Pennsylvania, and Massachusetts, however, demonstrate that there is room for integration of solar PV into utility EE portfolios. With ComEd's petition in Illinois and recent legislative changes in Maryland to allow solar PV as an EE measure in upcoming plans, it is reasonable to expect more jurisdictions to consider the idea. Regulators should evaluate the challenges to implementation identified in this paper before designing a framework for solar PV's inclusion in EE portfolios. There will not be a one-size-fits-all solution given the variability in climate, hours of sunlight, existing EE and RPS regulatory frameworks, and budgets that will impact the viability of solar PV as EE in any given jurisdiction.

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