

Energy Markets & Planning
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Promoting energy affordability through utility customer programs

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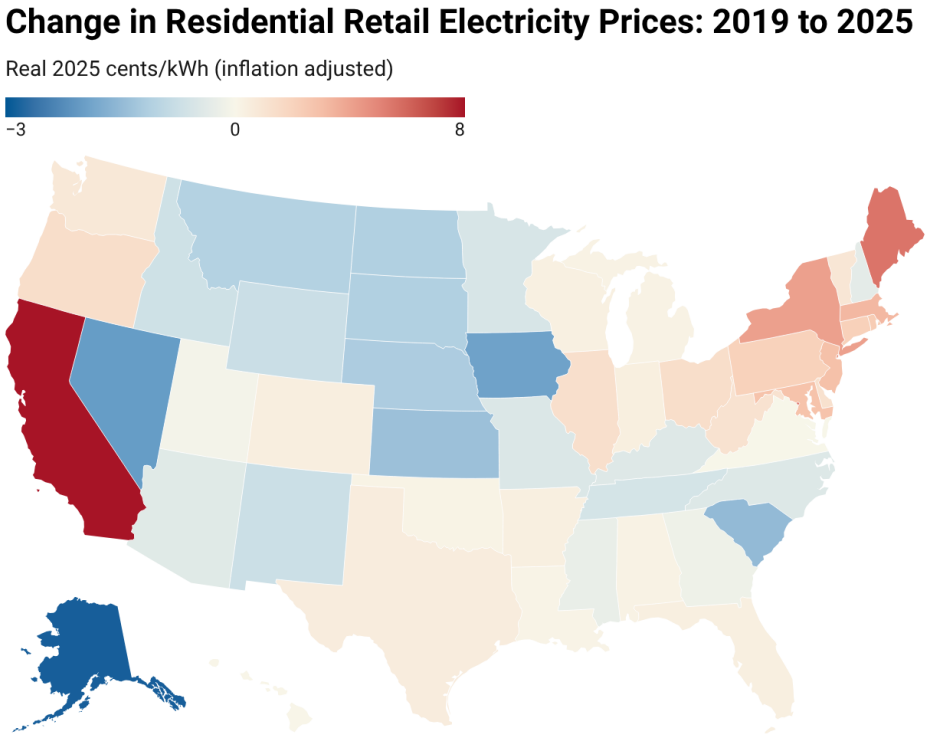
Summary

- Motivation & background
- Emerging practices in utility affordability customer programs with case studies
- Extending program reach: Financing
- Discussion



Motivation & Background

Energy affordability is not a new problem, but is receiving more attention



Source: Wiser et al. (2026) [1]

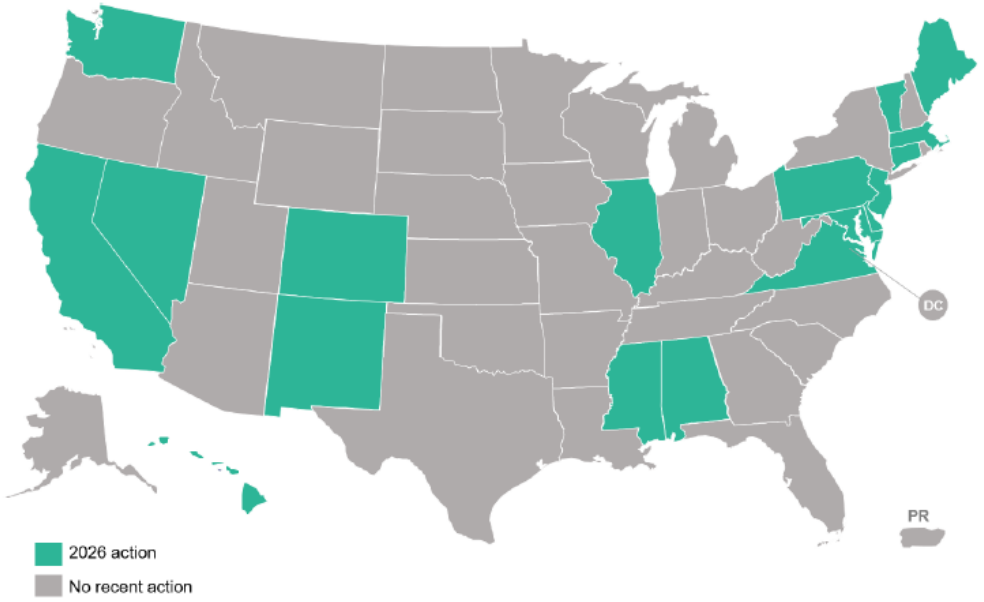
- Disconnections and ability to pay
  - Disconnections are up as consumer protections during the COVID epidemic are rolled back
- Increasing prices
  - Residential rates are rising faster than inflation[1]
    - Varies among states: more in CA and New England
  - Concerns of future price increases
    - Increased capital spending: upgrades to aging equipment, severe weather, increasing demand in capacity-constrained regions
- State actions
  - In the first half of 2026, 22 states and DC took actions to study and investigate issues related to energy affordability[2]

1. Wiser et al. (2026). "Retail Electricity Price Trends and Drivers: Data." LBNL
2. NCCETC (2026). "The 50 States of Energy Affordability: June 2026 Report"

State actions to improve affordability

- State actions span the entire spectrum: eliminating, reducing, refining, creating new programs
- Tradeoffs and timelines
  - Reducing programs to reduce public service benefit surcharges (*short term bill reduction*)
  - Increasing funding for participant and grid value (*long term/targeted bill reduction*)
- Shifting eligibility
  - Some programs are widening eligibility
  - Others are focusing funds, creating tiered incentives to focus on most vulnerable
- Affordability for whom?
  - Increased focus on grid utilization, affordability, reducing energy burden, cost-effectiveness

State Actions on Cost-Saving Programs



Source: NCCETC (2026) [1].

1. NCCETC (2026). "The 50 States of Energy Affordability: June 2026 Report"

Cost-saving potential of utility customer programs

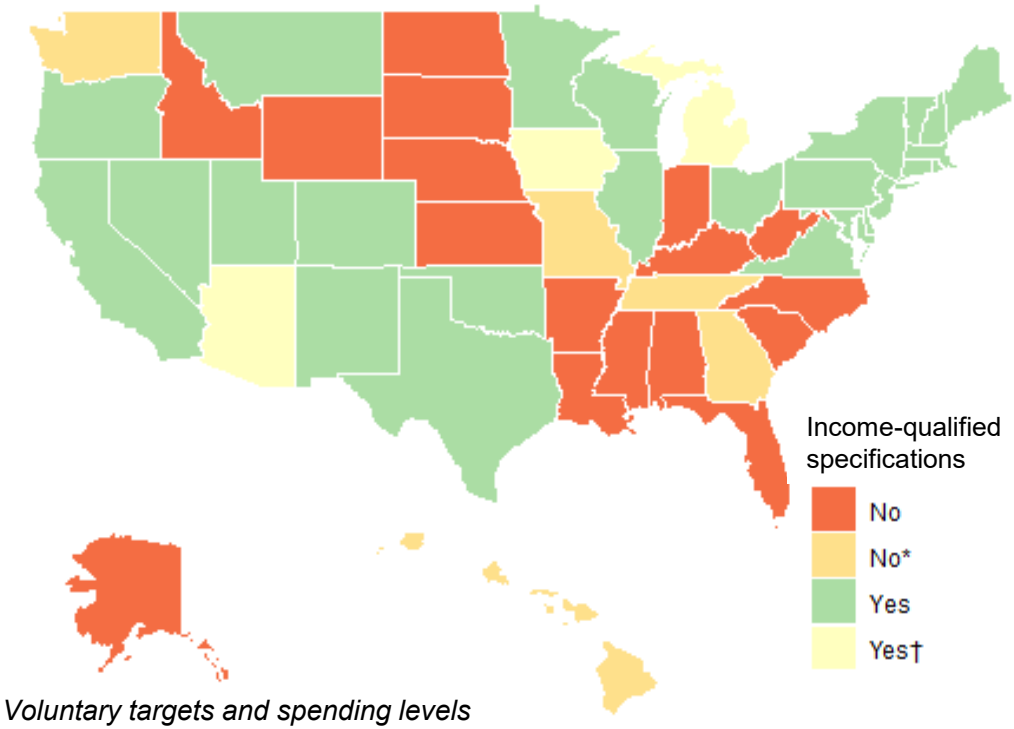


- Utility programs (and cost-effectiveness) vary
  - Cost impacts for participants
  - Cost impacts for non-participants
  - Size/funding of programs
  - Eligible measures (depth of program)
  - Target market: income-qualified can be more expensive
- Supporting activities
  - Pursuing all cost-effective energy-saving measures to improve customer affordability
  - Performance incentive mechanisms (PIMs) related to savings and other grid benefits from customer resources

Affordability programs for utility customers

- Income-qualified efficiency programs
  - Often more expensive: higher incentives, requires eligibility determination, outreach for participation
  - Additional benefits can account for large portion of total benefits, but may be difficult to quantify
- Income-qualified design
  - Indirect incentives to prioritize income-qualified participants (PBR)
  - Carve-outs or specifications within traditional programs
  - Specific income-qualified program
- Cost-effectiveness
  - Specifications often occur at the sector (i.e., residential) or portfolio level
  - Income-qualified measures/programs may use adders or benefit-cost threshold <1 to account for additional benefits

Income-qualified efficiency program specifications

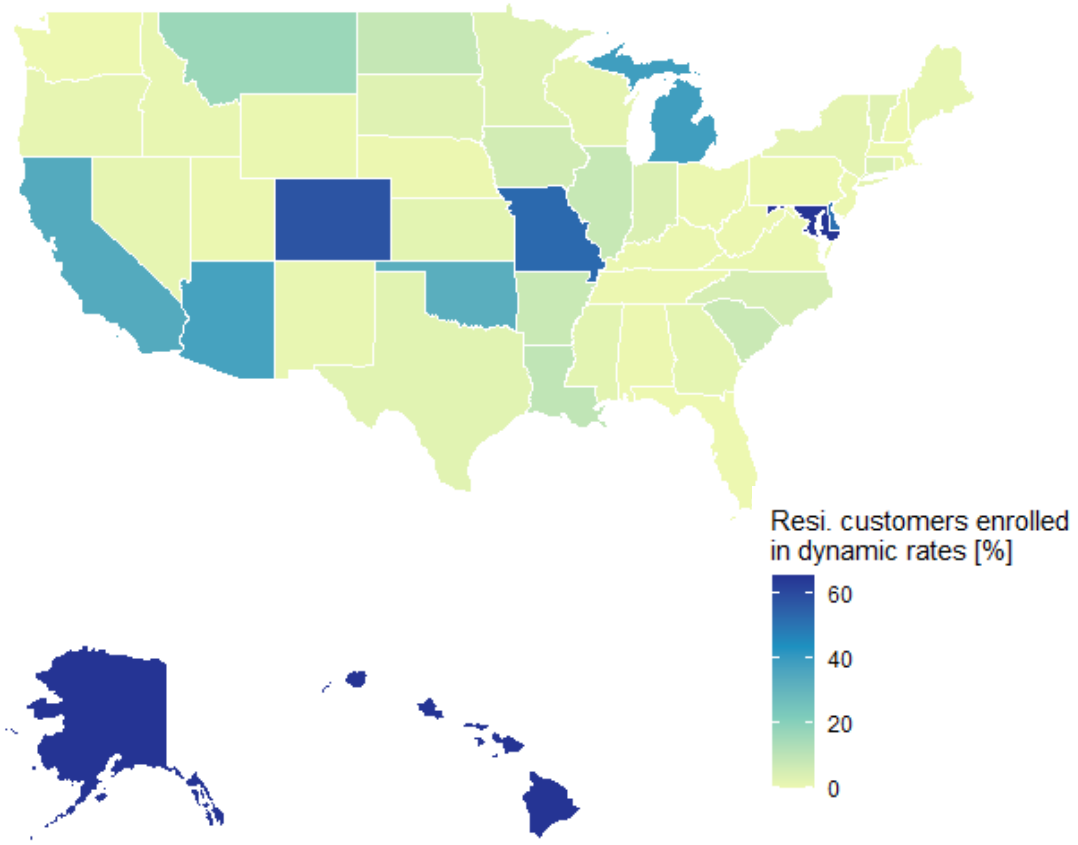


** Voluntary targets and spending levels*
† States are required to serve income-qualified customers; however, do not specify any mandatory levels
Created with data from ACEEE [1].

1. ACEEE (2026). "State and local policy database"

Demand flexibility

Residential customers on dynamic rates



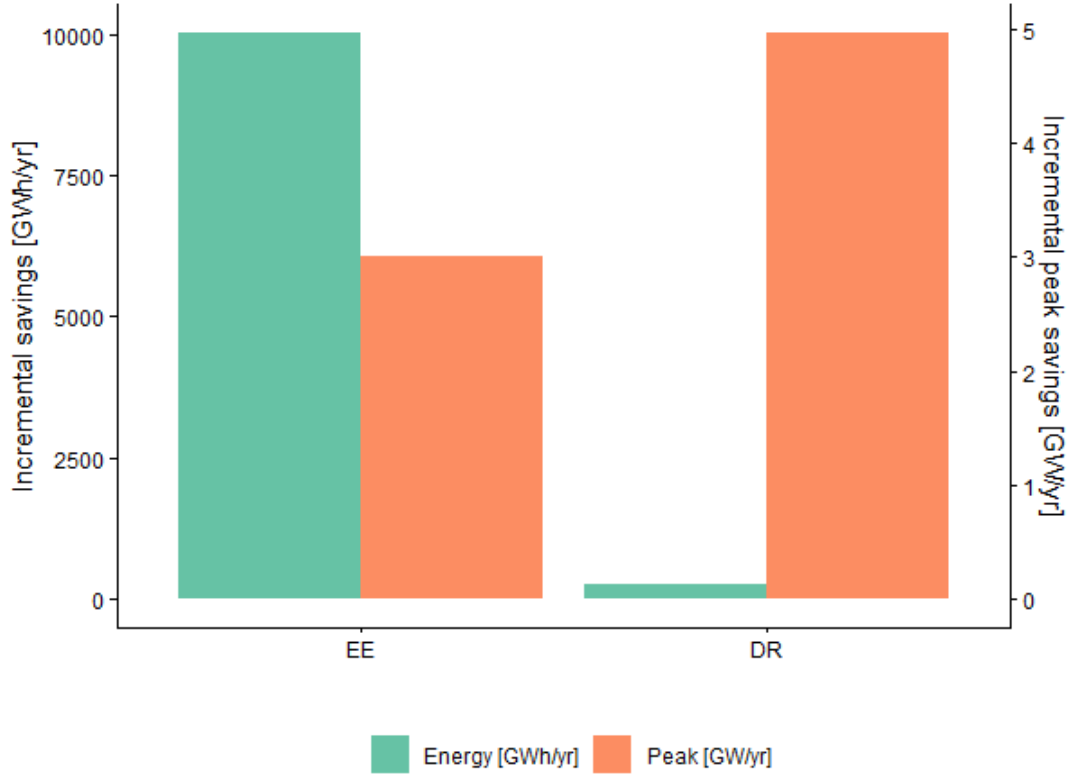
Created with data from EIA [1]

- Voluntary peak shifting and reduction with dynamic rates
  - Grid benefits as prices align better with costs
  - May increase or decrease individual household bills depending on behavior and flexibility of demand
- Traditional residential demand flexibility programs
  - Tied to specific end uses
    - Large, flexible loads (e.g., thermostats or pool pumps)
  - Typically seasonal for summer peak shaving/shifting
  - Design impacts both program cost and value
    - Control: manual by owner or direct by utility or third party
    - Response: voluntary or mandatory
    - Incentive: fixed, tariff-based, or performance-based
    - Events: passive (fixed day/month) or active/dynamic (only during events)
- Supporting activities
  - Integration into planning and incentive programs
  - Indirectly: e.g., market participation rules, rate design, regulations and programs

1. EIA (2025). "Annual Electric Power Industry Report, Form EIA-861 detailed data files"

Value of customer programs

Incremental savings from residential customer programs in 2025



Created with data from EIA [2]

- Grid value of utility affordability programs
  - Reduce total demand as well as some peaks (reduce supply-related constraints)
  - Cost of saving energy is often less than standard offer price for residential electric customers [1]
  - Avoid costs across wires (transmission and distribution (T&D)) in addition to supply
- Grid value of demand flexibility
  - Peak reduction avoids costs for both generation and T&D
  - Defers, reduces, or eliminates need for grid infrastructure to increase capacity
- Customer benefits
  - Economic benefits from bill savings, peak reduction, or energy arbitrage
  - Additional benefits: improved comfort, health and safety, property value

1. Frick et al. (2024). "Consumer benefits of clean energy: energy efficiency"
2. EIA (2025). "Annual Electric Power Industry Report, Form EIA-861 detailed data files"

Incentivizing affordability through performance incentive mechanisms

- Some states are moving toward **multi-year rate plans** in tandem with **performance-based ratemaking (PBR)**
- Affordability performance incentive mechanisms directly tie utility return to outcomes
  - Encourage market-rate and income-qualified programs to promote affordability and track impact

	Affordability Metrics used in PBR
IL	Disconnections
IN	Relative expenditure (5-year change in seasonal average monthly bill vs. national change)
NY	Energy burden/affordability index
WA	Energy assistance need
	Arrearages
	Electricity deepest need (“named community”)

Source: Forrester [1]

Example: Washington metrics related to utility programs and affordability

Net benefits of grid-edge resources (GER)	Net present value of benefits and cost-effectiveness ratio of GERs as measured through a Commission approved cost-benefit analysis
GER availability and utilization	Annual MWh produced/consumed/discharged from GERs by program; annual MW capacity from GERs by program; aggregated annual capacity of GERs providing additional grid services through utility programs
Utility assistance program effectiveness	Percentage of estimated income-qualified needs ($) met with dispersed funds
GER programs	# of customers in Named Communities and separately known low-income customers enrolled in each utility GER program divided by total customers enrolled in each program
GER program spending	Separately calculated percentage of utility spending on demand response (DR) and GERs that benefit Named Communities as compared to Non-named Communities

Source: Washington UTC [2]

1. Forrester (2026). “Energy affordability metrics across states.” Presentation for Maine PUC Workshop: Inquiry into development of affordability metric. 08 October 2026.
2. Washington UTC (2024). Docket U-210590: Interim policy statement addressing performance measures and goals, targets, performance incentives, and penalty mechanisms. 12 April 2024.

Tracking affordability with evaluation: non-participant & participant impacts

- Best practices
  - Third-party evaluator
  - Metrics aligned with goals
  - Iterative with feedback mechanisms to improve programs
  - Clear and transparent data collection, measurement, verification, reporting
  - Stakeholder engagement when creating or altering cost tests, evaluation, program design changes

- Evaluation and benefit-cost tests are well-established for customer programs, but are starting to shift
  - Incorporating new goals/objectives
  - Capturing larger suite of costs and benefits

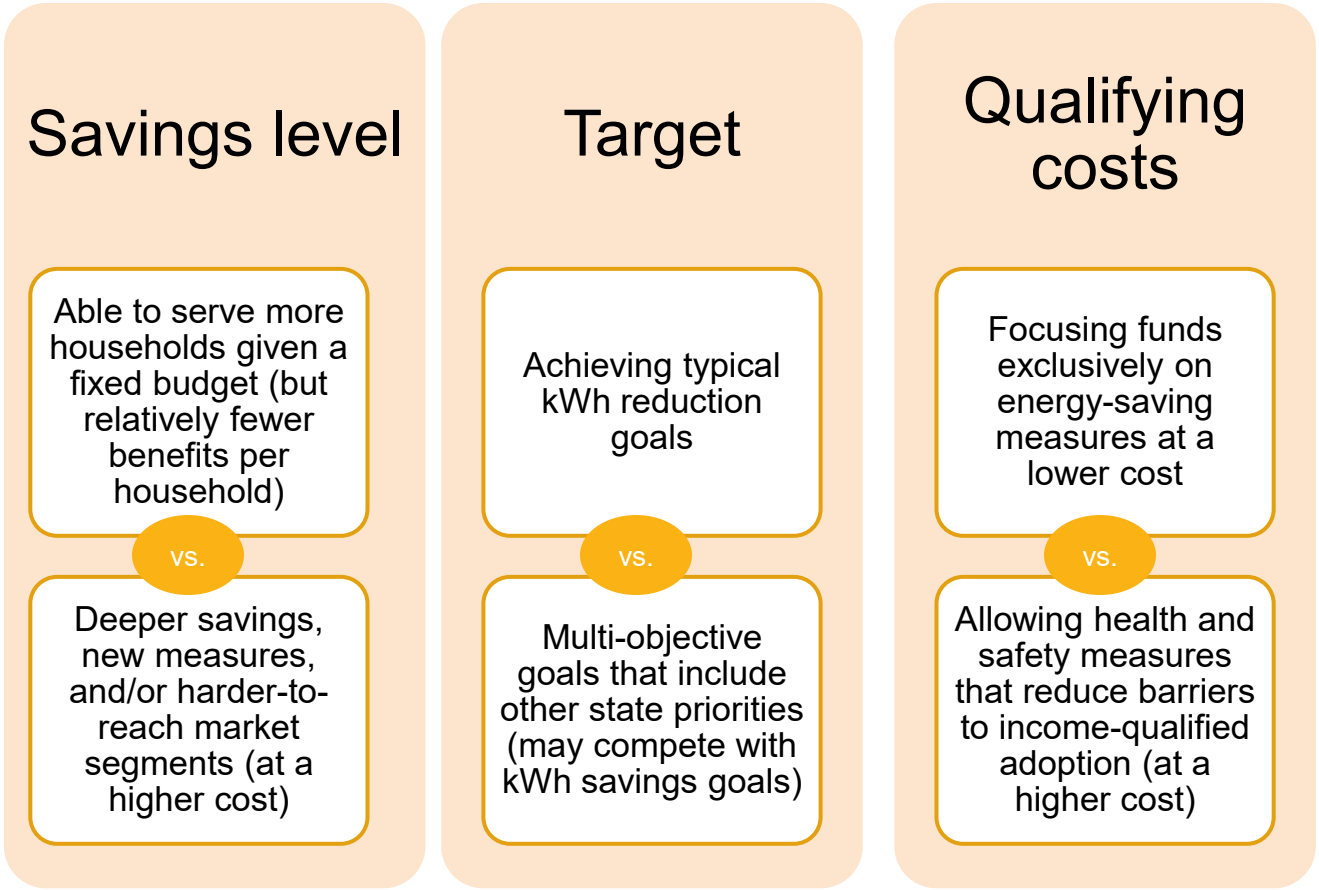
- Specific changes
  - Metrics to account for impacts across fuel types, support state energy goal tracking
  - Resources that standardize methods and quantify more cost and value streams (New England states were early adopters)
  - State-specific primary cost tests that align with state goals
  - Separate, complementary analyses for topics like rate impacts, economic development



Emerging practices in utility affordability customer programs with case studies

Emerging practices in customer programs

Tradeoffs in customer program design



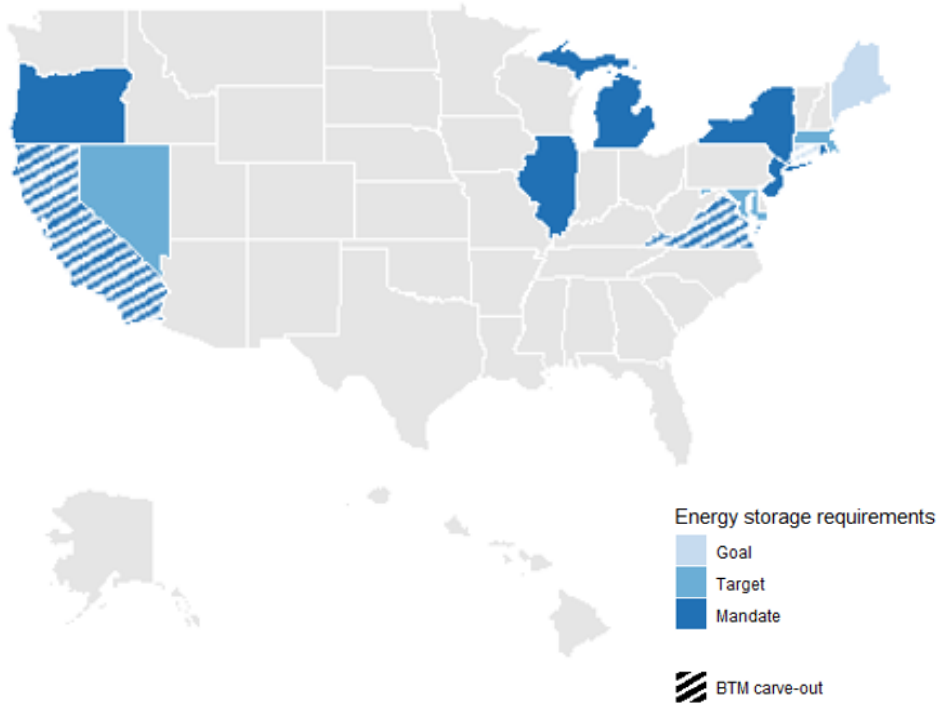
Trends in customer programs

- Pivoting or creating new programs to address multiple state goals
- Targeting higher incentives to income-qualified households
- Multi-objective programs with broad implementation
  - Aligning other changes (e.g., rate structures) in parallel
- Deeper retrofits and new measures allowed
- Altering evaluation methodology and metrics to go beyond kWh savings, dollars spent, and participation numbers alone
  - Peak demand reduction (kW) (Some states were early adopters [1])
  - Total energy savings (BTU)

1. Frick & Schwartz (2019). "Time-Sensitive Value of Efficiency: Use Cases in Electricity Sector Planning and Programs"

Residential batteries and demand flexibility

State energy storage goals



Created with data from CESA [1], where "a mandate is a goal with legal liability for non-attainment, a target is a defined goal with measures for follow-through, and a goal is a number without defined accountability."

- Traditional residential battery storage
  - Historically hybrid installation until 2023 tax credit change
  - Operational use
    - Primary: resilience
    - Secondary: increased self-consumption or bill credits
    - Tertiary: grid services
- Grid services
  - Typically provided through DR and peak shaving programs, which are fundamentally different
  - Capable of providing more grid services than currently used
- Supporting activities for adoption
  - Storage mandates, targets, and goals
  - Integration into planning, incentive programs
  - Indirectly: e.g., market participation rules, GER tariffs, demand response incentives

1. CESA (2026). "Table of State Energy Storage Targets and Progress"

Emerging practices for residential battery programs

- Advancements in hardware and software
  - Improved communication, control, coordination
- Shifts in market rules and regulations
  - Opportunities to use aggregated GERs at bulk and distribution levels

Batteries versus traditional demand response

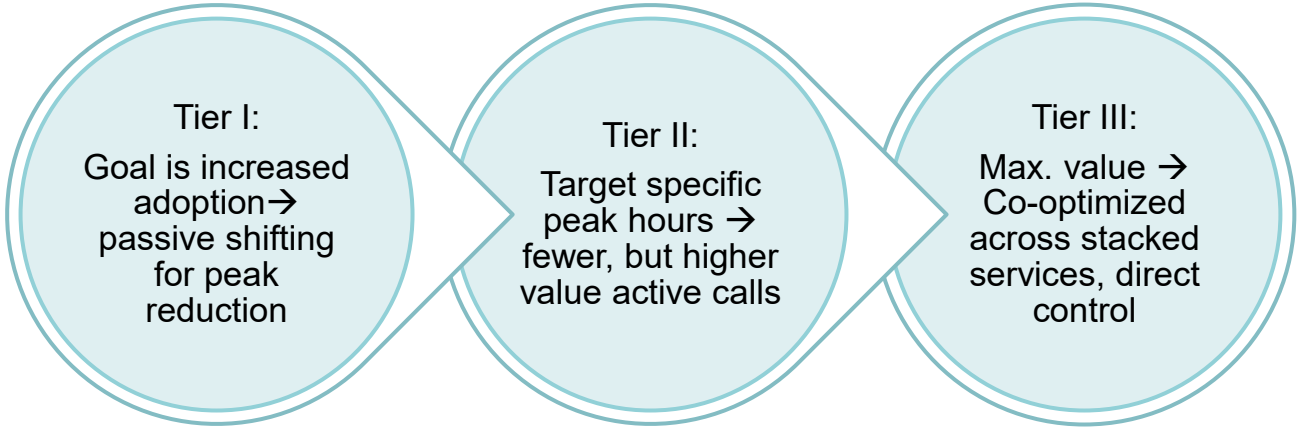
Pros	Cons
• Participate without impact to participant comfort • Can be used in all seasons • Can provide increases or decreases in load and respond very quickly	• More expensive • Limited duration • Round-trip efficiency losses • Cycle degradation

- New trends in program design
  - Leveraging existing batteries to provide grid services
  - Incentivizing adoption in target areas
  - Generating higher value
    - Aggregating GERs for bulk and/or distribution level services
    - Passive → active; dynamic calls; complementing voluntary, manual programs with direct control by grid operator or 3rd party
- Current program challenges
  - Cost
  - Value
    - Identifying and quantifying grid value (temporal & spatial)
    - Current programs don't capture full value potential
  - Income-qualified participation
  - Data: target incentives, event calls, performance validation
- Tradeoffs
  - More costly software/hardware for more grid services
  - Cost-effective for customer vs. grid
  - Higher performance predictability at higher cost
  - Simple versus complex with more dynamic services

Battery program and incentive design

- What is the goal of the program?
  - Increase adoption
  - Provide specific participant value
  - Provide specific grid service
  - Wholesale market participation
  - Maximize grid value
- What are the parameters around the program?
  - Cost-effectiveness
  - Budget, available funding streams
  - Existing data, hardware, software; limitations, gaps
- What are the use cases?
- What is specified?
  - Operator responsibilities
  - Data granularity/latency
  - Level of control, speed, precision, duration
  - Duration/frequency of event calls
  - Additional hardware, software, contracts

Simple to complex battery programs



Example: Early programs that consider additional grid value

	Bring Your Own Device (VT)	ConnectedSolutions (MA)
Contract	▪ Ten years ▪ Tariff ▪ Utility direct control	▪ Five years ▪ Performance-based ▪ Voluntary, opt-in
Participant Val.	▪ Back up power (only qualifies for incentive if used "exclusively" for customer's own back-up power) [1] ▪ Upfront incentive does not cover full cost of battery and could increase bills slightly if customer is on flat rates	▪ 74% cite back up as primary motivator [3] ▪ Can use batteries for personal arbitrage, etc. ▪ PCT was 1.00 taking into account resilience → incentives may not fully cover cost of battery [3]
Grid Val.	▪ ISO-NE Forward Capacity Market ▪ Avoided Regional Network Service transmission charges ▪ Net value for non-participants ($389/system) [2]	▪ Avoided peak costs (energy, capacity, transmission, distribution, and demand reduction induced price effects) ▪ ISO-NE Forward Capacity Market ▪ Estimated ratepayer impact measure is 2.15 for full program, typically higher than for utility customer efficiency programs [4]

Bring Your Own Device: Green Mountain Power (VT)

- Tariff and large upfront rebate launched in 2020

ConnectedSolutions (MA +)

- Launched in 2019 as DR for programmable thermostats and batteries
  - MA pursues all available cost-effective resources
  - Parallel state goals
  - 0% financing available or pay upfront
  - Performance-based
- Use of energy efficiency funds
  - Efficiency programs have larger budget than DR and other programs
  - PIMs are tied to efficiency, allowing for additional incentives
  - Subject to cost-effectiveness specifications (total resource cost test)

1. Green Mountain Power (n.d.), "BYOD Program Details"
2. Green Mountain Power (2023), "Case No. 23-1335-TF: Tariff filing requesting revisions to its Energy Storage System (ESS) Service and Bring Your Own Device (BYOD) Program Attachment 4"
3. Guidehouse (2024). "Massachusetts Residential Energy Storage Demand Reduction Offering Evaluation," 2024. doi: MA23-DR02E-2023-Res-BS-DR.
4. Simpkins et al. (2021). "ConnectedSolutions: The New Economics of Solar+Storage for Affordable Housing in Massachusetts"

Example: California

- Many programs have income-qualified goals or carve-outs, and most under-achieve on participation numbers
  - General barriers for income-qualified programs: split incentive, awareness/trust in program, upfront and ongoing costs
  - Programs that have goals or added incentives may not have specific program design to reduce barriers — for example:
    - Some may offer higher incentives, but do not offer net economic benefits or remove upfront cost barriers
- CA Self-Generation Incentive Program (SGIP)
  - Income-qualified carve-out (CA has $280M reserved) [1]
  - Recent evaluation (before Haven):
    - Under-performance in income-qualified customer participation [2]
    - Majority use for self-consumption (untapped potential for grid benefits); incentive level exceeds grid value [3]
- Haven
  - Funded through SGIP state funds, federal tax credits, grid services revenue
  - Goal of 10 MW total aggregated distributed hybrid capacity
  - Income-qualified customers get a free hybrid system installed, but must enroll in SGIP-approved DR program [4]
  - Haven owns and operates system for ten years, but allows owners to otherwise use for back up power (maintaining 20% minimum battery charge) and bill arbitrage (estimated 80%-90% reduction in bills) [1,5]
  - Future SGIP evaluations will include Haven impacts

1. Martucci (2025). "Haven Energy offers no-cost solar, batteries to income-qualified California customers." *Utility Dive.*
2. Verdant Associates & Grounded Research (2024). "2023 SGIP Program Performance and Process Evaluation (PPPE): Including the 2023 Annual PA Performance Review"
3. Verdant Associates (2025). "2023 SGIP Impact Evaluation"
4. State of California (n.d.) "SGIP-Approved Demand Response Programs"
5. Spector (2025). "Haven to install free solar, batteries for thousands of California homes," *Canary Media.*



Extending program reach: Financing

Overcoming upfront costs

- Some programs are moving to deeper retrofits, pricier technologies
- Can provide net savings over lifetime, but upfront costs can still be a barrier
- Financing: technology-neutral and can be structured for net savings immediately
  - Use of public dollars to leverage private capital and increase protections and incentives (credit enhancement, loan-loss reserves, alternative underwriting criteria, upfront rebates to drive down principal, other risk mitigation)
  - Research shows low delinquency and loss rates of loans across customer financing programs [1]
  - May not be a good option for income-qualified customers or those unable to pay
    - A program may not guarantee net savings
    - Even if there is a net reduction on bills, costs could remain unaffordable
    - Risks: debt, disconnection, lien on home for some programs (not the case for Tariffed On-Bill or Inclusive Utility Investment programs)
- Practices for income-qualified program design
  - National Consumer Law Center recommendations
    - Ensuring financing does not displace income-qualified programs
    - Guaranteed savings and guardrails (e.g., reserve fund) to reduce risks from unrealized savings
    - Screening for other programs that the customer may be eligible for and coordinating them
    - Loan loss reserve, eliminating disconnections in case of nonpayment, eliminating upfront co-payment, providing operation and maintenance funds, establishing dispute process
  - Example: Mass Saves diverts low-income customers to grant-based programs; financing directed to moderate income

1. Deason et al. (2022). "Long-Term Performance of Energy Efficiency Loan Portfolios."
2. National Consumer Law Center (2026). "Tariffed On-Bill Financing Poses Significant Risks for Low-Income Consumers"



Discussion

Considerations

- There is no “best” solution to improve affordability

- Considerations
  - Relevant state and program goals
  - Current hardware; software; and evaluation, measurement and verification of data
  - Specifications and parameters: cost tests, budgets

- Challenges & solutions
  - Minimizing cost shift
    - Braiding funding streams and using funds from other sources
    - Targeting higher incentives to income-qualified customers
  - Aligning incentives with grid value
    - Higher utilization of batteries
  - Properly tracking progress towards goals with evaluations

- Tradeoffs
  - General
    - Prioritizing short-term vs. long-term affordability
    - Simple or voluntary programs (easier to administer) vs. complex, dynamic programs (higher value)
    - Program cost vs. value
    - Eliminate/minimize cost shifts vs. incentive level sufficient for bill reduction and participation
  - Customer efficiency programs
    - Prioritizing energy savings alone or achieving competing goals (e.g., income-qualified participation levels, fuel neutral goals, new measures, deeper savings)
  - Demand flexibility
    - Simpler programs prioritizing *either* grid or participant savings
    - More complex programs providing cost savings for grid and participants
      - Requires identifying, quantifying, and compensating for new value streams and improving performance


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Additional Slide

Income-qualified efficiency specifications and cost-effectiveness by state

State	Income-qualified cost test adjustments, where applicable
Alabama	
Alaska	
Arizona	LI portfolio must be cost effective, but health and safety measures not included in calculation
Arkansas	
California	Uses Energy Savings Assistance Cost Effectiveness Test to balance traditional cost-effectiveness with goal of low-income affordability. Requires ESACET to be greater than 0.7 but promotes cost-effectiveness by valuing additional benefits and reducing administrative costs
Colorado	Benefits in test increased 50% to account for higher levels of additional benefits
Connecticut	TRC used for income-qualified to account for additional benefits than UCT
Delaware	Net-to-gross ratio of 1 and factors in specific additional benefits
Dist. of Columbia	5% adder and primary test (SCT) is at overall portfolio level (so LI programs can be less than 1 as long as the rest make up for it)
Florida	
Georgia	
Hawaii	
Idaho	Health and safety measures can be 15% of weatherization budget, and each dollar spent will count as $1 benefit
Illinois	LI programs exempt
Indiana	Some exceptions
Iowa	LI programs exempt
Kansas	
Kentucky	Some exceptions
Louisiana	
Maine	Individual LI measures must be > 0.7 TRC or could be bundled to achieve > 1.0
Maryland	LI programs exempt
Massachusetts	LI TRC tests include additional benefits
Michigan	LI programs exempt
Minnesota	LI programs exempt
Mississippi	

State	Low-income cost test adjustments, where applicable
Missouri	LI programs exempt
Montana	LI programs exempt
Nebraska	
Nevada	Regular programs get a NEB adder of 10% and LI programs of 25%; LI programs exempt from cost test as long as full program passes TRC
New Hampshire	NEBs for income-qualified programs are included and include a 20% adder; some exceptions if GST still less than 1.0 but otherwise well designed
New Jersey	LI programs exempt; Under NJCT, includes a 30% adder applied to avoided wholesale energy costs to account for NEBs and LI benefits
New Mexico	20% adder on energy savings for LI
New York	LMI programs considered separately and, while goal is to minimize overall program costs, SCT can be <1
North Carolina	
North Dakota	
Ohio	Programs with high levels of NEBs (incl. LI) do not necessarily have to pass the cost test
Oklahoma	Allow for lower cost-effectiveness threshold for LI
Oregon	LI programs exempt
Pennsylvania	No specific adjustments made
Rhode Island	No specific adjustments made
South Carolina	LI programs exempt
South Dakota	
Tennessee	Some exceptions
Texas	alternatively, SIR is used to assess LI programs and component measures taking into account incentive costs and customer avoided energy costs with societal discount rate of 3%
Utah	No specific adjustments made, but some exceptions
Vermont	15% adder for LI
Virginia	No specific adjustments made
Washington	LI programs must have TRC >0.67; applies 10% adder for NEBs
West Virginia	
Wisconsin	Accounts for health and safety benefits in SCT as secondary test
Wyoming	

Notes: Green corresponds to states with mandatory funding, spending, and/or savings targets; yellow to states that are required to serve income-qualified customers, however, do not specify any mandatory levels; deep orange to states without specifications or statewide programs; and pale orange to states with voluntary targets and spending levels.
Created with data from ACEEE's State Policy Database.