



Environmental Energy Technologies Division Lawrence Berkeley National Laboratory

Review of Self-direct Demand Side Management (DSM) Programs

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Presentation Outline

1. Background
2. Case Studies
3. Comparison of Self-direct
Program Design Elements



Benefits of DSM Programs

Over 40 states have DSM programs, benefits include:

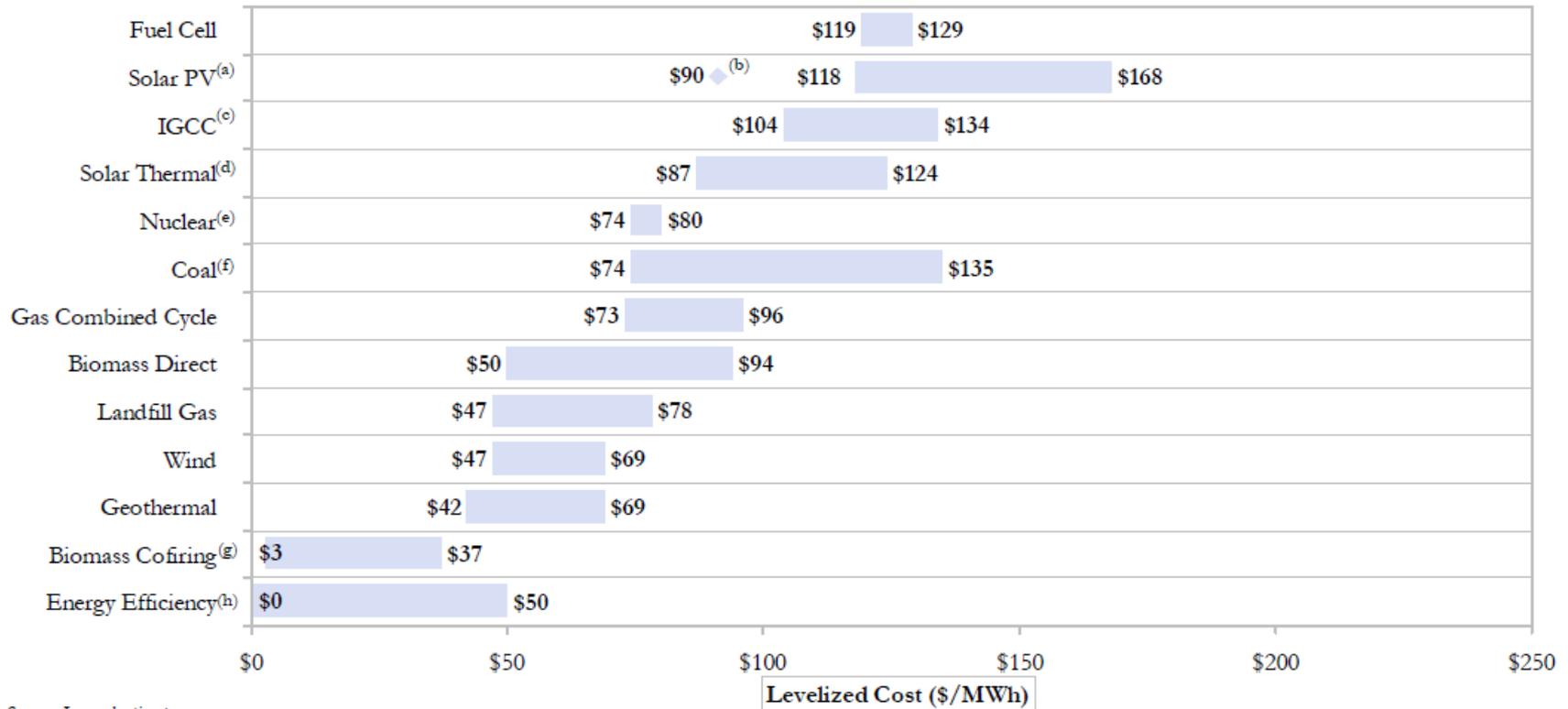
- Lower energy prices
- Reduced grid congestion
- Opportunity to delay or avoid building new generation
- Reduced emissions
- Increased system reliability
- Protection from fuel price risk



- One review of the cost of saved energy in 14 programs showed an average acquisition cost of 2.5 cents per kWh (Friedrich et al 2009)
- Cheapest DSM resources are from C/I customers
- Many of these benefits are only fully realized if the savings are **reliable, verifiable, and additional** so that the system can plan around these resources

Levelized Cost of Energy Comparison

Certain Alternative Energy generation technologies are already cost-competitive with conventional generation technologies under some scenarios, even before factoring in environmental and other externalities (e.g., RECs, potential carbon emission costs, transmission costs) as well as the fast-increasing construction and fuel costs affecting conventional generation technologies



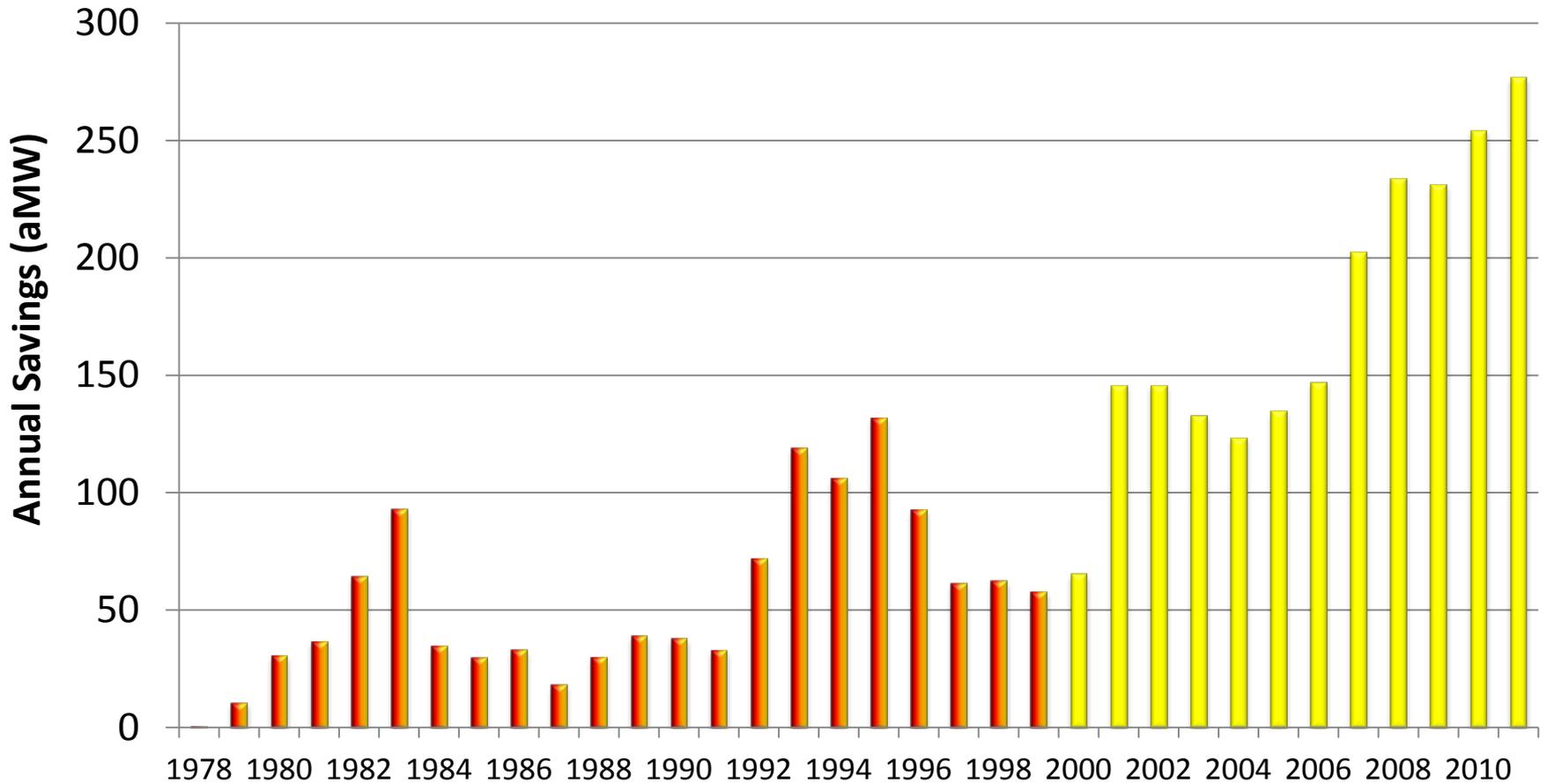
Source: Lazard estimates.

Note: Reflects production tax credit, investment tax credit, and accelerated asset depreciation as applicable. Assumes 2007 dollars, 60% debt at 7% interest rate, 40% equity at 12% cost, 20-year economic life, 40% tax rate, and 5-20 year tax life. Assumes coal price of \$2.50 per MMBtu and natural gas price of \$8.00 per MMBtu.

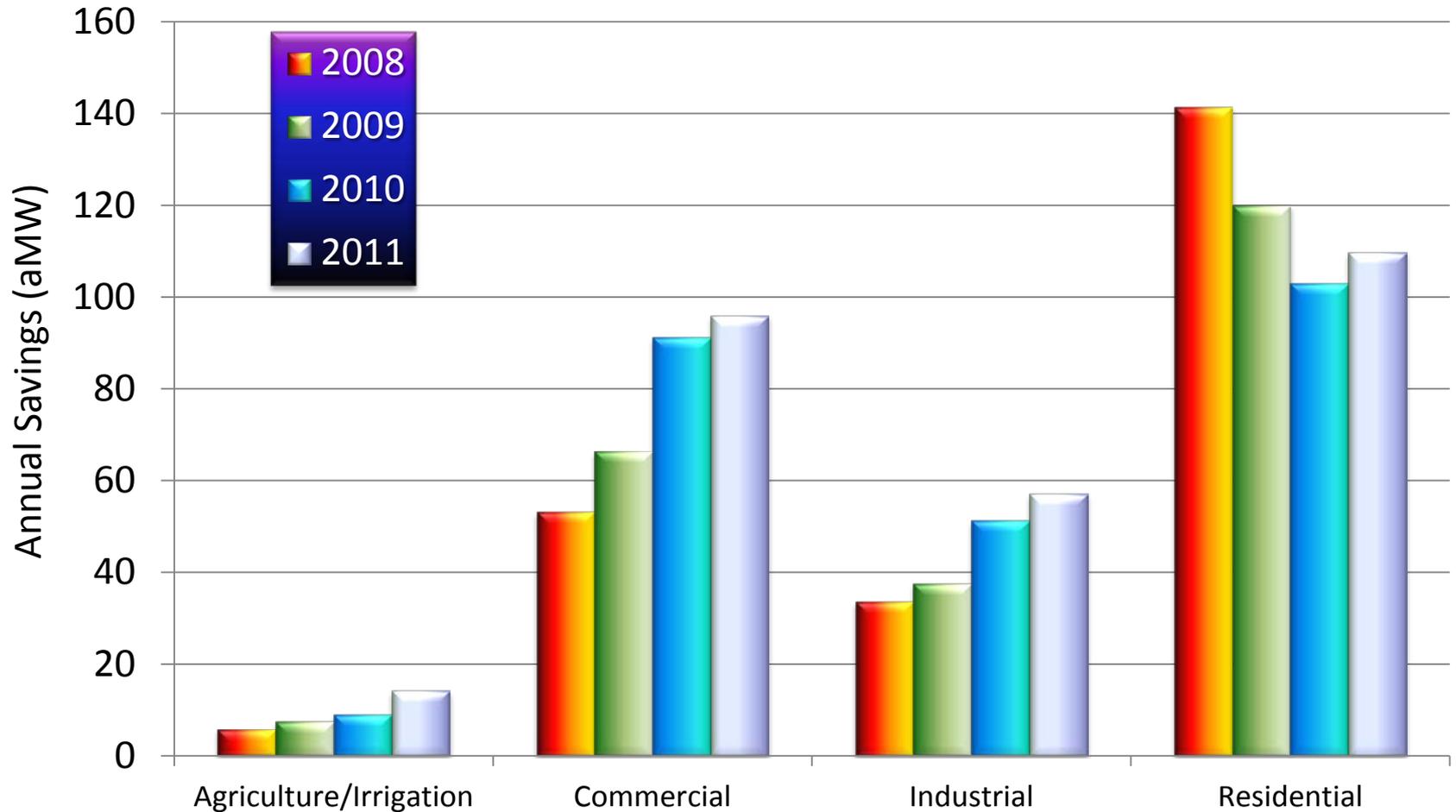
- (a) Low end based on total system cost per watt of \$3.99 per First Solar investor presentation dated December 3, 2007. High end based on utility-scale crystalline facility.
- (b) Represents First Solar's targeted implied levelized cost of energy in 2010, assuming a total system cost of \$2.75 per watt. First Solar 2012 guidance for total system cost of \$2.00 per watt would imply a levelized cost of energy of \$75 per MWh.
- (c) High end incorporates 90% carbon capture and compression.
- (d) Low end represents solar tower. High end represents solar trough.
- (e) Does not reflect potential economic impact of federal loan guarantees or other subsidies.
- (f) Based on advanced supercritical pulverized coal. High end incorporates 90% carbon capture and compression.
- (g) Represents retrofit cost of coal plant.
- (h) Estimates per National Action Plan for Energy Efficiency; actual cost for various initiatives varies widely.

Source: Lazard

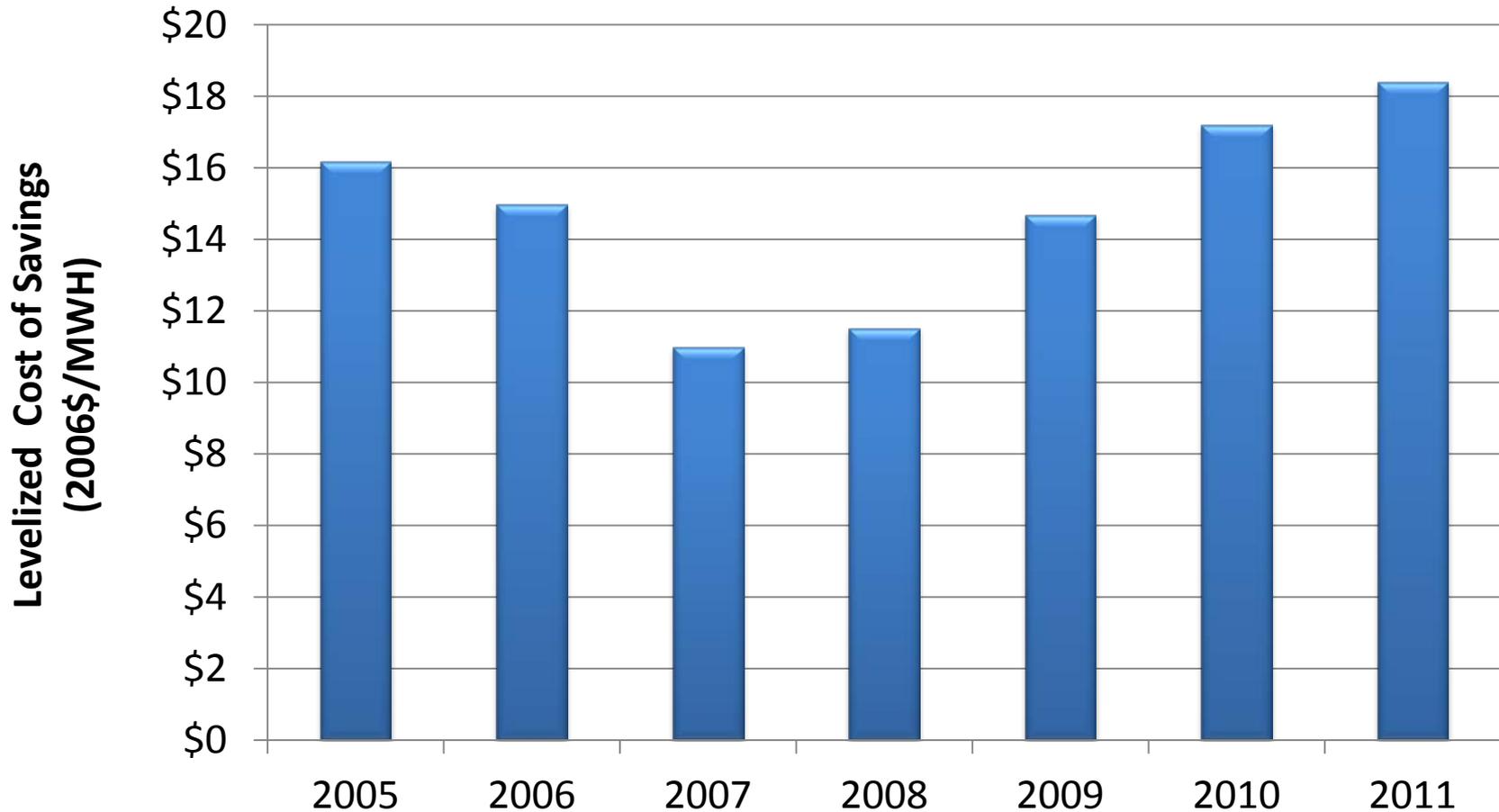
2000- 2011: Longest Sustained Period of PNW Utility Energy Efficiency Acquisitions in 30 Years



Commercial and Industrial Savings Continued to Grow the Most



Average Utility Cost of Conservation, While Increasing Remains Low



C/I Program Types

Four main types of programs are offered to commercial / industrial customers:

- Technical assistance / energy auditing services
- Prescriptive incentive programs
- Custom incentive programs
- Self-direct programs



Self-direct Programs

- Usually targeted at large industrial customers with specialized needs or strong in-house energy engineering capacity
- Self-direct programs are found in at least 24 states
- Many variants on how these programs are structured
- Least-used program in most jurisdictions due to eligibility limits and attractiveness of other program offerings





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Case Studies

- **Eligible customers:** Aggregated annual consumption of at least 5,000 MWh or demand of at least 1 MW
- **Eligible projects:** Projects must have a pre-rebate payback period of between 1 and 5 years, and meet the utility's cost effectiveness test
- **Incentives:** Credit against DSM charge of 80% of approved EE project costs, paid over multiple years if needed
OR “Opt-out” of 50% of the DSM charge if customer has no cost-effective DSM potential (none to date)
 - No incentives for historic projects
- Program benefit-cost ratio (TRC) of **~2.7**



- **Eligible customers:** Customers with demand of at least 3 average MW or 3-phase service over 50,000 volts
- **Eligible projects:** Projects must meet the utility's cost effectiveness tests
- **Incentives:** DSM charge funds can cover up to 100% of approved project costs
 - Program runs on a 4 year cycle – the first two years customers can use their own DSM funds; at the end of two years any unused funds are competitively bid out to the pool of self-direct customers
 - No incentives for historic projects
- Program benefit-cost ratio (TRC) has varied between **1.15 and 4.93** depending on the year



- **Eligible customers:** Aggregated annual consumption of at least 10,000 MWh and demand of at least 2 MW
- **Eligible projects:** Projects must meet the utility's cost effectiveness test
- **Incentives:** \$0.10/kWh for the *incremental* savings over the project lifetime, up to 50% of the *incremental* cost
 - No limit to total incentives a customer can claim (not limited to the DSM charges paid)
 - No incentives for historic projects
- Program benefit-cost ratio (TRC) of ~**3.5**





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Elements of Self-direct Program Design (comparison of programs)

Elements of Program Design

- Eligible Customers
- Eligible Projects
- Incentives
- Level of Exemption
- Length of Exemption
- Measuring Savings



Eligible Customers?

State	Program	Which customers are able participate?
Arizona	Arizona Public Service	Consume over 40,000 MWh/yr of electricity
Colorado & New Mexico	Xcel Energy	Consume over 10,000 MWh and demand of at least 2 MW (aggregated)
New Mexico	Public Service of New Mexico	Consume over 7,000 MWh/yr of electricity
North Carolina	Duke Energy	Consume over 1,000 MWh/yr of electricity
Ohio	Statewide	Consume over 700 MWh/yr (aggregated) of electricity OR have a national or regional account with multiple facilities in one or more states
Utah and Wyoming	Rocky Mountain Power	Customers with annual consumption of at least 5,000 MWh/year or demand of at least 1 MW (aggregated from all the customer's in-state facilities)

- Many ways of setting a bar for eligible customers - \$ in DSM charges per year, power demand, but the most common is **annual energy usage** (examples included above).
- Most programs have a ~10x higher threshold for energy consumption for their self-direct program than Ohio's.

Eligible Projects?

- Like Ohio, most programs allow projects with a benefit-cost ratio of greater than 1
- Some have simple payback thresholds, e.g. 1 to 7 year simple payback.

Xcel Energy C/I Programs

Program	Benefit/Cost Ratio
Self-Direct	3.59
Process Efficiency	2.53
Standard Offer	2.36
Custom Project	1.80

Source: Chittum 2012

PSE Self-Direct Program

Cost Effectiveness Reporting from Annual Reports

	<u>UC B/C</u>	<u>TRC B/C</u>
2007	1.34	1.15
2008	2.93	1.98
2009	4.60	3.30
2010	2.21	1.84
2011	6.20	4.93

Source: Takala 2012

Eligible Projects?

State	Program	What EE projects are eligible?
Arizona	Arizona Public Service	Projects must meet the societal cost test
Colorado & New Mexico	Xcel Energy	Projects must meet the total resource cost test
New Jersey	New Jersey Clean Energy Program	Projects must have a payback period of less than 8 years
New Mexico	Public Service of New Mexico	Projects must meet the total resource cost test with a payback period of between 1 and 7 years
Ohio	Statewide	Projects must meet the total resource cost test or the utility cost test
Oregon	Oregon Dept of Energy	Projects must have a payback period of less than 10 years
Utah and Wyoming	Rocky Mountain Power	Projects must have a pre-rebate payback period of between 1 and 5 years, and meet the utility's cost effectiveness test
Vermont	Statewide	Projects must meet the same cost effectiveness tests as other EE programs
Washington	Puget Sound Energy	Projects must meet both the total resource cost test and the utility cost test
Wisconsin	Statewide	Projects must meet the same cost effectiveness tests as other EE programs

Incentives?

- Many programs reimburse up to 50-100% of project costs
- A few programs provide incentives based on savings
- A few programs create a customized plan with the customer

State	Program	How are EE exemptions / incentives structured?
Arizona	Arizona Public Service	Incentives can cover 100% of EE project costs
Colorado & New Mexico	Xcel Energy	\$0.10/kWh incremental energy savings over the project lifetime or \$525/kW demand reduction (which ever is greater); up to 50% of incremental project cost
Idaho	Idaho Power	Incentives can cover 100% of EE project costs
Michigan	Statewide	If customers meet the goals in their plan, they are exempted from a portion of the DSM charge
New Mexico	Public Service of New Mexico	Incentives can cover 100% of EE project costs
Ohio	Statewide	Either 1) an exemption from the DSM charge for an amount of time based on the projected savings, or 2) a rebate capped at 50% of project costs
Oregon	Eugene Water and Electric Board	EWEB staff works closely with customers to design 5-year energy savings goals; the customers' DSM charges are reduced if these goals are met
Oregon	Oregon Dept of Energy	Incentives can cover 100% of EE project costs
Utah and Wyoming	Rocky Mountain Power	Incentives cover up to 80% of approved EE project costs
Washington	Puget Sound Energy	Incentives can cover 100% of EE project costs
Wisconsin	Statewide	Customer creates a self-direct energy efficiency plan with detailed M&V plans and submits it to the PSC

Level of Exemption?

- Many programs require customers to pay a portion of shared costs, such as program admin and M&V
- If self-direct customers aren't paying for the full cost of their programs, this burden fall to other customer classes

State	Program	How much of the EE fees are customers exempt from paying?
Arizona	Arizona Public Service	Incentives given up to 85% of the annual DSM charge
Colorado & New Mexico	Xcel Energy	No cap on the amount of incentive relative to the annual DSM charge (incentives can be greater than the DSM charge)
Idaho	Idaho Power	Incentives given up to 100% of the annual DSM charge
Michigan	Statewide	Incentives given up to 100% of the annual DSM charge, minus administrative and low income program costs
New Mexico	Public Service of New Mexico	Incentives given up to 70% of the annual DSM charge.
Ohio	Statewide	Up to 100% of the DSM charge can be waived over multiple years based on the Benchmark Comparison Method
Oregon	Eugene Water and Electric Board	The full DSM charge, minus utility M&V costs, can be returned to the customer - level of reimbursement is based on meeting the savings goals, not on \$ spent
Oregon	Oregon Dept of Energy	Incentives for projects given up to 68% of the annual DSM charge
Utah and Wyoming	Rocky Mountain Power	Incentives given up to 100% of the annual DSM charge, can be taken over multiple years. Customers must pay a \$500 admin fee per project that they submit.
Washington	Puget Sound Energy	Incentives given up to 82.5% of the annual DSM charge
Wisconsin	Statewide	Incentives given up to 100% of the annual DSM charge, minus administrative and renewable energy charges

Michigan Comp. Laws Section 460.1093
Self-directed energy optimization plan.
Sec. 93. (excerpt)



(5) The commission shall by order do all of the following:...

(b) Provide a mechanism to recover from customers under subdivision (a) **the costs for provider level review and evaluation.**

(c) Provide a mechanism to cover **the costs of the low income energy optimization program** under section 89.

Puget Sound Energy customers receive credits for 82.5% of their DSM charge when they invest in approved DSM projects, with carve outs for:

- Program administration – 7.5%
- Market transformation programs – 10%



Commercial Real Estate (CRE)

Encouraging energy-efficient building management practices among commercial portfolio property owners.



Existing Building Renewal (EBR)

Creating a market-attractive pathway and market capabilities to energy-efficient renewal of existing buildings.



Commercial Lighting

Creating tools and market capabilities to support continued advances in new lighting standards.

Length of Exemption?

- Most programs allow multi-year exemptions
- Multi-year exemptions are important for encouraging larger projects with deeper savings

State	Program	How long / under what conditions are customers exempt from all or part of the DSM charge?
Arizona	Arizona Public Service	Multi-year exemption, based on project costs
Idaho	Idaho Power	Up to 3-year exemption, based on project costs
Montana	NorthWestern Energy	Up to 2-year exemption, based on project costs
Ohio	Statewide	Multi-year exemption, based on savings
Oregon	Eugene Water and Electric Board	Multi-year exemption, based on meeting savings goals
Utah and Wyoming	Rocky Mountain Power	Multi-year exemption, based on project costs
Washington	Puget Sound Energy	Up to 4-year exemption, based on project costs

Opt-out Due to Lack of EE Potential?

- **Rocky Mountain Power:** If a customer is able to show that they have done all projects with an 8 year or less payback, they can become exempt from 50% of the DSM charge for 2 years (at which point they have to reapply); no customer has qualified for this opt-out.
- **Oregon Dept of Energy:** If a customer is able to show that they have done all projects with a 10 year or less payback, they can become exempt from 54% of the DSM charge for 2 years (at which point they have to reapply); no customer has qualified for this opt-out.

How are savings measured?

State	Program	How are energy savings counted?
Colorado & New Mexico	Xcel Energy	Xcel pre-approves projects, requires pre-project monitoring, provides estimates of the rebate level, and requires post-implementation verification reports. Xcel's senior engineers review all the proposals and the reporting.
Montana	NorthWestern Energy	No M&V; savings not reported by utilities as part of their EE portfolio
New Jersey	New Jersey Clean Energy Program	To receive their incentives, customers must submit an EE plan certified by an engineer that includes an M&V plan. Projects are reviewed by program staff.
Ohio	Statewide	M&V is the same as for other EE programs, either deemed savings or engineering analysis with review by the utility and the PUC staff, and subject to the same third party evaluation as other programs.
Utah and Wyoming	Rocky Mountain Power	RMP approves projects before rebates are given. RMP also requires post-implementation commissioning / verification reports, except when the amount of energy savings from the project can be deemed.
Washington	Puget Sound Energy	Program staff review the project proposal and M&V plan, and they inspect the project after installation.

- Most programs, like Ohio, use M&V similar to their other C/I programs – but the rigor varies
- The baseline matters - “as found” vs. “code or standard industry practice”

Summary of How Ohio Compares

- **Eligible Customers** – Significantly more customers qualify for self-direct in Ohio than programs in other states
- **Eligible Projects** – Unlike most programs, Ohio credits historic projects; Ohio's cost effectiveness criteria is similar to many other programs
- **Incentives / Level of Exemption** – Ohio's Benchmark Comparison Method is not used in other states; more than half of programs reviewed also have some carve out for costs such as admin
- **Length of Exemption** – Unlike most programs, in Ohio the length of exemption is based on savings rather than project costs
- **Measuring Savings** – Several states have practices similar to Ohio; may want to consider changing the baseline to code and/or industry standard practice (like Xcel) to increase likelihood that project savings are "additional" (and not free riders)

Questions for Consideration

1. More than half (10 of 19) of the programs reviewed provide some portion of the DSM charge to support costs such as program administration and EM&V – **Should Ohio’s self-direct customers pay for some of these costs, and if so to what extent?**
2. Few self-direct programs reward credit for historic projects – **Should Ohio re-direct resources to new and additional projects, and if so how?**
3. Most programs provide credit for projects based on project cost (or incremental project cost), and a few programs reward customers for aggressive savings with competitively granted funds or by allowing customers to receive incentives beyond their DSM charge – **Should Ohio consider alternatives to the Benchmark Comparison Method?**
4. To achieve many of the system benefits from DSM, savings need to be reliable, verifiable, and *additional* – **Should Ohio adopt the baseline of current code or industry standard instead of “as found”?**





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Additional Slides & Resources

Chittum, Anna, Today's Self-Direct Energy Efficiency Programs: Cost-Effectiveness, Structure, and Lessons Learned: An ACEEE Memorandum, American Council for an Energy-Efficient Economy. Washington, DC: July 2012.

[Utility Financing Programs for Industrial Customers](#) (PDF)

September 2012 - SWEEP Report

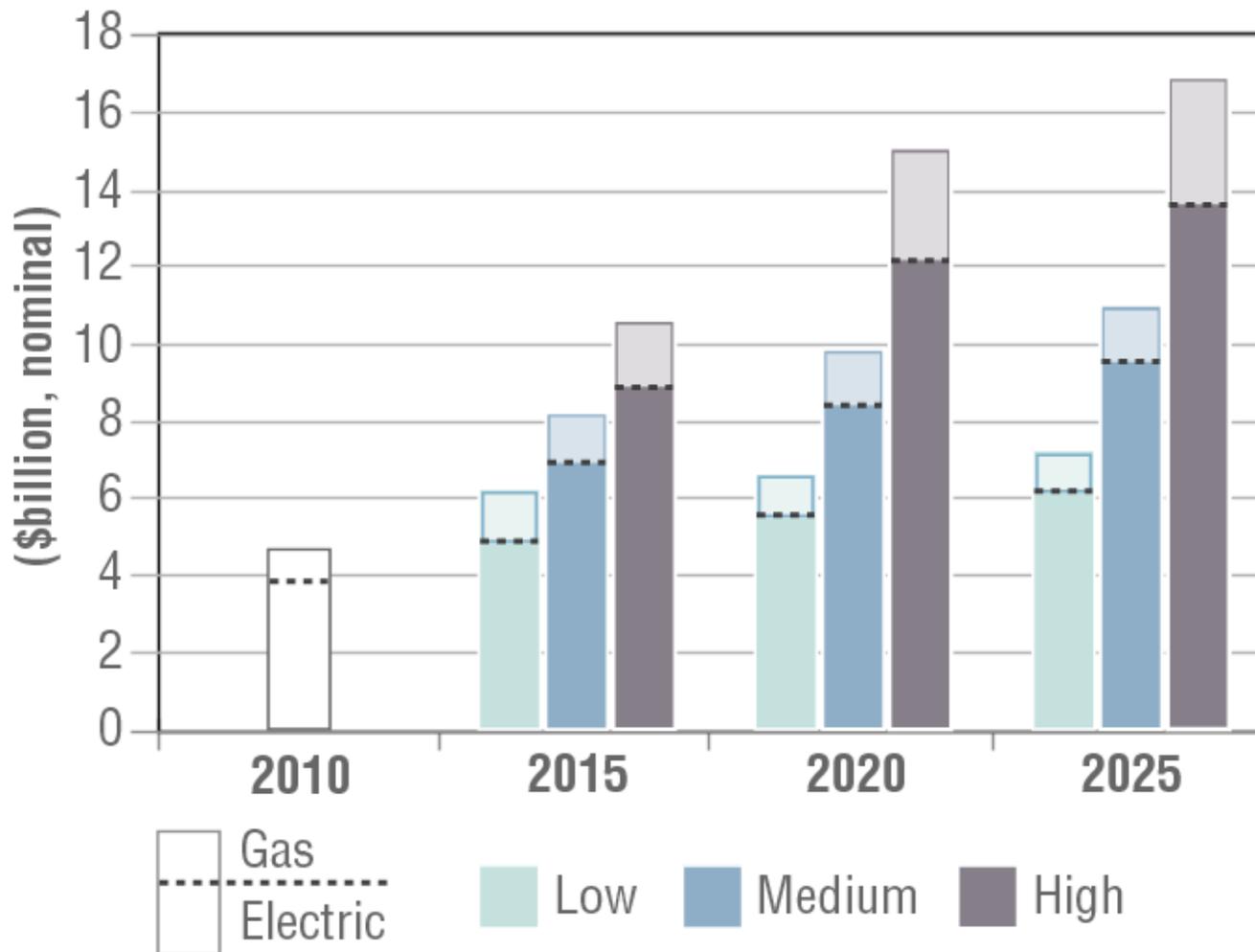
Chittum, Anna, Follow the Leaders: Improving Large Customer Self-Direct Programs. American Council for an Energy-Efficient Economy. Washington, DC: October 25, 2011. <http://aceee.org/research-report/ie112>

G. L. Barbose, C. A. Goldman, and J. Schlegel, The Shifting Landscape of Ratepayer-Funded Energy Efficiency in the U.S. Berkeley: , 2009, p. 41. Download: [Report PDF](#) (446.46 KB); [Presentation PDF](#) (79.49 KB)

Friedrich, Katherine, Maggie Eldridge, Dan York, Patti Witte and Marty Kushler. 2009. *Saving Energy Cost-Effectively: A National Review of the Cost of Energy Saved Through Utility-Sector Energy Efficiency Programs*. Report U092. Washington, DC: American Council for an Energy-Efficient Economy.

<http://www.aceee.org/sites/default/files/publications/researchreports/U092.pdf>

Projected Ratepayer Funding for U.S. EE Programs



(Barbose et al 2012)

Key features of well-designed self-direct programs:

1. Run as resource-acquisition efforts, with expectations the programs will yield energy savings like any other energy efficiency program;
2. Offer customers “carrots” for investing in energy efficiency projects;
3. Are flexible, allowing customers to use EE fees to fund long-term (multi-year) projects that might not be well-suited to traditional energy efficiency program offerings;
4. Employ the same cost-effectiveness criteria as other energy efficiency programs;
5. Conduct the same levels of evaluation, measurement, and verification as other energy efficiency programs;
6. Collect enough of an EE fee to cover administrative expenses;
7. Require customers to pay back retained EE fees or forfeit other benefits if they do not meet program requirements; and
8. Regularly collect meaningful data and use it to determine if the self-direct program is indeed acquiring cost-effective energy efficiency.

From ACEEE Memo: Chittum, Anna, Today’s Self-Direct Energy Efficiency Programs: Cost-Effectiveness, Structure, and Lessons Learned: An ACEEE Memorandum, American Council for an Energy-Efficient Economy. Washington, DC: July 2011.

Ohio's Benchmark Comparison Method

- When customers “commit” their EE/PDR resources they can be exempted from the EE/PDR rider
- Their expected savings are compared to the utilities’ “benchmark” energy savings requirements from SB 221, see table →
- Customers receive an exemption for the time period comparable to the utilities’ level of required savings; exemptions for more than 2 years require the customer to submit a report every two years to confirm continued savings
 - *Example:* A project installed in 2009 with an estimated **3.2%** savings with a lifetime of at least 5 years could exempt a customer from the EE/PDR rider from 2009 to 2013

Annual and Cumulative Energy Savings Benchmarks as Defined by SB 221

Year	Additional Reduction	Cumulative Reduction
2009	0.30%	0.30%
2010	0.50%	0.80%
2011	0.70%	1.50%
2012	0.80%	2.30%
2013	0.90%	3.20%
2014	1.00%	4.20%
2015	1.00%	5.20%
2016	1.00%	6.20%
2017	1.00%	7.20%
2018	1.00%	8.20%
2019	2.00%	10.20%
2020	2.00%	12.20%
2021	2.00%	14.20%
2022	2.00%	16.20%
2023	2.00%	18.20%
2024	2.00%	20.20%
2025	2.00%	22.20%

Specific provision: R.C. 4928.66(A)(1)(a)
Link: <http://codes.ohio.gov/orc/4928.66>