Cost-effectiveness of electric energy efficiency programs

comparative analysis from program administrators' perspective

University of Geneva

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Introduction

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United States

1970s

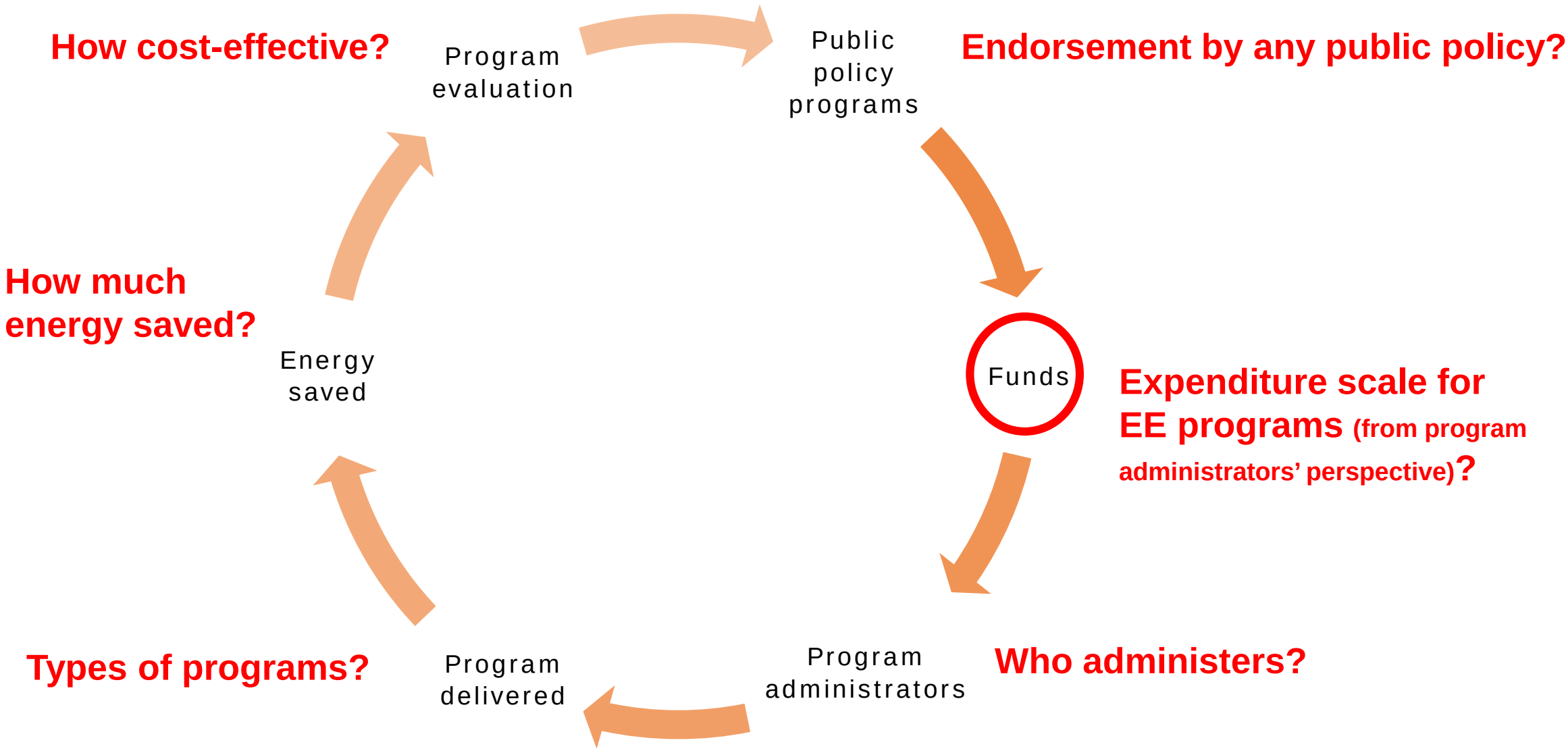
- 2006 and 2015, annual utility spending on efficiency increased from 1.6 billion USD to 6.3 billion USD (ACEEE utility scorecard, 2017)
- In 2015, a limited number of utilities had savings higher than 3% of sales (ACEEE utility scorecard, 2017)
- California, $90 billion in utility bill savings (NRDC, 2015)

Switzerland

2009

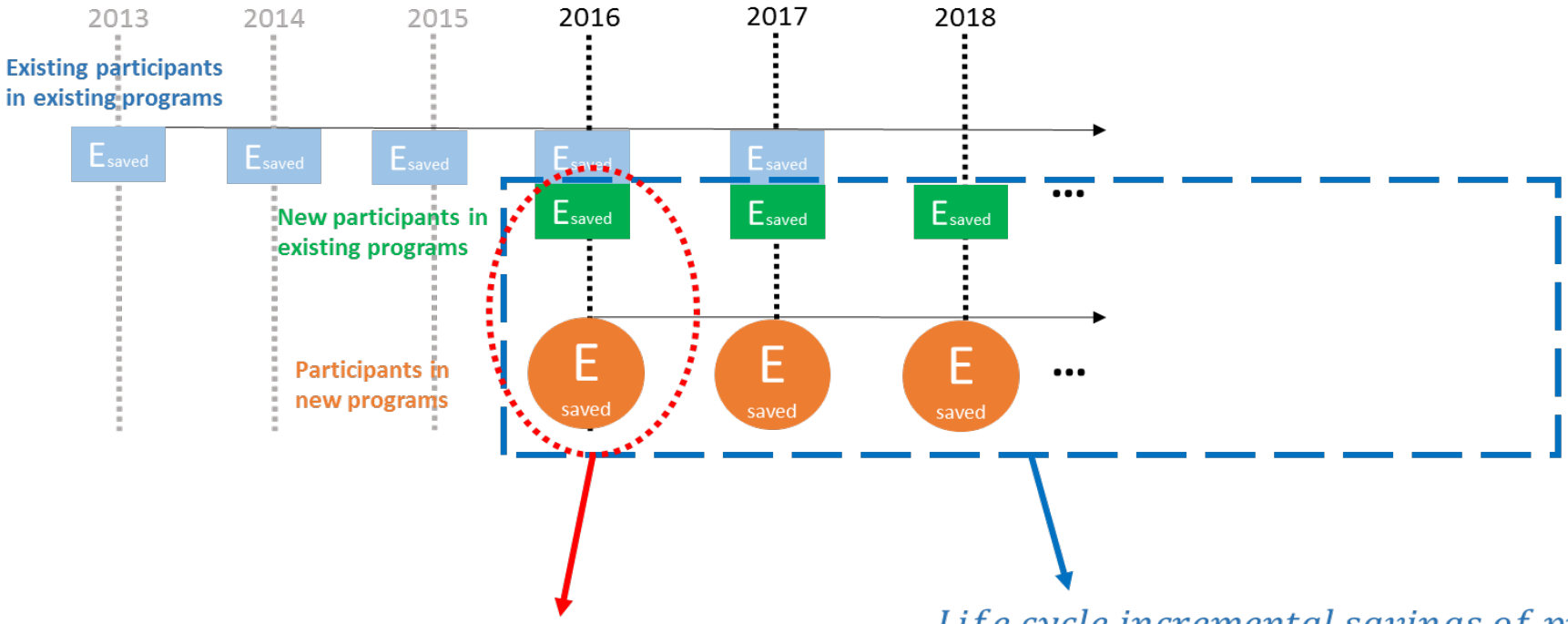
- Utility-run energy efficiency programs recently launched in a few cities

Introduction



Methodology

1. Select 11 leading states in the US
2. Annual gross incremental energy savings



$$Annual\ gross\ incremental\ energy\ savings = \frac{Life\ cycle\ incremental\ savings\ of\ program\ portfolio}{Weighted\ average\ life\ time\ of\ program\ portfolio}$$

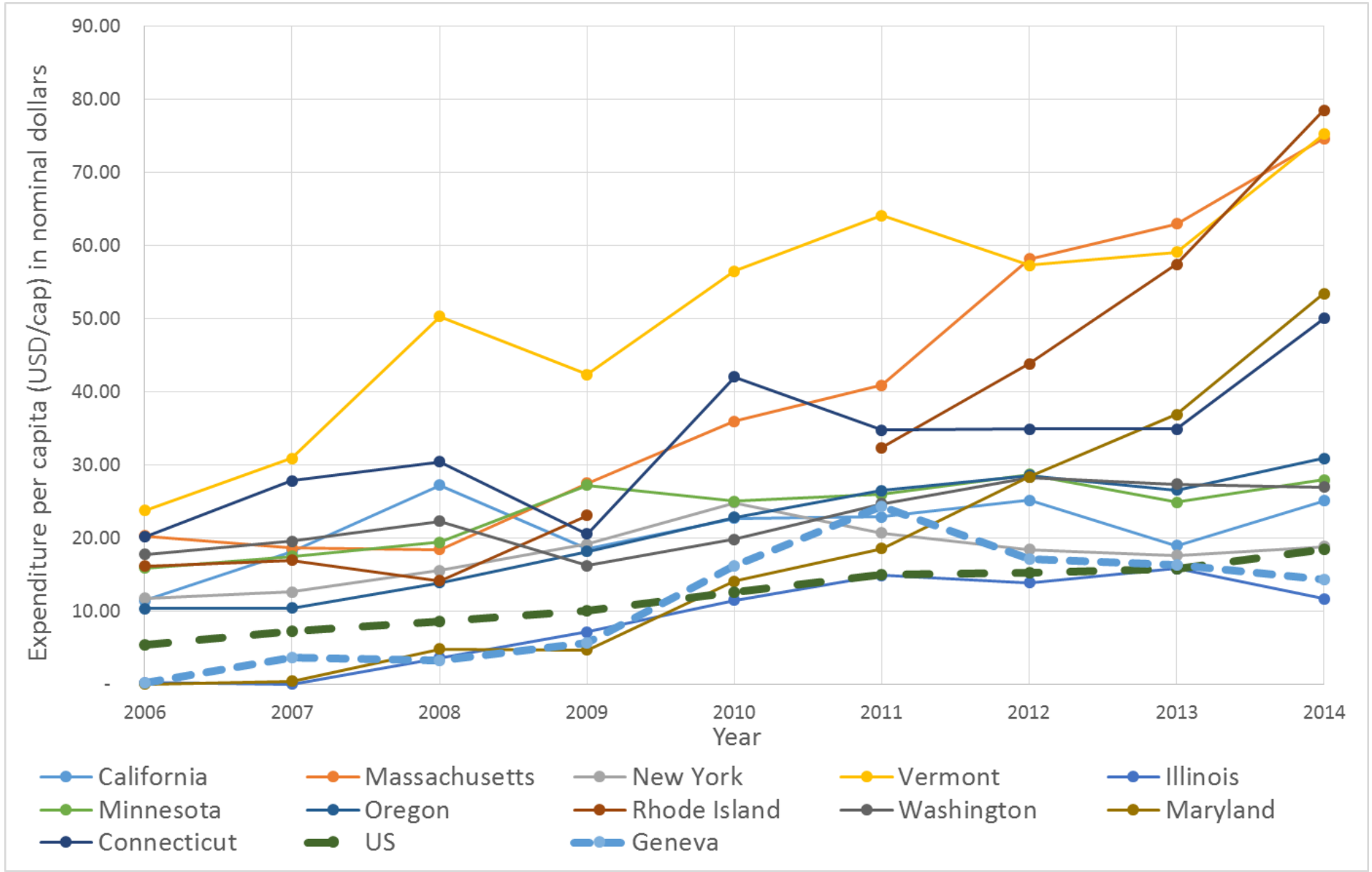
3. Program Administrator cost
   - Program administration cost
   - Financial incentives
4. Levelized program administrator cost of saved energy

$$\frac{Capital\ Recovery\ Factor\ \times Total\ Program\ Administrator\ Costs}{Annual\ Gross\ Energy\ Savings\ (in\ kWh)}$$

Where;
Capital Recovery Factor = $[r \times (1+r)^d] / [(1+r)^d - 1]$
r: discount rate (5%)
d: weighted average life of the portfolio

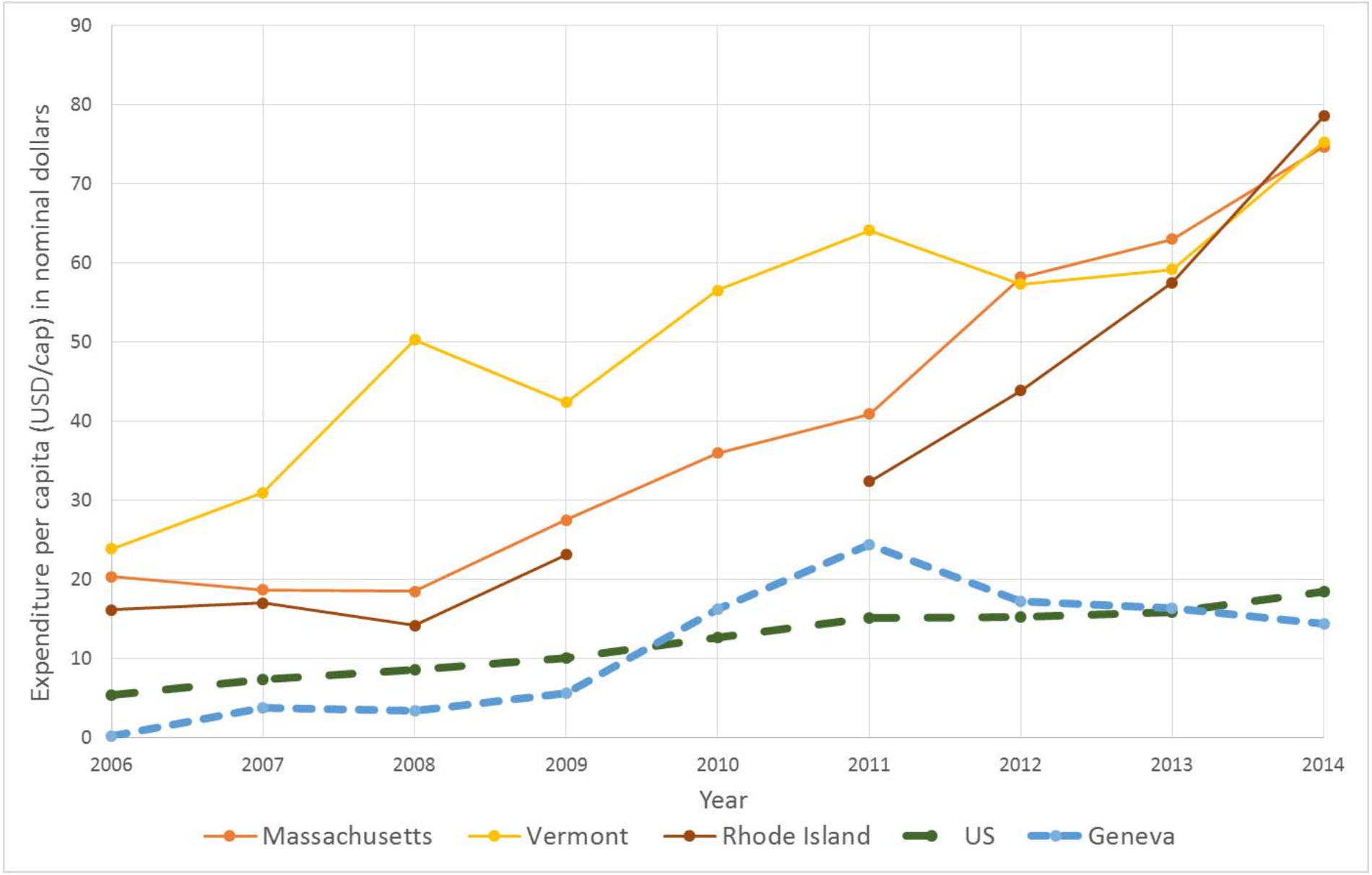
Results

Expenditure scale for EE programs (11 US states vs Geneva)



Results

Expenditure scale for EE programs (11 US states vs Geneva)



Results

Endorsement by any public policy?

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Table 1 Status of public policy adoption and achievement (source: ACEEE 2016 scorecard, ACEEE EERS policy brief)

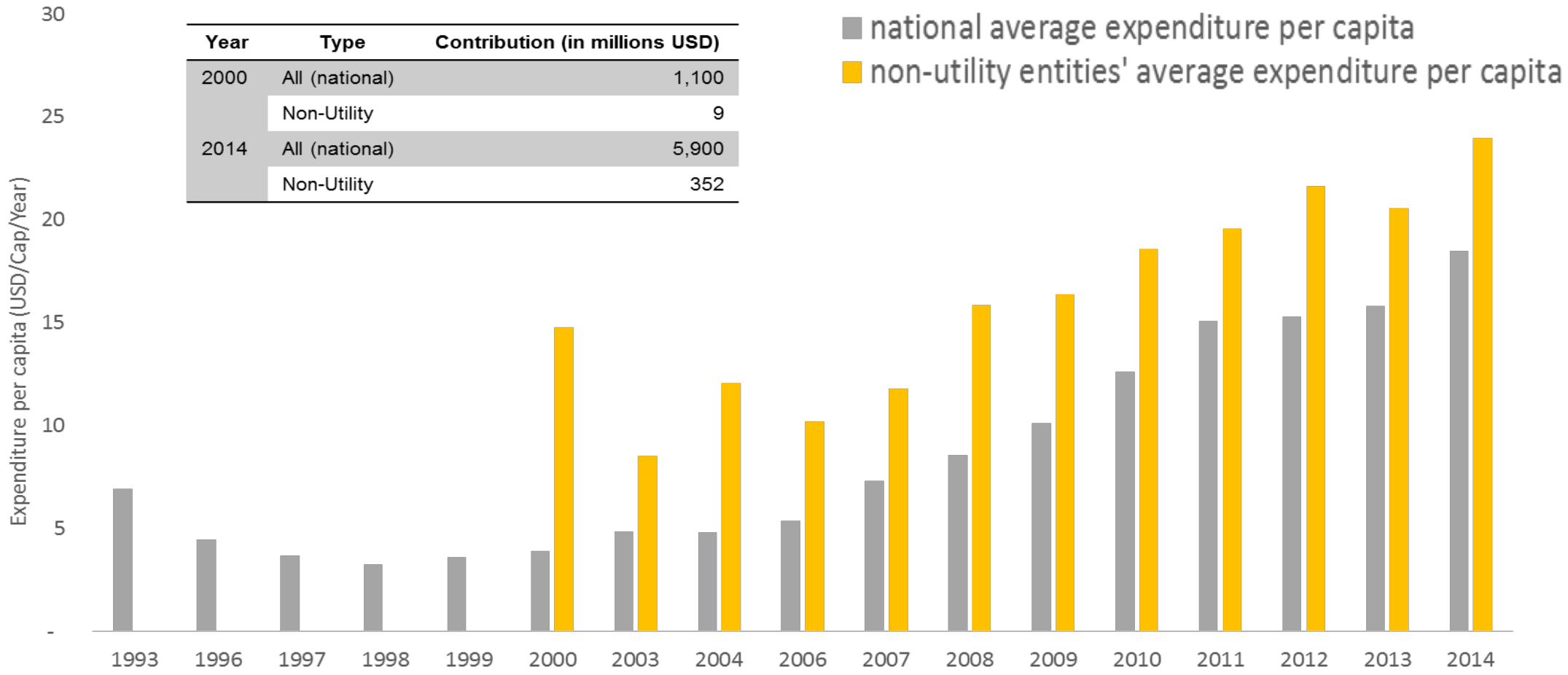
states	EERS	'All cost effective' mandates (in 2015)	Approx. annual electricity savings target (2014-2020)*	Actual achievement in 2015*	Spending per cap in 2015 (USD)
California	Y	Y	1.2	1.95	35.21
Connecticut	Y	Y	1.5	1.48	48.43
Illinois	Y	N	0.7	1.13	22.27
Massachusetts	Y	Y	2.9	2.74	82.11
Maryland	Y	N	2.0	1.01	46.08
Minnesota	Y	N	1.5	1.15	27.59
New York	Y	N	0.7	1.05	18.98
Oregon	Y	N	1.3	1.09	35.47
Rhode Island	Y	Y	2.6	2.91	78.48
Vermont	Y	Y	2.1	2.01	86.90
Washington	Y	Y	1.5	1.42	35.83

EERS: Energy Efficiency Resource Standard

Results

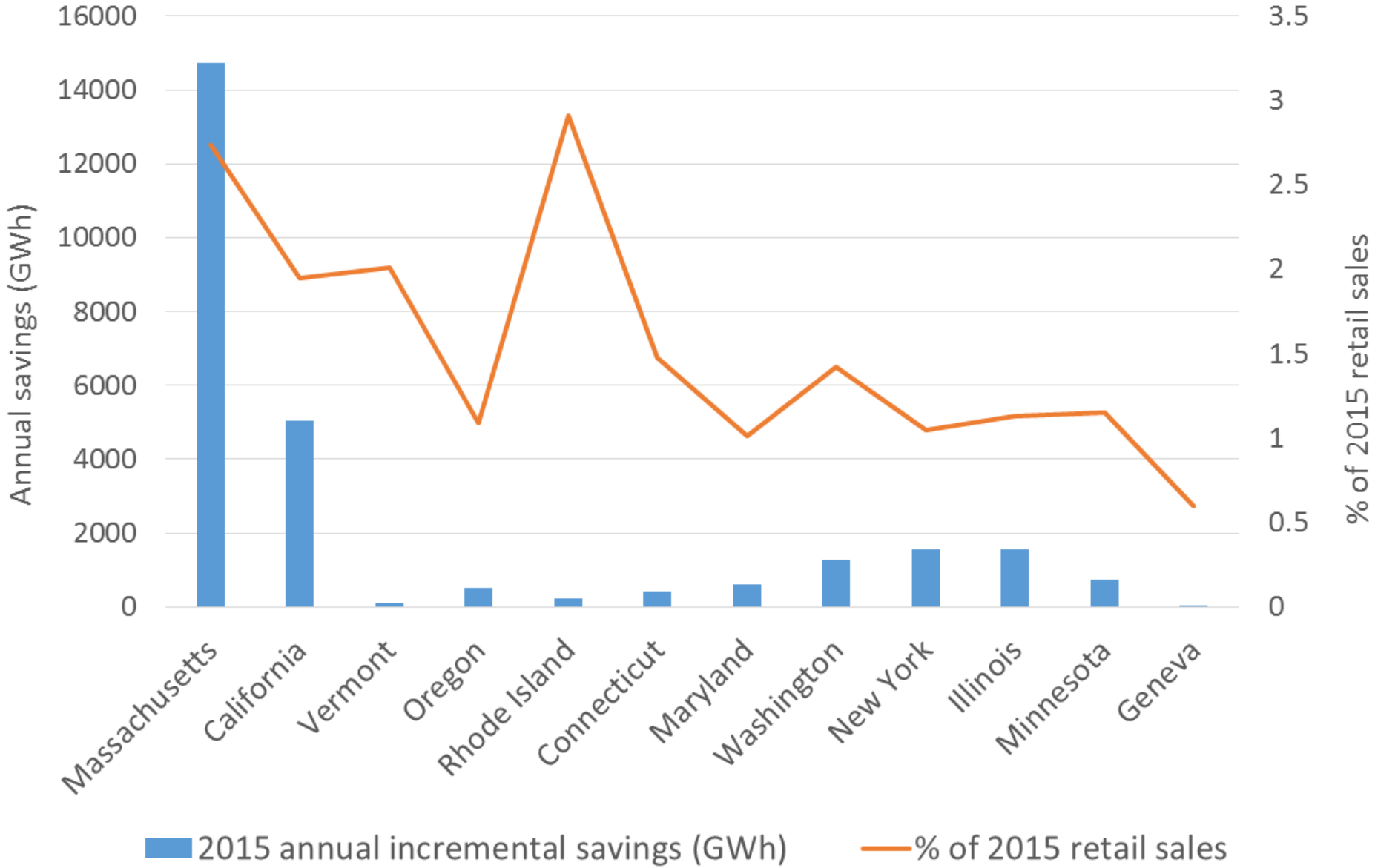
Who administers how much funds?

Year	Type	Contribution (in millions USD)
2000	All (national)	1,100
	Non-Utility	9
2014	All (national)	5,900
	Non-Utility	352



Results

How much energy saved?



Results

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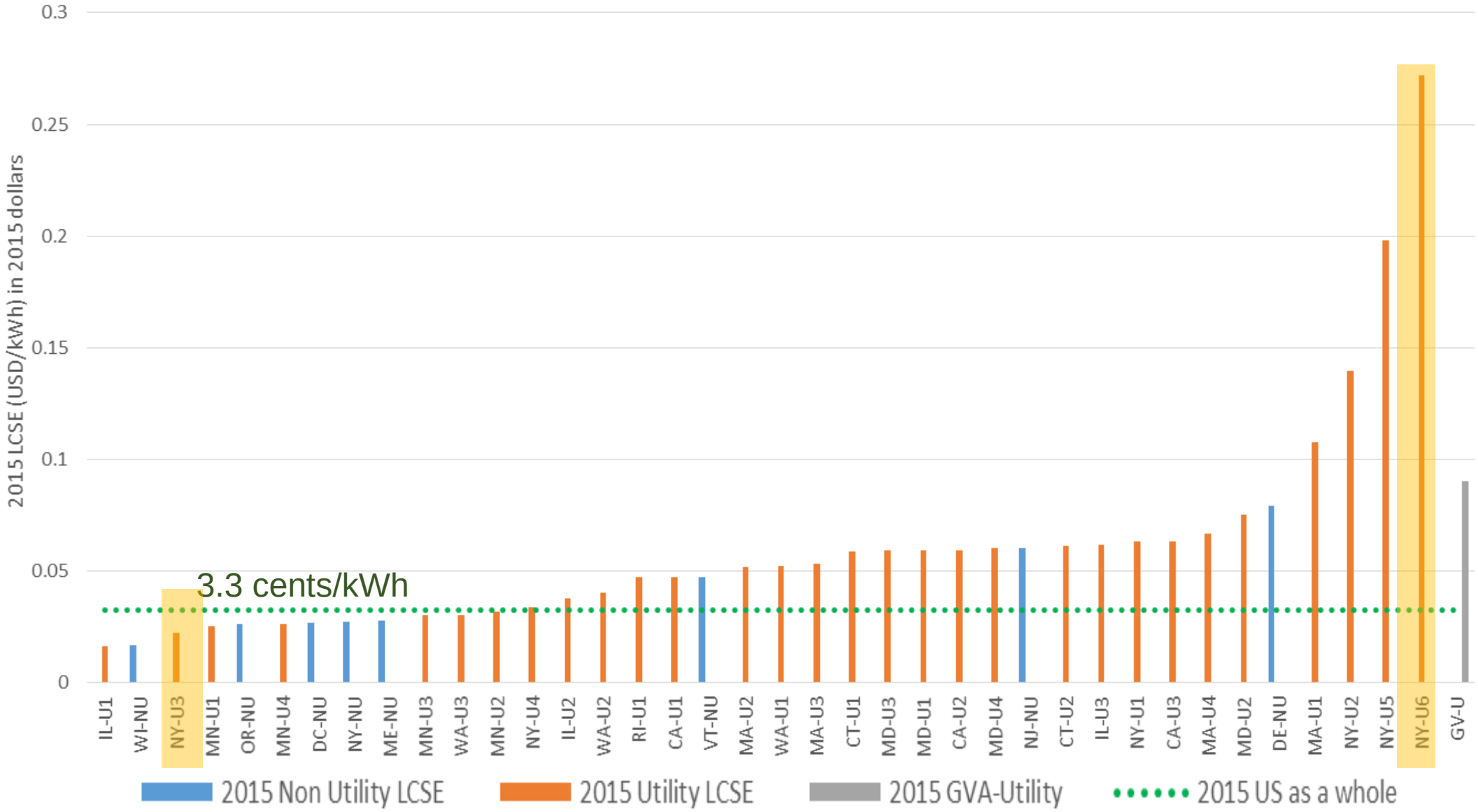
How cost-effective? – LCSE (USD/kWh) in residential sector (2015)



Results

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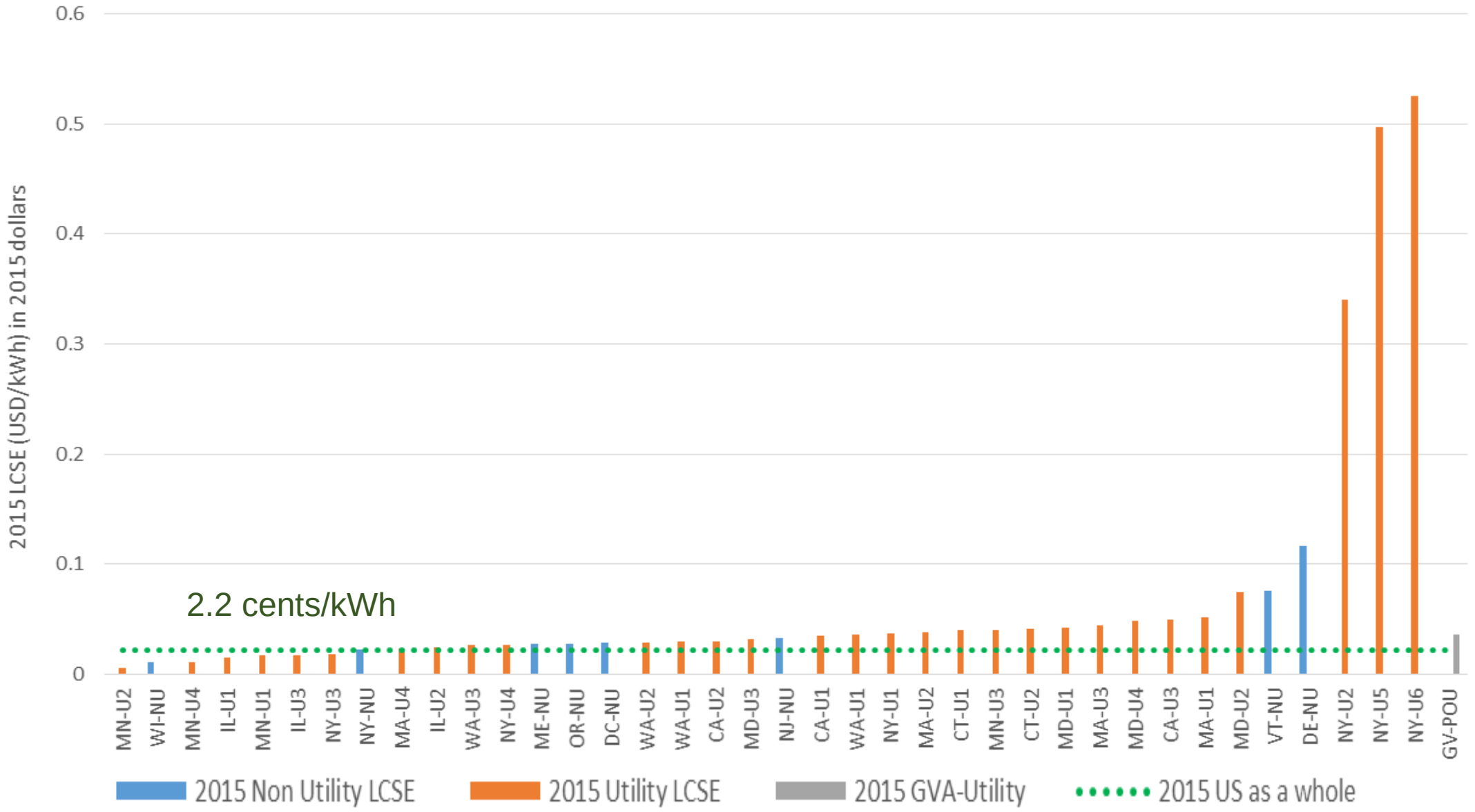
How cost-effective? – LCSE (USD/kWh) in commercial and industrial sector (2015)



Results

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Types of programs and their cost effectiveness (LCSE, USD/kWh)

		2013	2014	2015
Residential	Eco-Sociales	0.200	0.175	0.216
	Communs d'immeubles	0.044	0.054	0.053
	Chaleur renouvelable	0.275	0.067	0.084
	Ménages et indépendants	0.286	-	-
Commercial & Industrial	Négawatt	0.080	0.058	0.031
	Optiwatt	0.232	0.115	0.045
total		0.080	0.079	0.050

Based on data provided by SIG

Results

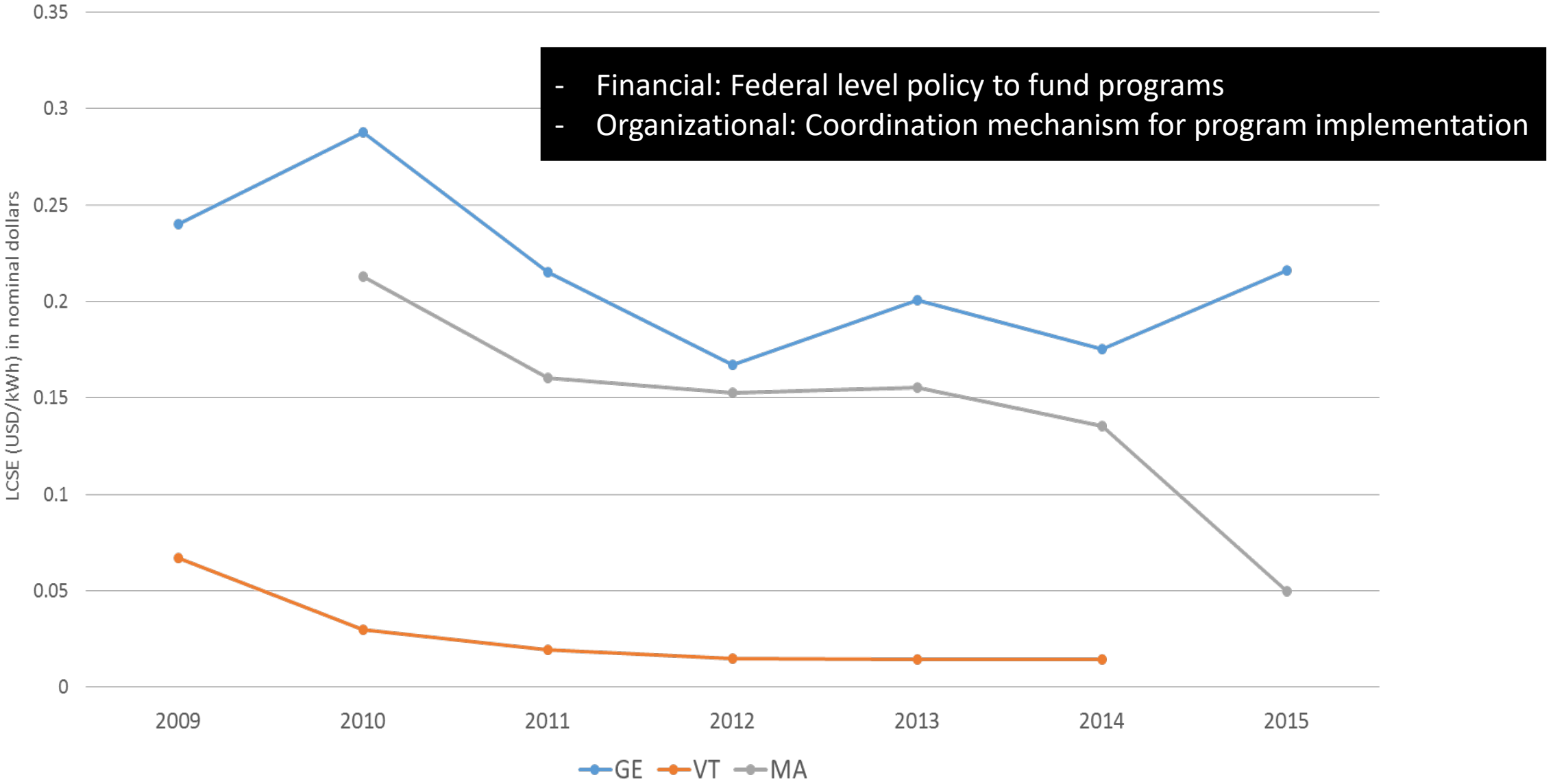
Low-income programs - Features

Program	Measures/Services provided	Financial support
Geneva Low-income Program (Eco-sociales)	• Energy efficient lighting equipment, shower heads (since 2014) • On-site installation services with energy advice • Household appliances (boilers, power strips, hot water flow restrictors) • Rebates on refrigerators	Fully subsidized by PA
Massachusetts Low-income Program (Cluett, et al., 2016)	• Insulation and air sealing, health and safety measures, and repairs • Refrigerator/freezer replacement/removal, efficient lighting, window air conditioners, and water heater replacement • Heating system repair and/or replacement	Fully subsidized by PA (CADMUS, 2012)
Efficiency Vermont Low-income Program (Cluett, et al., 2016)	• Insulation and air sealing, including targeting high-use households • Adding electrical efficiency measures to Vermont's core WAP services • Partnerships with food bank and food-shelf networks and the WIC food and nutrition program for refrigerator distribution • Distribution and installation of energy efficient products; referrals to deeper energy efficiency initiatives	Nearly or fully subsidized by PA

Results

Low-income programs – Cost-effectiveness

- Financial: Federal level policy to fund programs
- Organizational: Coordination mechanism for program implementation



Conclusion

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- **Policy context is decisive for utility-operated energy efficiency programs**

  [Typical procedures:]
  - Set the savings target
  - investigate all cost-effective energy efficient measures
  - Encourage collaboration among programs

- **States with higher ambition tend to invest more**

- **Collaboration with other parties, economies of scale and learnings allow to improve cost effectiveness of programs.**