How to better understand and improve cost-effectiveness of energy efficiency programs from multiple stakeholder perspectives?

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Swiss Competence Centers for Energy Research
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UNIVERSITÉ DE GENÈVE
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Context

- Cost-effectiveness analysis - core element of energy efficiency program evaluation.

- *How to better evaluate cost-effectiveness of energy efficiency programs?*
  - Technical perspective
  - Program administrator perspective
  - Multiple stakeholder perspectives

- Most energy efficiency programs are cost-effective. But *how to further improve the programs' cost-effectiveness (especially in times of low energy prices)?*

Research questions

Are non-residential energy efficiency programs in Switzerland **cost-effective** from the perspective of **different stakeholders**?

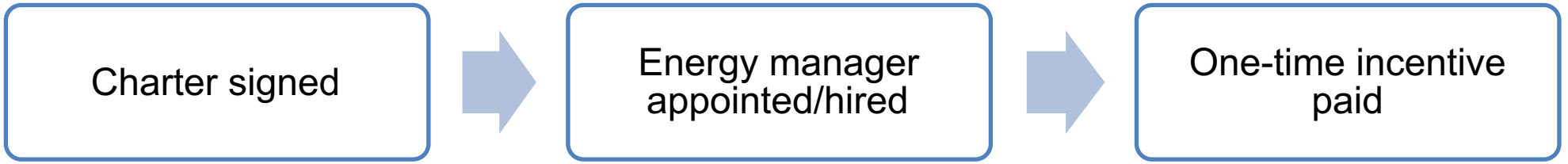
How can cost-effectiveness of the programs be **improved**?

Case study: *Négawatt* energy efficiency program

- Program administrator: **Geneva's public utility** *Services Industriels de Genève (SIG)*
- Target sectors: **Industry, services** and **public sector**
- Participation criteria:
  - **Electricity** consumption ≥ **1 GWh/year** OR
  - **Fossil fuels** consumption for heating and processes **≥ 4 GWh/year**
- Energy efficiency measures supported:
  - **Lighting**
  - **Cooling, ventilation** and **heating** equipment
  - **Optimization** of processes
  - **Energy management**
  - **Other** measures

Case study: *Négawatt* program functioning

- Long-term energy **management**



- Energy efficiency **measures** implementation

- **Trainings**

Case study: *Négawatt* program results (electricity savings part)

- **Program** start: **2009**
- Electricity **savings** start: **2012**
- **Program budget** in 2009-2014: **14.4 million CHF**
- Expenditure by **participants** in 2012-2014: **24.1 million CHF**
- Number of **energy efficiency measures** implemented in 2012-2014: 297
- Total first-year electricity savings in 2012-2014: **17.6 GWh/year****

*Preliminary results

** for which financial incentives have been paid before 2016

Benefits (+) and costs (-) by potential impact on groups of stakeholders

Cost/Benefit category	Participants	Ratepayers	Program administrators	Utilities	Geographic jurisdiction territory	Society
Costs of EE measures	-		-		-	
Program administration costs		-	-	-	-	
Financial incentives	+	-		-		
Energy cost savings to participants	+		+		+	
Lost utility revenue due to reduced energy bills		-		-	-	
Avoided costs to utility		+		+	+	
Tax deductions by program participants	+				+**	
Environmental and non-energy benefits					+	
Macroeconomic impacts of EE program (GDP, employment)						+
Macroeconomic impacts in the absence of EE program (GDP, employment)						-

* Preliminary results

** if received from outside geographic jurisdiction territory

Methodology: Finding the ways to improve cost-effectiveness

- Cost-effectiveness tests performed for every stakeholder group:

$$Cost - effectiveness\ ratio = \frac{\sum Benefits}{\sum Costs}$$

- Detailed analysis from program administrator perspective:

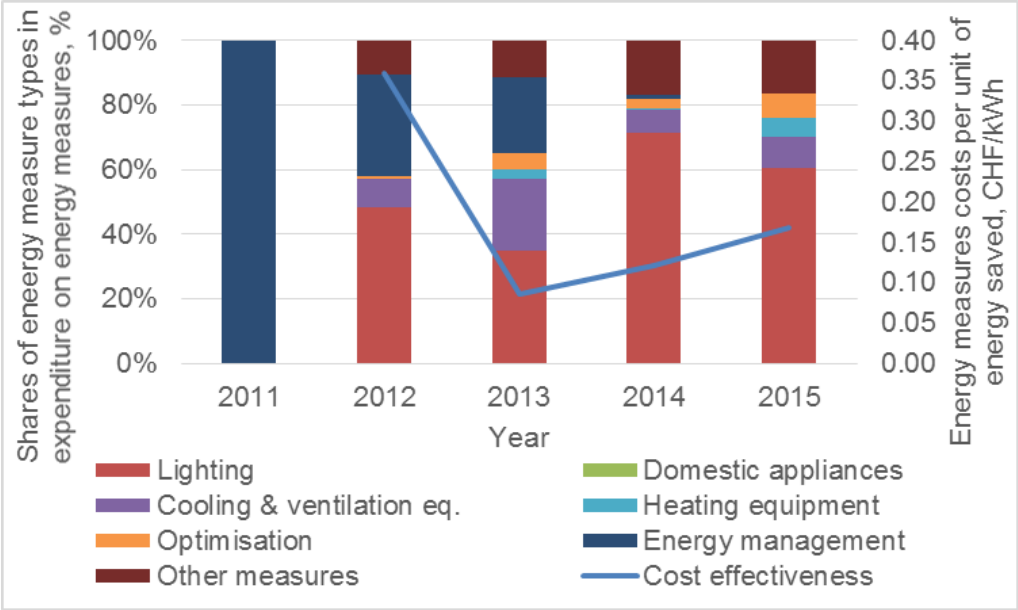
Total costs per unit of energy saved =

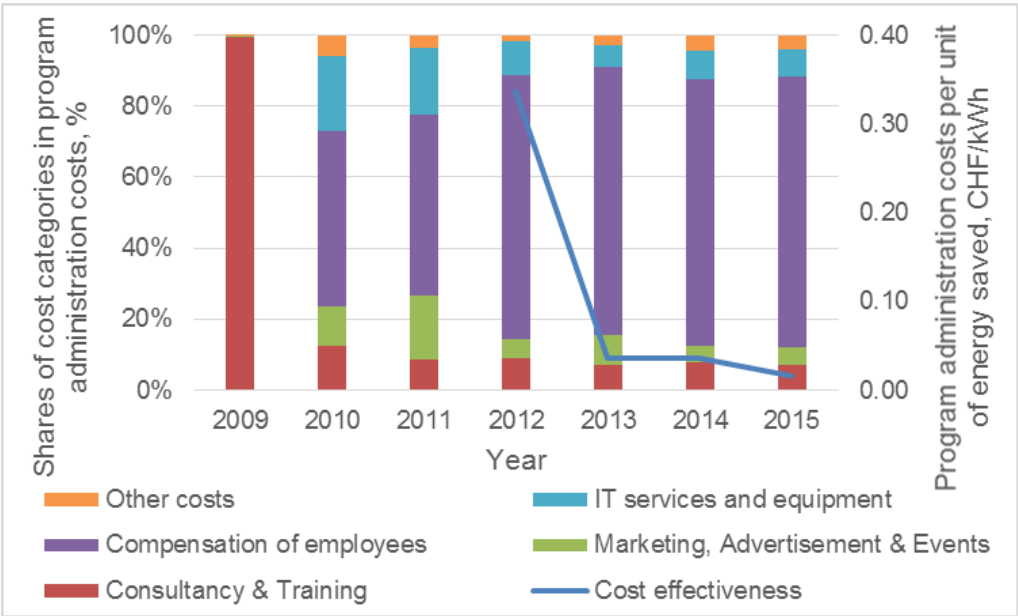
= (**Energy efficiency measures** costs + **Program administration** costs) / **Energy saved**

* Preliminary results

Results

Test	Value
Participant test	1.82
Ratepayers test	0.24
Program administrator test	1.10
Utility test	0.28
Geographical jurisdiction test	0.75
Societal test on GDP	1.24
on employment	1.23





* Preliminary results

Conclusions

- For Négawatt program:
  - **Benefits** to **participants** are **1.8 times larger** than costs.
  - It is **10% less expensive to save energy** than to consume.
  - Society as a whole benefits from **increased GDP** (+24%) **and employment** (+23%).
  - Among the trade-offs are potential **increase in energy tariffs** and **higher costs for utilities**.
  - **Other costs and benefits** should be accounted for in further studies (e.g., utility customer loyalty, other avoided environmental costs)

- The study shows importance of analyzing cost-effectiveness from **multiple stakeholder perspectives**.

- The proposed methodology can be used for **other locations**.

* Preliminary results

Recommendations: Program administration (1/2)

- Increased **program scale**
- Focus on **education and training**
- Priority to development of **long-term relationships** with program participants and contractors

- Expected outcomes:
  - Lower **program administration** costs
  - Negotiated **price discounts** on equipment and installation services
  - Maximized coverage of **energy saving potentials**
  - Improved **quality of energy services**
  - Positive **spillover effects**

* Preliminary results

Recommendations: Policy (2/2)

- Integration of energy efficiency programs with **energy supply**
- Coordination with **renewable energy** policies and programs
- Adequate **legislative base**

- Expected outcomes:
  - Avoided additional **costs for utilities**
  - Contribution to **smart grids** development
  - Increased **share of renewables** in generation mix
  - Decreased **import dependency**
  - Improved **security of supply**

* Preliminary results

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Thank you for your attention!

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