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Role of utilities and energy service companies in improving energy efficiency

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Background paper on lessons learned from utility-operated energy efficiency programmes in the United States and Switzerland¹

Note by the secretariat

I. Introduction

1. Utilities in the United States started to engage in energy efficiency programs since the energy crisis in 1970s. Based on knowledge and experience accumulated to date, energy efficiency programmes in the United States are often considered as a reference for energy efficiency strategies or public policies in other countries. In Europe, energy efficiency programmes have become a key element of energy efficiency policy since the introduction of the energy efficiency obligations for utilities in the context of the Energy Efficiency Directive of the European Union (2012/27/EU) in 2012. In Switzerland, there is no federal policy for utility-operated energy efficiency programmes, with very few Swiss cantons taking initiatives. Among the first, the canton of Geneva launched in 2009 the energy efficiency portfolio *éco21*, which has been operated by the local utility *Service Industriel de Genève* (SIG) and has seen significant expansion in funding scale and number of participants. Against this background, this background paper addresses the question about how utility-operated energy efficiency programmes in 11 leading states in the United States and in the canton of

¹ This background paper has been prepared by the ECE secretariat based on the documentation provided by Mr. Martin Kumar Patel, Vice-Chair of the Group of Experts on Energy Efficiency, and his team at the University of Geneva.

Geneva in Switzerland have been developed in terms of scale of investment and cost-effectiveness at portfolio and programme level.

II. Comparative review of exemplary energy efficiency programmes

A. Assessment of energy efficiency portfolio expenditure

2. Time series of the expenditure on utility-operated energy efficiency programmes provide insight into the level of uptake and expansion of the programmes, thereby representing an indicator for acceptance by policy makers and by local actors. The time series for eleven selected United States states² show some fluctuation but the overall trend of programme expenditure is clearly upwards, with the nation-wide average annual expenditures increasing from USD 5 per capita in 2006 to USD 19 per capita in 2014. Significant drops occurred during the financial crisis between 2008 and 2009 in five out of 11 states (between 2 percent and 32 percent) but they soon resumed an upward trend. In Geneva, annual expenditure for utility-operated energy efficiency programmes per capita increased rapidly to USD 24 per capita until 2011 and decreased to about USD 14 per capita in 2014. This is significantly below some leading states in the United States, such as Rhode Island, Vermont and Massachusetts where investments were above USD 70 per capita in 2014.

3. Regulatory foundation is a strong driver to ramp up energy efficiency programmes. As of January 2017, 26 American states had adopted Energy Efficiency Resource Standard (EERS), which set mandatory energy savings targets. States with EERS achieved more than three times greater energy savings and spending than the states without EERS. In addition, in 2017 six states (California, Connecticut, Massachusetts, Rhode Island, Vermont, and Washington) enforced so-called ‘all cost effective efficiency mandates’, which implies that states are expected to identify all available cost-effective efficiency opportunities, and programme administrators in those states are required to implement them. Out of the 11 states that adopted EERS, six states with ‘all cost effective’ mandates set higher targets and more heavily invested in efficiency on average. The highest savings target³ (between 2014 and 2020) and spending per capita (in 2015) among the six states that adopted both EERS and ‘cost effective’ mandates was 2.9 percent per annum and USD 87 per capita, while the remaining 5 states that adopted only EERS demonstrated at most 2.0 percent per annum and USD 46 per capita as the highest.

4. The level of expenditure per capita in Geneva is at a similar level as the average spending in the United States as a whole and up to a factor four lower than expenditure in the leading American states. The fact that Swiss utilities are not subject to similar obligations as in the United States or within the European Union may explain the lower investment in energy efficiency.

² The following 11 states were selected as exemplary in 2015 with regard to their utility-operated energy efficiency programmes according to the American Council for an Energy-Efficient Economy (ACEEE) scorecard report: Massachusetts (MA), California (CA), Vermont (VT), Oregon (OR), Rhode Island (RI), Connecticut (CT), Maryland (MD), Washington (WA), New York (NY), Illinois (IL), and Minnesota (MN). in our comparison

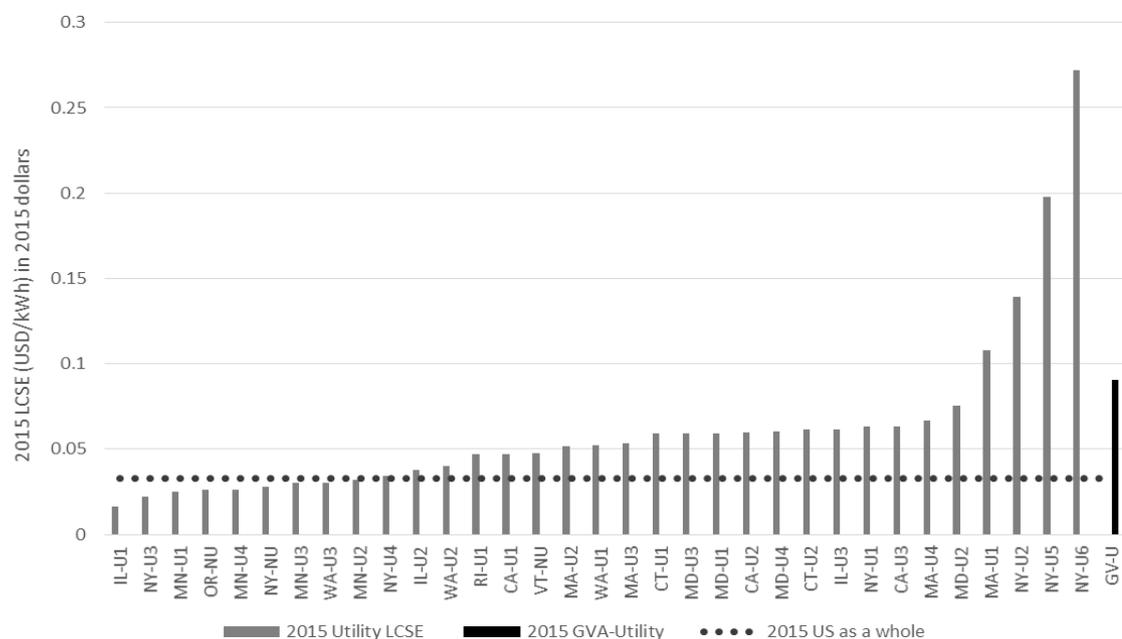
³ Savings target expressed as incremental annual energy savings as percentage of electricity retail sales.

B. Analysis of levelized cost of saved energy

5. To assess the cost-effectiveness of the programmes, (savings-weighted) levelized cost of saved energy (LCSE)⁴ associated with energy efficiency portfolios in the residential sector for the 33 programme administrators (PAs) in the 11 leading states have been calculated (Fig. 1). The cost-effectiveness is analyzed from the PA's perspective, hence the cost to be considered is the total cost incurred by the PA. This implies that programme administration costs and financial incentives are included while the costs incurred by electricity customers are not included. LCSEs vary greatly, even within the same state. In New York, for example, LCSE of NY-U6 was more than 10 times higher than that of NY-U3. The LCSE in the residential sector at the national level was 0.033 USD/kWh in 2015 (dotted line in Figure 1), which was lower than the average LCSE of 33 PAs considered in this study, i.e. 0.044 USD/kWh. This difference can be explained by the more ambitious energy saving objectives among the 33 selected PAs compared to the national average.

Figure 1

Levelized Cost of Saved Energy (LCSE) in the residential sector covering 33 PAs (values for 2015).⁵

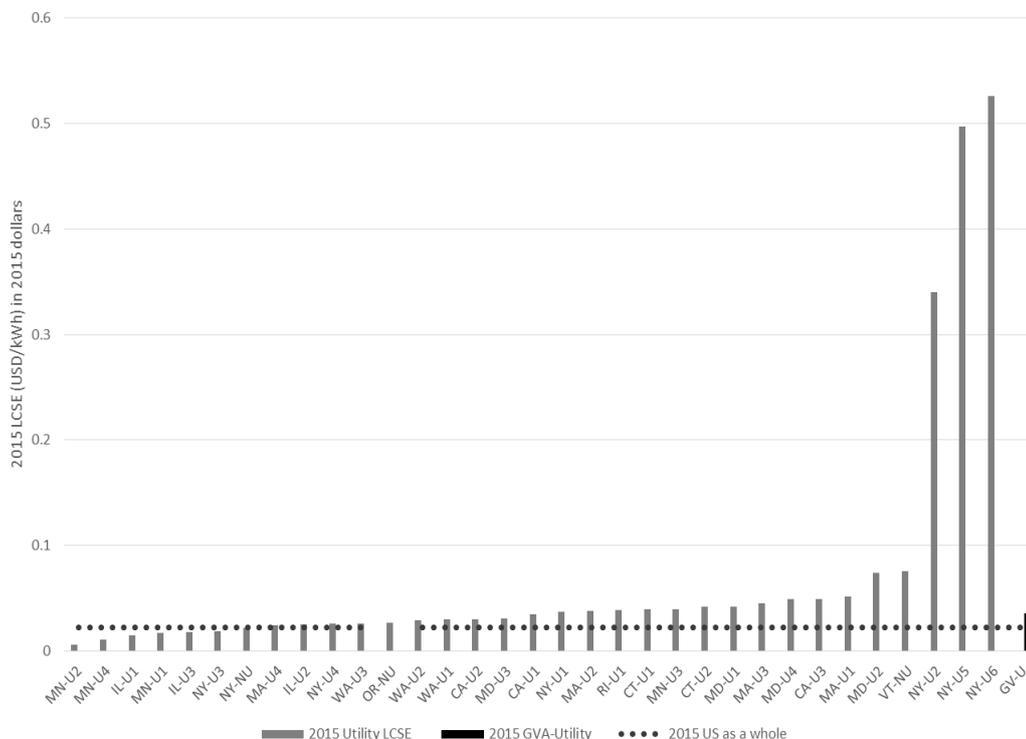


6. The average savings-weighted LCSE in the United States in commercial and industrial (C&I) sectors was 0.022 USD/kWh in 2015, which is lower than in the residential sector (Figure 2). The LCSE of the 33 PAs in C&I sectors was 0.034 USD/kWh, i.e. higher than the national average (as in the residential sector).

⁴ Levelized Cost of Saved Energy (LCSE) is calculated by spreading the costs in equal payments over the economic lifetime of the actions taken and then dividing by the energy saved annually.

⁵ To provide information for each Programme Administrator (PA) considered, there is a code in the form of a combination of state or canton abbreviation (e.g. GV for Geneva) and a number identifying a specific utility in the considered state (e.g. NY-U1).

Figure 2
2015 Levelized Cost of Saved Energy in commercial and industrial sector covering 33 PAs.



7. Compared to leading states in the United States, LCSE estimates of efficiency programmes in Geneva are close to average (C&I sector programmes) or on the higher side (residential sector programmes). This might be attributable to the fact that electricity efficiency programmes in Geneva were implemented rather recently (for the first time in 2009), with new and small-scale programmes involving relatively high learning, transaction and administrative costs. As PAs in the leading American states have accumulated expertise and expanded their programmes encompassing various efficient measures, PAs distribute administrative costs across a large number of programmes and participants and increase overall cost-effectiveness by combining measures that have varied cost-effectiveness but complement each other and jointly result in higher energy performance. C&I programs in Geneva achieved remarkable reduction in LCSE since the start of the *éco21* programme. The main reasons are learning and economies of scale that reduces administrative costs and costs for incentives. Significant improvement in LCSE has been observed in Geneva recently: during the first years since programme’s introduction (2009-2012), LCSE fluctuated between 0.072 and 0.13 USD/kWh but it was down to 0.08 USD/kWh in 2013 and 2014 and decreased further to 0.05 USD/kWh in 2015.

C. Observations on low-income programmes

8. Table 1 provides LCSE values for the various programmes implemented in Geneva under the *éco21* portfolio. *Eco-sociales*, which is the energy efficiency programme targeting electricity consumption in low-income housing, shows relatively high LCSE over the past three years. For example, in 2015, LCSE of *Eco-sociales* was 0.216 USD/kWh, which is more than 4 times higher than the programme *Communs d'immeubles*. Due to significant

effort required to identify eligible low-income households and foster awareness, as well as higher level of financial incentives to cover the cost of efficient appliances, low-income programmes cost more to implement compared to other residential programmes. Although local authorities in Geneva financially support programme implementation (while, for other programmes, part of the cost is covered by the participants), SIG still has to bear high programme cost⁶ to provide energy efficient measures (e.g. lighting equipment, boilers, power strips and hot water flow restrictors) and make on-site installation services available at no cost to participants. Furthermore, while the LCSE of the overall portfolio has declined, the LCSE of the two subprogrammes *Eco-sociales* and *Communs d'immeubles* has increased.

Table 1
Levelized Cost of Saved Energy (LCSE) of six programmes⁷ under *éco21* between 2013 and 2015 (in USD/kWh).

Type of programme	Name of programme	2013	2014	2015
Residential	<i>Eco-sociales</i>	0.200	0.175	0.216
	<i>Communs d'immeubles</i>	0.044	0.054	0.053
	<i>Chaleur renouvelable</i>	0.275	0.067	0.084
	<i>Ménages et indépendants</i>	0.286	-	-
Commercial & Industrial	<i>Négawatt</i>	0.080	0.058	0.031
	<i>Optiwatt</i>	0.232	0.115	0.045
Total		0.080	0.080	0.050

9. Comparison has been made of the low-income programmes in Geneva with those in Vermont and Massachusetts, taking into consideration the fact that Geneva implemented multifamily housing programmes while Vermont and Massachusetts carried out both multifamily and single-family housing programmes. Comparing LCSE of low-income programmes in Vermont and Massachusetts in the period 2009 and 2015, there is a slight decrease in LCSE in Vermont and substantial cost decrease (by a factor of four) in Massachusetts. In the case of Geneva, there was some fluctuation in LCSE between 2013 and 2015. In this period, Geneva considerably increased its annual spending for *Eco-sociales* (by 2.7 times) and generated 2.5 times more lifetime energy savings in 2015 compared to 2013. Compared to Geneva, Massachusetts and Vermont demonstrated lower LCSE for the low-income programme portfolio between 2009 and 2015. This may be attributed to the so-called coordination mechanism for programme implementation, i.e. the collaboration between utilities and local community action agencies (see example below).

⁶ In 2015, 74 percent of the entire programme expenditure was covered by SIG.

⁷ Short description of the programmes:

Eco-sociales: Installation of energy efficient measures for low-income households

Communs d'immeubles: Installation of energy efficient measures for common areas

Chaleur renouvelable: Installation of renewable heating solutions for homeowners

Ménages et indépendants: Financial incentives to households in accordance with the amount of energy saved (free equipment or financial reward such as bonus or rebates provided)

Négawatt: Various technical and behavioural training courses and financial incentives for companies that are actively involved in implementation of energy efficiency measures

Optiwatt: Efficiency services (replacement of energy-intensive installations, financial reward for energy improvements) for medium-size enterprises and local authorities

10. In the United States, there are two funds provided by federal and state governments that utilities have been able to use for financing energy efficiency programmes: state and local Low-income Home Energy Assistance Program (LIHEAP) and federal Weatherization Assistance Program (WAP). These funds were set up to address issues of energy affordability in low-income households and entrusted to Community Action Partnership (CAP) agencies. By establishing partnership between CAP agencies and PAs, they can share existing infrastructure, administrative costs and experience-based knowledge in operating weatherization programmes. For instance, PAs can utilize information of already identified low-income groups, service providers or community action groups that have close relationship with low-income households. In Massachusetts, state policy requires partnership and coordination among agencies serving low-income households on a statewide level. This avoids the otherwise incurred cost related to the identification of programme participants, verification of their eligibility and training of service providers, as well as helps in contracting process. Agencies including electric and gas programme administrators, the Energy Efficiency Advisory Council, the state Department of Health and Human Services (DHHS) and weatherization programme administrators meet to standardize implementation of programmes serving the low-income sector, thereby eliminating redundancy and related administrative costs. While still being in an initial stage, some Swiss utilities are making efforts to promote collaboration related to energy efficiency programmes. This is expected to expand the scope and size of programmes, ultimately increasing cost effectiveness.

III. Conclusions

11. The comparative case studies in 11 states in the United States and in Geneva in Switzerland highlight important features of policy measures to promote utility-operated energy efficiency programmes. An important conclusion is that economies of scale and learning can significantly enhance cost effectiveness of the programmes. Future energy efficiency programmes may need to be enforced by public mandates in order to ensure high funding levels and increased cost effectiveness (low LCSE). Moreover, experience in the United States indicates that effectiveness of energy efficiency programmes can be enhanced by introducing policy programmes, which earmark certain amounts of funds to target specific categories of people and engage various stakeholders and local community actions groups.
