éco21. Stabilisation of electricity consumption in Geneva: a project driven by a strong political will and the skills and dynamism of a public service utility

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Abstract

This article presents the éco21 programme implemented in the Canton of Geneva (electricity consumption of 3 TWh/year for 460,000 inhabitants) by the Services Industriels de Genève (SIG), the largest multi-utility company in Switzerland. SIG is a State-owned company which provides electricity, water, gas, thermal energy, recycles waste, offers fiber optic and a range of local services to residents and companies in the Canton of Geneva.

éco21 is an ambitious Programme of Demand Side Management (DSM) of electricity consumption which aims to save 150 GWh/year by the end of 2013. This program is managed in a pragmatic way of a professional electric engineer with clear investment process and significant commitment to results and resources. The éco21 budget for the period 2007 to the end of 2013 is 53 millions of Swiss Francs (MCHF) or 40 millions Euros (€40 M).

The éco21 plans are the result of interaction between the strict legislative Swiss context, the pro-active Geneva policy and SIG's dynamism. éco21 is based on 10 action-plans, each one dedicated to a specific category of clients, implemented, involving three different types of drivers:

- Financial incentive,
- Consultancy/training,
- Information/event.

éco21's structure is based on a thorough analysis of electricity demand characteristics to identify targets for DSM actions. The éco21 programme is based on a bottom-up energy and power analysis, supported by feasibility indicators, energy footprints and the analysis of financial impacts, both for SIG and consumers.

Three years from the end of the programme, 20 % of the éco21 electricity savings objectives (30 GWh/year) have been achieved thanks to 20,000 participants.

Global vision at a regional scale

In Geneva, electricity consumption has been multiplied by 5 during the last 50 years. After a slow-down in growth in the 90s, electricity consumption in the Canton increased again from the year 2000 with an annual average close to 1,7 % and annual growth peaks exceeding 3 % (2003 and 2008).

Since 2007, éco21, the ambitious programme of electricity Demand Side Management (DSM), has been implemented in the Canton of Geneva by the electric supplier SIG. With a budget of 53 MCHF (€40M), the objective of éco21 is to stabilise electricity consumption in Geneva This would represent savings of 150 GWh per year from the end of 2013 compared to the "business as usual" consumption.

éco21 is also characterised by the size of the programme in terms of energetic impact, diversity of the targeted consumers, budget and human resources mobilised within SIG and among its Geneva partners (State, entrepreneurs, mass distribution...). éco21 encompasses all 45 communes in Geneva and thus addresses 460,000 inhabitants and 1,900 professional consumers using more than 100 MWh/year, including 250 large consumers with over 1 GWh/year.

As it does not have to comply, in financial terms, with the usual profit rules, éco21 constitutes a real laboratory of energetic efficiency, aiming to develop new services, skills and validation tools for electricity savings.

Legal framework, political will and dynamism of a public service utility

The éco21 programme is the result of cooperation between the strict legislative Swiss context, the pro-active Geneva policy and SIG's dynamism. The main goals of Swiss energy policy are to promote the use of renewable resources and to encourage efficiency and Switzerland cannot avoid the upcoming liberalisation of the European energy market. Geneva's energy policy is based on a reference document, the Conception Générale de l'Energie (General Conception of Energy) unanimously adopted by the Grand Conseil in 2008, which aims to a "2000-watt society" without nuclear help. The "2000-watt society" is a vision where each person would consume an average of 2000 watts (i.e. 17,520 kWh/year of all energy use, not only electrical) by the year 2050, without lowering their standard of living.

SIG is a public law company shared by the regional government, the State (Canton) of Geneva (55 %), and the local governments, the City of Geneva (30 %) and all other small and medium-sized cities of the State of Geneva (15 %). SIG's mission is to supply the Canton of Geneva with water, natural gas, electricity, district heating telecommunications, as well as to treat and recycle both liquid and other waste. Besides supplying fluids, SIG has developed services in the field of energy savings (audits). SIG counts 1,700 employees and has an annual turnover of 1 billion CHF (€750B). SIG wants to stabilise Geneva's electricity consumption and its experience in the fields of energy and industry will be of great help. SIG undertakes the DSM with the pragmatic approach of a professional electricity engineer always taking into consideration its obligations of resources and results. Its knowledge of electricity demand and its consumers' proximity allow it to be the main actor of the Geneva DSM. Moreover, despite its position as an electricity "seller", the Board of SIG acknowledged its interest in volunteering undertaking the éco21 programme for the following reasons:

- Meet the cantonal and federal energy policy objectives and keep within the international context in favour of the environment,
- Help SIG to supply energy and other services of high quality, without seeking to maximise profit,
- Reduce cantonal energy dependence; avoid buying high cost energy on the European market (the sale of a marginal kWh can cost more than it brings in),
- Enhance the value of the enormous potential of electricity savings and reduce the pressure on energy resources in a sustainable development perspective,
- Reinforce its position as a public service concerned with improving the competitiveness of the energy service industry of Geneva,
- Be aware of its clients' preoccupations and develop customer loyalty; reinforce the image and visibility of SIG,
- Join forces around a strong company's project.

Geneva consumption and production profile

Around 3 TWh/year are distributed by the Geneva electricity network, ¾ of which are imported. Economic activities, including the primary, secondary and tertiary sectors, represent 60 % of the total electric consumption of the Canton. The tertiary sector (which includes public sector) has the highest consumption with 47 % of the total. Households consume a little more than a quarter of cantonal electricity. Compared with these two sectors, industry is a low consumer in the Canton with only 12 % of the total. Figure 1 is actually the same as for the common areas (e.g. corridor, entrance, staircases of buildings), designed as Estate General Services.

Contents of the éco21 programme

Instead of investing money in some heavyweight limited action (for example financing the replacement of 1 million incandescent bulbs by low consumption bulbs) éco21 is a five years programme which will use its budget to create a favourable environment for electricity savings among Geneva consumers.

The éco21 programme is composed of 10 Action Plans, each one targeting a different category of clients, all of them being eventually addressed by one of the Action Plans. For example lighting savings will be activated by several of these Plans, depending on the category of consumers focused on. This allows to increase the programme success chances, as well as to maintain a kind of flexibility and an optimal adaptability to the conditions of the electricity saving "markets".

Currently, more than 20,000 partners are involved into éco21:

- Thousands of consumers (households, smalls companies, etc.),
- Hundreds of professionals (engineer offices, electricians, suppliers, etc.),
- Dozens of influencers (professional associations, communities etc.).

"Industrial" approach to DSM

The éco21 Team (10 members in 2010) is in charge of developing and accompanying the implementation and display of each Action Plan. A Pilot Committee composed of internal main parties' representatives is in charge of the programme control. The decision, realisation and sales processes are modelled on SIG results proven methodology. Therefore, éco21 is not a dream set up by some idealist, but a realistic programme launched on an "industrial" scale with tools and a "strike force" not commonly used in DSM at European level. In order to follow-up the different building sites; the éco21 programme has been integrated into the overall SIG's commercial plan and analytical accounting. Costs (financial incentives, personnel charges, communication and internal operation expenses) are all charged, in order to be able to

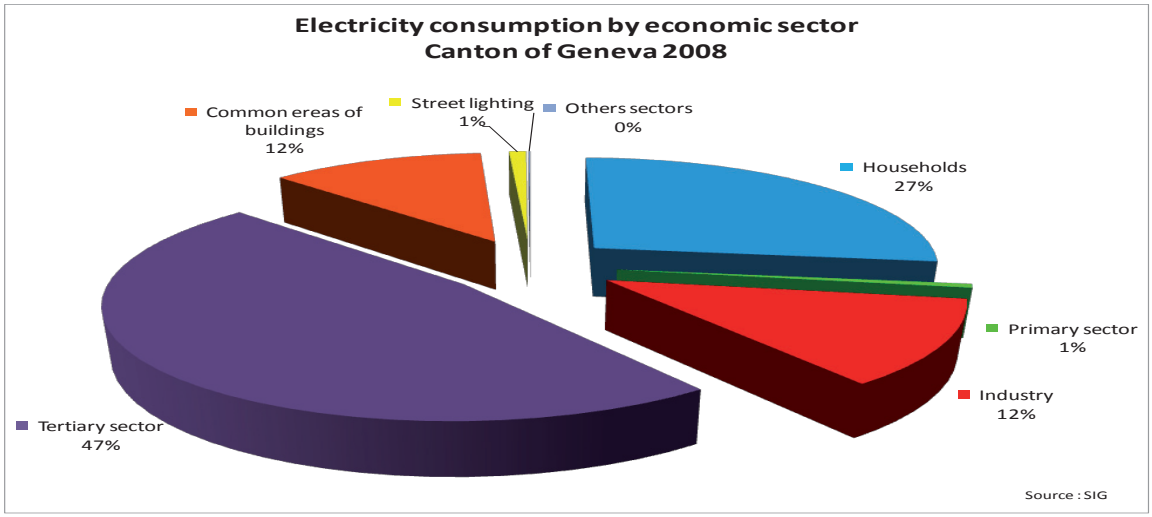

Figure 1. Electricity consumption by economic sector.

Table1: Description of the Programme éco21 Action Plans.

Target	Plan	Description	Partners
Individuals and Self-employed Workers	Operation Doubléco	éco21 doubles the financial savings realised by the consumers, deducing from their annual bills the savings measured by the annual meter readings.	Medias, mass distribution
	Household Electrical Part in double	Free pick-up and recycling of fridges or freezers used in double to avoid unnecessary energy consumption.	Public communities, social actors
	éco21 Kit	Distribution of efficient technologies among the population.	Mass distribution, importers
	éco-social Actions	Qualified counselling and distribution of efficient equipment to socially underprivileged environments.	Public communities, social actors
Real Estate and Equipments	Common areas Plan	Equipment of common areas with performing devices (light sources, automatic devices, washing-machines, ventilation, etc.).	Real estate owners, real estate agencies, electricity engineers
	Thermic Replacement Plan	Replacement of direct electric heating and production of sanitary hot water though wood-fuelled heating, solar thermal heating, heat pumps, etc.	Heating specialists
	éco21 Catalogue	Progressive measures and equipment catalogue to generate proven electricity savings (green data centres, etc.).	Specialised distributors and professionals
Large Consumers	Large Consumers Solutions	Comprehensive offer for companies taking part in Energy Performance Contracting solutions and other efficiency measures.	Research consultancies, service providers, installation engineers
	éco21 Workshops	Involving the employees of a company or community in optimal energy management.	Specialised services providers

follow and analyse the precise costs of electricity savings by segment and consumption sectors, and to verify the postulate on which éco21 is based. It's better to invest 5 cents for 1 non-produced kWh than to buy 1 wasted kWh at 10 cents and resell it for 15 cents.

Financial flows

SIG strategy is based on the values of a modern public service and a longstanding commitment to sustainable development. éco21 benefits from a 53 MCHF (€40M) total budget to reach the final objective of 150 GWh annual electricity savings, by the year the begin 2014. SIG reserves up to 32 MCHF (€24M) for the electricity savings actions undertaken by individuals, public and private consumers.

The 32 MCHF (€24M) granted to the consumers should generate 90 MCHF (€67M) of investments, purchases and services for the Geneva "green economy". SIG will also spend 15 MCHF (€11M) to coach Companies and suppliers to develop their activities in the efficiency side. The rest of the budget (6 MCHF or E5M) is used for éco21's programme administration (i.e. structure costs).

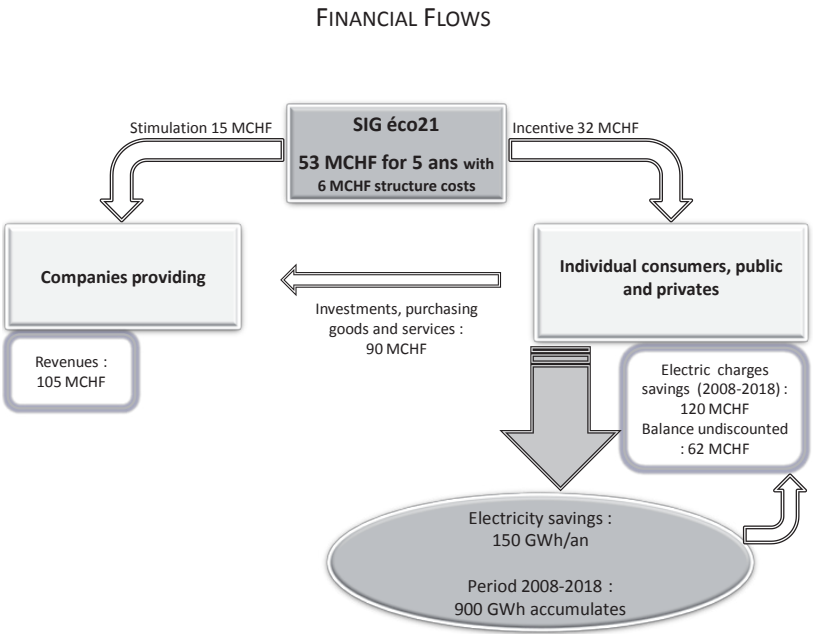

Figure 2. Financial flows.

From 2008 to 2018, cumulated energy savings should reach 900 GWh, which represents a reduction of 120 MCHF (€90M) in consumers' electricity charges. This estimate is thus positive for the consumers in a decade resulting in a balance of 62 MCHF (€47M) between the investment expenses and the savings in electricity charges.

Programme construction method

At the launch of the éco21 programme in 2007, the State of Geneva and SIG were aware of the potential of electricity savings in the Canton. The results of the audit campaign identified, in particular, potential savings of up to 68 GWh/year among the 173 Geneva large consumers (>1GWh/year). Moreover in 2003, SIG mandated the research consultancy agency Apogee to make a bottom-up study of DSM potential in the Canton. The results of this study were already very promising.

Just before setting-up the éco21 programme, several questions arose: is the potential of Demand Side Management realistic? How to progress from theoretical potential to programme construction and how to decide the resources of implementation? Can we have results guaranteed on specific terms?

The éco21 programme has been developed in such a way as to overcome the barriers and bring immediate-result solutions for engineers who often felt powerless facing numbers of available energy choices. In order to be able to identify the targets for DSM action, the elaboration of the éco21 programme was based on the dynamic analysis of electricity demand, over a 15 year period. This analysis constituted the basis of the programme and assessed it in terms of feasibility, energy impact and financial stakes for SIG and the end consumers.

Building steps of the éco21 programme

1. An in-depth assessment of electricity demand in Geneva: the objective was to determine as exactly as possible by whom, how and when the electricity was consumed. A bottom-up method reconstructed electricity consumption in Geneva, as well as the load curve for the year 2005, by economic sectors and by end-uses (more than 200).

2. Prospective simulations of electricity demand according to a trend scenario and a DSM "theoretical" scenario. The projection of evolution scenarios of electricity consumption was made on the basis of the evolution of macro-economic determinants and of electricity needs growth. Thus, a demand "frame" has been obtained, into which éco21 has taken position for the construction of its programme.

3. The development of the Action Plans: prioritisation of stakes, identification of prior action domains and determination of SIG's field of intervention, based on the DSM "theoretical" scenario. This scenario is exhaustive; potential savings correspond to each pair "activity/usage". Starting from this "theoretical" scenario, only the priority potentials are kept. The éco21 programme only retained the part within the SIG's field of intervention in addition of measures taken at federal, cantonal and international levels (objective of additionality).

4. A description of every éco21 Action Plan and weighting of these Action Plans in the light of qualitative criteria (e.g.: feasibility, visibility of the action, social and economic impact, etc.) and quantitative criteria (e.g.: saving electricity in GWh, investment costs for SIG, numbers of affected consumers).

5. Identification of the financial and general levers that can be called up. Benchmarking of the DSM programmes is existing worldwide. A thorough analysis of the different available financial levers has been done: subventions and direct

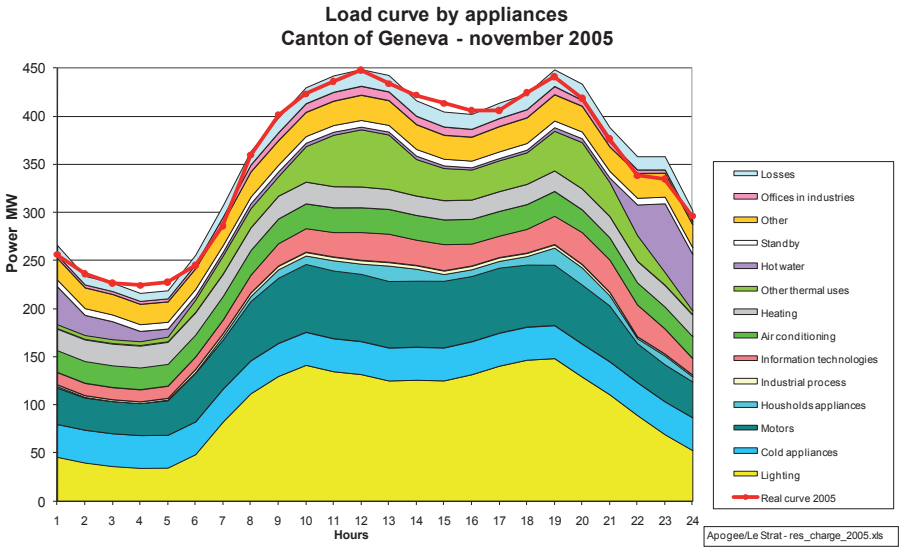

Figure 3. Load curve.

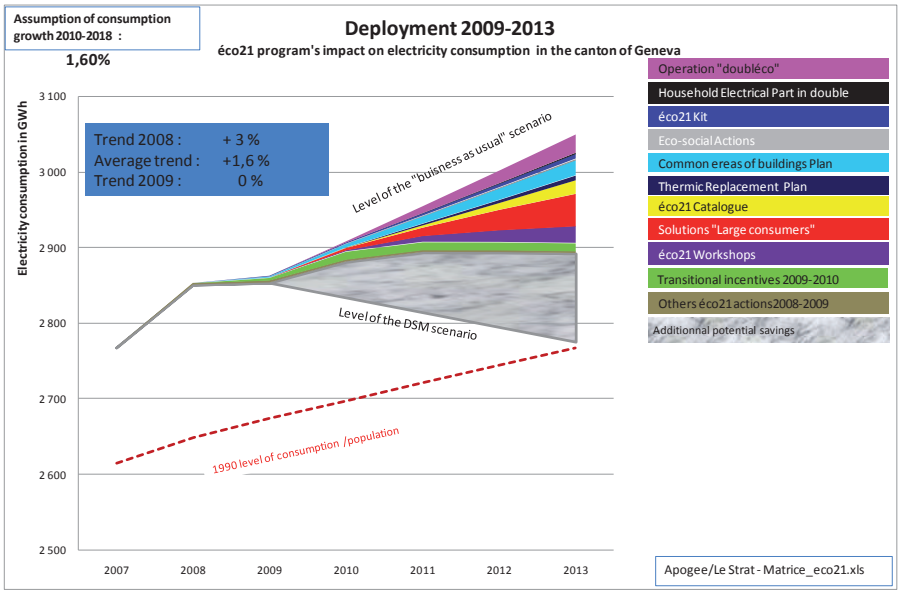

Figure 4. Deployment.

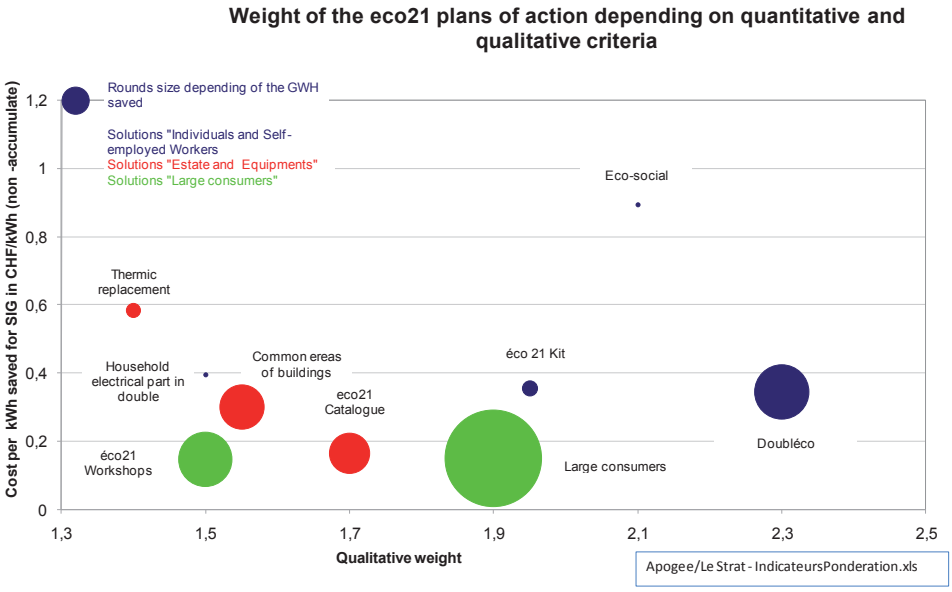

Figure 5. Action plans.

investment aids investment, banking products and take up of the project management and services offers.

6. Taking action: this last step links conception to implementation of the Action Plans. Drafting of the general Quality Insurance Plan that sets out the Programme's organisation methods as well as the human and financial necessary resources to schedule for each Action Plan. Drafting of the Mission Letters according to traditional project methodology.

7. Follow-up and assessment by the University of Geneva. These two points constitute one of the basic pillars of the programme. They have been created and integrated at the same time as the conception of the Action Plans. Follow-up and monitoring of the savings realised are made by the Institute for Environmental Sciences of the University of Geneva, which guarantees neutrality and expertise and which principally uses the method of the International Performance Measurement and Verification Protocol (IPMVP) created by the *Efficiency Valuation Organization (EVO)*. As the éco21 programme goes along, the hypothesis of the Action Plans will be confirmed or reviewed in order to adjust the resources used to match the objectives.

Implementation chronology and first results

After a conception phase in 2006/2007, a pre-launch phase in 2007/2008, development and production in 2009/2010, the éco21 programme has now entered into its display phase which will last until the end of 2013.

The first positive results have been registered and validated by the University of Geneva which is in charge of the assessment. Several pilot actions have been successful (i.e. eco-social operation in Les Libellules area) and the first saved GWhs have been achieved: 32 GWh/year by end of 2010, which equals to the electricity consumption of nearly 10,000 Geneva households. Already more than 4 million CHF have been reimbursed to éco21 beneficiaries as savings or cash incentives, allowing shorter return on investment delays. This amount would be multiplied by 8 by the end of 2013, as every day new partnerships are formed with éco21.

Conclusion

The first results of the éco21 programme are encouraging and confirm SIG's strategic choices. The programme is controlled in a neutral way, as it goes along, in order to re-direct choices if the success indicators are not favourable.

A real dynamism has been created around this programme, and many partners have joined in. The Action Plans are built in such a way to bring lasting changes to everyday behaviours and investment choices, as well as to increase local skills in Demand Side Management. éco21 is therefore an innovative project for the future allowing a local historical energy supplier to get closer to its clients, to fully play its role of sustainable development public actor, and to position a whole region on a future market: the demand side management's one.

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