

Article

Local Energy Advising in Sweden: Historical Development and Lessons for Future Policy-Making

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Abstract: In Sweden, energy-consulting services, here referred to as local energy advising (LEA), have traditionally contributed to improving household energy efficiency. The aim of this article is to analyze the development of this service from the 1970s, when the consultancy came into being, to the present day, through a review of documents and published literature. The analysis enables the understanding of the evolution of local energy advising as a policy instrument, and provides valuable insights for the future. Local energy advising has often been subsidized by the Swedish government and used as a state policy measure rather than a municipal one. As a policy measure, the function of the service has changed over time. In the early period, the oil crisis was a fact and the local advisers were used to inform households. In the 1980s, however, the task of energy-advising was taken over by the energy companies in the spirit of market liberalization. In the 1990s, Sweden became a member of the European Union, and the emphasis was put on general information campaigns. Recently, the development of decentralized energy systems (including micro-energy systems) has necessitated targeting individuals with information. One important lesson to learn from the historical development of LEA is the imperativeness of providing energy advising at the local rather than the state level for better efficiency.

Keywords: energy efficiency; households; information; policy measures; public energy advising

1. Introduction

Improving household energy efficiency, and thereby reducing direct and upstream greenhouse gas (GHG) emissions, is an imperative for sustainable development. There is an urgent need and clear possibility to change the situation and reach a more sustainable goal. Historically, environmental policies have not been designed for and targeting households. The preferred targets were public utilities and private sector industries. However, in line with the increased importance of energy efficiency in relation to climate change, households have become important actors [1–3]. Policy aimed at promoting energy efficiency in the household sector must, however, relate to and rely on individuals' daily choices. People's understanding of their responsibilities and willingness to shoulder them are seen as key factors in creating a sustainable society [4]. The challenge, however, is to reach out to the multitude of diversified households, each with its own characteristics, interests and engagement.

In Sweden, there has been a long tradition of focusing on households through energy inspections and consultancy services. About 40% of the total energy used in Sweden (equivalent to 143 TWh in 2015) is accounted for by the housing (and premises) sector. Space heating and water heating account for almost 60% of the 143 TWh, while the remaining 40% is used for lighting and powering appliances in the homes [5]. Over the past four decades, the use of electricity in households in Sweden has

more than doubled. Currently, there are about 4.5 billion housing units in multifamily and detached buildings, with an increasing share of single-person households [6]. This is one of the reasons for increasing electricity use. Another is that the number of electrical appliances has risen. However, the total energy use, including both electricity use and heating, has been stable in this sector in Sweden in this period, despite larger heating areas and one million more people. Two conspicuous changes have been the replacement of oil heating systems, first with electricity and then district heating (biofuels combusted in heat plants or combined heat and power plants). Later, electric heating was supplanted by electricity-driven heat pumps. In addition, buildings have become more energy-efficient as well [5].

Residential electricity users pay a fixed price for at least one month, which is the same throughout the day. This is the most common term in electricity power agreements. As the price is fixed, there is no question of shifting consumption from the hours when electricity is costlier, to hours when it is cheaper. Demand response is rare in the Swedish power market. The only part of the electricity bill the customer can influence is the electricity fee. The electricity market is deregulated and customers have the freedom to change their loyalties and renegotiate their contracts. The grid fee (fee for transmission of electricity) is fixed and the customer does not have the flexibility to choose the network provider. The grid fee, however, is regulated by the government, and has to be non-discriminatory and reasonable. The third component of the user payment includes the taxes. Smart meters have been in vogue in Sweden since 2009, and monthly readings for electricity bills are mandatory. Bartusch et al. [7] has reported that the potential demand response resources in Sweden was 10–20% of the maximum power output, but it should be mentioned that, thus far, demand response has only been tried out occasionally.

Since 1978, Swedish municipalities have periodically received state funding to employ local energy advisers, entrusting them with the responsibility to interact with (and educate) households on energy-related issues. The institution and functioning of this publicly-funded energy-advising body has thus long been an important policy measure in Sweden. To date, the history of energy advising in Sweden has not been investigated in great detail. The first author of this article wrote about the development of energy advising in Sweden in the 1990s [8], while Khan [9] studied this activity *via-a-vis* the rules and regulations which had come into place in 1998. Thereafter, Mahapatra et al., in a range of surveys, studied the perceptions of the two stakeholder-groups—the energy advisers themselves and the homeowners at the receiving end of the advice and guidance [10,11].

The aim of this article is to analyze the development of local energy advising (LEA) services from the 1970s, when the consultancy came into being, to the present day, through a review of documents and published literature. The analysis enables the understanding of the evolution of LEA as a policy instrument, and provides valuable insights for the future.

2. Energy Policy Targeting Households: A Background

The design of policy instruments in the domain of energy use is guided by the need to promote habits and practices that would result in efficient utilization of resources. Bemelmans-Videc et al. [12] have discussed such policy instruments as “carrots,” “sticks” and “sermons.” Sticks include regulations that the addressee is forced to follow. The carrot is an economic instrument that makes a measure either cheaper or more expensive. Sermons are informational instruments that try to influence the addressee through persuasion or education. Lindén et al. [13] have categorized policy instruments differently—informational, economic, administrative and physical. The informational category includes the dissemination of information to educate the users—pamphlets, articles in newspapers, audio-visuals, advertisements, and so forth. The economic category encompasses, *inter alia*, taxes, rebates, pricing and subsidies. Administrative instruments are the limits set for emissions into the environment (greenhouse gases for instance, in terms of carbon dioxide equivalents) and other legislated regulations. The last category—physical—includes energy meters and nudging tools such as shower clocks.

Follow-ups conducted to determine the efficacy of campaigns using informational instruments have shown that it is usually not easy to ascertain what measures the targeted households would have undertaken in any case. However, there are some published studies in which it has been reported that there is a possibility to reduce energy usage by up to 30%, just by using the informational instruments [2,14–17].

Benders et al. [18] identified personalized information as information based on the specific characteristics of the household. Steg [19] concluded that tailored information is more effective than general information, when it comes to changing user behavior. It is possible, according to Steg, to address a person's financial and environmental concerns through the information being provided to him/her. Stieß et al. [17] are of the opinion that the effectiveness of the feedback provided to the users by energy-advisers depends on the frequency with which it is provided. It must be noted here that people, in general, tend to stop engaging with feedback after some time, which necessitates the development of innovative methods (to supplement energy audits) to communicate with the energy users in households [17,19,20]. A review on earlier research on energy advising shows that research indicates that a measurement—feedback—communication strategy for households is necessary if one wishes to effect a change in consumer behavior [20,21].

Werff and Steg [22] have opined that it is difficult to find information campaigns focusing on the reduction of energy use in general. In other words, campaigns have narrower and specialized foci—reducing dependence on cars for mobility, lowering the indoor room temperature in the winter months, and so on. The result of such differentiation is information overload, which leads to a drop in interest and scantier attention on the part of the targeted entities. Further, one size rarely fits all. As mentioned earlier, information needs to be tailor-made for different groups of people to have the best possible outcome.

Bemelmans-Videc et al. [12] discuss that information dissemination is seen as a modern form of intervention, which is attractive to policymakers because it can put emphasis on prevention of undesirable (wrong) behavior and the stimulation of desirable (right) conduct by providing insights into consequences of action. It can be labelled as a “pedagogical” measure taken by the government with the intention of informing users about what is good and what is not, how they must act responsibly and what type of behaviors must be avoided [23].

The historical analysis in this article is based on a review of earlier research, and studies of relevant documents such as bills passed by the Swedish government, official reports and published evaluations of the energy advice function in the country.

3. Method

The literature accessed was diverse and included journal papers published in the period 2000–2017; books (or chapters in books) published between 1987 and 2017; and online documents (government bills, regulations and official reports, industrial publications or conference proceedings) dating from 1984 to 2017. While Google Scholar was the repository accessed for the government reports and industrial publications (along with the list of References in Kjeang [1989]—a book authored by the first author of the present paper), Science direct was the database referred to for the peer-reviewed journal publications. About 18 scientific journal publications highly relevant to the current study (focusing on Sweden and/or energy advising) were shortlisted for review. In addition to journal papers, about 13 books/compendiums of conference proceedings/academic reports were also useful sources of information for this historical analysis. Among the keywords used to extract publications of relevance were “energy advising”, “energy consulting” and “energy advice”. The keyword “energy advice” yielded the highest number of matches among all the keywords used for the search. The figure below charts the year of publication for the documents analyzed. Figure 1 shows the spread of the publications accessed over time, from 1984 to 2017.

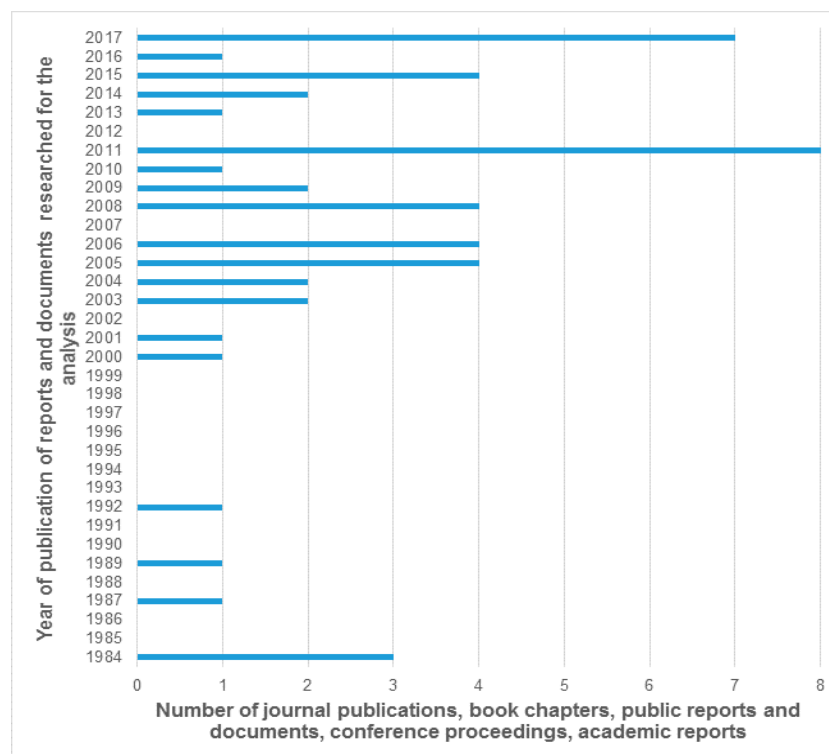


Figure 1. Year of publication of the documents in this study.

In the opinion of the authors, the method adopted proved successful in accessing and reviewing many relevant publications, but there is always the possibility that some were missed in the process. This risk has been minimized to some extent by checking the lists of references in the publications shortlisted.

4. Results: Energy Advising in Retrospect

In this section, the development of energy advising as a policy tool and the factors promoting/hindering its evolution are discussed in brief.

In 1973, oil accounted for 75% of the energy use in Sweden. The oil crisis in 1973–1974 posed new problems to politicians, decision makers and citizens. Managing the great dependence on Middle East oil at considerably higher costs was a challenge. In 1975, the social democratic government presented an historic energy bill, with the aim to stop the increasing use of energy and radically reduce the use of oil. The concept of energy politics assumed meaning [24]. The increased use of nuclear power became an important energy policy when further expansion of hydropower capacity was challenged on environmental grounds.

Two years later, in 1977, the Swedish parliament decided to provide subsidies to the municipalities in order to institute a public service for local energy advising. These local energy experts would become key elements in the implementation of a decade-long energy-efficiency improvement program. In 10 years, the aim was to reduce energy usage in the existing housing stock by 25–30%. Starting from the fiscal year 1977–1978, in which start-up financial aid was provided, the subsidy granted by the government increased steadily to SEK 300 million (in current value). Annual subsidies were also paid directly to the major housing corporations to fund energy inspections from 1983–1985 and to the public housing board agency for energy advising activities. After being discontinued during the period 1986–1997, the subsidies emerged again in 1998.

In the early 1980s, between 500 and 600 local energy advisers worked with energy advising and inspection in the municipalities. In 1988, two years after the state subsidy ended, 100 advisers

were still active. Progressively, the number dwindled; some being asked to quit and others being transferred to different capacities in the energy companies owned and operated by the municipalities. With the reintroduction of subsidies in 1998, there was a gradual increase in the number of energy advisers—to around 200 persons in the year 2003. Many, however, worked part-time with energy advising. While the structure and function of the energy advising services remained quite stable until 2015, owing to the new bill passed by the Riksdag (SFS 2016:385), changes are being implemented at the time of writing this article.

4.1. The First Eight Years, 1978–1985

Starting in 1978, local energy advisers were employed by the Swedish municipalities. The new Act on municipal energy planning 1977 had forced the municipalities to start energy planning. One important task was to develop a local energy-saving plan for the existing local building stock. The referendum on nuclear power held in 1980 enhanced public interest in and knowledge about energy issues. LEA activities pervaded the entire country in 1981 [25].

As it was a newly constituted professional body, there was some confusion regarding locating its members within the hierarchy of a municipality. The functions performed by the advisers could link them to different departments within the municipality. Formally, they were often housed within the architectural or building units of the municipalities [25]. According to the government's instructions for the grant, advising should be directed to the public, homeowners, as well as tenants. As the energy advising services evolved, they acquired an extra-municipal identity and were commonly offered from a consulting office in the city center—not physically integrated with the other municipal departments. There is reason to believe that the municipalities gained citizens' trust by providing this high quality energy service at no cost. However, the lack of integration in the municipal organization was a disadvantage when state subsidies were abruptly discontinued some years later.

After the first evaluation of the 10-year energy saving plan in 1981, the Swedish Parliament decided to increase the reduction goal to 30%. Shortly after, the Agricultural Board and regional development fund also provided energy advising. In this way, agriculture and small industries could get tailor-made assistance with energy issues. Government representatives promised to maintain the increased oil prices through taxation, if needed, to motivate homeowners to invest in energy efficiency and oil replacement [8]. By 1983, the annual cost of energy-advising had reached SEK 150 million (equivalent to about SEK 400 million in 2017).

In July 1984, 420 energy advisers were employed by the Swedish municipalities and, one year later, 20% of all single-family and 50% of all apartment buildings in Sweden had been visited by an energy adviser [8]. The typical local energy adviser was a man with higher education qualifications in construction or energy engineering, but more importantly, several years of practical professional experience. In addition to providing energy advice and inspecting households to detect flaws and explore possibilities for energy efficiency improvement, the advisers also participated in professional development workshops organized nationally by the Swedish Association of Municipalities.

A follow-up of the decade-long energy saving plan was carried out by a team, formed by the Swedish Government's Ministry of Housing, midway through 1983. The team concluded that the targets set had been surpassed—overachievement, in other words—but that it was difficult to ascertain the correlation between energy advice and the reduction in energy use. The key factor for the reduction turned out to be the high energy prices. The team selected 10 instances to illustrate the effect of the energy advice function on the municipal organization and the approaches adopted. Among these was the setting-up of an energy-saving committee under the aegis of the municipality board, the organizing of courses, seminars and field trips for officials and politicians with a focus on optimizing energy-related expenditures and replacing oil as a fuel source, as well as exhibitions, presentations and information dissemination to the general public and students in schools and universities. The team's concluding remark was: "In our opinion, it is reasonable to assume that all these measures and activities have been of great importance for the energy saving in 1978–1984" [26].

Continued state support for the LEA units was recommended for the remaining years of the 1980s, and at best until 1993, although lesser than in the years before. In another report submitted for evaluation, the national council for construction research suggested that a new energy-saving plan should include both existing buildings and planned constructions, and that support must be provided continuously to inspection and advising functions, improved evaluations of the progress achieved, and also for further training of the energy advisers [26]. The benefits of LEA and state subsidies were questioned by the National Energy Administration (NEA). Based on many evaluation reports, it was concluded that high oil prices had played a greater role in the improvement of energy efficiency than the other instruments adopted by the government in response to the rising oil prices [27]. The NEA advocated a gradual increase of energy taxes, dissemination of information top-down, and hoped at the same time that the municipalities would continue providing energy advice to the users. Ivar Franzén, a parliamentarian and member of the NEA, objected to the abolition of funding being provided to the LEA units without prior discussion with the municipalities [27].

4.2. *Withdrawal of the State Subsidy in 1986*

On the 1 January 1986, subsidies became a thing of the past and the municipalities were expected to continue the advisory services at their own expense [27]. The consequence was a phase-out of the services from Swedish municipalities. However, at the end of 1988, two years after this phase-out, there were still about 100 energy advisers employed—most of them in the municipalities in southern Sweden [8]. The state-owned energy company Vattenfall launched an energy-efficiency project “Mission 2000” on behalf of the Swedish government. It was assigned the task of profiling itself as an energy service company and exploring the potential for efficient use of electricity in different economic sectors. Equipped with SEK 370 million and inspiration from field trips to energy plants in the USA, Vattenfall commenced what would be the single biggest energy efficiency improvement project in the country to date [28]. Among the insights from this project was the fact that the maximum saving potential in electricity use in Sweden over a 10-year period would be 13 to 15 TWh. A significant proportion of this potential was in the area of maintenance and operations, where sizable profits could be made. It was also noted that active customer service and professional marketing of customized products and services would gain more importance in energy use in the future than higher electricity prices [29]. The subsidiary was closed down and the project ended in 1993 despite having been effective in identifying the economic potential for improving energy efficiency in Sweden.

In 1987, under the leadership of professor Arne Elmroth of the Faculty of Engineering at Lund University in Southern Sweden, seven researchers made the following claim: “At the national level, the decisions aimed at improving energy efficiency have mainly consisted of financial stimulants and information. In the first years of the energy crisis, the political ambitions were implemented in a nearly campaign-like way, as if energy saving was something temporary. The more long-term political interest was not geared towards a lower energy consumption but towards an increased energy production” [30].

In 1988, the Swedish parliament voted to start the nuclear phase-out in 1995–1996. The decision resulted in a program for efficient electricity usage under the auspices of the Swedish National Board for Technical and Industrial Development (acronym NUTEK in Swedish). This program included the introduction of a procurement scheme for new technology to stimulate the development and commercialization of new products. These efforts, which were intentionally acclaimed, included the start-up of around 30 different schemes from refrigerators/freezers and washing machines to new family houses and electric cars involving more than 100 client groups [31]. When the LEA service was phased out, NUTEK paid more attention to the local energy companies. Partnership projects on energy efficiency were set up. The energy companies were also busy diversifying from selling electricity and district heating to becoming energy service companies. Such demands had been placed on electricity suppliers in connection with the concession review which was to start in 1991 [32].

Many energy companies developed their own expertise in advising customers and selling services in addition to energy. This was facilitated also by the transfer of some energy advisers to energy companies owned by the municipalities, as referred to earlier in the article. With financial support from NUTEK, the energy companies participated in various campaigns on low-energy light bulbs and appliances. They also took their own initiatives. These activities were toned down a few months before the year of the energy market reform in 1996. In [28], which is a comprehensive analysis of the investments made by energy companies in services, it is noted that the intention to market energy services was initially not so strong, as the companies thought that this would conflict with their core businesses—that of selling energy. The reason that it was subsequently adopted was that the energy companies realized that the energy services could be used to compete effectively in the marketplace in the future. Energy companies such as Borlänge Energy, Göteborg Energy and Sydkraft went ahead to develop extremely successful energy services arms. Borlänge Energy's strong municipal affiliation was to contribute significantly to its success in improving the efficiency of energy usage among its customers. Over time, the 'energy company' in Sweden metamorphosed from a public agency to a modern company committed to serving its customers [28].

4.3. EU Membership Creates New Opportunities

On 1 January 1995, Sweden became a member of the European Union (EU). The EU commission's SAVE program made available partial funding (50% of the total outgo) for three years, which was used to set up regional energy offices (EG directive from 1993 SAVE, 93/76/EEG), assigned the responsibility of promoting efficient use of energy and the transition to renewable energy wherever and whenever possible. In spring 1996, the first offices based on this European model opened in Sweden (the regions of Västerbotten, Västernorrland, Nordöstra Skåne and Gotland). Public ownership was an EU requirement and, for a long time, the regional municipal associations were the principal owners of these offices. In 2017, there are 15 regional energy offices in Sweden with different solutions regarding ownership and operational content.

The municipalities' Agenda 21 project after 1993 also affected the interest in energy issues in general and energy advising in particular. The UNCED (United Nations Conference on Environment and Development) in Rio de Janeiro in 1992 laid the foundation for the Swedish government to encourage the municipalities. The local connection—the delegating of the responsibility to the municipal government—was one of the cornerstones of Agenda 21. It worked well with waste management (the sector in which it was first experimented with) and this success then inspired the application to energy and environmental issues as well. NUTEK, the Association of Energy Advisers' in Sweden and others attempted to facilitate the cooperation.

Starting in 1998, Swedish municipalities could apply for subsidies again. Government Bill 1996/97:84 states: "The municipalities should have the expertise required for specialized advising on energy issues. Municipal advising is a complement to the recommendations of the electricity and fuel suppliers. Municipal energy advising has a direct local connection and an important task in disseminating knowledge to the local organizations involved in energy issues, for example." The government allocated SEK 250 million for the five-year period from 1998–2002.

The Swedish energy consultant service model is rather unusual in the EU. It was, and is, principally municipal-based with primarily municipal staff funded by state subsidies. In France, there was a model through which the state energy agency employed and organized energy advising in cities and municipalities. In the UK, there was a similar model, Energy Efficiency Advice Centers, under the management of Energy Saving Trust, which commenced operations in 1992 as a non-profit entity [28]. A few years after the Energy Saving Trust was set up, a team named the "Behavioural Insights Team" was formed, thanks to a subsidy program called the Green Deal, initiated by the UK Government. In Germany, Norway, Denmark and Finland, energy-advising services modelled differently from the one in Sweden, have been in operation for quite some time now. Denmark and

Norway have well-designed websites for this purpose and, locally, energy advising is provided by private consultancy services [32–34].

In 2004, all municipalities in Sweden were in a position to offer energy advising to its citizens through a team of 200 energy advisers [35]. The Swedish Energy Agency (SEA) considered the advisers and the regional energy agencies as key players when it came to the provision of energy advice, support and guidance to the public, and small-, and mid-sized companies. The municipalities were granted SEK 77 million in 2003 for advising. In addition to this economic support, the regional energy offices received SEK 9 million for coordination and professional development of the energy advisers [36].

The state gave the municipalities the freedom to decide upon the how, what and when, so to speak, of energy advising. In the government ordinance (SFS 1997:1322) on subsidies to municipal energy advising the following stipulations have been listed:

Energy advising shall:

- pertain to households, companies and local organizations without being directed to a particular household, company or local organization
- not include inspections.

The Swedish model has been altered over time. In the 1980s, energy advisers were supported by hired consultants, especially for inspections. The municipal energy consultant services, post-1998, became heterogeneous and were provided in different ways by different municipalities in Sweden. Over 50% of the municipalities were running their own consultancy services. Several officials shared the responsibility, with a high share of personnel employed on a project basis. About 25% of the municipalities also provided services to their neighbors. Municipalities also entered into agreements with private consultancy services or local energy companies. In 2002, about 60% of the energy advisers had higher education qualifications; and the percentage of women employed in this capacity was higher than what it was in the 1980s. In 2002 the three most common questions from the public were about pellets, heat pumps and energy subsidies [35]. Only very few of the local energy advisers had also been active in the 1980s.

Khan [9], who discusses the merits and disadvantages of a publicly-owned and privately-owned LEA agencies, has also recommended that energy advising at a regional level would be more effective in reaching a desired goal. From 2003 the regional energy agencies are playing a key role in offering courses and creating a strong network among energy advisers in the region [36,37]. Khan has also recommended a better coordination of the energy advising program with other policy instruments. He criticized the SEA for transferring the responsibility for energy advising to the municipalities without any prior quality control. In 2003, SEA initiated a training program for energy advisers, and started what would become an annual conference.

4.4. The Swedish Model after 2008

A change in regulations in 2008 resulted in local energy advisers being renamed energy and climate advisers as the link between energy use and climate change was becoming widely accepted. The transport sector also came under their purview at that point [38]. Surveys, conducted after 2008 to understand the needs and behavioral patterns of owners of single-family houses, showed that energy advising services were considered important, but only some of the respondents had been in direct contact with an energy adviser. Investment subsidies and tax deductions, quite obviously emerged as preferred economic instruments [39].

Another instrument (an administrative one), prompted by Directive 2002/91/EC of the European Parliament, is the system of energy declarations of buildings, which was introduced in 2006, with the National Board of Housing, Building and Planning as the central authority. The Directive pertained to the improvement of the energy performance of buildings in the EU. Many Swedish single-family houses are now a part of this system, which makes energy declaration mandatory when it comes to the sales of such houses. The afore-named Directive has now been replaced by Directive 2010/31/EU.

The Energy Agency describes the energy advisers as very important actors in distributing information about this and related EU directives [40]. So far, this instrument has only partly affected the owners' interest in taking energy efficiency measures [39]. Brokers and many sellers still see the energy declaration as an unnecessary cost [41].

A major evaluation of energy advising in Sweden was made in 2013 by Swedish Consultants (Sweco). This study included both surveys and interviews with energy advisers and homeowners. The results indicate that the advisers had become older; or in other words, the average age had increased, with 25% of them over 65 years of age. Half of the interviewees—especially younger persons who had just been employed as energy advisers—felt that they did not have enough expertise. According to Sweco, when homeowners wanted help in evaluating different proposals, there was a potential conflict of interest as energy advisers were required to be unbiased in their approach to advising. Being neutral and unbiased entailed that the energy advisers were not allowed to rank the proposals in order of suitability. As a result, the homeowners ended up dissatisfied with the service offered [42]. In 2012, 287 of the 290 municipalities offered some kind of energy advice to homeowners. Around 39% of the municipalities also collaborated in different ways to advise the users. The total cost was now approximately SEK 115 million annually. The municipalities contributed SEK 15 million and the states subsidies SEK 100 million.

In 2016, the regulations changed again [43], when new rules for state subsidies were initiated. While the subsidies provided pre-2016 were not at all related to the population of a municipality, a distinct correlation between the size of the population and the size of the subsidy was introduced. Further, municipalities with fewer than 18,000 inhabitants were required to coordinate their energy advising services with other municipalities to guarantee that a LEA service was at least 50% of a full-time position [40]. As a result, 15 municipalities had to disband their energy-advising services for good. The new organization also included regional development leader(s) and national intervention projects. These projects were initiated by SEA and the municipalities (LEA units) must participate in at least one project a year. The possibility to apply for EU funding to incorporate a coaching function targeting SMEs (small and medium scale enterprises) was also put in place.

The Swedish energy system is under transformation, as are most European and Western systems, and new buzzwords are “micro-produced electricity”, “prosumers” and “active customers” interacting with the “smart grid” to contribute to increased flexibility [44]. In this context, the energy adviser should be expected to be in even more demand in the 21st century, but sadly, this does not seem to be the case. According to the survey results in [41], about 70% of the respondents think that municipalities ought to have energy advising services. Interestingly, in 2015, only 30% of those who owned homes, knew that there was an energy and climate advising service to consult in the municipalities.

After 2008, the Internet became the “default” route for citizens to look for information about different energy-related issues and, as things stand at the time of writing, it seems this trend will strengthen and continue. Westelius [45] has stated that energy advisers have not made use of all that the Internet facilitates and has to offer. He gives the example of the heat pump forum (called the *Värmepump* forum in Swedish), which was agile enough to set up a website and use it to inform potential adopters. It must be mentioned, however, that in 2006, the municipalities in the Stockholm region had already launched their own websites (called *energiradgivning.se*), setting a trend which will perhaps be followed in the years to come elsewhere in the country.

5. Discussion

Local energy advising has been a Swedish policy instrument for almost four decades now. It has evolved over time, and the evolution has been marked by a host of external influences as well as internal decisions. The oil crisis, financial challenges, environmental awareness and energy efficiency have been the driving factors for the growth and development of LEA in Sweden. Figure 2 captures the history of LEA, as a timeline with the stimuli at the top and the reactions below the time arrow.

The development, which has been described in the article in great detail, is summarized as follows:

- The second half of the 1970s and the first half of the 1980s—1974 to 1984—were periods of increasing crisis awareness and targeted information was used as a policy measure
- The decade 1985–1995 was characterized by liberalism. Energy advising was taken over by the energy companies and sold as an additional service. “Freedom of choice for the end-user” was a key-phrase, and this applied to the choice of power suppliers and telecommunication service providers in deregulated markets.
- A few years into the period 1997–2007 Sweden joined the EU and energy advising services were again transferred to the municipalities. General information campaigns took precedence over targeted information delivery.
- In 2008–2017, the emergence of micro-power producers and the demand for flexible utilization of the power grid indicate an increased demand for individual, tailor-made information dissemination. This is partly reflected in the new organization of the LEA when the number of citizens to be targeted comes into focus for the first time, and more resources are allocated to LEA activities in more highly populated municipalities. At the same time, LEA, with increased national governing, has become more regionally anchored with a focus on regional management and coordination.

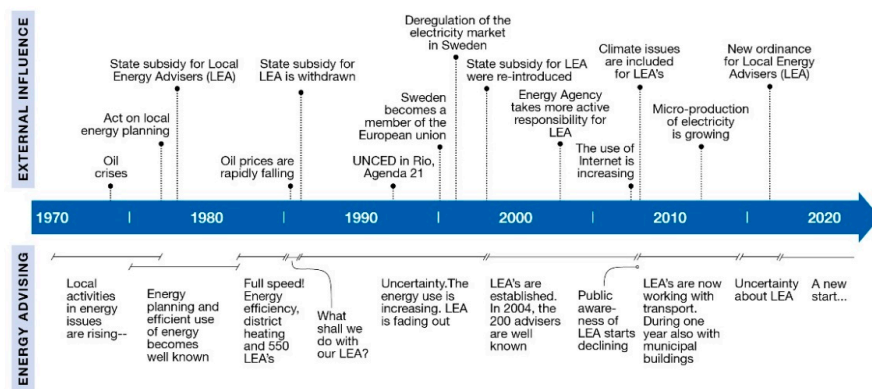


Figure 2. The timeline of the external influences on the energy advising in Sweden.

To start with, local energy advising had a strong connection to the state's policy goal to reduce oil dependency and improve energy efficiency in buildings and in people's everyday activities. When Sweden entered the EU, the relation of energy advising to other policy measures and goals became blurred. The role of LEA in relation to other energy policy goals is not clarified and there is a lack of specified goals for LEA units against which they can be evaluated. As previous research has shown, it is not easy to evaluate the effects of general information campaigns, which may be one explanation for the lack of evaluations of the results of LEA activities. The number of people that know about the service is something that has been evaluated throughout the years and in this respect the trend is negative, with fewer citizens that know about the existence of public energy advisory services. LEA units have not been able to make use of the Internet as an information tool, but have relied on traditional face-to-face activities and that people will call them to ask questions.

During the times when the Swedish state paid for LEA almost all municipalities has had one employed adviser in their organization. The local base has been important during the whole period. The idea is that energy advising should be as close to the citizens as possible to facilitate taking local characterization and uniqueness into account regarding climate, geography, technical infrastructure, etc. At the same time, it would seem that local energy advising has not easily been integrated into the municipal administration. It has not been an obvious service and when state support was withdrawn, LEA disappeared too or was taken over by, for example, energy companies. In this perspective, LEA has been a state policy measure rather than a municipal measure. This might also indicate that

a local connection is more important to energy advising than being part of a local public authority. On the other hand, a municipal administration can guarantee neutrality of advice better than a private actor. For the future, LEA should be developed into a municipal policy measure, integrated with local energy and climate strategies with the purpose to fulfil local policy goals. This integration will increase the quality of the process of applying for and issuing building permits. Energy efficiency measures are imperative, especially when construction activities are high in urban centers.

Another instrument, which was presented earlier, is the energy declaration of buildings. At the time, intentions were good, but in practice it turned out differently. Sellers and estate agents do not find it useful. The inspection became standardized, with little regard to the state of the house or its inhabitants. The requirements have since been stricter. Under the new regulations (2010), the inspector has to visit the house, and much could, without doubt, be gained by linking this instrument to energy advising.

Improving energy efficiency in buildings is a long-term and slow process. With many stakeholders involved—installers, construction engineers, homeowners, maintenance personnel—good communication is a *sine qua non*. Decisions related to energy efficiency improvement in single-family households may seem simple enough, but they determine the energy profiles of the houses for over 25 years. If the system boundaries are extended to include all Swedish households in the analysis, such decisions would have huge impacts (positive or otherwise) on the energy system of the country.

When the energy advising service offered by municipalities was phased out in the 1980s, and remained non-existent for some years into the 1990s, Sweden lost momentum. Presently, the service has been reintroduced and surveys show that energy advising has a place in Swedish society. LEA, however, needs to have a clearer connection to other policy instruments in society and explicit purpose, goals and outcome evaluation. Research has shown that homeowners who invest in photovoltaics do not have access to objective information about solar PV panels or how the electricity market functions in reality [46]. This is one example in which LEA can play an import role. There is also a need to educate citizens about the smart grid. In other words, local energy advising has to be included in a broader policy context to see how LEA as a policy instrument can support other policy measures, and vice versa. The new regulation is an important step towards more effective energy advising, but some challenges lie ahead.

6. Conclusions and Recommendations

This paper is based on an extensive review of literature to gain an understanding of the historical development of energy advising in Sweden from 1978 to the present day. The main conclusion of this analysis is that energy advising can and should be better integrated with the activities of municipal administrations, as advising is a crucial part of municipal energy and climate strategies. As a policy instrument, LEA is likely to support other related government policy measures. Among the potentially effective instruments are energy declaration of buildings and information about solar power systems in the new electricity market. From economic, energetic and environmental perspectives, long-term holistic thinking, supported by different policy instruments such as regulations, energy advising and subsidies, is crucial.

More research is needed regarding how households seek information about energy efficiency and climate-related issues, as well as on how best to communicate information with households.

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