ENERGISE

EUROPEAN NETWORK FOR RESEARCH, GOOD PRACTICE AND INNOVATION FOR SUSTAINABLE ENERGY

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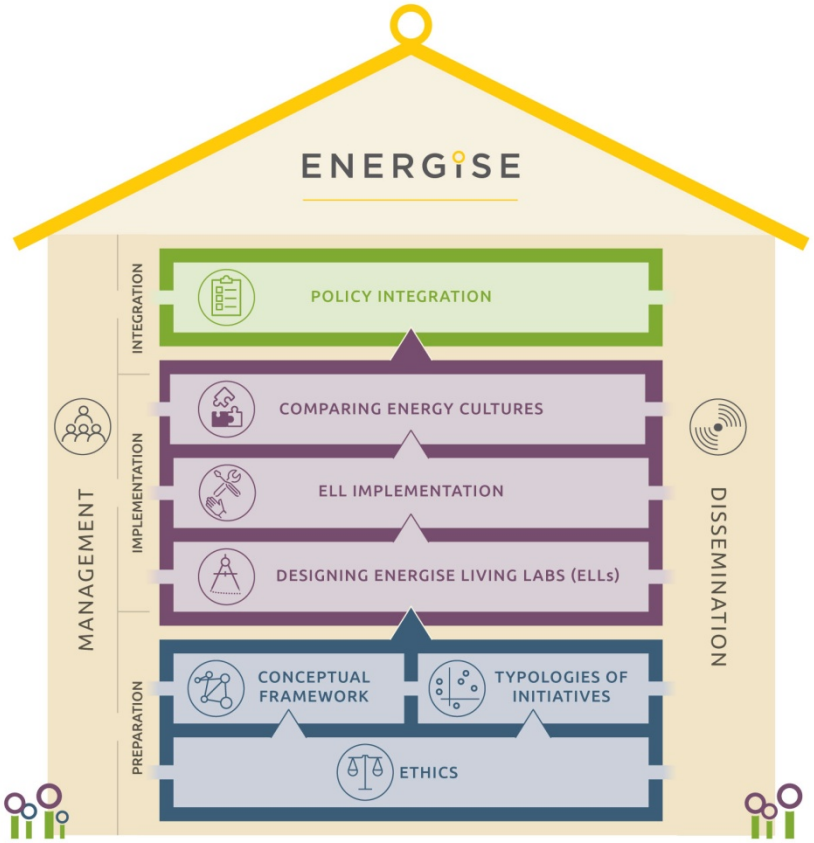
ENERGISE PROJECT

ENERGISE is an innovative pan-European research initiative to achieve a greater scientific understanding of the social and cultural influences on energy consumption. Funded under the EU Horizon 2020 programme for three years (2016-2019), ENERGISE develops, tests and assesses options for a bottom-up transformation of energy use in households and communities across Europe. ENERGISE's primary objectives are to:

- **Develop an innovative framework** to evaluate energy initiatives, taking into account existing social practices and cultures that affect energy consumption.
- **Assess and compare the impact** of European energy consumption reduction initiatives.
- **Advance the use of Living Lab approaches** for researching and transforming energy-related practice cultures.
- **Produce new research-led insights** into the role of household routines and changes to those routines towards more sustainable energy.
- **Encourage positive interaction** between actors from society, the policy arena and industry.
- **Effectively transfer** project outputs towards the implementation of the European Energy Union.



INTRODUCTION

This document is one of 30 national briefs, demonstrating key aspects of national energy supply and demand dynamics. Each brief is comprised of five sections:

Section 1 summarises the energy profile of the country. The section provides basic quantitative information of demand demographics and usage profiles, market trends and energy supply profiles, as well as qualitative reflections on current national energy policy. ***For all the briefs, the quantitative information is derived from ec.europa.eu/eurostat (2015 data), eea.europe.eu (2015 data), and climate-zone.com, unless otherwise stated.***[1] The qualitative reflections are based on a literature reviews and desk-research. References for the literature review and the desk-research are provided in footnotes or in section five.

Section 2 summarises the nationally based sustainable energy consumption initiatives (SECIs) that have been identified as part of ENERGISE WP2 framework (Jensen, 2017). Each SECI has been coded according to the Problem Framing Typology developed in ENERGISE WP2 (Jensen et al, 2017b).

Section 3 provides a *good practice* example of a national SECI that corresponds to category 3: “Changes in Everyday Life” or 4: “Changes in Complex Interactions” in the Problem Framing Typology. Please refer to Jensen (2017) and Jensen et al (2017b) for more information on the way the data for the good practice SECIs has been researched and documented.

Section 4 provides a brief summary of major nationally specific trends and their implication for energy consumption policies.

Section 5 provides an overview of sources used for qualitative assessments, and can be used as inspiration for further reading.

The national briefs provide contextual socio-material information for the further work to be carried out in Work Package 4, Work Package 5 and Work Package 6 in ENERGISE.

1.1 WP2: TYPOLOGIES OF ENERGY INITIATIVES

ENERGISE WP2 is a systematic criteria-guided review and classification of existing sustainable energy consumption initiatives from 30 European countries (EU-28, Switzerland, and Norway), which provides a comprehensive European database of energy initiatives involving households, and related typologies of sustainable energy consumption initiatives. This extensive synthesizing work guides the selection of Living Lab design elements for ENERGISE and future energy consumption research, policy and practice.

[1] Some piecharts will be empty, as no information is available.

This is done in order to

- Construct innovative typologies of sustainable energy consumption initiatives that can inform further research and action.
- Identify key success factors and related indicators, focusing on individual-level, collective, organizational, institutional and societal aspects of energy consumption, which will inform subsequent WP 3 (Designing Living Labs), WP 4 (ENERGISE Living Labs) and WP 5 (Capturing Energy Cultures).
- Progress the goals of the European Energy Union by creating a publicly archived open access dataset of sustainable energy initiatives across 30 countries in Europe.

Suggested further reading:

Jensen (2017) *Identification of key success factors and related indicators.* ENERGISE – European Network for Research, Good Practice and Innovation for Sustainable Energy, Grant Agreement No. 727642, Deliverable 2.2.

Jensen et al. (2017a) *Establishment of a comprehensive open access dataset of sustainable energy consumption programmes and Interventions.* ENERGISE – European Network for Research, Good Practice and Innovation for Sustainable Energy, Grant Agreement No. 727642, Deliverable 2.3.

Jensen et al. (2017b) *Constructions of typologies of sustainable energy consumption initiatives (SECIs).* ENERGISE – European Network for Research, Good Practice and Innovation for Sustainable Energy, Grant Agreement No. 727642, Deliverable 2.4.

Sources of quantitative statistics (unless otherwise stated):

Climate data:
http://www.climate-zone.com/continent/europe/

Demography data:
http://ec.europa.eu/eurostat/statistics-explained/index.php/Population_structure_and_ageing

http://ec.europa.eu/eurostat/statistics-explained/index.php/Educational_attainment_statistics

Dwelling type data:
http://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Distribution_of_population_by_dwelling_type,_2015_(%25_of_population)_YB17.png

Energy demand and supply quantitative data:
http://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_consumption_in_households

Final energy consumption of households per capita data: https://www.eea.europa.eu/airs/2017/resource-efficiency-and-low-carbon-economy/household-energy-consumption

MWh conversion data:
https://www.unitjuggler.com/convert-energy-from-toe-to-MWh.html?val=893.9

SWEDEN

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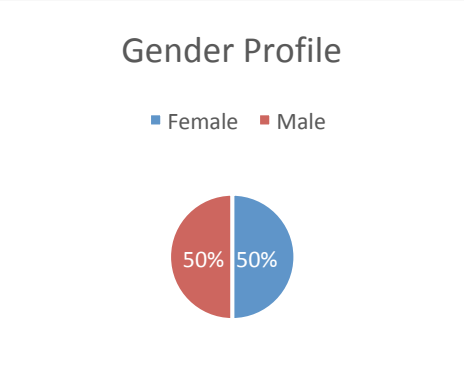
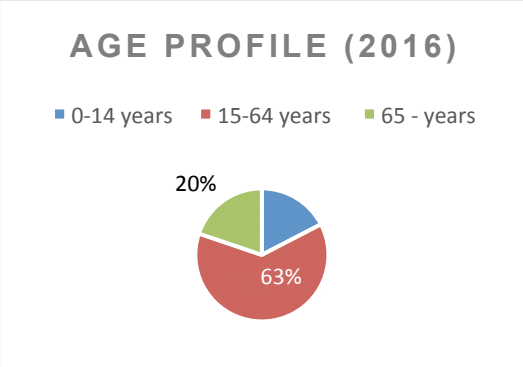
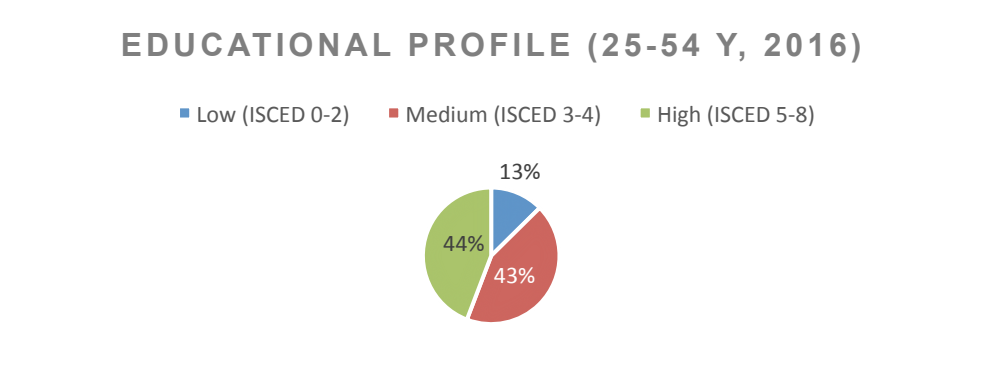
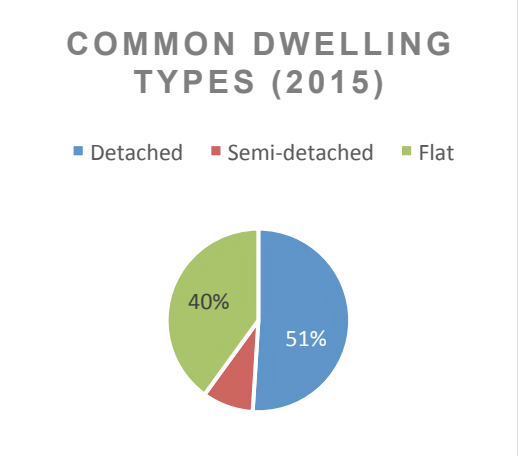
DEMOGRAPHY, ENERGY CONSUMPTION AND ENERGY SUPPLY

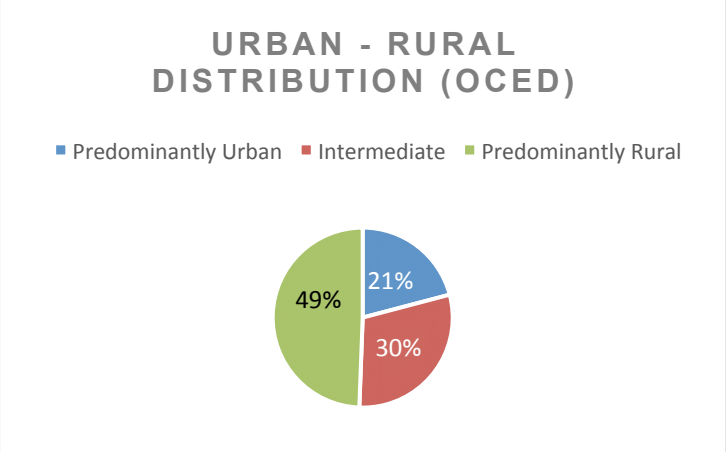




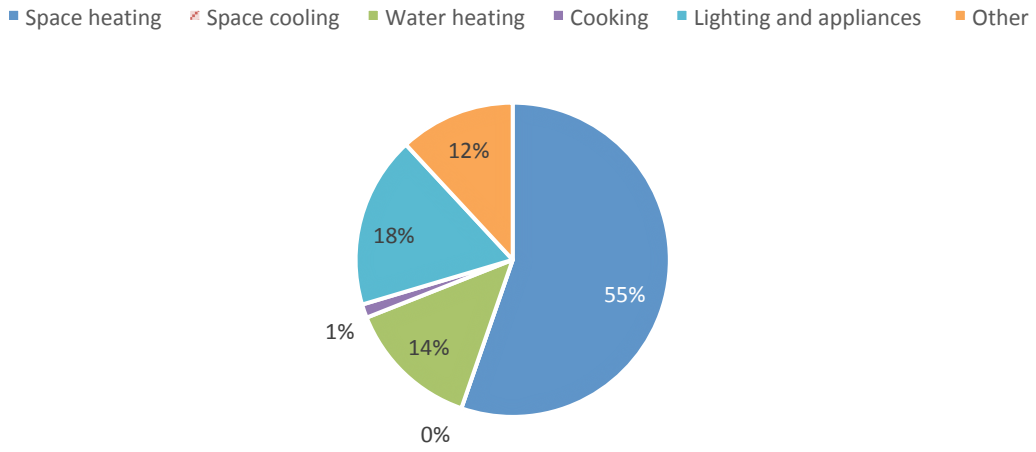
CLIMATE: temperate in south with cold, cloudy winters and cool, partly cloudy summers; subarctic in north



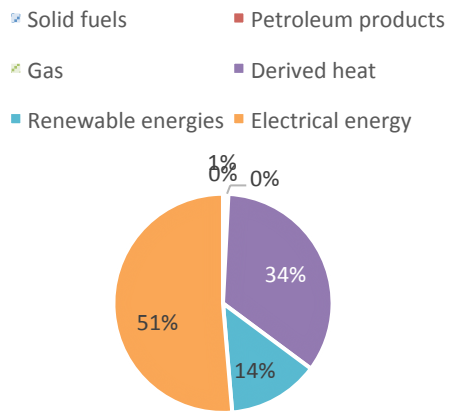




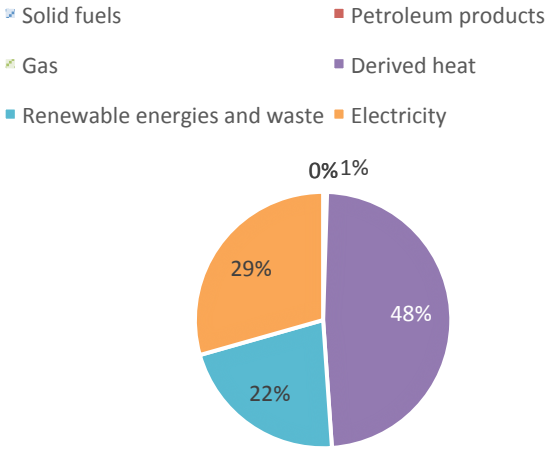
RESIDENTIAL FINAL ENERGY CONSUMPTION BY TYPE OF END-USE (2015)



SHARE OF FUELS IN THE FINAL ENERGY CONSUMPTION IN THE RESIDENTIAL SECTOR (2015)



SHARE OF FUELS IN FINAL ENERGY CONSUMPTION - RESIDENTIAL SPACE HEATING (2015)



FINAL ENERGY CONSUMPTION FOR HOUSEHOLDS, PR CAPITA (2015)

8.541 MWh

ENERGY SYSTEM AND ENERGY POLICY TRENDS

Energy system

The Swedish energy system is powered by domestic sources of renewable energy such as water, wind and biofuel, and imports such as nuclear fuel for electricity production in nuclear reactors and fossil fuels like oil and natural gas for the transport system. Electricity production is mainly based on hydropower and nuclear power, but currently the use of wind power and biofuel is increasing as well.[2] The overall energy generation in 2016 was 154.8 TWh with renewables accounting for 57% (hydropower – 40%; wind – 10%; biofuels and waste – 7%), nuclear power for 41%, gas and coal for 1% each, and oil representing 0.4% of the total energy generated.[3]

The single transmission system operator in Sweden is Svenska Kraftnät. It operates and manages the Swedish power grid and the electricity network. There were 121 electricity suppliers in the electricity market at the end of 2016. The three biggest suppliers are Vattenfall, Fortum and E.ON that in 2012 controlled 79% of the electricity generation.

Sweden has no natural gas sources. The country covers domestic gas demand by imports through the pipeline from Denmark. There are three gas operators active at wholesale level – E.ON, Dong Energy and Goteborg Energi. Since all gas is imported, there is no wholesale market hub. The TSO for gas in Sweden is Swedegas.[4]

In 2016, the Swedish national market for electricity, gas and district heating was deregulated, which allowed household customers in the country to freely choose their electricity supplier. The Swedish Energy Market Inspectorate became responsible for monitoring how the market functions. Another important change in the energy sector occurred in 2003 when monthly meter readings were introduced, ending a period of payments for estimated values of electricity consumption. These developments led to increase of energy prices and it was estimated that after the liberalization of the market, average household electricity prices have increased by around 50%, mainly due to higher taxes since year 2000. This, in turn, made households consider more energy efficient options that would lower their energy use.[5]

Around 270 out of the 290 municipalities in Sweden have a district heating system and more than 90% of apartment buildings are connected to this system. A large percentage (around 80%) of the heat supplied to the Swedish district heating systems is generated from renewable and recycled fuels. This makes Swedish heating sector pretty sustainable.[6]

Particular socio-material aspects that influence energy consumption

A study from 2012 made the following observations regarding the socio-economic parameters that influence households' energy related behaviour and consumption:

i) No direct influence of outdoor temperatures on domestic electricity or hot water consumption is observed. There are winter-summer consumption variations but they are mainly a result of holiday periods and excessive usage of electricity and hot water during winter periods when Swedish energy consumers tend to spend more time at their homes;

[2] Swedish Energy Agency (2015). *Energy in Sweden 2015*. Available at: https://www.business-sweden.se/globalassets/invest-new/data-center/energy-in-sweden-till-webben.pdf

[3] International Energy Agency (2016). *Sweden – Energy System Overview*. Available at: https://www.iea.org/media/countries/Sweden.pdf

[4] European Commission (2014). *Sweden Country Report*. Available at: https://ec.europa.eu/energy/sites/ener/files/documents/2014_countryreports_sweden.pdf ; Lindblom, J. et al. (2017). *The Swedish Electricity and Natural Gas Market 2016*. Available at: https://www.ei.se/PageFiles/310277/Ei_R2017_06.pdf

[5] Vassileva, I. (2012). *Characterization of Household Energy Consumption in Sweden. Energy savings potential and feedback approaches*. Available at: https://www.diva-portal.org/smash/get/diva2:536634/FULLTEXT02.pdf

[6] Stockholm Data Parks (2017). *A Brief Introduction to District Heating and District Cooling*. Available at: https://stockholmdataparks.com/wp-content/uploads/a-brief-introduction-to-district-heating-and-district-cooling_jan-2017.pdf

ii) Income levels of households affect the electricity consumption. Observations show that low income consumers are more aware about their consumption and put efforts to reduce it, while moderate and high-income consumers lack the economic pressure and have almost no incentive to lower their energy usage;

iii) The number of occupants and the size of the house also influences energy consumption. The higher the number of occupants, the higher the energy consumption. The same is valid for the size of the house.[7]

In 2015, the household sector in Sweden accounted for 40% of the total energy used in the country. Space heating and water heating represented 60% of the total household consumption, and the remaining 40% were used for lighting and domestic appliances. According to statistics from the past four decades, electricity consumption in households in Sweden has more than doubled. Among the reasons for that are claimed to be the increasing share of single-person households and the raising number of electrical appliances. Significant changes in the household energy sector have occurred as well that could also affect the level of energy consumption. These are the replacement of oil heating systems with electricity, district heating and electricity-driven heat pumps. A positive development is that buildings in Sweden have become more energy-efficient.[8]

Electricity prices for households have increased from 18.51 euro cents per kWh for the first half of 2015 to 19.36 euro cents per kWh for the first half of 2017. In comparison, the average electricity price for households in the EU in the first half of 2017 was 20.41 euro cents per kWh, a bit higher than the price in Sweden.[9]

Current Trends in Energy Policy

Due to the migration of millions of people from the country-side into the cities in the 1960s and 1970s, around one million new dwellings were built in Sweden. Nowadays, these buildings are in urgent need of refurbishment and efficient heating systems. Tenants complain about draught and low indoor temperature as well as about the worn out sanitary equipment and façades in an urgent need of repair. In result of the refurbishment programmes that were implemented on national and local level, the following measures were implemented: i) thermal insulation on the ground floor and the outer walls; ii) acoustic insulation on inner walls; iii) new façade material; iv) new windows; v) energy efficient household appliances. A concrete example is the local refurbishment project in Alingsås (Sweden) that was started in 2008 by the municipality-owned housing company Alingsåshem and that contributed to the renovation of 16 buildings with 300 apartments to passive house standard.[10]

There are also long term policies that have contributed to energy efficiency in Sweden. The country has invested in improved information dissemination on energy efficiency since 2010. An average saving of 2 MWh for households and 20-30 MWh for SMEs was achieved as a result of this scheme. Another example of policies and developments in the field of energy is tax deduction for energy efficiency renovations and reconstructions that have been valid since 2010 and that allow households to receive a tax deduction of up to 50% of renovation expenses. Also, web tools for information on energy efficiency have been developed recently.

It is claimed that with the introduction of the automatic meter reading (AMR) that started in 2003 and that resulted in the deployment of advanced meter infrastructures (AMI), Sweden was the first EU country to indirectly adopt smart meters. The adopted system architecture includes meters, data

[7] Vassileva, I. (2012). *Characterization of Household Energy Consumption in Sweden.*
[8] Kjeang, A. E., Palm, J. and Venkatesh, G. (2017). 'Local energy advising in Sweden: Historical development and lessons for future policy-making.' *Sustainability* 2017, 9, 2275
[9] Statista (2018). *Electricity Prices for Households in the European Union (EU-28) from 2010 to 2017*. Available at: https://www.statista.com/statistics/418049/electricity-prices-for-households-in-eu-28/
[10] Zinko, H. (2011). *Building Refurbishment to Passive House Standards of the Quarter Bogarden in Alingsas, Sweden. Sustainable Cities and Regions*. Available at: http://www.ep.liu.se/ecp/057/vol12/043/ecp57vol12_043.pdf

collectors and the network company's data management system for billing. The reason behind adopting AMR and AMI was that the Swedish parliament decided that all electricity customers in the country should have monthly billing based on their actual consumption. After additional amendments to the legislation that were made in 2006, a full scale installation of AMR and AMI systems for nearly all Swedish consumers was achieved.[11]

Sweden's energy efficiency targets by 2020 are at least 50% of total energy use to come from renewable energy sources, at least 10% of energy in transport to come from renewable energy sources, to achieve 20% more efficient energy use and 40% reduction in greenhouse gas emissions.[12]

In 2012, with a share of 51.13% Sweden managed to already go beyond its goal of a 50% renewable energy share. This percentage continues to grow. In 2016, the share of renewable energy sources in Sweden was 53.82% which puts the country in top 3 in Europe after Iceland (72.60%) and Norway (69.44%). In comparison, the EU-average share of RES is 17.04%.[13]

The future of nuclear power remains vague. Although in 2010 the Swedish parliament decided to allow new nuclear power plants to be built in 2015, the owners of two of the three nuclear power plants in Sweden have announced their plans to shut down reactors corresponding to around 30% of the nuclear power capacity in the country in the years 2017-2020. Besides, nuclear energy tax was raised significantly in order to stimulate transfer of investments into renewable energy production.[14]

Trends in national campaigns

Sweden's government invests heavily in information and advice campaigns for households on how to save energy. An example is a long time initiative of municipalities employing local energy advisers who are responsible for interacting with and educating households on energy-related issues. This public-funded initiative started in Sweden in 1978 and since then is considered an important policy measure. Since 2004 all municipalities in Sweden have introduced energy saving advisors who offer energy counselling to citizens. All municipalities receive funding for this service as well as for coordination and professional development of the energy advisors. After change in regulations in 2008, local energy advisers became also climate advisors and advisors in the field of transport sector.[15]

The Swedish Energy Agency plays an important role in providing information through various channels and working with a large number of different actors ensuring the delivery of the information to the targeted groups. In 2006, it started the Energy, IT and Design national programme that was focused on consumers' every-day habits, values and behaviour. The aim of the programme was to make it easier for the households to control their consumption and to become more energy efficient.[16]

[11] Widegren, K. (2013). 'Development of Smart Grid and Smart Meters – the Swedish Experience.' *Government Gazette*. Available at: http://governmentgazette.eu/?p=5540
[12] Telenius, B. (2012). *Energy Policy in Sweden: A Pathway to a Carbon Neutral Society*. Available at: https://www.hhs.se/contentassets/7c92412606ee433e9720780066 2742a1/telenius.pdf
[13] Eurostat (2018). *Energy from Renewable Sources*. Available at: http://ec.europa.eu/eurostat/web/energy/data/shares
[14] Swedish Institute (2018). *Energy use in Sweden*. Available at: https://sweden.se/society/energy-use-in-sweden/
[15] Kjeang, A. E., Palm, J. and Venkatesh, G. (2017). 'Local energy advising in Sweden.'
[16] Vassileva, I. (2012). *Characterization of Household Energy Consumption in Sweden.*

OVERVIEW OF NATIONAL SECIS

Below please find a list of Swedish SECIs that have been researched and documented through WP2 of ENERGISE. The SECIs are researched, selected and documented based on a set of requirements and research interests (please see Jensen 2017 for details). The list should not be regarded as exhaustive or representative of all kinds of energy initiatives carried out in the country.

POWER HOUSE NZC: Powerhouse Nearly Zero Challenge	 Changes in Technology
EEPLIANT: Energy Efficiency Compliant Products 2014	 Changes in Technology
iBROAD: Individual Building (Renovation) Roadmaps	 Changes in Technology
TRIBE: TRaIning Behaviours towards Energy efficiency: Play it!	 Changes in Individuals' Behaviour
TOPTEN ACT: Enabling consumer action towards top energy-efficient products	 Changes in Individuals' Behaviour
ECHO ACTION: Energy-Conscious HOuseholds in ACTION	 Changes in Complex Interactions
EYEMAN CHAMPIONSHIP: European Young Energy Manager Championship	 Changes in Individuals' Behaviour
FEEDU: Persuasive force of children through education	 Changes in Individuals' Behaviour
ICOSAW: Promotion of the Intelligent Combination of Sun and Wood for Producing Warm Water and Heating for Private Houses	 Changes in Technology
SPIRIT: Energising Faith Communities	 Changes in Individuals' Behaviour
"Swedish largest energy saving experiment"	 Changes in Individuals' Behaviour
"End-use metering campaign in 400 households in Sweden, assessment of the potential electricity savings"	 Changes in Individuals' Behaviour

Energy Neighbourhood: Climate Competition between Municipalities and Their Citizens	 Changes in Everyday Life Situations
STATIC! - Energy as a Design Material	 Changes in Everyday Life Situations
CEPHEUS project (Cost-Effective Passive Houses as European Standards)	 Changes in Technology
M CUBE	 Changes in Individuals' Behaviour
Värme i Villan (Heat in the House)	 Changes in Individuals' Behaviour
"Energy advice in the Region of Stockholm"	 Changes in Individuals' Behaviour
SAVES: Students Achieving Valuable Energy Savings	 Changes in Individuals' Behaviour
A Transnational Nordic Smart City Living Lab Pilot	 Changes in Technology
TOGETHER on the move - Energy Efficient Transport Training for Immigrants	 Changes in Everyday Life Situations
ACTIVE LEARNING: Integration of Active Learning and Energy Monitoring with School Curriculum	 Changes in Individuals' Behaviour
KIDS4FUTURE: Creating Actions among Energy Conscious Children	 Changes in Individuals' Behaviour
BEHAVE: Evaluation of Energy Behavioural Change programs	 Changes in Individuals' Behaviour

‘GOOD PRACTICE’ EXAMPLE OF SWEDISH SECI

STATIC! - Energy as a Design Material

Description

The Swedish Interactive Institute has been working on a project to redesign everyday items (lamps, tiles, window shades) in order to increase awareness of how energy is being used.

The ‘STATIC!’ project has two main goals:

1. Increase awareness of energy use
2. Stimulate changes in user’s consumption behaviour.

The project builds on the assumption that one of the largest barriers in encouraging energy conservation is simply the lack of awareness. ‘STATIC!’ products serve as effective and permanent reminders to be more energy conscious.

Contextualization

Energy is an increasingly valuable – but too often invisible – resource. The infrastructure for delivering electricity and the meters for measuring the amount of consumed electricity are often out of sight. Wires are hidden inside walls, electricity meters are located in basements or on outer walls. The project ‘STATIC!’ views energy as a design material, and proposes innovative design solutions for everyday items that use or transfer electricity in order to make energy more ‘visible’ and ‘tangible.’ The result of this effort is a series of products that are a standard feature of the average household, but have been redesigned in a unique and innovative way to make consumers more aware of the presence and use of energy, and consequently encourage more sustainable practices of energy consumption.

Aims and objectives

The main objective of ‘STATIC!’ is to stimulate changes in energy behaviour by changing the design of typical household items directly or indirectly involved in the household electricity consumption. A varied palette of prototypes and different scenarios are employed to help the consumers to ‘visualise’ electricity and become more aware of different ways in which they consume it.

‘STATIC!’ explores application of innovative solutions in design of everyday objects in order to:

- make energy visible and tangible to all senses
- express relations among different forms of energy used
- support reflection on the energy behaviour over time
- empower consumers by enabling them to understand and control energy use in their home environment

Methods for Intervention

‘STATIC!’ is an experimental project based on the premise that energy can be understood and viewed as a design material – not entirely different from other materials such as plastics, wood and textile, and can be therefore used to produce objects. By treating energy as an expressive material in its own right, we render it visible, enabling consumers

to have an increased awareness of and control over the energy in the things they use. Moving beyond awareness promoted in information campaigns, this approach focuses on energy as a core aesthetic and functional issue in early stages of product design, thereby triggering substantial changes in the ways energy is perceived and used in everyday life.

Steps of implementation

- An extensive search for inspirational examples of related work (books, academic papers, articles, Internet, workshops).
- Selection of the design approach and methodology.
- Focusing the project's approach and intent: target young people between 15 and 25 years old and families with children; use interaction design as a means of increasing young people's awareness about energy and for stimulating changes in their energy behaviour.
- Research phase to gather inspiration and information about young people and their everyday life, focusing on their interaction with energy.
- Development of products: brainstorming of ideas; sketching and drawing; refinement of ideas; design of concepts.
- Testing the design proposals: proposals were presented to young people on a workshop and evaluated.
- Production of final version of products.
- Testing in pilot households.
- Collecting feedback through interviews with household residents.

Results/outcomes

The following innovative designs / products were developed:

- Appearing Pattern Wallpaper: wallpaper has a solid colour when purchased, but a pattern emerges over time as sunlight exposes textures printed with UV-sensitive ink.
- Disappearing Pattern Tiles: bathroom tiles are decorated with patterns in a thermo-chromic ink that reacts to heat, fading away to reflect hot-water use. The longer the shower, the less decoration on the wall.
- Element: radiator made out of glass, metal and light bulbs, which are glowing when radiator is on.
- Energy Curtain: a window shade woven from a combination of textile, solar-collection and light-emitting materials. During the day, the shade collects sunlight and in the evening, the collected energy is expressed as a glowing pattern on the inside.
- Erratic Radio: radio which "goes out of tune" when there are too many objects in the room consuming energy.
- Flower Lamp: lamp changes its shape depending on the energy consumption in a household. In order to make the lamp more beautiful, a change in behaviour is needed.
- Heat Sensitive Lamp: lampshade is made of heat sensitive paper – the heat generated from the bulb causes the lampshade to change form, as bubbles grow from the previous flat shade.
- Power Aware Cord: re-designed electrical cord which shines when electricity flows through it. Expressing the presence of energy through light can inspire people to explore and reflect upon the energy consumption of electrical devices in their home.

The role of the households

Households were first involved in evaluation of initial designs of products, which were presented to them during a workshop. Selected products were then tested in pilot

households, which provided feedback through interviews. Two interviews were conducted in each household: one at the beginning of the test period when the prototype was brought into the domestic setting, another at the end of the test period.

Location
'STATIC!' was carried out between 2004 and 2006 in Swedish cities Eskilstuna and Göteborg.

Was/is the initiative successful?
The initiative was definitely successful. The feedback from pilot households was very positive and the energy-aware household products were presented in numerous events such as symposiums, seminars and exhibitions. The initiative resulted in numerous journal publications and a book[17] featuring original texts by research leaders and previously unpublished images of the conceptual designs. The School of Design and Crafts at Göteborg University conducted a series of workshops 'STATIC! Energy as design material' for its students. The Static! Power-Aware Cord and the Static! Flower Lamp has received major international awards. The research project stimulated a growing research area in energy, design, and IT in Sweden and abroad.

Textual and communicative aspects of the initiative
'STATIC!' explores how the design of everyday household objects can influence and change practices and patterns of (over)consumption of electricity at home by materialising it and making it more visible and tangible for people.

The physical/technological aspects of the initiative
Technological aspects are at the core of the initiative – the range of innovative and effective design solutions has been described in more detail above under 'Results/Outcomes.'

Shared understandings related to the initiative:
The initiative builds upon understanding that a considerable part of our contemporary lifestyles is powered by electricity. The economic and environmental costs of energy require us to rethink how we consume energy and how to change our behaviour. Participants in the initiative consider energy as an expressive material for design, in the sense that visibility and use of energy are brought to the forefront in products, enabling people to increase their awareness of and control over the energy in the products they use.

[17] Mazé, R. (ed.) (2010). *Static! Designing for Energy Awareness*. Stockholm: Arvinius Förlag.

CONCLUDING REMARKS AND POLICY IMPLICATIONS

Although Sweden is among the European leaders regarding the use of renewable energy sources (mostly hydropower, but also wind and biofuel), further increase in the share of RES in the final energy consumption is among the priority goals of the national energy polices, along with the reduction in greenhouse gas emissions and improved energy efficiency. Efforts to consume energy in a more efficient way are concentrated, as in many other countries, on renovation and thermal insulation of old building stock and modernisation of the heating systems. Sweden was also a European pioneer in the adoption of smart metering, and the process of installation of automated meter reading has been practically completed. As the processes of applying technological solutions for increasing energy efficiency are quite advanced, most national campaigns focus on promoting behavioural changes and informing people how to consume less energy and diminish their carbon footprint. Often, the approach is quite innovative, as demonstrated by the 'STATIC!' project described in Section 3.

Numerous other initiatives focus on promotion and exchange of innovative ideas that help households to understand and control the ways in which they consume energy. ECHO ACTION addressed families as final users to shift the "demand side" towards more responsible energy use. "Swedish largest energy saving experiment" involved 10,000 households in an experiment to find out how much electricity could be saved if they have continuous feedback on their electricity consumption, load demand and costs in real time. "Transnational Nordic Smart City Living Lab Pilot" tested innovative technical energy solutions in real-life settings to produce energy saving solutions in homes and transportation.

Some initiatives focused on providing user-friendly information on energy performance of household appliances and other products (EEPLIANT; TOPTEN ACT), while others raised knowledge about sustainable heating alternatives (Heat in the House; Energy Advice in the Region of Stockholm; ICOSAW). The youngest energy consumers were not forgotten either. Education is at the core of several initiatives – for example FEEDU, which raised awareness about renewable energy sources and rational use of energy and mobility in schools, ACTIVE LEARNING that promoted energy education among children aged 6-12 years, and KIDS4FUTURE, striving to create understanding and enthusiasm for energy issues and raise interest towards the question of a sustainable future among children in 20 pilot schools. EYEMAN CHAMPIONSHIP and SAVES involved young people in energy saving competitions.

Two more projects deserve to be mentioned. SPIRIT engaged faith-based organisations in efforts to achieve measurable energy savings. Members of faith communities were trained as Energy Champions, who delivered energy saving advice to fellow members of their communities. 'TOGETHER on the move' developed and implemented energy efficient transport training for immigrants.

Compared to the initiatives implemented in most other countries, 'STATIC!' stands out as an example of SECI that goes beyond the usual approaches such as awareness campaigns and technical solutions, by using innovative solutions in design of products, like

lamps, domestic appliances and electronic devices, to influence people's awareness and choices. Illustrating how we can work with energy not only from a technical but also from aesthetic point of view, 'STATIC!' reinterprets basic functionality of familiar objects and stimulates users to make active choices to save energy on a daily basis.

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