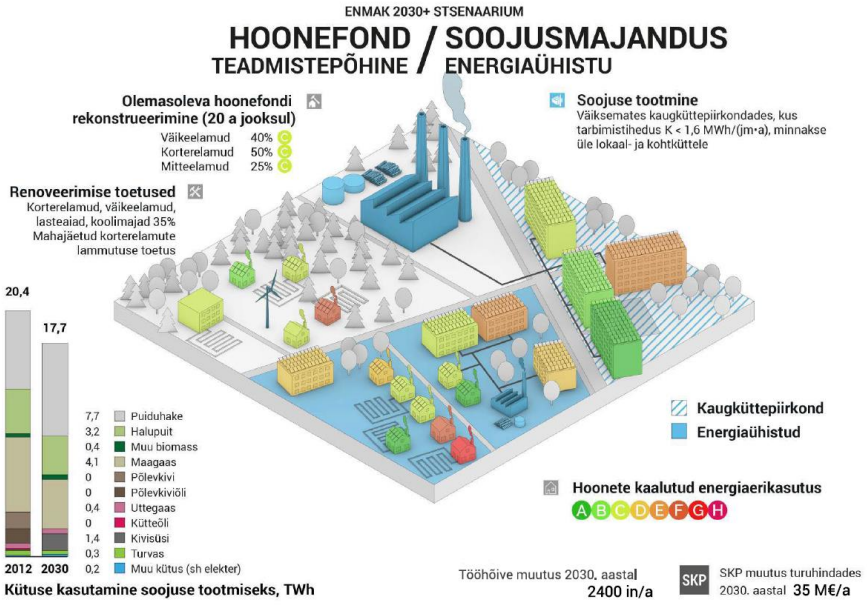
Final report to the Baltic Sea Region Energy Cooperation on "Best practices, business models and incentives for launching small-scale electricity and heat cooperatives"



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1 Executive summary

The need to initiate the project arose from the unsustainable solutions of heat supply and dissatisfaction with the security of electricity supply in Estonian rural settlements (villages with less than 300 habitants[1]). Often the heating solutions do not comply with construction norms and the decreasing workload of district heating network areas is experienced that results in a relatively high price of heating. Due to a variety of reasons explored in the project local governments have not been able to solve the aforementioned problems. Forming energy cooperatives on the basis of communities[2] was analysed and tested in this project as one of the potential solution to the problems of energy supply, as it is set in the draft of National Development Plan of the Energy Sector Until 2030[3].

A large-scale formation of energy cooperatives in Estonia would lead to improvements in the following aspects:

- hinder the depopulation of remote areas,
- reduction of energy costs,
- developing new electricity generation capacities without subsidies,
- reduction of heat loss,
- implementation of the potential for the cogeneration of electricity and heat,
- increase in using renewable energy resources.[4]

Baltic Sea Regional Energy Cooperation (BASREC) Executive Committee and Estonian Development Fund agreed as a goal of the project to intensify collaboration concerning the assignment of **best practices, business models and incentives for launching small-scale electricity and heat cooperatives during the period from 1 July 2014 until 31 December 2015.**

In this project, options for location-based small-scale generation of electricity and heat based on communal cooperative activity were analysed. It was considered that equipment of energy generation and distribution belongs to the members of communal cooperative (hereinafter energy cooperatives).

[1] Bases and procedures for determining the type, name and division line of a habitation unit https://www.riigiteataja.ee/akt/106102015010

[2] A community forms from local action groups, the members of which represent the socio-economic interests of the local public and private sector Vihma, P. ja Lippus, M. Community survey „Eesti kogukondade hetkeseis" (Current situation of Estonian communities). Tallinn, 2014. Tallinn, 2014.

[3] Eesti energiamajanduse arengukava aastani 2030 eelnõu ptk 3 http://www.energiatalgud.ee/img_auth.php/5/5b/ENMAK_2030._Eeln%C3%B5u_13.02.2015.pdf

[4] Introduction of additional renewable energy sources together with the establishment of energy cooperatives contributes to the climate and energy politics of the European Commission A policy framework for climate and energy in the period from 2020 to 2030 Communication from the European Commission 22.01.2014. – http://eur-lex.europa.eu/legal-content/ET/TXT/PDF/?uri=CELEX:52014DC0015&from=EN

The main activities carried out by the Estonian Development Fund during the project were:

- involvement of expert knowledge from other countries;
- collecting and disseminating knowledge to Estonian stakeholders about the possibilities to create energy cooperatives based on BASREC countries' experience;
- workshops, seminars and mentoring was used to create a basis for informed decision-making among the groups of stakeholders;
- a webpage was created with tools to facilitate cooperative energy production (http://energiayhistud.ee/);
- impact assessments were carried out on different levels to analyse the effects associated with the creation and development of energy cooperatives to initiate follow-up activities;
- first energy cooperative initiatives were filtered out and assisted by arranging cooperation and identifying financing possibilities.

Key messages from the project:

- **Juridical framework for energy cooperatives.** It might be necessary to fine tune the legislative framework in order to enable the production and sales of energy to consumers restricted to a specific community. In Estonia for example, the production of energy for direct sales to the consumers is allowed only in the juridical form of a business company and the production and distribution falls under regulation that is not crafted for energy communities.
- **Technological choices**. A holistic view has to be taken while developing projects: if necessary, the first step should be reconstruction of buildings for the purpose of reducing heating demand and creating healthy indoor climate. In Estonia, energy cooperatives have the potential to solve the heating problems above all in apartment buildings and social buildings.
- **Reduction of energy costs (less cost on distribution) and better security of supply may be achievable through energy cooperation in a local community.**

In order to facilitate the community-based and cooperative generation of electricity and heat for self-consumption and sales, **following actions should be taken**:

1. specification of the concept of energy cooperatives and making amendments in the legislation for the purpose of facilitating the creation of energy cooperatives if needed;
2. creation of as upport framework (web environment, counselling services, trainings, technology databases, supervision over the establishment of cooperatives, etc.);
3. adaptation of production and distribution regulation to promote cooperative energy production for local communities.

Based on the analysis of the experience with energy cooperatives of BASREC countries[5], the following contributes to the creation of energy cooperatives:

[5]Estonian Development Fund 2015. Experience of BASREC countries in development of energy cooperatives. Overview of Finland, Iceland, Latvia, Lithuania, Norway, Poland, Russia,

- long-term experience with democratic decision-making processes in society,
- existence of country-wide and/or regional support/umbrella organisations,
- existence of laws which regulate precisely and unambiguously the rights, obligations and limitations of energy cooperatives,
- existence of national support measures,
- energy grid which is in a sufficiently good physical condition.

The following conclusions of the project are applicable in most of the BASREC countries:

Preconditions for establishing energy cooperatives	• Need for reconstruction of buildings to improve energy efficiency • Sufficient building density in a community to find common energy solutions • Sufficient potential of fuel-free and renewable energy sources • Freely available technology for the generation of heat and electricity • Previous experience with joint action in a community • Existence of smart energy system elements (e.g. smart meters) • Possibility to sell the energy produced from renewable energy sources to the network
Arguments to establish energy cooperatives	• To reduce electricity price, incl network fee • To reduce the consumer expenses for heat • To increase consumer satisfaction with energy supply • To increase network capacity for new connections • To attract people to live in rural areas • To improve quality and security of supply of energy through smart network • To replace unsustainable district heating with viable local heating • To earn additional revenue from energy production
Results of the creation of energy cooperatives	• Good relationship and cooperation among communal members are developed • Good practical solutions for heat generation are developed • Good practical solutions for electricity generation are developed • Good practical solutions for insulation (renovation) of buildings are developed • Good practical solutions for smart energy system are developed • Living conditions for rural area become attractive • Quality (indoor climate) of living environment improves • Real estate value increases • Energy security

Denmark, Germany, Sweden and Estonia http://energiayhistud.ee/tutvustus/teostatud-uuringud/

2 Results of the project

The project "Best practices, business models and incentives for launching small-scale electricity and heat cooperatives" consisted of three WPs (Work Packages) with results as follows.

2.1 Results of WP1 Developing and prototyping new models for energy cooperatives – piloted mentor program among communities and SMEs

Within WP1, the initiatives of energy cooperatives of the communities were offered knowledge and experiences of Estonian and international experts both in workshops and in the form of individual consultations in the following fields:

- **Analysis of the experiences with energy cooperatives of BASREC countries**[6] gave an overview of the experiences and current situation in 11 BASREC member states (Finland, Iceland, Latvia, Lithuania, Norway, Poland, Russia, Denmark, Germany, Sweden and Estonia). The compiled report in Estonian gives an overview of historical development of the energy sector each discussed country and current situation concerning the topics of energy production, transmission, sales and smart network. In addition, the report discusses the current situation of energy cooperatives in each country and, in case of their existence, gives an overview of their activities through legal, economic and social point of view.
- **In technological issues** [7]concerning various resources (solar, wind, biomass, biogas), the communities were advised by Ülo Kask, Andres Meesak, Aivar Paabo, Tuuliki Kasonen, Lutz Ribbe and Hans Christian Sørensen who carried out a workshop concerning technology (where, inter alia, the importance of energy saving was explained to the participants) in December 2014.
- **In financial matters**[8] (composing a financial model and a business plan, an overview of funding opportunities for the acquisition of technology and the realization of a business plan), the communities were advised by Villem Vohu who conducted a workshop on financial issues in February 2015. In the financial workshop, [9] Enlife tool, [10] crowdfunding platforms, website of energy cooperatives [11] , state funding opportunities [12] and bank services (by the example of SEB bank) were introduced. The initiatives made profitability calculations of different technologies.

[6] Analysis "Experiences of BASREC countries in the development of energy cooperatives" is available here: http://energiayhistud.ee/tutvustus/teostatud-uuringud/.
[7] Summary of the technology workshop is available here: http://energiayhistud.ee/uudisnupp-eu-mentorprogrammist/
[8] Summary of the financial workshop is available here: http://energiayhistud.ee/energiauhistute-finantspool/
[9] http://enlife.ee/
[10] https://fundwise.me/
[11] http://energiayhistud.ee/
[12] www.eurotoetus.ee

- **In achieving a community agreement** [13] (community involvement, negotiations and motivation), the communities were advised by Peeter Vihma, Hans Christian Sørensen and Lutz Ribbe, who performed community outreach workshop in March 2015. In this workshop, the experiences of Germany and Denmark, theories of involvement and Estonian experiences of involvement (including how to convince communities to establish wind turbines to their region) were introduced. In addition, the participants were informed about a range of grant opportunities offered by the Environmental Investment Centre (follow-up to the financial workshop). Involvement plans were prepared by the initiatives. The workshop pointed out a need to find several spokespersons for the community, to start on a small scale and be consistent.
- **In legal matters** [14] (drawing up contracts and necessary instruments, solving the legislative matters of the process of creating an organization), the communities were advised by Moonika Kukke and other representatives of the Law Firm GLIMSTEDT, who carried out a workshop concerning legal issues in May 2015. The workshop consisted of five parts: comparison of the forms of entrepreneurship, forms of entrepreneurship in energy business, agreements between parties, involvement of local government, grids. Most of the initiatives received recommendations on legal format choice, which in the context of the current legislation was usually establishing a private limited company.
- **Website** [15] **and calculator** [16] **of the created energy cooperatives** have contributed to the success of the project. The website enables the cooperation network to communicate and share the information about the activities of energy cooperatives. The calculator prepared by Jaanus Uiga is a tool providing a quick and primary indication of the potential profitability of the planned energy technology after you fill its fields of electricity and heat consumption of the community.

2.2 Results of WP2 Proposals focusing on the new and possible cooperation and business models for community-based energy generation

In analysing the potential and socio-economic impacts of energy cooperatives [17], the percentage of energy consumed and produced by potential heating and electricity cooperatives in Estonian electricity and heat generation, as well as its impact on entrepreneurship, livelihood of the residents and regional development, was forecasted. The potential of heating cooperatives lies, above all, in the network areas of district heating with high price for heat and low consumption density; apartment buildings with local central heating, stove and fireplace heating and social buildings, covering approximately 240,300 residents, 6200 apartment buildings and the

[13] Summary of the community outreach workshop is available here: http://energiayhistud.ee/kas-oled-valmis-kaima-ukselt-uksele-et-kogukonda-kaasata/
[14] Summary of the workshop concerning legal issues is available here: http://energiayhistud.ee/energiauhistute-mentorprogrammi-oiguskusimuste-tootuba/
[15] http://energiayhistud.ee/
[16] http://energiayhistud.ee/tooriistakast/kalkulaator/
[17] Analysis of the potential and socio-economic impact of energy cooperatives is available here: http://energiayhistud.ee/tutvustus/teostatud-uuringud/

buildings managed by local governments. The potential of electricity cooperatives lies, above all, in the installation of solar panels in apartment buildings and social buildings to cover self-consumption of the buildings (3 % of annual electricity need of the buildings) and covering approximately 940,000 residents, 23,616 apartment buildings and the buildings managed by local governments. Combined power and heat generation with wood gasification has the potential for the communal energy production. The potential to generate wind energy does not correspond to the communal generation potential in Estonia, i.e. location of apartment buildings and social buildings. Even in small islands and on the coast, the buildings are mostly not located to the places open to the winds, in order to use wind by the means of small wind turbines for the self-consumption of the buildings. Based on the effect of scale, it is more profitable to produce electricity in big wind parks for the sales to power network. The potential for joint activities for business purposes was not assessed within the framework of this project.

On the basis of the data submitted on the socio-economic implications of 10 initiatives of different models of energy cooperative, which participated in the project, the following conclusions were made:

- By reconstruction of buildings, decreasing heating demand and modernisation of energy technologies, atmospheric emissions of fine particles caused by the combustion of wood-fuels and the expected health effects will reduce in case of the initiatives related to densely populated areas.
- Community-based energy production is possible and appropriate for finding joint energy solution for different energy consumers. Nevertheless, the most popular solutions are solar power station for electricity generation and designing wood-fuel boilers for heating.
- Heat generation is planned with the price lower than price ceiling of district heating.
- Power generation is planned mainly for self-consumption and thus grid related taxes and fees will be avoided.
- For 4 initiatives, a leading role is played by local government, for 1 initiative, by forest association, for 1 initiative, by the manager of industrial park as the representative of undertakings, for 1 initiative, by apartment association and for 3 initiatives, by the community-based activity group. It shows that energy cooperative can also be created on other basis than apartment association, in fact, it can be the association of different energy consumers.
- On average, at least 1 working place will be created per an apartment association in connection with the operation of energy technology.
- For the initiatives related to densely populated areas, the number of potential association members is significantly bigger than in the case of the initiatives related to low-density areas.

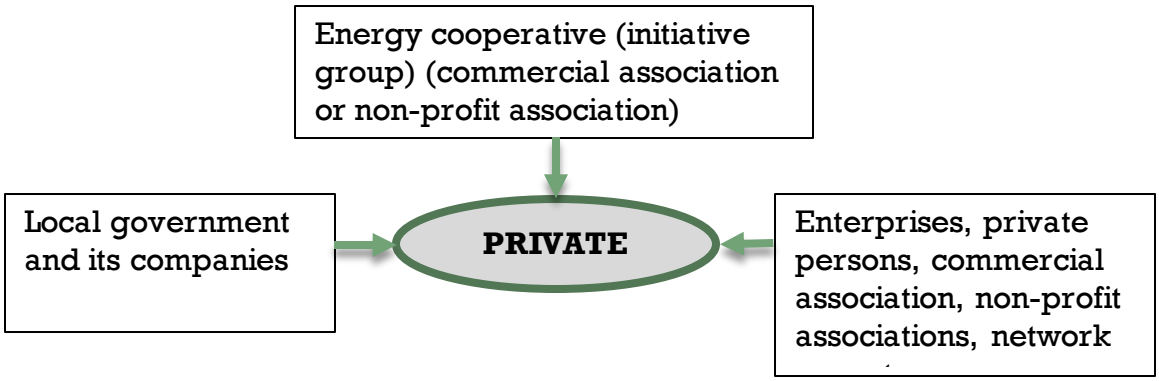
Legal analysis of energy cooperatives [18] was carried out on the basis of ten communities participating in the project. Main problems, which were identified and need to be solved in selecting cooperation and business model, creating and functioning of energy cooperatives, are the following:

[18] Legal analysis is available here: http://energiayhistud.ee/wp-content/uploads/2015/09/EY_oigusmojude-analyys.pdf

1. The concept of "energy cooperative" is not unambiguously defined in Estonian legislation.
2. Legal formats for creating an energy cooperative are limited (usually the format of a private limited company is chosen).
3. Involvement of local governments is complicated.
4. In certain situations, it is necessary to make relatively large capital contribution.
5. Establishment and use of power lines and networks are strictly limited by legal requirements.

As one possible solution, the analysis proposes to use combined organisational model for the creation of energy cooperative (Figure 1). It is an ownership model that is similar to a group and involves all the members of energy cooperative, thus forming a single economic entity.

Figure 1 Combined organisational model



In principle, the so-called central "body" can also be some other form of entrepreneurship, e.g. a commercial association. For example, the similar cooperatives are the most preferred forms of energy cooperatives in Germany and Denmark. In the context of valid legislation, a commercial association is not the most suitable form for energy entrepreneurship in Estonia, because in many cases, the specific laws applicable to the field of energy require that the activities must be carried out in the form of a private limited company or public limited company. It is recommendable to choose using the combined organisational model in case of such project initiatives, where a local government is the initiative group of energy cooperative (e.g. Vormsi, Kõpu, Hiiu, Kärla). Arising from legal requirements, in Estonia, a local government can be a partner or a shareholder only in private limited company or public limited company, establish foundations and be a member of a non-profit association. Local government cannot be a member of the commercial association which would be one of the most preferred forms upon founding a communal energy cooperative. Therefore, in case of the project initiatives, where a local government is the initiative group of an energy cooperative, it is appropriate to use the combined organisational model, thus involving all the members belonging to the interest group at community level in the partnership of a private limited company. Within the framework of the project, a debate arose as to whether it would be possible,

when using such combined model, to create a company, where network operator has a leading role, but the community (e.g. owners of registered immovables) can participate as partners, holding a 20% of the share capital of this joint venture.

2.3 Results of WP3 Communication and raising awareness among potential target groups

Webpage of energy cooperatives[19] has been prepared both in Estonian and English. Webpage is divided into the following parts: main page, news, introduction, toolbox, events, media, energy cooperatives, cooperation network and contact. The section "Toolbox" gives the necessary initial data and guidelines for the creation of energy cooperatives and the decisions related to their creation; creates an understanding of the necessity and procedures related to the commencement of energy cooperative; increases the volumes of sectoral investors and the investments of end-users; raises awareness and increases competencies; provides a basis for the preparation of further research works and launch of programmes. The section "Energy Cooperative" gives an overview of the concept of energy cooperative, the necessity of its creation, advantages, experiences of other countries and the news related to the energy cooperatives in Estonia.

Social media channels have been used to raise awareness of the energy cooperatives and spread messages (mostly the webpages of the Estonian Development Fund and Facebook pages of the project partners). The employees, project mentors and partners have spoken out on several occasions both in print media and radio channels.

News, completed analyses and progress made in the project initiatives were forwarded to the Cooperation Network via e-mail and webpage.

Workshop "Do-it-yourself small wind turbine" was conducted in June 2015 within the framework of Ruhnu Island initiative.

Final conference of the project [20] on 29 September 2015 was attended by approximately 100 persons, including policymakers, potential creators of energy cooperatives, as well as the people interested in the topics of energy and green economy.

3 Experience in the Baltic Sea Region (BSR)

It is not possible to create a standard model for successful creation of energy cooperatives, which is applicable to all countries and under all circumstances. Based

[19] Energy cooperatives: http://energiayhistud.ee/en/

[20] Overview of the conference is available here: http://energiayhistud.ee/energiauhistute-konverentsi-kokkuvote/. You can find here also the links to the video recordings of conference presentations.

on the analysis of the experience with energy cooperatives of BASREC countries[21], the following contributes to the creation of energy cooperatives:

- **Long-term experience with democratic decision-making processes in society**, which facilitates the creation of energy cooperatives and cooperation between their members. In Eastern European countries, the tradition of democracy was demolished by Soviet totalitarian governance system.
- **Existence of country-wide and/or regional support/umbrella organisations,** which provide support services to the new and already functioning energy cooperatives, facilitating the distribution of information, experiences and contacts and thereby accelerating and simplifying the creation process of energy cooperatives.
- **Existence of laws which regulate precisely and unambiguously the rights, obligations and limitations of energy cooperatives.** On a broader scale, it can be regarded as the interest shown by and readiness of public sector to support the activities of energy cooperatives.
- **Existence of national support measures** on legal and financial level either for the activities of energy cooperatives or the use of renewable energy in power/heat generation.
- **Energy grid which is in a sufficiently good physical condition** to be able to receive the energy generated by energy cooperatives.

In Tables 1 and 2, the countries having the same preconditions and justifications to create energy cooperatives are marked with a cross.

Table 1 Preconditions for creating energy cooperatives in BASREC countries.

Preconditions for creating energy cooperatives:	**Estonia**	**Iceland**	**Latvia**	**Lithuania**	**Norway**	**Poland**	**Sweden**	**Finland**	**Germany**	**Denmark**	**Russia**
Need for the reconstruction of buildings to improve energy efficiency	x	x	x	x	x	x	x	x	x	x	x
Sufficient building density in a community to find common energy solutions	x	x	x	x	x	x	x	x	x	x	x
Sufficient potential for fuel-free and renewable energy sources	x	x	x	x	x	x	x	x	x	x	x
Freely available technology for the generation of heat and electricity	x	x	x	x	x	x	x	x	x	x	x
Previous experience with joint action in a community	x	x	x	x	x	x	x	x	x	x	x
Existence of smart grid elements (e.g. remotely-read energy meter)	x				x	x	x	x		x	
It is possible to sell to network the energy generated from renewable sources	x	x	x	x	x	x	x	x	x	x	

[21]Estonian Development Fund 2015. Experience of BASREC countries in development of energy cooperatives. Overview of Finland, Iceland, Latvia, Lithuania, Norway, Poland, Russia, Denmark, Germany, Sweden and Estonia http://energiayhistud.ee/tutvustus/teostatud-uuringud/

Table 2 Justifications for founding energy cooperatives in BASREC countries.

Justifications for founding energy cooperatives	Estonia	Iceland	Latvia	Lithuania	Norway	Poland	Sweden	Finland	Germany	Denmark	Russia
It is possible to reduce electricity price with network fees	x	x	x	x	x	x	x	x	x	x	
It is possible to reduce the consumer expenses to heat	x		x	x		x					x
It is necessary to increase consumer satisfaction with energy supply	x		x	x		x					x
It is necessary to improve the quality of living environment	x	x	x	x	x	x	x	x	x	x	x
It is necessary to increase network capacity for new connections	x	x	x	x	x	x	x	x	x	x	x
Low-density area must be made more attractive to the people	x	x	x	x	x	x	x	x	x	x	x
Quality and security of supply of energy must be improved through smart network	x	x	x	x	x	x	x	x	x	x	x
To increase percentage of renewable energy (to reduce CO2)	x		x	x		x	x	x	x	x	x
In case of reduced consumption, heat networks will become economically unsustainable	x		x	x		x					x
In case of reduced consumption, the parameters of district heating networks do not correspond to loads	x		x	x		x					x
Possibility to earn additional revenue from energy production		x	x	x	x	x	x	x	x	x	

Results of the creation of energy cooperatives which are possible to implement in all BASREC countries

- Increased willingness of people for cooperation
- Typical solutions for heat generation are completed
- Typical solutions for electricity generation are completed
- Typical solutions for insulation (renovation) of buildings are developed
- Smart energy network solutions are created
- Living conditions for low-density area become attractive
- Quality (microclimate) of living environment improves
- Real estate value increases
- Need to adapt legislation for the functioning of cooperatives

Analysis of the experience with energy cooperatives of BASREC countries was prepared in three parts:

- Historical development of national energy economy
- Overview of the current situation in national energy economy
- Overview of the current situation in energy cooperatives

By countries, the indicators of energy economy are set out in Table 3.

Table 3. Indicators of energy economy in BASREC countries.

Indicators	**Estonia**	**Iceland**	**Latvia**	**Lithuania**	**Norway**	**Poland**	**Sweden**	**Finland**	**Germany**	**Denmark**	**Russia**
Number of energy cooperatives	3	0	0	0	0	1	**110**	**80**	**880**	**700**	0
Electricity price for domestic consumer 2014[22] EUR/kWh	0.1302	0.1197	0.1635	0.1256	0.1614	0.1444	0.1851	0.1552	0.2951	0.3068	0.0749
Average price for heat 2011[23] EUR/GJ	15.42	3.14	15.35	18.6	16	10.73	20.63	14.8	20.28	27.8	-
Average net income per capita 2012[24] EUR/year	8812	26,696	6,244	5,634	48,241	7,008	17,807	29,246	26,681	32,396	4,572
Percentage of renewable energy in power generation 2012 (including hydropower 2012)[25] %	15.8	100	44.9	10.9	104.4	10.7	60	29.5	23.6	38.7	15[26]

So far, the creation of energy cooperatives has been active in Sweden, Finland, Germany and Denmark. In brief, the situation in energy economy, including energy cooperatives, is the following by these four countries:

The main energy sources in **Sweden** are hydropower and nuclear energy, both of which account for about 40% of electricity produced in Sweden. Most of the heat is produced by waste incineration and renewable energy accounts for about ¼ of thermal energy. The use of fossil fuels is continuously decreasing in the energy sector of Sweden and the relative importance of renewable energy is increasing. Establishing

[22] Eurostat

[23] http://www.euroheat.org/Admin/Public/DWSDownload.aspx?File=%2fFiles%2fFiler%2fdocuments%2fDistrict+Heating%2f2013_Country_by_country_STATISTICS_OVERVIEW_A3.pdf

[24] Eurostat

[25] Eurostat

[26] http://www.s-ge.com/en/filefield-private/files/53230/field_blog_public_files/14171

energy cooperatives and their operation is common in Sweden and according to the 2015 estimates, there are about 110 active energy cooperatives in the country.

In Sweden, the formation of energy cooperatives (mostly wind energy cooperatives) has been organised by using three main models:[27]

- A model where the output of the energy cooperative is deducted from the energy consumption of a member of the energy cooperative and the cooperative member shall pay to the service provider only for the difference in consumed energy amount.
- A model where the energy cooperative sells the produced energy to a network and transfers part of the revenue to the members of the energy cooperative once a year. Each member's share of the revenue is determined by the amount of energy cooperative shares they have. In this case, the members of the energy cooperative generally do not have to pay the related taxes (income tax, VAT). The prerequisite of this model is that a member of the energy cooperative does not own enough shares to exceed their yearly consumption, which would constitute as earning a profit.
- A model where the output of the energy cooperative is sold to a network and the revenue is divided between members of the energy cooperative or used as investments.

Considering that the production and transmission of heat is exceptionally cost-intensive, Sweden does not have any large-scale heat cooperatives.

According to the reform of 1996, an energy company cannot be both an energy producer and the owner of an energy network. This is why municipal companies and large corporations are the owners of energy networks in Sweden today. The ownership of networks is impractical for energy cooperatives as the corresponding market has already been divided between the existing service providers. Additionally, the establishment and managing of a network is extremely costly, and the potential cooperative does not have sufficient resources to do so. Another reason why owning an energy network is not useful for cooperatives is that the goal of most cooperatives is to provide affordable energy to their members and ownership of an energy network is not necessary for that end.
Energy cooperatives use existing networks that are owned by state or private companies. In these cases, energy cooperatives pay a small fee, which has been previously agreed upon, to the owners of the network for using their network.

An energy cooperative operates on the basis of a statute and at least three members are required for the establishment of an energy cooperative.[28] Energy cooperatives are organised as economic associations based on cooperation in which every member has one vote. This is a more democratic model than a public limited company for example, as it offers an equal opportunity to participate in deciding over the development of the cooperative for all its members, regardless of the size of their investment to the cooperative.

[27] Wizelius, Tore. *Windpower ownership in Sweden: business models and motives*. Routledge, 2014.
[28] *International Handbook of Cooperative Law*. Springer Science & Business Media, 2013.

No widely accepted concept or definition has been created in Sweden for energy cooperatives. Instead, they use various concepts that summarize the contents of the current cogeneration form. In Sweden, the following three main models are used:[29]

- The members of real estate communes are real estate owners in the given area who want to purchase equipment necessary for electricity production with their own funding instruments. The energy produced is sold to a network and the revenue is divided between members of the energy cooperative. This is the simplest model as only a standard contract signed by each member is sufficient.

- The most common model is the energy cooperative where the electricity produced by the cooperative is sold to network companies and at the end of the year, energy produced and energy consumed will be offset for all members of the cooperative and the gained profit will be paid out in the form of dividends.

- The model in which the energy cooperative sells their electricity directly to its members is also used. In this case, the network company will charge a small fee for energy consumption from the cooperative, but there is no need for the cooperative to include third parties in the energy sales.

Based on the Swedish experience of creating energy cooperatives, one can highlight the following important factors that affect the establishment and development of energy cooperatives in Sweden positively:

- The interest of the public sector in supporting the use of renewable energy (and thereby indirectly supporting energy cooperatives) and as a result of that, well-developed renewable energy policy and grants.
- There is strong network of state and private organisations, the task of which is to help start-up cooperatives (incl. energy cooperatives) and already operational cooperatives.
- The activities of energy cooperatives (and cooperatives in general) are strictly regulated on the legislative level, the rights and obligations of cooperatives are also defined on the legislative level.
- On the social level, the Swedish people see energy cooperatives as a positive opportunity to create added value for the community, while at the same time investing into a project with long-term returns.

Nuclear energy and hydropower play the most important part in the electricity production in **Finland**. At the same time the electricity consumption in Finland exceeds the production and thus the state has to import electricity from its Scandinavian neighbours or over the Eastern border from Russia. The percentage of fossil fuels used for electricity production is relatively small, but the heat production in Finland is still mainly based on the use of fossil fuels, that is more than 51% of the heat plants and CHPs use natural gas or coal for production. Energy cooperatives are very common in Finland and according to data from 2015, there were about 81 energy cooperatives in Finland.

[29] http://www.energiatalgud.ee/img_auth.php/0/0e/Advokaadib%C3%BCroo_Glimsdedt._Energia%C3%BChisused_Eesti_%C3%B5iguskorras._2013.pdf

In Finland, the definition of a cooperative as a form of joint activity, which applies to all cooperatives regardless of their field of activity, has been fairly clear in terms of legislation up to recent times: "A cooperative is an organisation the membership and capital of which have not been predetermined. The goal of the cooperative is to promote the economic interests of its members via an economic activity, which the cooperative provides itself, through a subsidiary or some other way."[30] As of 1 January 2014, Finland has a new valid law that regulates the activities of cooperatives, specifies and updates the establishing of cooperatives and rules that affect its activities.[31]

Also popular in Finland is the cooperative model where forest owners are the initiators of an energy cooperative as they have resources that the cooperative can use. CHP plants that work with forest chips are widespread; therefore, forest owners have a good position for using their raw materials. Most Finnish energy cooperatives are combined heat and power producers (with only a few exceptions). CHP plants make up a substantial part of district heating systems in Finland – approximately 75%.[32] Energy cooperatives created by farmers that use biogas to cogenerate heat and electricity are gaining popularity. Biogas, in turn, is produced by using residues from agricultural activities (mostly livestock manure and plant debris).

Main sources of funding for creating energy cooperatives are contributions paid by members and state grants, the size and limit of which may depend on various factors (the planned field of activity, size of production volumes etc.). There is no separate support mechanism for establishing cooperatives. The incentives offered by the state are same for all forms of entrepreneurship. Energy cooperatives can use grants that are offered to all producers of heat and electricity who use renewable energy. Various public subsidies are used, mostly for building new stations and purchasing necessary equipment. Feed-in tariffs, which the state uses to compensate the deficit in market price to the producers, are also used in the case of renewable energy.[33]

Based on the example of Finland, most important reasons fostering the creation of energy cooperatives are the following:

- The law that regulates the activities of cooperatives (incl. energy cooperatives) and which sets clear limits to the rights and obligations of cooperatives.
- Support measures for using renewable energy for electricity and heat production (feed-in tariffs, construction grants for stations etc.).
- The presence of umbrella organisations, which link existing cooperatives together, share their experience and provide sectoral aid (legal, financial, technological counselling etc.).
- The completeness of the state transmission network for the development of distributed generation.
- The significant interest of the public sector towards the activities of energy cooperatives and readiness to cooperate with them, if necessary.

The Finnish example of implementing energy cooperatives in the society is and extremely successful on, and the influence of energy cooperatives reaches further

[30] Free translation. http://www.finlex.fi/en/laki/kaannokset/2001/en20011488.pdf
[31] http://www.finlex.fi/fi/laki/alkup/2013/20130421#Lidp2863984
[32] http://www.iea.org/publications/freepublications/publication/Finland2013_free.pdf
[33] http://www.res-legal.eu/search-by-country/finland/

than energy generation by offering people an opportunity for community-based cooperation and facilitating regional development.

Energy production in **Germany** is mostly based on fossil fuels. In 2014, about 26% of electricity was produced using renewable energy sources and that is about the same amount produced with lignite. Natural gas plays an important role in the heating economy and this is mostly imported from Russia. Germany has focused on decreasing its energy dependency on fossil fuels and by 2050, 4/5 of the electricity produced in Germany should be from renewable energy sources. Promoting renewable energy is also a positive factor for the creation and operation of energy cooperatives in Germany. As of 2015, there are estimated to be 880 energy cooperatives in Germany and considering their popularity in the German society, the number is likely to grow in the coming years.

In Germany, cooperatives (incl. energy cooperatives) are seen as a separate form of commercial undertakings on the legislative level, and as of 1889, there have been distinct laws to regulate their activities. In Germany, cooperatives (including energy cooperatives) are associations of natural or legal persons that have been created to promote the economic, cultural or social interests of the members of said associations though joint economic activities. [34] Therefore, German energy cooperatives are taxable; they pay taxes related to the activity of their company and its commercial activities.[35]

Statistically, the vast majority of energy cooperatives in Germany are cooperatives active in electricity generation (82% of all energy cooperatives), who mainly use solar panels for production. Only 7% of cooperatives are active in heat generation. About 20% of energy cooperatives deal with managing heating networks, and only 1% of energy cooperatives are operators of electricity networks.[36]

In order to create an energy cooperative, its members have to confirm the statute of the cooperative with their signatures. During the establishment and its activities, the energy cooperative should adhere to the Law on Cooperatives, which regulates the rights and obligations of the energy cooperative throughout its entire lifecycle, from the establishment to the termination of activities. The most important reasons of creating energy cooperatives in Germany:[37]

- Balance of interests. People want to get involved in the activities of the company and get to participate in making decisions that concern its development policy. Additionally, it provides the opportunity to fill several goals simultaneously – people can earn profits with energy generation and work according to their environmental/regional/social interests.
- Energy cooperatives provide regional added value; new jobs are created and economic resources stay within the community.
- Reasonable use of resources. In most cases, energy cooperatives only produce as much as their members need, and unlike commercial enterprises, earning profits is not their main goal.

[34] https://www.wbs-law.de/eng/doing-business-germany/types-company/operating-forms/
[35] https://www.wbs-law.de/eng/doing-business-germany/types-company/operating-forms/
[36] http://www.genossenschaften.de/sites/default/files/DGRV-Jahresumfrage_2015.pdf
[37] http://www.genossenschaften.de/warum-energiegenossenschaft

- Long-term involvement. The projects of energy cooperatives can last years and decades, thereby bringing together people in communities and creating long-term investments for the promotion of regional development.
- Energy cooperatives are more "transparent" than regular commercial undertakings, i.e. members have a far greater overview of the economic situation of the energy cooperative than in the case of some other legal form of commercial entrepreneurship.
- The minimum number of members in an energy cooperative in Germany is three, but the maximum number of members is not regulated by law.[38] There are also no legal restrictions on the geographic scope of energy cooperatives, but energy cooperatives themselves have the right to determine their geographic coverage in their founding statute. Electricity cooperatives implement this less, but it is more common in the case of energy cooperatives that produce heating.
- German energy cooperatives are regulated by law in a way that the members of each energy cooperative can be held directly responsible for the activities of the cooperative, incl. debts that the energy cooperative may incur.[39]

Renewable energy plays a huge role in the electricity production in **Denmark**. Almost 40% of the electricity was produced from renewable energy sources in Denmark in 2012. Heat is produced by using both renewable and non-renewable energy sources equally. Denmark plans to stop using fossil fuels by 2050 and supporting the development of renewable energy is essential in the country. It is estimated that there are around 700 energy cooperatives in Denmark and their establishment is widespread thanks to the supportive policies of the government.

Different cooperative activities are historically popular **in Denmark** (mostly consumer and agricultural cooperatives) and this principle is introduced to people already in school. Thus it is not surprising that there is a huge number of cooperatives in Denmark and it is really popular to be part of a cooperative. Government policies have promoted and supported the development of backyard energy and the establishment of energy cooperatives in the last 30 years.

Although energy cooperatives are not explicitly defined in Denmark, a general concept is applied to them, which means that cooperatives are independent and democratic entities, managed by the members with the goal to achieve common economic, environmental and social goals. Most cooperatives in Denmark operate according to non-profit principles with the goal to provide benefits for its members, which is why they are mostly focused on reinvesting profits.

There are five common energy cooperative models in Denmark[40]:

38 http://www.dgrv.de/de/genossenschaftswesen/dasgenossenschaftsgesetz/errichtungdergenossenschaft.html

39 http://www.dgrv.de/de/genossenschaftswesen/dasgenossenschaftsgesetz/rechtsverhaeltnissedergenossen.html

40 According to the information from Hans Chr. Sørensen.

- Project based on community investments, where the cooperative is created by citizens, who are interested in the environment and who are willing to invest their time and money.
- Facilities owned by the consumers with the goal to produce cheap and effective energy and make long-term investments in the infrastructure.
- Farmers' cooperatives that mostly produce natural gas, offering the members the possibility to adjust to the changing market circumstances and legal acts, and to improve the economic situation of farmers.
- New undertakings with the sole goal of grouping together people, who want to form a cooperative and sell the energy produced for profit.
- Professional bodies with the aim to share experience and knowledge about this sector and to develop sector-specific support measures.

Most of Denmark's electricity distribution system operators are energy cooperatives. In addition to that, almost 20% of wind energy is produced by energy cooperatives, which is one of the highest indicators both in Europe and in the world. In addition to the electricity economy, energy cooperatives also generate heat (about 460 heat plants) and farmers' cooperatives produce natural gas (22 plants), which is used to produce electricity or heat.

The principle of Danish cooperatives is that every member has one vote, irrespective of the amount of shares. Usually 5 to 7 members are elected to be the board of the cooperative and they manage the work of the cooperative without any pay. In general, all the work is done as voluntary work by the members in cooperatives, except technical tasks (equipment maintenance, accounting), which are contracted out. In general, everyone interested in the activities of the cooperative can join the electricity cooperative, but membership of heat cooperatives is usually limited to residents of the operational area of the cooperative. If cooperatives produce natural gas, the members are usually farmers, who have the raw material (manure, crop residues) for producing biogas.

In view of the bigger picture, Danish energy cooperatives still follow the principle that the profit has to stay in the community, for example in the case of wind energy cooperatives, a certain percentage has to be offered in the district of the created cooperative and only then can people from farther away be asked to become members. Considering that the payback time of an average cooperative is about 20 years in Denmark, it is important to find members, who are willing to wait long enough for the return on the investment.

The success of energy cooperatives in Denmark is based on the following:

- Widespread national support for the use of renewable energy through different tariffs and tax exemptions; in more general terms, public sector's interest for the existence of energy cooperatives.
- Long-established tradition for cooperative activities and thus people are accustomed to participating in collective projects such as energy cooperatives.
- Widespread and versatile support and information network, which introduces the ideas of energy cooperatives in the society and supports new energy cooperatives with different measures.

Common traits of these countries:

- no direct support for energy cooperatives on the national level, but producing renewable energy is supported and/or promoted,
- most of the cooperatives are focused on earning profits that stay in the area,
- existing umbrella organisations and other support networks,
- there is a long-established tradition of cooperative activities and thus people are used to participating in collective projects.

4 Results of pilot initiatives in Estonia

During the project, one of the ten energy cooperative initiatives managed to establish an energy cooperative, seven initiatives continue with performing the activities (they will hopefully establish an energy cooperative next year) and two initiatives gave up on the idea of an energy cooperative. **Results of the activities of the 10 communities that participated in the project are the following:**

1. **Sõpruse 202 or an apartment building with 162 apartments in Tallinn is a de facto energy cooperative.** A properly renovated apartment building, which uses heat pumps, and considered selling warm water to neighbouring buildings, but gave that idea up: a) when selling to neighbouring buildings, it is necessary to build a separate utility line, adjust the boiler room and install meters; b) district heating companies cannot buy heat without a public procurement (it is not reasonable to have a public procurement for such a small amount); c) connecting the heat pump system and the solar panel systems to be installed with the existing district heating network is not feasible with the current technical possibilities. In order to utilize solar energy, measurements have been taken since the summer of 2015 to install solar panels on the facade of the building, with the aim to cut the cost of the heat produced by the ground source heat pump through the heating and ventilation systems and to improve the building's energy efficiency.
2. **Target groups for a potential energy cooperative in Lauka Village and Kõrgessaare Small Town, Hiiu [41] Rural Municipality, are municipal buildings and apartment buildings.** When considering the overall involvement in the project, this initiative has the most professional management and the clearest vision. At the moment they are actively holding meetings to establish energy cooperatives (especially with apartment associations). At first, they are focusing on producing and distributing heat. It is planned to use wood chip or a pellet boilers. In the longer term, they are considering producing electricity with the energy cooperative.
3. **Pakri Science and Industrial Park established on the Pakri peninsula in 2007 is planning the establish an energy cooperative in 2016.** At the moment they are designing the first phase of the electricity network, pricing the

[41] The energy cooperatives of Hiiu and Kõpu Rural Municipalities were mentioned in the project of Urban Lab, the e-Governance Academy and Network of Estonian Non-profit Organisations "Open Government Partnership in local governments", which organised the competition of best practices of cooperation, and the cooperatives received the prize *"Cooperative action innovation"* http://www.ega.ee/news/six-best-estonian-cooperation-practices-announced-at-forum-of-communities-and-municipalities/

electricity and preparing for the installation of the first Goliath Capella 3.3 MW wind turbine (this includes a detailed plan of the Smart City and Smart Energy grid). The detailed plan of the PAKRI Science and Industrial Park has been through all the necessary processes, so that the detailed plan could be enforced by the City of Paldiski by the beginning of 2016 the latest. After that they can apply for a building permit to build the first wind turbine.

4. **In Saaremaa, Lääne-Saare Rural Municipality, Kärla Small Town, establishing an energy cooperative is one of the possibilities to replace the ageing central heating system.** The energy cooperative would be established by the local government, apartment associations of Kärla small town, local residents, companies and all other interested parties. The rural municipality is compiling a development plan of the heating economy for the next ten years, which includes the development of the Kärla district heating system. In communities, which have similar problems as Kärla, the most profitable solution is usually to renovate the district heating pipes and to produce heat from wood chips. It is reasonable to maintain the district heating network in the long-term, if the amount of heat exceeds 1 MWh per one metre of the district heating utility line. The corresponding number in the Kärla district heating network is 1.4 Mwh/m. The mentors are of the opinion that the first thing in Kärla should be the renovation of the apartment buildings, not installing the heating system. This would guarantee that the new boiler or heat pump would be dimensioned according to the post-renovation heat load.
5. **Small Footprint is an eco-community with a commercial association in Mõisamaa manor complex, in Märjamaa Rural Municipality and their objective is to manage real estate.** It is a functional community with 20 energy consumer (incl. companies), which is limited to one immovable property and has a functional mechanism for decision-making and management. At the moment, the residential buildings are heated by wood-burning ovens, and wood and oil-fired boilers. Heating audits were carried out and the energy consumption was measured. The community decided to install a 10 kW PV park (a total of 40 solar panels) on a field on the property and to distribute the electricity produced by the panels among the buildings on the property. A little more than half of the produced energy will be used by the community and the rest will be sold to the network. According to the wind maps, there is not enough wind at the working height of simple small wind turbines. Performing wind measurements in the future is not ruled out. The weakness of this well-functioning community is the insufficient formal (i.e. written) planning, which may jeopardize the optimal schedule of establishing an energy cooperative.
6. **Ruhnu is an island located about 70 km from mainland Estonia, with 60 permanent residents, who live there year-round, and the population multiplies in the summer months. This community decided not to establish an energy cooperative.** The island does not have an electrical connection with the mainland. The island depends on electricity produced by diesel generators, which have a high cost price and environmental risk. In order to save fuel, the island used a production solution which combined two Vestas wind turbines of 75 kW and a diesel generation that retained the frequency, but this was discontinued due to the faults of the wind turbines and automation. At the moment the rest of the electricity consumers in Estonia subsidise electricity consumption on Ruhnu, i.e. in reality the residents of Ruhnu consume electricity at a cheaper price than the actual cost price and the

alternative electricity solution will be more expensive for the locals. No off-grid electricity production and/or an energy cooperative based on energy savings is not cost-effective enough to promote this further on the island. The Environmental Board is planning to set up a nature conservation area on Ruhnu, which includes a big part of the forests on the island, limiting the use of biomass. As off-grid solutions are complicated, the community needs to think about the possibilities for energy storage and solutions for managing consumption. During a small wind turbine workshop in June, people built a wind turbine with nominal power 1.5 kW[42], which covers a few percent of the average annual consumption, but saves about 1 t of diesel fuel (the equivalent of switching off a few electric water heaters). The distinctive character of Ruhnu, like with many other islands, is that people live in the middle of the island, which means that most of the electricity is consumed in the middle of the island, which is surrounded by forests. However, a (small) wind turbine should be installed in an open space, usually on the coast. Ruhnu is hoping for a solution from the network operators, which would include the interested local community to achieve a better result. They continue to service the small wind turbine.

7. **Haljala Soojus AS supplies district heating to the Haljala Small Town in Lääne-Viru County and the company was hoping to lower the price of heating during the project in cooperation with the local forestry cooperative, but an energy cooperative will not be established.** The main idea behind the energy cooperative in Haljala would have been to combine the supply chain of fuel and the consumption chain of heat, enabling the final consumer to use heat with the cost price. There is no heat load for the production of electricity in the summer and therefore it is not reasonable to produce heat and electricity together. The financial analysis indicated that by producing wood chips by themselves, the community cannot offer the same price as the service providers, whose production volume is many times larger, and regarding technology, it is reasonable to use a service to produce and transport wood chips. Thus the cooperative would not have saved money for the consumers. The heating company, owned by the local government, has to carry out a public procurement to find the best offer for wood chips. This does not have to be a forestry association, as it was originally planned.
8. **OÜ Kõpu Energia was created in Kõpu Small Town in Viljandi County in order to mitigate the risks of energy supply (relatively frequent and long power outages) under the leadership of the local government and dairy farm, school, service companies and others.** Members of the cooperative included the farmers in the sparsely populated areas, so as to rent the roofs of their buildings for the energy cooperative. The community is still exploring, whether solar panels can be installed on the church roof and a single apartment association is being established for five apartment buildings. External consultant Lutz Ribbe suggested that the district heating of the manor and

[42] 20 people participated in the practical workshop organised at the Ruhnu historical naval rescue station. Introductory video of the workshop financed by the Enterprise Estonia Clusters Program, European Regional Development Fond, Estonian Development Fund, Tallinn Enterprise Department and members of the Estonian Wind Power Cluster and organised by the Estonian Wind Power Cluster and the Estonian Development Fund: https://www.youtube.com/watch?v=bQxiFPnyJjU

agricultural companies should be with biogas. In theory, it is possible to form an independent energy area of Kõpu by using local resources. In addition to that, it is recommended to measure wind in Kõpu. The measures of energy conservation in general are still under discussion in Kõpu.

9. **Vormsi island wants to develop a central heating system and a power system in the largest village (Hullo with 100 residents, total population of Vormsi is 417) and to apply the concept of distributed generation on the rest of the island. Members of the Vormsi community, local government and companies would constitute the energy cooperative.** A wood gas cogeneration plant is planned to be built in Hullo. In the first phase, the number of potential members of the energy cooperative in Hullo would be 20 households/companies. During the second phase, all households on the island can become members of the sparsely populated area energy cooperative. The Vormsi initiative has previous experience with solar panels thanks to the ones installed on the school building. The local community opposes the establishment a high-power wind farm, but they might agree with smaller wind turbines. In case of an off-grid wind turbine, it is practical to install a wind turbine when the average wind speed is at least 3.5 m/s and in case of a wind turbine connected with the network, the average wind speed should be at least 4.5 m/s. The predominant wind directions on Vormsi are south and southwest, which is why it would be recommended to install the wind turbines on the south and southwest coast. Vormsi plans to continue with the Smart Vormsi project[43] and an energy cooperative will potentially be established during the project.
10. **The aim of the non-profit association (MTÜ) Piiriäärne Energiaarendus operating in Setomaa[44] is to among other things guarantee the energy security of four rural municipalities in Southern Estonia. They are preparing for the establishment of an energy cooperative and for the building of the first phase of the power plant. The problem is that commercial associations cannot sell electricity.** 10 power plants have been built or are under construction with the direct or indirect involvement of the association. The power plants belong to local governments, companies and private persons. The total electric power of the plants already connected and waiting to be connected to the network is 90+ kW, which constitutes 1% of the yearly electricity consumption of the area with 3700 residents. The objective of the regional development plan is that 10% of electricity (= 1 MW of the power of the installed solar panels) is produced off-grid by 2020. The biggest contribution should come from the cooperative energy production. The energy cooperative is formed by the consumers of the area: members of the community, local governments, companies and others. At the moment the plan is to create an energy cooperative that would connect people who have experience with energy cooperatives and/or renewable energy, but do not necessarily live in Setomaa. This would be a commercial enterprise in the form of a commercial association.

[43] **www.vormsi.ee/en/**
[44] http://www.setomaa.ee/en

5 SWOT

Macro-economic strengths, weaknesses, opportunities and threats of the community energy and heat cooperatives can be described with a SWOT analysis. The SWOT analysis shows that the preconditions for establishing energy cooperatives are also the strengths and opportunities of the energy cooperatives. Energy efficiency can be achieved in facilities management with the comprehensive renovation of the buildings and creation of new energy solutions. The SWOT analysis indicates that the legislation needs to be adjusted in order to create and successfully operate cooperatives. Another weakness is that the residents do not have the capability to invest in renovations and to create energy solutions. The state needs to support the creation and financing of the creation of preconditions for energy cooperatives. The most significant threat is the uncontrollable decline of consumption caused by the migration, which leads to making wrong investment decisions.

STRENGTHS:	**WEAKNESSES:**
• The reconstruction of buildings and modernisation of energy devices increases tax revenue, stimulates economy and GDP growth; the microclimate and living environment in buildings will improve and healthcare expenses will decrease as a result of that. • Energy costs for the members of cooperatives will decrease • The need for additional work force will arise • The use of renewable energy sources will increase • The security of energy supply and the quality of energy in low density areas will improve • The capacity of the electricity distribution network will improve	• The sustainable solution for an energy cooperative may be more expensive than the current energy solution • Residents do not have the capacity to invest in renovations and creation of energy solutions. Cooperatives may depend on the current scheme of renewable energy grants, which may be subject to change • Cooperative actions for starting cooperative energy production are not common in rural areas, cooperation between communities is weak • Existing heating solutions are fragmented
OPPORTUNITIES:	**THREATS:**
• People's awareness in the fields of energetics, renewable energy and energy efficiency, will increase • Combining communities will bring about new potential initiatives for joint business activities • Increase in general business activities • Hindering the depopulation of remote areas • Increase in the value of real estate in cities • The regeneration of unsustainable network areas of district heating of rural settlements or keeping them	• The new energy solution is implemented without renovating the buildings • Legislation deficiencies may hinder efficient solutions • Investments made based on erroneous grounds • People may continue to leave rural settlements, i.e. the use and establishment of cooperative solutions decreases

operational on the basis of communal energy production	

6 Recommendations

Based on experience in BASREC countries and the project activities recommendations for the other BASREC countries are the following.

6.1 Recommendations to define energy cooperatives

The concept and treatment of energy cooperatives should be elaborated in legal requirements, i.e. is an energy cooperative:

- commercial or non-profit,
- associated with a geographical region or not,
- with or without operational restrictions (for example the requirement for a higher share capital may be disproportionally high for an energy cooperative; enabling the participation of the local government),
- corresponding to an existing form of association or should a new form be created for energy cooperatives,
- professional company operating in the field of energy or which features are used to distinguish communal energy production, consumption and sale.

In order to deliver energy, energy cooperatives would have to act as network operators. Communal energy production and sale to other consumers is not possible in Estonia at the moment. The entire territory of Estonia has been divided into service areas among distribution network operators. These areas cannot overlap and only the distribution network operator, who has a license to operate in that area, can set up a network or power lines and provide network services. The current legal act does not provide for the creation of new distribution network operators. The regulation of the competition establishing the production capacity of electricity is not in accordance with the participation of energy cooperative initiatives. In order for cooperatives to be able to produce and sell heat, the connecting of a heat producer with the district heating network has to be regulated. Current Estonian law does not regulate the circumstances whether and how a heat network operator has to guarantee connecting a producer to the network. The obligation to coordinate price can impose a huge administrative burden on energy cooperatives, which may not be feasible. Fulfilling the obligation would also increase the administrative burden of the Estonian Competition Authority. The production of gas and providing network services to the producer is under-regulated. All the obligations of a network operator may be disproportionally cumbersome for an energy cooperative. Imposing all these requirements on energy cooperatives also means a significantly greater administrative burden on the Estonian Competition Authority. In establishing energy cooperatives, the fragmentation of the license proceedings would increase the administrative burden, because the Estonian Competition Authority, who issues licenses in the field of energy, does not have the competence to issue for example building permits and environment permits.

6.2 Recommendations for preparation the project and involvement the community

The community involvement experience regards the project initiatives showed that it is practical to start with small joint projects and then to broaden the circle of leaders (it is difficult to lead an initiative alone). Written documents about involvement (incl. an involvement plan) have to be prepared early and information should be made available to all parties by door-to-door visits and in written form. Community involvement can be summarised as follows:

- The circumstances in Estonia do not favour cooperation and involvement, knowledge about this is scarce and good examples rare.
- Pooling resources used to establish cooperatives depends on the management team. Thus, if there is only person in a management team, it is not as successful as for example a team based on the local government, where establishing the cooperative is a task for the whole local government. Involving external experts and participating in Estonian and international programmes will increase the resources of the process and will significantly impact the establishment of the energy cooperative in a positive way.
- Finding and focusing members of the cooperative depends on the previous organisation of the community. Establishing an energy cooperative based on apartment associations or other associations is significantly easier than coordinating unorganised people.
- Organisations operating in the area are rarely included into the process of establishing an energy cooperative and the existing resource is frequently left unused. Relations with commercial undertakings have to be handled differently, as they see an energy cooperative more as competition.
- Although manuals about establishing energy cooperatives and community involvement are available, it is important to continue supporting the establishment of energy cooperatives. It is recommended to create an organisation, which would support and advise energy cooperatives, lobby for the change in legislation and facilitate cooperation both between energy cooperatives and with other organisations.

Based on the experience of the project initiatives, the best **legal business structure of energy cooperatives** in the current Estonian judicial area is a private limited company. The operation of the cooperative is not ensured in case of a private limited company, which is why it should be clarified when establishing an energy cooperative as a private limited company, how the essence and involvement of all parties will be guaranteed.

The selection of technologies for the project initiatives mostly included technologies that use solar energy and biomass. The possibilities of energy saving, energy management and automation should be taken into account when planning the solutions.

Financial calculations indicated that the payback time of many initial energy solutions of many initiatives was not short enough. The first reasonable step in establishing an energy cooperative would be to use the calculator on the web page of

the energy cooperatives [45], then the community itself should do the financial calculations and consult with experts. Regarding community involvement, the financial analysis and business plan have to be in writing, so they could be shared with the possible members of the community. The economic effect (of the cooperation of parties) of the activities of energy cooperatives will be evident through synergy (economic effect, which is achieved with the interaction of several parties and which will grow bigger than the added resources) and economies of scale (increase in efficiency based on volume growth, which can be seen in either the depreciation of inputs or the improvement of efficiency of the production process). One or both of these factors are necessary, so that the operation of the energy cooperative would be financially reasonable.

Energy cooperatives mostly come about in communities (village, urban region, eco- and other communities), **where a joint energy supply can be utilised** in the following buildings:

- Apartment buildings
- Non-residential buildings managed by local governments and others (health institutions, educational, sports, and other buildings), which are not in the district heating area or are in the district heating network areas with a low consumption density.

According to the external mentors, a decision should be made on the political level to promote the establishment of energy cooperatives, eliminating both legal and financial barriers. The interest groups can continue their activities independently, but it would certainly help if a decision from the upper level would ensure that establishing energy cooperatives is important for Estonia.

Recommendations for other BASREC states based on the results of the energy cooperative initiatives:

- Perform a thorough analysis of the legislation, which would define the participation opportunities of different parties and their functions.
- Provide example solutions of different possibilities of producing and distributing energy for typical consumer groups.
- Draw up a sample business plan for energy cooperatives to use for making the first choices.
- Create a cooperation network for energy consultants and energy cooperatives.
- Involve the local governments in the preparation of energy cooperatives.

6.3 Recommendations for promoting the investments in energy facilities

The selection and acquisition of energy facilities for communal production of electricity and heat are promoted by the following:

- **developing financial measures, if necessary,** to start up energy cooperatives (public and private sector measures for boosting investments and project

[45] http://energiayhistud.ee/en/toolbox/calculator/

management), developing crowd-funding platforms, loan and guarantee measures in cooperation with banks;

- **creating support networks (including advisors, energy efficiency experts)** in order to form apartment associations and energy cooperatives, including sharing practices and experiences about energy technologies, for example with the participation of companies that produce and sell energy;
- **implementing the first pilot projects** to establish an example of a functional energy cooperative;
- **maintaining and developing the energy competence of the officials of local governments,** because the local government plays an essential role both in optimising the energy supply of the buildings it manages and also in developing the entire heating economy of the local government;
- **offering constantly updated information (managing cooperatives, selection of appropriate technology, cost etc.)** (e.g. through the local government) to building managers, through the website of a professional organisation, by developing appropriate training programs for energy efficiency experts, energy consultants, engineers etc., and by supporting their continuing training;
- **systematic monitoring of the support for the renovation of buildings in order to increase their energy efficiency** and improving the support measures according to the results of the monitoring, e.g. to develop microclimate solutions suitable for the building in cooperation with research institutions, intermediate bodies and energy companies;
- setting up, maintaining and making available a **database of new energy technologies and their prices** that are appropriate for buildings with the potential of communal energy production, which also **includes the contact information of the providers of the technology and energy services (incl. advisors and experts on energy efficiency)**;
- if possible, **sponsoring the installation of solar panels for self-consumption** when drawing up and realising the support measures for the energy efficiency of buildings for local production;
- **developing a systematic training and/or mentor program** to realise the potential of communal energy production for apartment associations, community associations, local government organisations, associated producers' cooperatives etc.;
- **to monitor the initiatives' process of establishing energy cooperatives**, the achievements and barriers in implementing new energy technologies and the accompanying socio-economic impacts;
- **if necessary, develop measures for promoting the establishment of energy cooperatives on the state and/or local level,** for example based on the demographic, social, legal, financial, technological and other aspects that influence the establishment of energy cooperatives with the example of typical densely populated areas[46].

6.4 Recommended steps for establishing an energy cooperative

[46] Taking into account the existing typologies, for example the Rural Development Report 2011 by the Institute of Economics and Social Sciences of the Estonian University of Life Sciences. www.riigikogu.ee/download/6be2bb89-5365-6982-6be2-1b39d3f089fc

Based on the experience of the initiatives that participated in the project and the performed analysis, **the steps for planning small-scale production of electricity and heat as a community cooperation,** are the following:

1. **PRESENTING A PROBLEM**: description of the problem by the initiators of the community (for example the necessity and scope of renovating the buildings and modernising the energy facilities)
2. **FORMING A SPEARHEAD GROUP**: engaging members of the community, who are interested in helping to solve the problem
3. **DESCRIBING THE BASELINE SITUATION**: the need for renovating buildings, energy consumption and requirements, cost and price of electricity, condition of the technology etc.
4. **DESCRIBING THE POSSIBILITIES**: describing the technological possibilities with the help of a toolbox (calculator for technologies)
5. **INITIAL SELECTION OF TECHNOLOGY**: initial comparison of the possible solutions, incl. cost
6. **INVOLVEMENT**: explaining the problems and possibilities for the potential members of the energy cooperative, drawing up the engagement plan
7. **FINDING MEMBERS**: finding potential members for the energy cooperative
8. **DECIDING ON THE SOLUTION FOR THE PROBLEM**: performing the technical, legal and financial analysis, ordering an energy audit and involving experts
9. **APPROVING THE SOLUTION**: by the members of the energy cooperative, including agreeing on the membership fees or shares
10. **MEMORANDUM OF ASSOCIATION OF THE COOPERATIVE**: drawing up the documentation necessary for the regulation of the relationships between shareholders
11. **DECISION TO REGISTER THE ENERGY COOPERATION**: decision of the general meeting to establish an energy cooperation
12. **REGISTERING THE ENERGY COOPERATIVE IN THE COMMERCIAL REGISTER**: drawing up the appropriate documentation and processing it in the Commercial Register
13. **PROCUREMENT**: if necessary for the renovation of buildings, buying, installing and servicing energy facilities etc.

The experience of Estonia is supported by the previously developed guidelines for establishing energy cooperatives and the better organisation of the operation, which is based on the European Union experience in energy cooperatives, see REScoop Action Guide **http://rescoop.eu/sites/default/files/project-resources/action_guide_deliverable_3.3.pdf**