

Project ID: 96751

“Integrating energy sufficiency into modelling of sustainable energy scenarios”

Template guidelines (please leave these guidelines on the title page of the submitted proposal)

- The project description must be in English. All monetary amounts must be in NOK.
- All sections must be completed, and their headers may not be edited, reordered or reformatted.
- The content of the project description (sections 1 to 7, not including this title page) may not exceed 11 pages including all tables and references. Links within in the project description will not be included in the assessment.
- The page format must be A4 with 2 cm margins, body text must be 11-point Times New Roman with single line space. 9-point Times New Roman with for references, figures or figure captions.
- All explanatory text [marked with square brackets] in the template should be deleted before submitting. Please leave the text in this box.

1. Background, state-of-the-art and objectives

1.1 Background and state-of-the-art

In order to ensure adequate action in relation to the objectives in the Paris Agreement, the Nordic and Baltic countries have to define clear 2050 decarbonisation and energy transition strategies. Today, sustainable energy scenarios often built upon a supply-side with increasing amounts of renewable energy, and a demand-side building upon increasing efficiency in cars, buildings etc. However, the demand side is often developed through technical analyses of energy efficiency and not on analyses of the dynamics of social needs and the potentials and limitations to reduce or change the drivers of energy demand such as mobility demand, the demand for housing space, the need for comfort, etc. This technical approach to energy demand includes the recent report with energy technology scenarios for the Baltic countries (Lindroos et al 2018).

There is a growing understanding that progress within renewable energy and energy efficiency alone may not be enough to curb energy demand in line with the 1,5°C climate goal. Changes in social practices and societal organisation can also contribute and can be addressed as a sufficiency element in energy scenarios, where sufficiency is defined as ‘rethinking and redesigning individual and collective practices to favour activities and services that are intrinsically low on energy use’ (Toulouse et al 2017).

Many sustainable energy initiatives have been carried out in households and communities in many countries the recent years and have shown both potentials and limitations for reductions on the demand side, including reductions in drivers of energy demand. The social science research about the shaping and impact of these initiatives is growing. The EU H2020 project ENERGISE has as a kind of meta-study systematised and analysed more than 1000 energy initiatives, which involve households and communities and their social practices in different European countries (Fahy et al, 2019). The ENERGISE project shows a big potential for further development of the demand side in sustainable energy scenarios by integrating knowledge from such analyses as a sufficiency element in energy modelling tools and then using these improved energy modelling tools to improve existing national sustainable energy scenarios by including sufficiency aspects.

As scenarios are frequently applied tools to support decision-makers within public agencies, NGOs and businesses, capacity building within the development and use of energy scenarios can influence the ambition and coherence of the considered transition strategies. It is therefore important to develop the quality of energy scenarios, and the capacity to build and apply the scenarios in policy discussions and development. In order to raise the level of ambition and relevance of energy scenarios, possibilities and barriers from sustainable practice experiments, like those studied in the ENERGISE project, should be included to allow development of ambitious, but also realistic, strategies for mitigating climate change.

When combined with energy efficiency and renewable development policies, sufficiency can be a key to reach long-term climate goals. However, plans for carbon neutrality in national long-term plans are in some cases challenged by an increase in the drivers of energy demands (volume of personal transport, size of housing etc.). This has even lead to increased energy consumption and GHG emissions despite the implementation of energy efficiency measures.¹ Such experiences show both the need for addressing sufficiency, but also the challenges to the development of this aspect of sustainable energy policies.

According to analyses based on the French project Negawatt project (Negawatt 2018, Toulouse et al 2017), there are two main reasons why sufficiency rarely is considered in national energy strategies:

- Politically, sufficiency faces acceptability issues linked to resistance towards degrowth and perceived constraints to daily life.

¹ CO2 emissions from energy use increased in Denmark 2015-2016 after a reduction 2008-2015. The increase cannot be explained by natural variations in renewable energy production as some of the increases were in transport emissions and industry and agriculture. See energy statistics from www.ens.dk, Downloadable spreadsheet “figurer2017 - figures2017.xlsx

- Technically, modelling can fail to apprehend changes in social practices and the interaction with the role of technological elements because the impact chains («theories of change») are poorly understood.

1.2 Overall project objectives

In order to contribute to the development of more advanced strategies for systemic, sustainable transition of energy production and use, a group of Nordic and Baltic research institutions and civil society organisations will in this project develop new, improved national 2050 energy and climate scenarios based on the feasibility of reaching a net-zero emission and 100% renewable energy system by 2050. The scenarios will build upon existing national sustainable energy scenarios and will as a new element integrate experiences from recent national sustainable energy practice initiatives within buildings (for housing, service sectors, etc.), household products, and mobility by applying as one of the sources, the experiences from the ENERGISE project. Furthermore, the project will explore the possibilities and public acceptance of a sufficiency approach in reaching these 2050 targets.

The project objectives are:

1. Integrate sufficiency aspects into energy modelling tools that have been applied for development of sustainable energy scenarios
2. Develop modified Danish, Latvian and Lithuanian national sustainable energy scenarios, which build upon the combination of sufficiency, efficiency and renewable energy
3. Create national policy dialogues among public and private actors in the Nordic and Baltic countries about energy scenarios that include demand changes from a sufficiency perspective and discuss the feasibility of these scenarios and the possibilities and limitations for socio-economic and regulatory changes to move towards these scenarios
4. Disseminate the methodology for integration of sufficiency into energy modelling tools and scenarios and the experiences with developing and applying to Nordic and Baltic stakeholders and to scientific journals

2. Relevance to the call

The aim of the Baltic-Nordic Energy Research Programme is to promote energy research and analysis in the Baltic States and to inspire intra-Baltic and Baltic-Nordic collaboration. This proposal is research into energy system analysis and energy scenarios and is thus well within the aim of the programme.

The aim for this call is to strengthen the common Baltic-Nordic knowledge on future challenges and developments. The project has partners from one Nordic and two Baltic countries (Denmark, Latvia and Lithuania) and observers from three more Nordic countries and one Baltic country (Estonia, Finland, Norway and Sweden). Dissemination activities are planned towards all Baltic and Nordic countries. The project deals with the challenge of transition of countries to greenhouse gas neutrality, which is indeed a future challenge. Thus, the project fulfils the aim of the call.

The thematic scope of the call is focused on decarbonisation of the transport sector, energy efficiency in buildings and industry, and energy system analysis. The project will analyse the effectiveness of sustainable energy consumption initiatives from an energy sufficiency perspective and will contribute to progress within energy system analysis by integrating knowledge from analyses of such initiatives into energy system modelling tools. Focus will mainly be on energy consumption for electricity and heating in buildings and for mobility. National policy dialogues in the project based on adjusted national sustainable energy scenarios for Denmark, Latvia and Lithuania that include energy sufficiency will develop the relevance of the adjusted energy modelling tools. Thus, the project covers three of the thematic areas in the call - buildings, mobility and energy system analysis.

The scope of the call covers technical/natural sciences and social science-based research on energy. The project covers social science based research on possibilities and challenges for influencing drivers for energy

demand as well as inclusion of the results in energy modelling based on technical/natural science. Thus, the project is within the research scope of the call.

Projects are supposed to address research questions from a Baltic-Nordic perspective, and focus on regional perspectives or solve questions that will result in added Baltic-Nordic knowledge. The research questions of the project are focused on one Nordic country (Denmark) and two Baltic countries (Latvia and Lithuania). Through the observers in the consortium, Estonia, Finland, Norway and Sweden are involved in the project. At a competence workshop at the end of the project NGOs and energy modellers from Estonia, Finland, Iceland, Norway and Sweden will be invited. All in all, the project has a broad Baltic and Nordic participation and dissemination and contributes to both intra-Baltic and Baltic-Nordic collaboration and knowledge development. Thus, the project fulfils the aims of the call.

3. Research questions, analytical and practical approach

The following describes the research questions of the project and the analytical and practical approaches connected with each of the research questions.

Considering the general question of how Nordic and Baltic countries can realise fast reductions of greenhouse gases until 2030 and greenhouse gas neutrality in 2050, the research questions of the project are:

- A. *What can influence the preferences for increased quantitative consumption compared with qualitative improvements in consumption?* Increased quantitative consumption will be understood as bigger houses, more and bigger cars, longer travels, etc. Qualitative improvements in consumption will be understood as more sustainable practices including better quality houses with lower energy demand and better indoor climate, more healthy transport with bicycles, electric cars, and higher quality public transport, etc.). The ENERGISe project will be an important empirical source.
- B. *How can sufficiency, understood as changes in consumer preferences, be integrated in energy modelling tools?* This will be analysed by using the EnergyPlan and MESSAGE models as the primary cases.
- C. *How much can energy sufficiency with changes of citizen preferences contribute to reduction of greenhouse gas emissions in 2030 and 2050?* This question will be answered by using the EnergyPlan and MESSAGE modelling tools for the development of modified national energy sustainable energy scenarios, which include energy sufficiency aspects. The national results will be compared to show the differences among countries with different socio-economic conditions and different energy systems. The use of two different modelling tools will show model-related influence on the results. The cases are Denmark, Latvia, and Lithuania.
- D. *How can policies influence preferences for qualitative improvements versus quantitative increases?* Policies could e.g. include taxation, subsidies, and other economic policies, consumer information, urban planning and transport policies. This will be evaluated in two Baltic countries (Lithuania, Latvia) and one Nordic country (Denmark) based on systematization from recent research about sustainable social practices combined with policy dialogues among public and private actors within each of the four countries.

The project introduces new elements in energy scenario modelling in terms of integration of sufficiency elements in the modelling of energy demands in energy modelling tools. The project will be inspired by the sufficiency modelling methodology developed by the French Negawatt Group (<https://negawatt.org/en>), which will be combined with the results of Nordic and Baltic research in consumer demand development and consumer preferences, including the results from the comprehensive EU H2020 ENERGISe project, which analysed more than 1000 European sustainable energy consumption initiatives (Fahy et al 2019). The result will be comprehensive methodologies for modelling the effects of sufficiency in energy scenarios in different societal conditions (Nordic and Baltic, and variations between these countries).

The primary cases in the project are Denmark, Latvia and Lithuania. For these countries the entire energy system (all industrial sectors) will be analysed. As regards to the GHG emissions, the scope of the project is

to cover so-called Scope 1 (direct GHG emissions) and Scope 2 (indirect GHG emissions from heat and power) emissions. Scope 3 or embedded emissions will not be included in the modelling.

For the final project workshop, an energy-NGO representative and an energy modeller from a university or a research institute will be invited from Estonia, Finland, Iceland, Norway and Sweden in order to develop sufficiency energy modelling competence in other Nordic and Baltic countries.

4. Research strategy

This project will develop and test an innovative methodology that enables the construction of national sustainable energy scenarios, which include recent experiences with sustainable practices, based on a methodology initially developed in France by négaWatt that has been refined and applied for more than fifteen years in France and has resulted in the construction of ambitious and comprehensive visions in the country for sustainable energy transition.

4.1 Research strategy and methods

The research strategy is based on the following methods:

- I. **Systematic analysis of experiences from sustainable energy experiments and initiatives**, based on research reports and scientific articles, combined with - where necessary - so-called “grey literature” (newspaper articles, student reports etc.)
 - A. Development of a typology for sustainable energy consumption initiatives based on their problem framing inspired by the EU H2020 project ENERGISE, including the categories technology change, individual behaviour change, change in everyday social practice, and interaction between supply and demand
 - B. Systematization of sustainable energy initiatives from Denmark, Latvia and Lithuania that were not included in the ENERGISE analyses
 - C. Development of a typology of interactions between sustainable energy consumption initiatives and socio-economic and regulatory context, including the role of rebound effect, energy poverty and public regulation. This includes microdata analysis to see how much room for sufficiency different societal groups in the different countries have
- II. **Further development of two energy modelling tools** (EnergyPlan and MESSAGE) with including aspects of energy sufficiency into the use of the tools
 - A. Development of methods for integration of these aspects of energy sufficiency: housing (electricity and heating) and mobility into energy scenario modelling with existing tools (EnergyPlan, MESSAGE)
 - B. Development of a common methodological framework to ensure the coherence of the modelling work in the case countries
- III. **Development of revised national sustainable energy scenarios** (Denmark, Latvia and Lithuania) which integrates sufficiency aspects combined with a focus on energy efficiency and renewable energy
 - A. Compare the national scenarios, including comparing the theory of change the limitations and opportunities of the present energy system, regulatory context at different levels, etc.
- IV. **National policy dialogues** in Denmark, Latvia and Lithuania about the feasibility of different sufficiency strategies and the governance strategies that can support transition processes towards these sufficiency scenarios
 - A. National policy dialogues organised as workshops with NGOs, utilities, policy makers, energy modellers, social practice researchers (one workshop in each of the case countries Denmark, Latvia and Lithuania)

V. **Development of Nordic-Baltic competence for integration of sufficiency into sustainable energy modelling**

- A. At the end of the project, a Nordic-Baltic workshop is organised, where an energy-NGO representative and an energy modeller from a university or a research institute from Estonia, Finland, Iceland, Norway and Sweden are invited for competence development based on the methodologies developed in the project
- B. At the workshop the participants will work with the developed project methods for a) characterising energy sufficiency, b) integration into energy modelling tools and c) organising policy dialogues about sufficiency based on sustainable energy scenarios. The NGO representatives and the modellers will work with data from their national sustainable energy experiments and consider how to integrate them into an existing national sustainable energy scenario and the energy modelling tool they normally use.

4.3 Use of data

The following data will be applied in the project:

- Primary and secondary data from analyses of development and socio-economic and environmental impacts of sustainable energy practices, including data from the EU H2020 project ENERGISE
- Existing scenarios for the participating countries: EnergyPlan scenarios by AAU for Denmark and MESSAGE scenarios for Lithuania and Latvia
- Trends from energy statistics from the three partner countries
- Hourly variations in demand and in solar power, windpower, and hydro-power production from open source information on the Nordic-Baltic electricity market, from at least three selected years within the last decade. The three years will be selected to be representative of respectively average, high-renewable and low renewable years.
- Micro datasets of household budget surveys and survey on income and living conditions

5. Project organisation and progress plan

5.1 Project organisation

The project runs from 1 January 2020 until 31 October 2021.

The project is organised in a cross-national project group and with a cross-national project coordination group with one from each partner institution: Michael Søgaaard Jørgensen (AAU) (project manager), Janis Brizga (Green Liberty), Vidas Lekavičius (Lithuanian Energy Institute) and Gunnar Boye Olesen (INFORSE Europe).

Furthermore, a project panel is organised where also the observers in the consortium are members.

5.2 Project implementation

The project will be organised in the following six work packages:

Work package 1: Project coordination and management

Work package 2: Systematisation of experiences with energy sufficiency initiatives

Work package 3: Integration of sufficiency into energy modelling tools

Work package 4: Development of adjusted national sustainable energy scenarios

Work package 5: National policy dialogues

Work package 6: Dissemination to other Nordic and Baltic countries

Table A. Progress Plan

Milestone	Year	Quarter
Work package 1: Project coordination meetings every month (on line). Meetings with project panel with project observers every second month (on line)	2020-21	1-4, 1-3
Work package 2: Report about sustainable energy consumption initiatives + brief	2020	1
Work package 3: Report about integration of sufficiency in energy modelling tools + brief	2020	2
Work package 4: Report with adjusted national sustainable energy scenarios including sufficiency for Denmark, Latvia and Lithuania + brief	2020	4
Work package 5: Report from national policy dialogues (Denmark, Latvia, Lithuania) + brief	2021	1
Work package 6: Report from competence workshop with Baltic and Nordic NGOs and energy modellers + brief	2021	2
Work package 6: Final project report. Articles to newsletters and journals	2021	3

5.3 Expertise, partners, infrastructure and other resources from the applicant organisations

Partners in the project consortium:

Denmark: Department of Planning, AAU and INFORSE-Europe, International Network for Sustainable Energy

Lithuania: Lithuanian Energy Institute (LEI)

Latvia: Green Liberty

Observers in the project consortium:

Estonia: Stockholm Environment Institute - Tallinn office: Contribute with national knowledge about sustainable energy consumption

Finland: Finnish Nature Conservation Society: Contribute with national knowledge about sustainable energy consumption

Norway: Naturvernforbundet: Contribute with national knowledge about sustainable energy consumption

Sweden: Air Clim: Contribute with national knowledge about sustainable energy consumption

France: Negawatt: Contributes with knowledge about energy sufficiency modelling and policy dialogues

Nordic energy modellers from AAU's H2020 project SEENERGIES (seeenergies.eu) will be invited as observers during the project..

Expertise from earlier projects, relations to stakeholders, access to modelling tools etc.

Department of Planning, Aalborg University (AAU)

AAU has long term experience with organizing and analysing co-creation processes within different societal areas such as energy transition, housing, mobility, and food production and consumption. AAU is part of international networks within Science and Technology Studies, sustainable transition, social innovation, urban development, energy system modelling, local energy initiatives, co-creation, citizen science and community-based research. AAU brings to the consortium expertise and relations to different public and private stakeholders from a number of international and national projects about energy transition and about sustainable practices, including:

- ENERGISE - European Network for Research, Good Practice and Innovation for Sustainable Energy approach (H2020) (2016-2019), where AAU was responsible for the empirical analyses
- Energy Forum South Harbour: Research project with the Copenhagen Municipality on local energy saving and flexibility initiatives supporting energy transition (Danish Energy Agency 2017-2018)
- TRANSIT: Transformative Social Innovation Theory (FP7) (2014-2017)
- Wind2050: Multidisciplinary study on local acceptance and development of wind power projects (Danish Strategic Research Council) (2014-2017)
- Smart Energy Regions: large scale implementation of low carbon technologies in the built environment (COST Action TU1104)(2012 – 2016)

AAU has access to the EnergyPlan tool, which has been developed by AAU, and is one of the modelling tools that will be applied and further developed in the project. The participating researchers are: Michael Søgård Jørgensen (governance of energy transition), Inge Røpke and Charlotte Louise Jensen (sustainable energy consumption initiatives) and Brian Vad Mathiesen (sustainable energy modelling).

Green Liberty

Green Liberty is involved in advocacy work with national decision makers about climate and energy policy and follows European and international policy development. Green Liberty is a member of the Climate Action Network (CAN) and CEE Bankwatch Network. Green Liberty promotes a climate-friendly lifestyle and works on climate education and research (carbon footprinting). Green Liberty has with University of Latvia published “Climate and sustainable development“. Green Liberty (Janis Brizga) is on the ENERGISE project expert panel and has cooperated with INFORSE-Europe for several years. Some recent projects are:

- “Accelerating the Energy Transformation of Central and Eastern Europe and Learning from the German Experience” (2017-2020) is funded by the European Climate Initiative (EUKI). Project aims at climate cooperation within the European Union in order to mitigate greenhouse gas emissions.
- “Climate Change Education for All” (2015-2017) (EEA Grants): Development of training programs and materials, and training on climate change for local government representatives and educators.
- "Campaign for the Development of Low Carbon Municipalities" (2014). The aim was to involve local authorities in assessing the climate load and integrate the climate aspect into formation of policies, strengthen their climate capacity and develop a method for calculation of carbon footprints

Green Liberty (www.zalabriviba.lv/energija/; www.zalabriviba.lv/klimats-un-energija/) will contribute to the project with:

- Experiences from projects on climate and energy as well as demand side management or sufficiency;
- Experience in organizing stakeholder dialogue on environmental and energy policy issues;
- Knowledge on policy assessments and data collection
- Knowledge and experiences of Janis Brizga who is involved in the SCORAI network of researchers working on sustainable consumption and production and have published numerous peer reviewed publications on carbon footprint, sustainable consumption and environmental governance.

Lithuanian Energy Institute (LEI)

LEI contributes to the project with its data, research tools (the main tool will be MESSAGE model; microsimulation might also be applied for better understanding about energy sufficiency in households), expertise on comprehensive energy planning methodologies (energy system, input-output, computable general equilibrium, and microsimulation models) as well as experiences from recent projects:

- Horizon 2020 project REEEM (Case study on energy security in Baltic countries and Finland using MESSAGE model; energy poverty and distributional impacts of energy transition)
- Horizon 2020 project BRILLIANT (MESSAGE model for Baltic countries and Poland; training on energy system modelling using MESSAGE model for the researchers from Latvia, Estonia, and Poland; input-output analysis of the macroeconomic impact of nuclear power programs)
- BENTE project (Baltic Energy Technology Scenarios 2018)
- Preparation of Lithuanian National Energy Strategy (developing energy development scenarios with MESSAGE; evaluation of social and macroeconomic impacts using a computable general equilibrium model; probabilistic energy security analysis; strategy drafting)

INFORSE-Europe

INFORSE-Europe has experience with energy modelling with its members in 10 countries in Europe, using EnergyPlan and other modelling tools. This includes development of scenarios for Lithuania, Latvia, and Denmark, including development of drivers for energy demand. INFORSE-Europe has developed the Low-carbon Societies Network of researchers, civil society and others interested in sustainable energy models and strategies, (<http://lowcarbon.inforse.org>) INFORSE-Europe has a global network of members and contacts from civil society, including Nordic and Baltic countries. INFORSE-Europe contributes with:

- Experiences from network members in many European countries, and in particular in Denmark, Lithuania and Latvia on sustainable practices and proposals for promoting them with policies.
- Knowledge on Scenarios from many European countries from the Lowcarbon Societies Network and the ENCI-LowCarb Project, see <http://lowcarbon.inforse.org/index.php?id=29>
- Knowledge and experiences on data collection and modelling of national models with EnergyPlan

5.4 Gender balance

Two of the researchers, who participate in the project from Aalborg University are women - professor Inge Røpke and assistant professor Charlotte Louise Jensen.

6. Dissemination plan

The project will **involve** stakeholders from civil society and the scientific community **during** the project in the following ways:

- Throughout the project: Energy NGOs and energy modellers are observers in the project and will be informed and contribute to the project through online meetings every second month
- Work package 3: National policy dialogues in Denmark, Latvia and Lithuania
- Work package 5: Competence workshop about energy sufficiency for an energy-NGO representative and an energy modeller from Estonia, Finland, Iceland, Norway and Sweden

There will be the following **dissemination and communication** during the project to external actors:

- The five project reports will have NGOs, energy modellers and public agencies as target groups and will be written in English
- Five report briefs: Each project report is summarised in a report brief in English targeting civil society, utilities and public agencies
- National articles: After each report a national article is written in Denmark, Latvia and Lithuania targeting civil society, utilities and public agencies
- International newsletters: Short articles will be written for international newsletters (e.g. Nordic newsletters and INFORSE Europe)
- Scientific community: Papers will be submitted for international conferences autumn 2020 and 2021, including the 11th International Sustainable Transition conference 2020 and the 15th Conference on Sustainable Development of Energy, Water and Environment Systems (SDEWES) 2020
- Scientific community: Articles will be submitted for the following scientific journals: Energy, Energy Research and Social Science, and Journal of Cleaner Production

Table B. Dissemination activities

	2020	2021	Total
Peer reviewed articles, books, book chapters etc. published with or submitted to academic publishers	1 peer reviewed article submitted	3 peer reviewed articles submitted	4 peer reviewed articles submitted
Non-peer reviewed publications (reports, briefs, books, articles targeting policy-makers, industry or other end users)	2 reports 2 briefs 4 national articles 2 international articles	3 reports 3 briefs 6 national articles 3 international articles	5 reports 5 briefs 10 national articles 5 international articles
Presentations given by project participants (including participation in panel debates)	6	6	12

7. References

Fahy, F, Goggins, G., Jensen, C. L. (eds) (2019). Energy Demand Challenges in Europe: Implications for policy, planning and practice, Palgrave

INFORSE Scenarios, <http://inforse.org/europe/Vision2050.htm>

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Negawatt (2018). Energy sufficiency Towards a more sustainable and fair society Available at https://negawatt.org/IMG/pdf/181029_energy-sufficiency_negawatt-scenario_eng.pdf

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