



RESEARCH AREA 3

FUTURE ENERGY MARKETS



WHAT IS THIS RESEARCH AREA ABOUT?

Reorganizing the energy sector is one of the cornerstones of the transition to a low-carbon society, driven by the Paris Agreement and EU's climate programme. We focus on the development, design and implementation of the future energy market in Norway and in Europe.

Our researchers will assess future European market design and integration of markets for energy and flexibility, with particular emphasis on decentralized markets that focus on consumers. We will also contribute to evaluating Norwegian interests, where our low-emission energy resources can be valued and utilized within such a market framework.

We will determine the role of the energy market and the potential in the future energy market – in the transition to an energy system with zero emissions, and to facilitate a future low-carbon society.

WE ARE BRINGING THE FACTS TO THE TABLE

“Our researchers’ mission is to provide the knowledge base for the energy transition. It can’t be grounded on opinions and beliefs. Facts are king,” says Stefan Jaehnert, who is heading research area 3, and also Research Manager in SINTEF Energy Research.



“Our research is the important knowledge base for the energy transition,” says Research Manager Stefan Jaehnert.
(Photo: Vibeke Ann Pettersen/NTRANS)

“Society, politicians and the industry need the knowledge base we are providing for the energy transition. The research and the knowledge is essential for the discussion – and for making good decisions”, says Jaehnert.

DEFINING THE RESEARCH QUESTIONS WITH USER PARTNERS

“Our PhD Candidates in NTRANS are really getting into the work, and we have also been very active in use cases 1 and 2 during 2021.

“We identify the research questions together with our user partners in the cases. Then we study and analyse those further in our research. There are specific topics we must investigate further: like new energy production and the effect on the energy sector. There is a lot of discussion now on how the market should be designed,” says Jaehnert.

ELECTRICITY PRICES – HOT TOPIC

Energy has certainly come on the agenda in 2021. From late 2020/early 2021 wind power issues were really debated in the public. NTRANS researchers also contributed a lot with their know-how in the ongoing debates.

At the end of the year the rising electricity prices, especially in the southern parts of Norway, have been a much-debated topic.

“Our job is to provide facts to this discussion, not opinions,” says Jaehnert.

“There are multiple factors to consider, for example natural gas, those prices also rocketed sky high, and this plays an important role in this picture.

RENEWABLE ENERGY VARIES MORE

Wind and sun are examples of renewable energy sources that change with weather conditions. When an increasing part of power production comes from renewable and unregulated sources, at the same time as power consumption becomes more power-intensive, the need for flexibility increases. This will mean that we need a new system for the energy market in the future.

FLEXIBILITY WILL HAVE GREAT VALUE

“So, how can today’s energy market, with increasing need for flexibility, be operated?”

“One solution to this is to establish actors that represent several households or companies, and compile their offer of flexibility and then supply it in the markets. Such a company is often called an aggregator, and Tibber is one example.”

New technology makes it possible for the demand side to have a more active relationship with its electricity consumption. Some power consumption can be moved to other times without affecting the user’s comfort or business activity to a great extent. That means, for example, to move your power consumption to other times of the day. Charging of electric cars during night-time when the general consumption is lower, is one measure that most people could easily adapt.

In the future, many devices will also be able to automatically respond to, for example, price signals or load conditions in the network.

CONSUMERS – ACCEPTABLE LEVEL OF COMFORT?

“The bottom-up perspective is important; we must always take the end user into consideration. We are working on different scenarios, with aggregators and models for the distribution of energy. The consumers also play an important part here. How much will they respond, and possibly also which loss of comfort are they willing to accept?” Jaehnert wonders.

“In this research area we work on finding the best way to distribute the energy we have. Not at an individual or household level, but on a national and possibly European level. NTRANS’ research area 1 is covering more of the individual perspectives.

“There are so many questions that need to be answered. For example: Is it a good idea to have cables between us and other countries? Our research shows that on the whole, it is a plus, on the European level, but there can be significant effects for Norwegian actors.”



NTRANS researchers are providing the knowledge base for the energy transition.

THREE WORK PACKAGES IN RESEARCH AREA 3

Market design and integration (WP3.1.1)

Lead by: Endre Bjørndal, NHH

- EU policy framework/4th energy package
- Market design for sector integration

The consumer in the centre of the energy system (WP3.2)

Lead by: Jayaprakash Rajasekharan, NTNU

- Digitalisation, active consumers
- Local/decentralized markets

Value creation from Norwegian energy sources (WP3.3)

Lead by: Sambeet Mishra, SINTEF Energy Research

- Potential of renewable energy sources (economic/low-carbon society)
- Distribution effects of welfare/value creation

CASE STUDY ON EFFECTS FOR NORWEGIAN STAKEHOLDERS



This working paper by Vegard Viken Kallset and Stefan Jaehnert (both SINTEF Energy Research) aims to explore how the impact of building an offshore wind farm will be different depending on how it is connected to the existing grid. In chapter 2 the dataset and the four

cases are described in further detail. Then, the economic results of the cases are presented and compared in chapter 3. Finally, chapter 4 discusses the impact of historical weather years, infrastructure investment costs and effects on stakeholders.