

Til medlemmene av Styret for **CREE - Oslo Centre for Research on Environmentally friendly Energy**

Lars Bergman - Stockholm School of Economics - HHS.
Brita Bye - Statistisk Sentralbyrå
Karine Nyborg - Økonomisk Institutt - ØI
Sverre A. C. Kittelsen - Frischsenteret
Ståle Aakenes - Gassnova
Kenneth Birkeli - Miljødirektoratet
Ellen Skaansar - Norges vassdrags- og energidirektorat - NVE
Kjell Steinar Berger - Statkraft
Rolf Korneliussen - Statnett
Knut Kroepelien – Energi Norge

Observatør Forskningsrådet:

Hans Otto Haaland

Fra:

Rolf Golombek

Styremøte i CREE - Oslo Centre for Research on Environmentally friendly Energy

Det innkalles med dette til styremøte

08. mars 2018, kl. 13.15-15.00

i Forskningsparken, rom **AQUA**, Gaustadalléen 21, 0349 Oslo.

Sak S-18/01 Godkjenning av innkalling og saksliste

Sak S-18/02 Godkjenning av referat fra forrige møte
(Ett vedlegg)

Sak S-18/03 Informasjonsaker
CREE-leder orienterer
-CREE aktiviteter våren 2018

Sak S-18/04 CREE årsrapport
(Ett vedlegg)
Forslag til vedtak:
Årsrapport godkjennes med de foreslåtte endringene.

Sak S-18/05 Ny utlysning av FME-S
CREE-leder orienterer

Sak S-18/06 Utlysning av kunnskapsplattformer for klimapolitiske virkemidler
CREE-leder orienterer

Sak S-18/07 Eventuelt
Neste styremøte: Satt til 22 mai
Første styremøte høsten:

Møtereferat – styremøte for CREE S-III.17

Referat fra styremøtet i CREE - Oslo Centre for Research on Environmentally friendly Energy, kl. 13.15-15.00, 06. november 2017, møterom Hagen 4, Forskningsparken, Gaustadalleen 21, 0349 Oslo

Styrets medlemmer som var til stede:

Lars Bergman - Stockholm School of Economics (HHS)
Brita Bye - vara Statistisk Sentralbyrå (SSB)
Karine Nyborg - Økonomisk Institutt (ØI)
Sverre A. C. Kittelsen - Frischsenteret
Ståle Aakenes - Gassnova
Kenneth Birkeli - Miljødirektoratet
Ellen Skaansar - Norges vassdrags- og energidirektorat (NVE)
Kjell Steinar Berger - Statkraft
Knut Kroepelien - Energi Norge

Observatør:

Ben Smith - Norges Forskningsråd (NFR)

Fra administrasjonen:

Rolf Golombek - Frischsenteret
Jørg Gjestvang - Frischsenteret

Referenter:

Rolf Golombek og Jørg Gjestvang

Forfall:

Rolf Korneliussen – Statnett.

Sak S-17/12 Godkjenning av innkalling og sakliste

Vedtak: Godkjent

Sak S-17/13 Godkjenning av referat fra forrige møte (ett vedlegg)

Vedtak: Godkjent

Sak S-17/14 Informasjonsaker

- CREEs websider er oppgradert. Arrangementene høsten 2017 omfatter CREE research workshop, to CREE hot line, CREE dialogseminar om kalkulasjonsrenten, to CREE lunsjer, CREE seminarer, to nummer av CREE newsletter og CREE juleavslutning.
 - Styret ga uttrykk for at CREE hotline bør bli mer synliggjort. Videre ble det reist spørsmål om CREE kan tilby bilaterale brukermøter, samt muligheten for å integrere CREE-forskere i prosjektbrukergrupper.
- CREE miljøet har sendt inn fem søknader til Norges forskningsråd. Dette er en nedgang fra i fjor, men da var finansieringssituasjonen svak, mens det høsten 2017 er omtrent full kapasitetsutnyttelse.
- Golombek og Gjestvang var på FME-kontaktmøte hos Forskningsrådet. Der ble det blant annet informert om en ny runde med FME-S. Utlysningen er planlagt tidlig i 2018.
- Frischsenteret har ansatt én person innenfor CREEs fagområde. Brita Bye informerte om den usikre bemanningssituasjonen i SSB.

Vedtak

Styret tar informasjonen til etterretning.

Sak S-17/15 Regnskap og økonomi - prognose for 2017 og budsjett for 2018

Vedlegg: CREEs budsjett for 2017-2019

Gjestvang opplyste at man forventer å overføre ca. 1,1 mill. kroner til 2018. Hovedårsaken er at Frischsenteret pga. usikkerhet rundt CREE i 2017 hadde funnet dekning til forskerne på andre prosjekter. For 2018 forventes hele det disponible beløpet å bli brukt.

Vedtak

Styret tar orienteringen om økonomien i 2017, inkludert prognosen, til etterretning. Styret vedtar fremlagte budsjett for 2018.

Sak S-17/16 Rapportering til Norges Forskningsråd

Kort gjennomgang av CREEs arbeidsplan for 2017 og årsrapport for 2016.

Vedtak

Administrasjonen bes om å ta hensyn til kommentarene som kom fram under møtet ved utarbeidelse av årsrapporten for 2017 og arbeidsplanen for 2018.

Sak S-17/17 Eventuelt

De neste styremøtene blir torsdag 8. mars 2018, kl. 13.15-15.00, og tirsdag 22. mai 2018, kl. 13.15-15.00.

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Lars Bergman
Stockholm School of Economics
Styreleder

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Brita Bye
Statistisk sentralbyrå

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Karine Nyborg
Økonomisk Institutt

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Sverre A. C. Kittelsen
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Ståle Aakenes
Gassnova

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Kenneth Birkeli
Miljødirektoratet

.....
Ellen Skaansar
Norges vassdrags- og energidirektorat

.....
Kjell Steinar Berger
Statkraft

.....
Knut Kropelien
Energi Norge



Oslo Centre for Research on Environmentally friendly Energy

Annual Report 2017



Executive Summary

CREE - Oslo Centre for Research on Environmentally friendly Energy - was established in 2011 as a Social Sciences based energy research centre funded by the Research Council of Norway (FME Samfunn) with an annual grant of NOK 8 million over an eight-years period (2011-19).

Research and impact

To a large extent, energy and climate policy is focused on how to develop and utilize new technology and more environmentally friendly energy sources. This does not occur by itself, but instead is dependent on institutional and economic frameworks. In this regard, CREE fills the gap compared to the knowledge coming from the other FME centres, as it is based on a broad aspect of economic research including theoretical and empirical analyses, numerical modelling and laboratory experiments. Economic analyses in combination with knowledge in other fields are highly relevant for policy makers, regulators and important agents in the energy market.

Cooperation and partners

The main focus is on economic research as the research partnership is formed by the Frisch Centre, the Department of Economics (ØI) at the University of Oslo (UoO), the Research department at Statistics Norway (SSB), and the Tilburg Sustainability Center, in the Netherlands. Cooperation with the Centre for Development and Environment (UoO), Faculty of Law (UoO), and Institute for Energy Technology broadens the research perspective. The user perspective is ensured by several partners from industry and government; Energy Norway, Gassnova, the Norwegian Environment Agency, the Norwegian Ministry for Petroleum and Energy, the Norwegian Ministry of Climate and Environment, the Norwegian Water Resources and Energy Directorate, Statkraft Energy AS, and Statnett SF.

Research goal

The main aim of the centre is to collect and develop knowledge on the effects of regulatory conditions in the energy market and how these affect technological improvements such as innovation in and diffusion of technology for renewable energy, energy efficiency and carbon capture and storage. The centre provides a basis for better regulatory strategies and for policy

instruments designed to reach energy and climate goals established nationally and internationally. CREE will also strive to develop methodological frameworks appropriate for achieving these goals.

Organization of the research

Our portfolio is divided into four flagships that cover radical emissions reductions in ETS sectors, environmentally friendly transport, green innovations and utilizations of smart technologies and transmission towards the low-emission society. The research packages cover what we consider to be the most important aspects in the economics of energy and climate.

Activities and outreach

2017 has been the sixth year of CREE activities. The activities have concentrated on the research done in the different flagships, in addition to the annual research workshop, CREE seminars and several user activities including the annual user conference, the annual dialogue seminar, CREE newsletter, CREE Hot Line and seminar presentations for users. The different activities organised by CREE cover a large aspect of discussions of topics and analyses on both theoretical and applied character. The meeting places are important for networking and the outreach of our research.

The CREE scientists have held more than 65 conference and seminar presentations in 2017, and they have been mentioned numerous times in the media. For more details:

<http://www.cree.uio.no/outreach/presentation/>

<http://www.cree.uio.no/outreach/news/in-the-news/>

Publications

In 2017, we published 23 papers in international peer reviewed journals, 1 book chapters, 10 working papers and 4 popular science articles. See also list of publications:

<http://www.cree.uio.no/publications/>

Educational activities

In 2017, CREE researchers supervised master students. Three theses were finalized in 2017, see http://www.cree.uio.no/projects/p_057.html. CREE also contributed to the EAERE summer school in Venice.

CREE has during its operation contributed to the understanding of energy markets, impacts of regulations on energy use, emissions and innovations, and effective and fair design of climate policies. Our research is important as it is published in very good and good international journals, CREE researchers receive international prizes, it has attracted media attention, and it is appreciated by users as our researchers are constantly demanded as advisors for policy makers, as presenters at seminars and discussion partners.



1 CREE

There is clear evidence that the global climate is changing, and that this change is mainly due to human activities. As has been stressed by the latest IPCC assessment report published in 2014, climate change can have a substantial impact on the economy, ecosystems and human welfare, and may have catastrophic impacts for parts of the world. Thus, there is a need to reduce greenhouse gas emissions as well as to adapt to inevitable changes. In 2015, the international community was successful in reaching a treaty (the Paris agreement) where nearly all countries in the world agreed to reduce their greenhouse gas emissions. A lot of details have still to be worked out, but technology improvements are widely held to be essential if we are to achieve the required emission cuts.

However, there are several challenges: the research and development effort, as well as diffusion and utilization of new, environmentally friendly energy sources, require appropriate incentives. Another important challenge is the future design and improvements of climate and energy treaties, such as the Paris agreement, that will help achieving a better social outcome. In this respect, effective policy instruments and fair outcomes are important. The aim of

CREE, Oslo Centre for Research on Environmentally friendly Energy, is to provide a solid base for policy making on these topics. CREE will also contribute to the collection and establishment of knowledge on how different regulations affect both the energy market and technological development. The centre studies policy instruments designed to reach the goals established in national and international energy and climate policy, while also examining how international treaties could be designed to achieve broader participation and deeper abatement.

The research of the centre is primarily grounded in economics, as reflected by the main research partners: Department of Economics at the University of Oslo, the Research Department at Statistics Norway, the Frisch Centre and the Tilburg Sustainability Centre. In addition, in 2017 the centre has drawn on other perspectives through cooperation with researchers from other disciplines within the social sciences, law and technology.

The centre has the following vision, which is stated in our Strategic Plan:

- We want to be a leading international research centre within energy, environmental, resource and climate economics
- We will generate knowledge that can contribute to a cost-effective and sustainable exploitation of Norwegian and international energy resources by industry and governments, as well as an effective and fair climate and energy policy, both nationally and internationally
- We will contribute to recruitment and training at the master, doctoral and post-doctoral levels in energy and environmental economics at the University of Oslo. Recruiting women to research will have a particular focus.

This report summarizes the activities and the achievements of the centre in 2017.

2 Research plan and strategy

Flagships

The Centre research activities are organized within four thematically specified Flagships to strengthen the thematic unity and focus of the CREE center.¹ Each Flagship also have specific activities and tasks related to making research more cross-disciplinary, more responsive to user needs, and with a strong international component.

Flagship I: Radical emissions reductions in ETS sectors

The ETS sectors (the sectors covered by the EU Emissions Trading system) are mainly heavy energy-using installations such as power stations, oil and gas platforms, and industrial plants. These cover about 45% of EU's greenhouse gas emissions. Non-EU members like Iceland, Lichtenstein and Norway are also part of the trading system.

ETS puts a limit on total emissions in these sectors, but individual participants can trade permits between themselves. In addition, these sectors also face other regulations, both from the EU and their domestic governments (e.g., carbon taxes), that provide further incentives to reduce emissions.

In this flagship, we consider emissions reductions in the ETS sectors. We concentrate our research on the power market, but we will also study other sectors. We aim to study and understand the driving forces behind the regulations and the choice of regulatory instruments in these sectors. Further, how they impact the Norwegian energy system and energy production, including investments in technologies and transmissions. We also study how regulations can be designed to ensure first-best or second-best investment decisions. Finally, we study environmental costs of investments in the energy system.

Flagship leaders: Professor Nils-Henrik von der Fehr, University of Oslo, and Dr. Snorre Kverndokk, Frisch Centre.

¹ Until 2016, the CREE research activities were organized in five work packages.

Flagship themes

I.1 Intermittency, Flexibility and Security of Supply – How can we accommodate rapidly increasing shares of intermittent energy sources (solar, wind) in the power mix? More intermittent electricity will require enhanced flexibility in other parts of the power market to ensure overall balance at all times: Where will this flexibility come from? Will the market provide sufficient incentives for flexibility or are special measures required? Are current regulations conducive to flexibility, or is there a need for reform?

Transmission and Integration – Intermittent power generation will vary by time and place (e.g., wind, sun, weather), and will frequently be produced in areas that currently have limited transmission capacity. This will require more transmission capacity. Weather stochasticity may be reduced by increasing the capacity of interconnectors (such as the one between the Nordic countries and the rest of Europe). Also, more efficient use of existing transmission capacity is warranted. How can new transmission resources be mobilized? Are transmission system operators (TSOs) and regulators able and willing to facilitate development of transmission networks, in particular where cooperation across jurisdictions is required? Do current market conditions, in particular transmission tariffs, encourage efficient use of transmission networks, or are reforms required?

I.2 Distributed Electricity and Storage – New technology – including renewable generation, batteries and information and communication technology – is rapidly changing the role, not only of distribution networks, but also of distribution system operators (DSOs). Are there barriers to the rolling out of new technologies? Do (distribution) tariffs and electricity prices encourage the adoption and efficient use of new technologies? What should be the role of DSOs, in particular in relation to other, new market players, such as suppliers of technology, service providers and middlemen (aggregators)? Does the current regulatory regime support efficient development of distributed electricity and storage?

I.3 Regulatory Instruments and Impacts – Reductions of emissions in the ETS sectors may be achieved with different instruments, including emissions quotas and taxes, quality standards, subsidies to green energy sources and an outright ban on the use of certain resources. What is the experience with the various instruments? Are they equally efficient? To what extent should the choice of instrument depend on the underlying characteristics of regulated sectors? What motivates the different regulatory choices that governments make, across countries, sectors and types of emissions? Are there conflicts between stimulating renewable production and the local environment?

I.4 CCS – Carbon capture and storage may be necessary to contain global warming below 1.5 or 2 degrees, as is the current political ambition. Adoption of CCS technology in the power sector, however, has by far been behind predictions. Why has the technology not been implemented, and which policy instruments are available to raise adoption of this technology? What is the economic value of CCS-effort with regard to learning effects, CO₂ reductions and the option of storage? What are the market imperfections in the three markets (capture, transport, storage) and what policies would target these imperfections? Can CCS be economically profitable without government support? What will the consequences for Norwegian industry (including oil and gas) be with and without CCS, given that we aim for the two-degree target?

Multi-disciplinary activities

- Close collaboration with engineers from Institute for Energy Technology (IFE) on I.1 and I.4, as well as the new projects *Security of supply* and *Windland* (see below).
- Close collaboration with lawyers from Faculty of Law (UoO) on I.1 as well on *Security of supply* and *Windland* (see below).
- Close collaboration with natural scientists from Norwegian Institute for Nature Research (NINA) on the project *Windland* (see below).

International collaboration

Professor Fridrik Baldursson, Reykjavik University. Professor Claude Crampes, University of Toulouse. Dr. ing. Markus Blesl, University of Stuttgart. Professor Claudie Boiteau, Director of the Master programme Law and Market Regulation, Université Paris-Dauphine.

Large research projects

CREE has two research projects with funding by the Research Council of Norway that address topics under this flagship:

Security of Supply, funded by ENERGIX and lead by the Frisch center. Scientific partners: Frisch Centre, Statistics Norway, University of Oslo (Department of economics, Faculty of law) and Institute of Energy Technology (IFE). This project started in 2016, and relates to flagship themes I.1 and I.3.

Windland: Spatial assessment of environment-economy trade-offs to reduce wind power conflicts, funded by ENERGIX and led by SSB. Scientific partners: Institute for Energy Technology (IFE); Norwegian University of Life Sciences, NMBU; Norwegian Institute for

Nature Research (NINA), Vista Analyse; Faculty of Law, University of Oslo (UoO). This project relates to I.4.

User involvement

- NVE and Statnett have been involved in Flagship I through meetings, consultations and seminars.

Flagship II: Environmentally friendly transport

Norway has committed to a 40% reduction of greenhouse gas emissions from the non-ETS sectors by 2030. Transport makes up a major share of Norwegian emissions in the non-ETS. Although there will be flexibility available for the non-ETS sector across the EU members, the Norwegian Parliament has announced that they aim for radical domestic emission cuts in transport.

Norwegian transport can be divided into sea, air, rail and road. Road can further be divided into private, light duty and heavy duty vehicles. The sustainability of transport can be improved by i) reducing the total amount of traveling, ii) modal shift, e.g. from road to rail, and iii) by introducing new technologies (e.g., electric vehicles). For policy it is important to obtain the right balance between the measures; taking into account that there may be market imperfections when introducing new technologies.

Flagship leader: Dr. Mads Greaker, Statistics Norway

Flagship themes

II.1 Electrification of private road transport. What is the most efficient way to increase the share of plug-in hybrid electric vehicles (PHEV) and/or battery electric vehicles (BEV) in the Norwegian car fleet? How have the different incentive mechanisms for PHEVs and BEVs like free parking, free charging, and access to bus lanes, worked with respect to increase the PHEV and BEV market shares? What determines the right balance between PHEV/BEV usage and public transport, and how can this mix be achieved? What are the potential costs of incompatibility between charging systems?

II.2 Integrating transport with electricity markets. What kind of problems may arise in electricity supply as the share of the car fleet requiring charging on the

road increases towards 50%? How can BEV owners be motivated and incentivized to provide back-up power capacity and frequency regulation when their car is not in use? How does the market share of BEVs affect the value of a smart grid?

II.3 Over-coming barriers to more sustainable commercial transport. What types of technological, behavioral and infrastructure barriers exist for low- or zero-emission technology in commercial road transport? How can firms be motivated and incentivized to adopt zero- or low-emission light and heavy duty vehicles? One proposal has been to create a CO₂-fund to finance low emission technology for light and heavy duty vehicles – what are the benefits and drawbacks of such a solution? What is the potential for emission reductions in national sea transport, including the fishing fleet? Is there a future role for hydrogen, and should the government actively support its introduction?

II.4 Biofuels in road and air transport. What is the optimal policy mix of biofuels; should storage of organic carbon receive subsidies, should those who burn organic carbon be taxed, and should biofuels technologies for transport purposes be subsidized? Which of the politically feasible second-best policies come closest to the first best? Is the proposal by the Norwegian Parliament to increase the blending of biofuels in gasoline and diesel to 20 percent by 2020 a good idea? To what extent should Norwegian consumption of biofuels be covered by Norwegian forestry resources?

Multi-disciplinary content

For II.1 and II.2, we have close cooperation with TØI, and the research encompasses disciplines like political science and engineering.

International collaboration

We have cooperated with Professor Stef Proost at Leuven University on II.1 and II.2, and with Professor Thomas Sterner, University of Gothenburg, on II.3.

Large research projects

Electrification of transport: Challenges, mechanisms and solutions - ELECTRANS (KPN funded by the Norwegian Research Council under the ENERGIX program, with participation from Statistics Norway, Frisch Centre and Institute of Transport Economics)

The overall objective of ELECTRANS is to provide new knowledge about the challenges and opportunities in electrifying the private car fleet in Norway. The point of departure is that by

2030, at least 50% of the private car fleet will be electric. The project is a part of the research in both II.1 and II.2.

Driving towards the low-emission society (Funded by the Norwegian Research Council under the ENERGIX program, with participation from Frisch Centre and Institute of Transport Economics)

The primary aim of the project is to obtain accurate and reliable knowledge on the effects of existing and potential future policies to support the transition to zero- and low-emission automobiles in Norway. The project is a part of II.1.

User involvement

Statkraft, Ringerikskraft, Meschkraft and Veidirektoratet are involved in II.1 through ELECTRANS.

Flagship III: Environmental regulations and utilization of smart technologies

Achieving ambitious environmental and climate goals requires broad adoption of environmentally friendly and energy efficient technologies in homes and businesses. This flagship aims to increase our understanding of how policies can motivate and incentivize research, development and diffusion of both low-emissions technologies and technologies aiming at lowering energy consumption. What impact will economic factors, habits and norms have on development and utilization of new technologies? How do firms and consumers use and respond to new technologies? To what extent does adoption of the new technologies actually reduce energy demand? A variety of analytical and empirical approaches that draw on economic theory and other social sciences will be applied.

Flagship leader: Dr. Bente Halvorsen, Statistics Norway

Flagship themes

III.1 Innovation and diffusion of green technologies – Are there reasons to support the development of environmentally friendly technologies at higher levels than the development of other technologies? How can we design efficient support schemes for green R&D specifically? Is an innovation prize an efficient instrument to spur research and development? Are CCS technologies best supported by subsidizing

development of technology or by subsidizing acquisition of technology? What are the effects of the Norwegian R&D tax credit program on environmental patenting?

III.2 Technical building standards and energy use - How do technical building standards affect energy consumption? How does the design of the built environment and energy saving devices influence user behavior? What are the greatest barriers for not achieving the full energy savings potential?

III.3 Increased energy efficiency in existing buildings - How do firms react to investment subsidies aimed at increasing energy efficiency in existing commercial buildings? How does household behavior affect the opportunity to release the technical energy savings potential in existing residential buildings, and how does this affect planned investments in the energy system?

III.4 Utilization of smart technologies – To what extent will the load curve change due to new, smart technology applications and time-dependent tariffs? How does the utilization of new, smart technologies depend on characteristics like design, placement within the home and habits?

III.5 Energy security and option value – To what extent are households and businesses concerned about energy security when choosing their energy technologies? How are households and businesses affected by power grid failures? What is the option value of having an alternative energy source for heating or being a prosumer?

Multi-disciplinary activities

- Close collaboration with social anthropologists from Centre for Development and the Environment (SUM), which is a CREE sub-contractor, on topics III.2, III.3, III.4 and III.5.
- Collaboration with architects and engineers from SINTEF Building and Infrastructure (SINTEF Byggforsk) on topic III.4.

International collaboration

Professors Reyer Gerlagh and Sjak Smulders, Tilburg University and Tilburg Sustainability Centre, on topic III.1.

Large research projects

CREE has one research project with funding from the Norwegian Research Council that addresses topics under this flagship:

Security of Supply, funded by ENERGIX and lead by the Frisch center, is related to III.4. Scientific partners: Frisch Centre, Statistics Norway, University of Oslo (Department of economics, Faculty of law) and Institute of Energy Technology (IFE).

User involvement

Ringerikskraft is involved in III.4.

Flagship IV: Towards the low-emission society

While the first three flagships focus on specific sectors and technologies, this flagship aims at taking a comprehensive view by focusing on larger entities; nations, regions and the world.

Development and diffusion of environmentally friendly technologies are driven by the long-term goal of becoming a low-emission society. The public good-characteristics of the environment and the climate call for coordinated and over-arching policies across sectors and/or nations. There is a need to understand the political, legal, economic, behavioural and technological motivations and obstacles for alternative pathways.

Approaches in this flagship embrace theoretical and numerical models of technological, behavioral and political responses to challenges in the energy-environment-climate nexus. It is also pivotal to learn from experience by using empirical methods and experiments of behavioral responses.

Flagship leader: Senior Researcher Taran Fæhn, Statistics Norway

Flagship themes

IV.1: Greening the economy

- Transition of the economy from fossil-fuel based industries and petroleum dependency to green energy and clean activities
- National, regional and global scenarios of technological, economic and environmental development (e.g. in the wake of Paris)
- The conflict between short-run abatement considerations and long-run transformation
- Time-inconsistency and commitment problems.

IV.2: National and international climate policies and treaties

- Impacts on competitiveness, trade and carbon leakage of low-emission strategies
- Multilateral negotiations, agreements, coalitions/clubs and coordination of policies
- Impacts on global energy markets of demand and supply side policies.

IV.3: Barriers and opportunities to transformation

- The interaction of multiple political goals and policy instruments
- Political and distributional aspects of transformation (lobbyism, inter-generational burden and inequality)
- Ethical, psychological and legal aspects of transformation, inter-generational burden and inequality

Multi-disciplinary activities:

- Close collaboration with technology experts from IFE on IV.1
- Collaboration with expert of psychology and behavioral economics on IV.2

International collaboration:

As seen from the table below, there is substantial international involvement in our projects. We will have particularly close and frequent cooperation with Professor Böhringer, University of Oldenburg (IV.1 and IV.3).

Large research projects

CREE has four research projects with funding from the Norwegian Research Council that address topics under this flagship:

Will: Funded by KLIMAFORSK and led by SSB, is related to IV.3. Scientific partners: CICERO, University of Oldenburg and NMBU.

Prospects: Funded by PETROMAKS and led by SSB, is related to IV.1. Scientific partners: Frisch, University of Stavanger, University of Oldenburg and Nord Universitet.

Smart Paths: Funded by KLIMAFORSK and led by SSB, is related to IV.2 and IV.3. Scientific partners: IFE, BI, University of Strathclyde and University of Oldenburg. This project has a policy/science forum of experts from policy-making, government and industry.

Sustainable transformation to sustainability: Funded by KLIMAFORSK and led by the Frisch center, is related to IV.2. Scientific partners: Frisch Centre, Statistics Norway, University of Oslo (Department of economics, Department of Political Science).

User involvement

Norwegian Environment Agency, Ministry of Finance, Ministry of Climate and Environment, The science-policy forum in the Smart Paths project.

3 Centre organization

Figure 1 shows the organization of the centre in 2017

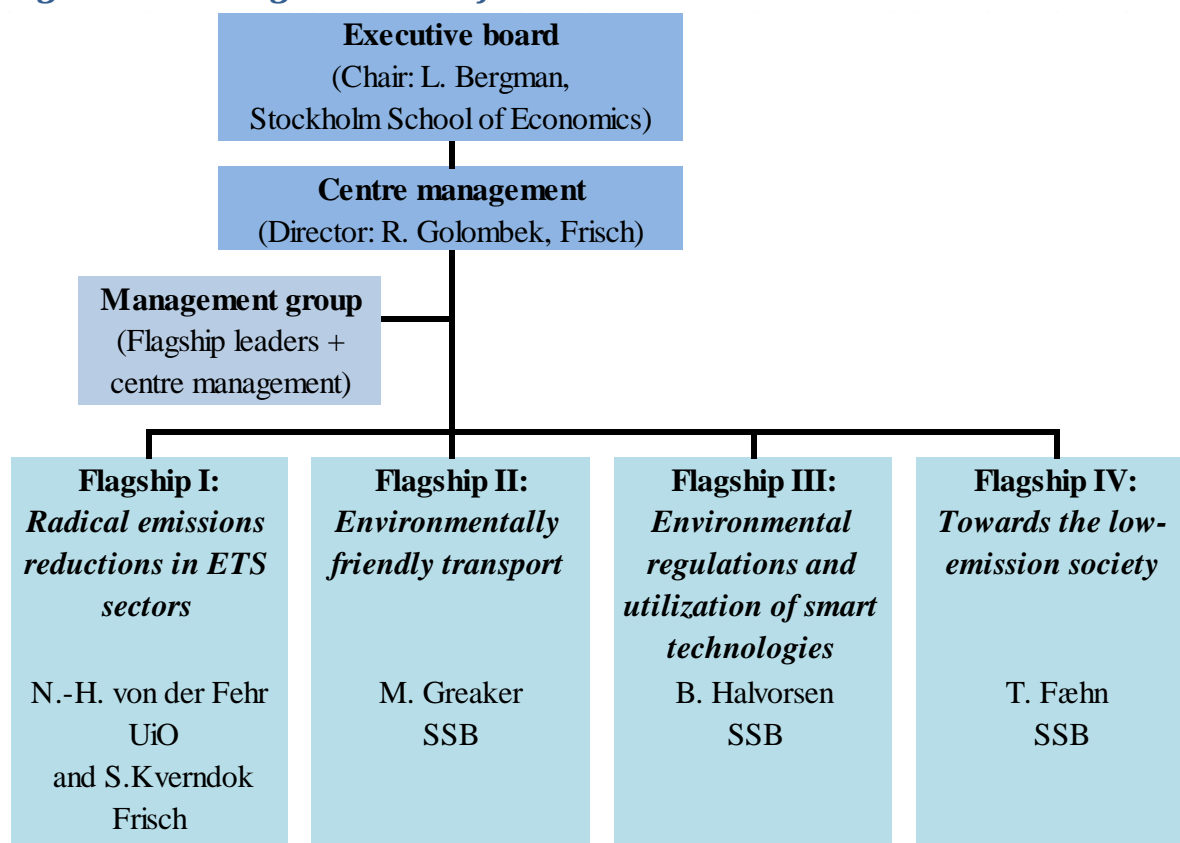
The chair of the executive board (Lars Bergman, Stockholm School of Economics) does not represent any of the research partners, user partners or sub-contractors, and is therefore independent of the partners in CREE.

The board also consisted of one member from each of the three Norwegian research partners and one member from each of the user partners. At the end of 2017, the board members were Sverre A. C. Kittelsen (Frisch Centre), Cathrine Hagem (Statistics Norway), Karine Nyborg (University of Oslo), Kenneth Birkeli (The Norwegian Environment Agency), Kjell Berger (Statkraft), Rolf Korneliussen (Statnett), Knut Kroepelien (Energy Norway), Ellen Skaansar (Norwegian Water Resources and Energy Directorate) and Ståle Aakenes (Gassnova). The Norwegian Ministry of Climate and Environment and The Norwegian Ministry of Petroleum

and Energy do not want to be on the board. The board had three meetings in 2017, see http://www.cree.uio.no/about/board/board_meetings/.

The administration of CREE is located at the Frisch Centre. Dr. Rolf Golombek is the Director, and Jørg Gjestvang is the Project Coordinator. The administration has regular meetings with the management group, that is, the work package leaders, to discuss matters of importance for the centre.

Figure 1: The organization of the centre in 2017



The partners of CREE are divided into research partners and user partners. The research partners are:

Ragnar Frisch Centre for Economic Research (Frisch Centre), Oslo (host institution)
 Research department, Statistics Norway, Oslo
 Department of economics, University of Oslo
 Tilburg Sustainability Center, Netherlands.

CREE has eight user partners:

Energy Norway
 Gassnova SF
 Norwegian Environment Agency
 Norwegian Ministry of Climate and Environment
 Norwegian Ministry for Petroleum and Energy
 Norwegian Water Resources and Energy Directorate

Statkraft Energy AS

Statnett SF.

The user partners of the centre contribute with funding and with members on the board, but also to the research with detailed knowledge about markets, technologies and policy.

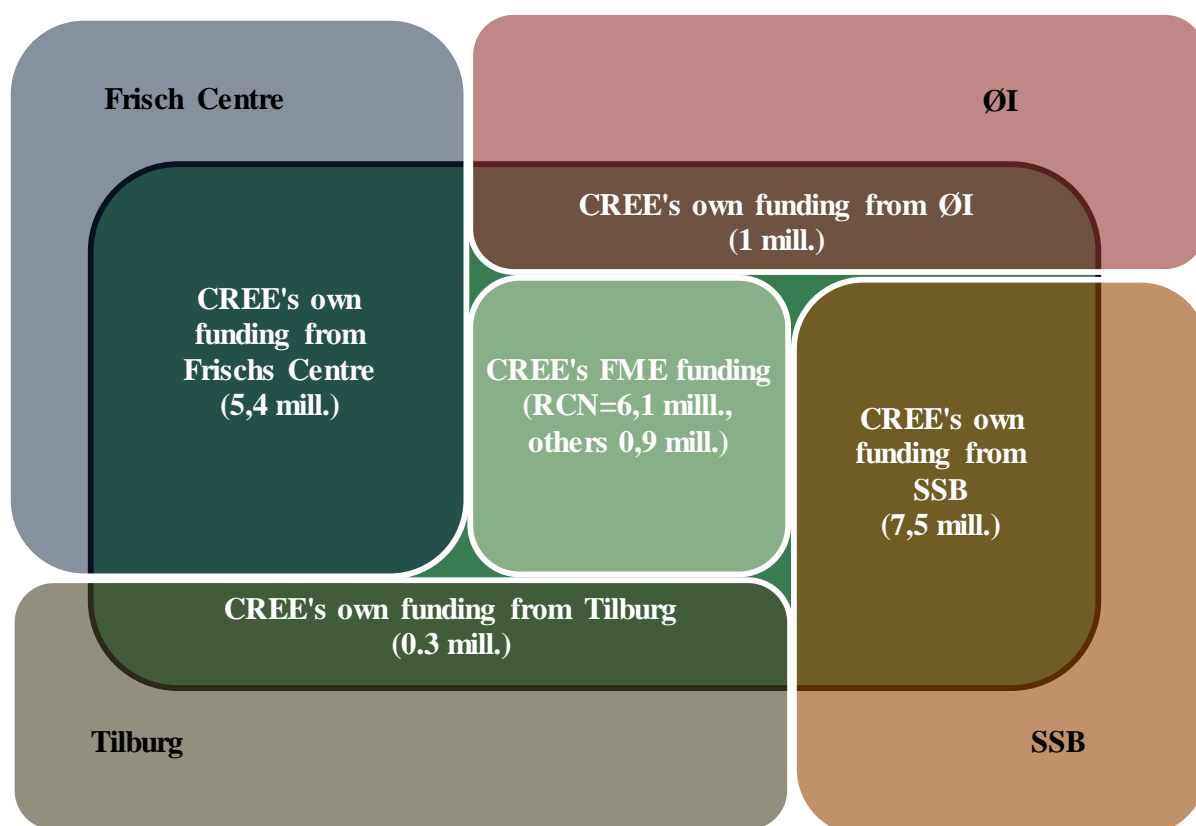
4 Funding

The funding of CREE in 2017 comes from various sources. The centre has normally an annual contribution from the Research Council of Norway (RCN) of NOK 8 million, user partner funding of NOK 350,000, and funding from the University of Oslo (UoO) of NOK 500,000. In addition, the centre has secured its own funding through other programs under RCN. The figure below gives an overview of the total funding in 2017. Note that in the figure, the funding from RCN is NOK 6.1 million, which is less than the annual grant. The reason is that 1.9 million was transferred to 2018, reflecting that CREE researchers are involved in so many (ordinary) research projects, funded by RCN, see Section 2, that sufficient man months to carry out CREE research of NOK 8.0 million have not been available. For more detailed information, see Appendix A2, which also shows the distribution of costs by CREE research partners and other units affiliated to the centre. Note that costs cover activities directly funded by RCN as well as activities financed by own funding, for example, funding through other RCN programs.

Figure 2:

CREE funding in 2017

Total CREE centre funding incl. own funding. (21,2 mill.)



Own funding = professional work that is beneficial to the CREE centre, but is not part of CREE's direct funding from The Research Council of Norway. Own funding should be at least 25% of the total budget of CREE.

FUNDINGS

The Research Council of Norway	6,1
Others	0,9
<i>Public funding (UoO)</i>	0,6
<i>Privat funding (User partners)</i>	0,4
Own funding	14,2
<i>Frisch</i>	5,4
<i>SSB</i>	7,5
<i>ØI</i>	1,0
<i>Tilburg</i>	0,3
Sum total funding	21,2

5 Professional activities and results

The professional activities in 2017 have been concentrated on the research in the flagships, the research workshop, CREE seminars, and several user activities including the user conference and the dialogue seminar.

The workshop Implications of Paris took place at 5-6 and 8 March. This was the second in a series of invitation-only workshops identifying key insights from emerging research in the post-Paris environment, exploring the research needs, reporting results and motivating new research. Although the architecture for an international approach to addressing climate change was set by the Paris Agreement at the 21st Conference of the Parties (COP21) to the United Nations Framework Convention of Climate Change, in combination with prior agreements, many issues remain to be worked out. This was a joint workshop with the FME-S centre CenSES and Joint Global Change Research Institute (JGCRI), University of Maryland, see also website for more information:

http://www.cree.uio.no/outreach/events/research_workshops/implication-of-paris.html

The CREE workshop took place in Oslo (at Statistics Norway) on 26-27 October. 30 people attended the workshop, mainly researchers from the research partners and sub-contractors in CREE, but also from our international network. Presentations covered research from the work packages, and on subjects related to the work packages.

The program is available at:

http://www.cree.uio.no/outreach/events/research_workshops/7th-research-workshop.html

There were 7 CREE seminars 2017, including 2 seminars given by international visitors. The seminars were given at Statistics Norway, Frisch Centre and University of Oslo.

For a list of all seminars, see: <http://www.cree.uio.no/outreach/events/seminar/2017/>

The annual user conference was held in April and was again co-organized with CICEP, another centre for social science research on environmentally friendly energy (FME-S). The conference was in Norwegian and the topic was “Populisme og veien videre for en ambisiøs klimapolitikk” (Populism and the potential for an ambitious climate policy)”. About 90 people attended the conference.

For more information about the conference, see

<http://www.cicep.no/aktuelt/2017/3/23/seminar-populisme-og-veien-videre-for-en-ambisis-klimapolitikk>

CREE also organized a half-day dialogue seminar with the user partners, where the user partners chose the subjects for dialogue; see

http://www.cree.uio.no/outreach/events/user-meetings/dialogseminar_171116.html

In 2017, 23 papers were published in international peer reviewed journals (see the Publications table below and Appendix A3). We have also published one book chapter and produced 10 CREE working papers. Further, we have published 4 popular science articles. The CREE scientists have held 65 conference and seminar presentations. They have also been mentioned at least 11 times in the media.

Table 1 Publications 2011-2017

	2011	2012	2013	2014	2015	2016	2017
Journal articles:	8	16	21	28	19	23	23
Books and article in books:		2	7	6	2	6	1
Working Papers:	9	21	30	20	24	15	10
Popular scientific articles:	4	10	12	7	7	18	4
Other publications:		5	3	2	18	8	
Conference and seminar presentations:		100	100	74	108	76	65
CREE in the media:	9	41	31	23	26	20	11

For more information about the publications, see <http://www.cree.uio.no/publications/>

Table 2 shows planned deliverables in 2017, according to the CREE work plan for 2017, relative to realized deliverables. As documented by the Table, all planned deliverables were met.

Table 2 Planned versus realized deliverables, 2017

Planned	Delivered
• One user seminar	-Populisme og veien videre for en ambisiøs klimapolitikk -Klimalov og kvotehandel: Kan det virke sammen for grønn vekst i Norge?
• At least one dialogue seminar	-Kalkulasjonsrenten(The social rate of discount)
• At least one synthesis report	-Report based on the dialogue seminar
• At least three news letters	-CREE newsletter Nr 1 - 2017 -CREE newsletter Nr 2 - 2017 -CREE newsletter Nr 3 - 2017
• At least two CREE hot line meetings	-Miljødirektoratet -Nærings- og fiskeridepartementet (NFD) -Nærings- og fiskeridepartementet (NFD) -Norges vassdrags- og energidirektorat (NVE)
• Updated CREE web pages	-http://www.cree.uio.no/
• One research workshop	-Implication of Paris -7th research workshop 2017
• At least 10 reports	-10 CREE working papers 2017
• At least 8 accepted papers in journals or books.	-23 Scientific Journals



5.1 Snapshots of some research projects in 2017

The impact of alternative policy instruments on environmental performance

During the recent decades, environmental concerns have attracted increasing attention. Different kinds of environmental regulations have been introduced in order to curb polluting emissions to air, soil, and water. The regulations have been multifaceted ranging from direct pollution regulation (“command-and-control”), such as technology standards and non-tradable emission quotas, to indirect (“incentive-based”) regulations, such as environmental taxes and tradable emission quotas.

Using a rich Norwegian panel data set that includes information about environmental regulations such as environmental taxes, non-tradeable emission quotas, technology standards, various polluting emissions, and a large number of control variables, this paper analyses the effects of direct and indirect environmental regulations on environmental performance. The study identifies positive and significant effects of both direct and indirect policy instruments. Moreover, whether the two types of regulations lead to positive and persistent effects on environmental performance is tested. Evidence is found that direct regulations promote such effects. Indirect regulations, on the other hand, will only have potential persistent effects if environmental taxes are increasing over time.

Bye, B. and M. E. Klemetsen (2018), The impact of alternative policy instruments on environmental performance: A firm level study of temporary and persistent effects. *Environmental and Resource economics*, forthcoming.

<http://doi.org/10.1007/s10640-016-0081-8>

Electrical vehicles

Loading characteristics of electrical vehicles may be decisive for the speed of transition from standard gasoline cars to electrical vehicles. For gasoline cars, there is one loading standard, and thus all these cars can load in all gas stations. However, currently there are multiple loading standards for electrical vehicles. For example, the car manufacturer Tesla has chosen to design its own standard, and the German car manufacturers may follow the same strategy. But multiple standards can hardly be warranted because each car owner has access to only some of the loading stations, which may have negative impact on the development of electrical vehicles.

Because the market may not come up with a single common standard even if that is technological feasible, the government may try to enforce a single standard. Three strategies to obtain a single standard is i) a government-appointed committee of experts sets a standard, ii) the government imposes a standard, and iii) the government subsidizes extensive distribution of adaptors.

In the article, it is argued that multiple standards will imply unnecessary high costs of cutting greenhouse gas emissions in the transport sector.

Greaker, M. and M. Kristoffersen (2017), Lading av elbiler. Bør vi godta flere standarder? (Loading of electrical vehicles: should we accept multiple standards? Samfunnsøkonomen, nr. 4, 67-77.

http://www.cree.uio.no/publications/pdf_popular_scientific_articles/samfok_2017_4_lading_av_biler_greaker_kristoffersen.pdf

Should government direct R&D from dirty into clean technologies?

Reducing the share of fossil fuels in the energy mix is a major challenge for climate change policy. Research and development (R&D) drives down costs and improves technologies, and hence, facilitates the diffusion of new, clean technologies. On the other hand, this mechanism is also present for dirty technologies. For instance, recent improvements in the “fracking”

technology have made it profitable to extract oil from under-ground shale layers, putting a downward pressure on the oil price, and thus reducing the relative attractiveness of electric vehicles.

Economists normally argue that putting a tax on carbon emissions is the single most important instrument for tackling climate change. Moreover, although most economists agree that research and development of new carbon-free technologies should be subsidized, few advocate prioritizing public R&D funds for clean technologies. This view has, however, recently been challenged in the literature linking climate and R&D policy.

This paper follows the tradition of grouping technologies into clean and dirty. Two research questions are posed: Under what circumstances should governments actively direct research effort away from dirty technologies into clean technologies? To what extent can a clean research subsidy replace a carbon tax? These questions are examined by introducing two novelties; decreasing returns to R&D, and allowing future carbon taxes to influence current R&D decisions.

The results suggest that government should prioritize clean R&D. Dealing with major environmental problems require R&D to shift to clean technologies. However, with most researchers working with clean technologies, both productivity spillovers and future risks of being replaced increases. Consequently, the wedge between private and social value of an innovation is largest for clean technologies.

Greaker, M., T.- R. Heggedal and K. E. Rosendahl (2018), Environmental policy and the direction of technical change. *Scandinavian Journal of Economics*, forthcoming.

<http://doi.org/10.1111/sjoe.12254>

How to mitigate carbon leakages?

In response to the threat of climate change, many countries consider, or have introduced, unilateral climate policies. However, greenhouse gases are global pollutants and unilateral actions lead to carbon leakage, such as relocation of emission-intensive and trade-exposed activities to countries with no or more lenient climate regulations.

To mitigate counterproductive leakage, countries have either exempted emission-intensive and trade-exposed industries from the regulation, or searched for supplemental anti-leakage measures. As a prime example, emission-intensive and trade-exposed industries in the EU, which are regulated under an emission trading system (EU ETS), have received large amounts of free allowances. Another potential anti-leakage measure that figures prominently in the economic literature is border tax adjustment with carbon tariffs on imports and rebates on exports of emission-intensive and trade-exposed goods.

Previous studies have suggest that emission pricing combined with border tax adjustment is a second-best instrument, and is more cost-effective than free allowance allocation conditional on output (output-based rebating). In this article, it is shown that the combination of output-based rebating and a consumption tax for emission-intensive and trade-exposed goods, can be equivalent with border carbon adjustment. It is welfare improving for a region that implements emission pricing along with output-based rebating to introduce such a consumption tax.

Böhringer, C. K. E. Rosendahl and H. Briseid Storrøsten (2017): Robust policies to mitigate carbon leakage. *Journal of Public Economics*, 149, 35-46.

<https://doi.org/10.1016/j.jpubeco.2017.03.006>



5.2 Snapshots of some collaboration with user partners

CREE Hot Line

CREE offers CREE Hot Line to its user partners. These are informal meetings where the user can discuss methodological and policy issues with CREE researchers. In 2017, four meetings were organized; one on non-ETS emissions (Norwegian Environment Agency), two on environmentally friendly R&D (Norwegian Ministry for Petroleum and Energy), and one on energy demand in Norwegian households (Norwegian Water Resources and Energy Directorate).

In the meeting with the Norwegian Environment Agency, CREE researchers presented output from model runs for the development of non-ETS emissions in the EU. The meeting was followed up by dialogues between the CREE researchers and the Norwegian Environment Agency, which resulted in updated and extended results on non-ETS emissions in the EU. The Norwegian Environment Agency used the results as inputs in their own report on flexible mechanisms in the EU climate policy, commissioned by the Ministry of Climate and Environment.

User partner conference

Once a year, CREE organizes, joint with CICEP (another research center on environmentally friendly energy) a half-day conference directed at user partners and the general public. In 2017, the topic was populism and climate policy. Some key questions discussed in the course

of the conference were i) what is a populist environmental policy? ii) what are the characteristics of the climate policy of populists like Trump? and iii) how can populist leaders affect international climate cooperation?

CREE dialogue seminar

Once a year, CREE organizes a half-day seminar for its user partners on topics of mutual interest. In 2017, the topic was the social rate of interest, which had been requested by several CREE user partners. Both CREE researchers and user partners gave presentations. Later, an article on the social rate of interest, directed at CREE user partners, was written by two CREE researchers.

Workshops with user partners

In order to ensure policy and technology relevance of CREE projects, workshops with user partners have been organized. This is the case for one project on electrification of transport, and one project on smart paths toward the low-emissions society. In the latter workshop, qualitative green scenarios were developed joint with the stake holders, thereby ensuring compliance with the perspectives of the users.

5.3 Interdisciplinary contact and cooperation

Technology research is essential for developing our numerical models. IFE has been an important partner and subcontractor to CREE from the beginning. Their work on modelling various energy technologies in the detailed energy optimization model TIMES-Norway can provide valuable input in economic models. Especially IFE has supplied estimates of energy efficiency technologies and potentials in the building sector, and we have published a joint article in the journal *Samfunnsøkonomen* where we compare the engineering approach and the economist approach of modelling energy efficiency and relevant measures. Cooperation with IFE has also resulted in research projects from the research programme ENERGIX (RCN), and an ongoing CREE-funded activity on electricity storage technologies, focusing mainly on the interplay between wind power, solar power and batteries in the Nordic countries.

Beyond the collaboration with technologists, we have initiated and started a series of multidisciplinary collaborative projects with researchers from the fields of anthropology,

psychology and law. Social anthropologists at SUM (UoO) are involved in the flagship "Green innovations and utilizations of smart technologies". A joint project with the Department of Psychology (UoO) is based on the common methodology of behavioural experiments (in lab). The project provides a good foundation for studying attitudes to risk relevant to the design of climate policies. Further, researchers at the Faculty of Law (UoO) are participating in one of our ENERGIX projects as well as in the flagship "Radical emissions reductions in ETS sectors".



6 International cooperation

All the research partners in CREE have a large international network, which is shown through extensive co-authorship with researchers from other countries (see <http://www.cree.uio.no/publications/>). When it comes to articles in peer reviewed international journals, about half of the 23 papers that were published in 2017 had foreign authors or co-authors. This illustrates that CREE works internationally, both through co-authorship and through impacts in the international research community.

CREE researchers also participate actively at international conferences and seminars (e.g., IAEE and EAERE), in international groups (e.g., IPCC), networks (e.g., CESifo), and lecture at foreign universities and institutions.

CREE has an international research partner - Tilburg Sustainability Center - and two foreign researchers had a part-time position paid by CREE in 2017:

- Fridrik Baldursson, Reykjavik University
- Christoph Böhringer, Oldenburg University

In addition to the foreign researchers who are employed part time by CREE, several foreign researchers have contracts on CREE projects that are externally funded, i.e., not paid by the direct funding of CREE.

CREE organizes an annual research workshop where we invite researchers from our network. At the workshop in 2017 (26-27 October), the following non-Norwegian researchers attended (see

http://www.cree.uio.no/outreach/events/research_workshops/7th-research-workshop.html):

- Stefan Ambec (Toulouse School of Economics)
- Fridrik Baldursson (Reykjavik University).
- Christoph Böhringer (Univ. Of Oldenburg)
- Reyer Gerlagh (University of Tilburg)
- Richard Jaimes (University of Tilburg)
- Sjak Smulders (Tilburg University)
- Olli Tahvonen (University of Helsinki)

Some foreign researchers held CREE seminars in 2017:

Frances Sprei, Chalmers, Energy and Environment: Consumer perspectives on electric vehicle adoption: incentives and range anxiety, March 28, 2017

James Stock, Harvard: Federal Coal Program Reform, the Clean Power Plan, and the Interaction of Upstream and Downstream Climate Policies, March 14, 2017

7 Recruitment

Every year, CREE gives a master scholarship of NOK 20.000 to master students. These are offered an office at one of the Norwegian research partners, supervision by one or two of the CREE researchers, access to all CREE events, and the possibility to publish their thesis in the CREE Working Paper series. For 2017 scholarships were given to Linnea Lorentzen, Ole Røgeberg, Katarzyna Segiet, Casandra Velten, Carl Frederik Kontny, Mats Kristoffersen and Nour-Eddine Elkadi. Their theses are published in the CREE working paper series.

http://www.cree.uio.no/projects/p_057.html

8 Cooperation with other FME centres

CREE has a close collaboration with CICEP, one of the other social science-related energy research centers (FME Samfunn) funded by the Research Council of Norway. CICEP has many overlapping projects with CREE as both centres have a large interest in international

climate negotiation and agreements. Every spring CREE and CICEP organize a joint user conference for our research partners and other interested institutions. We also organize research workshops together, write joint research proposals and have some joint research projects.

In addition, we have common interests with CenSES, the third FME Samfunn, in numerical modelling of energy markets and new energy technologies, and we have organized workshops and Model Forums together. We were both involved in the project “Implications of Paris”, a project initiated by Joint Global Change Research Institute (JGCRI), University of Maryland. As part of this project, in 2017 we jointly organized a two-day workshop, focusing mainly on electricity production, transport and green competitiveness, as well as implications for Norway. The project is organized as a series of three workshops during 2016 and 2017.

<http://www.globalchange.umd.edu/implications-of-paris-project/>

9 Communication and dissemination

The main users of CREE are, in addition to the research community, industry, Government and the general public. The communications to users are mainly through the following channels:

- Dissemination of research and media activity through our webpage (www.cree.uio.no)
- An annual user conference (April). This is organized together with CICEP
- Organize user activities such as meetings and seminars
- Publish in Norwegian-language journals such as *Samfunnsøkonomen* and *Økonomiske analyser*
- We contribute to hearings in the Parliament and public debates.

CREE has invested heavily in communication, for instance through an internal reward system for communicating through the media. We have dedicated a website for news on CREE research, see <http://www.cree.uio.no/outreach/>, and had 11 reports in the media in 2017. Researchers from CREE have been involved in debates in the media over the past year on subjects such as climate treaties, electric vehicles, bio fuels, and energy efficiency.

When it comes to user-oriented communication measures, we usually give about 65-100 presentations each year. This includes meetings with all user partners, seminars, workshops and conferences. In addition to the two regular user arrangements in the spring and the fall, we organize seminars for users that are interested in certain topics.



CREE - Oslo Centre for Research on Environmentally friendly Energy

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Web: www.cree.uio.no/

Annual report: Appendix:

CREE

A1 Personnel

Key Researchers

Name	Institution	Main research area
Gaure, Simen	Frisch Centre	Statistical, Algebraic and numerical methods, Applied mathematics
Golombek, Rolf	Frisch Centre	Environmental Economics, Energy Economics, Applied Game Theory
Hauge, Karen	Frisch Centre	Environmental Economics
Kittelsen, Sverre	Frisch Centre	Production theory, Efficiency measurement, Regulation, Health Economics, Energy Economics
Kverndokk, Snorre	Frisch Centre	Environmental and Resource Economics, Health Economics
Nævdal, Eric	Frisch Centre	Resource Economics, Economic management of ecological systems, dynamic optimization, modeling of the risk of disasters, animal behavior
Røgeberg, Ole	Frisch Centre	Welfare analysis, endogenous preferences, rational addiction theory, consumer theory
Strøm, Steinar	Frisch Centre	Microeconomics
Asheim, Geir	Department of Economics, University of Oslo	Game theory, intergenerational justice, green national accounting
Brekke, Kjell Arne	Department of Economics, University of Oslo	Behavioral Economics, Experimental Economics, Resource and Environmental Economics, Real options and stochastic analysis
Førsund, Finn	Department of Economics, University of Oslo	Resources, energy, environment, production theory, productivity
Framstad, Nils Christian	Department of Economics, University of Oslo	Stochastic optimization
Harstad, Bård	Department of Economics, University of Oslo	Political Economics, Public Economics, Contract Theory, Environmental Economics
Hoel, Michael	Department of Economics, University of Oslo	Energy and climate economics, environmental economics, resource economics
Lund, Diderik	Department of Economics, University of Oslo	Resources, energy and environment, economics
Nyborg, Karine	Department of Economics, University of Oslo	Environmental economics, economic analysis of social and moral norms, behavioral economics.
Piacquadio, Paolo Giovanni	Department of Economics, University of Oslo	Microeconomic Theory, Welfare Economics, Public Economics, and Environmental Economics.
Traeger, Christian	Department of Economics, University of Oslo	Environmental Economics, Intertemporal Welfare Analysis, Decision Theory
Vislie, Jon	Department of Economics, University of Oslo	Microeconomics, environmental economics, incentives, public economics
Von der Fehr, Nils	Department of Economics, University of Oslo	Microeconomics, Industrial Economics, Regulation, Competition Policy.
Aune, Finn Roar	Research Department, Statistics Norway	Energy and environmental economics
Bye, Brita	Research Department, Statistics Norway	Macroeconomic
Fæhn, Taran	Research Department, Statistics Norway	Macroeconomic
Greaker, Mads	Research Department, Statistics Norway	Energy and environmental economics
Grimsrud, Kristine M.	Research Department, Statistics Norway	Energy and environmental economics
Hagem, Cathrine	Research Department, Statistics Norway	Energy and environmental economics
Halvorsen, Bente	Research Department, Statistics Norway	Energy and environmental economics
Holtmark, Bjart	Research Department, Statistics Norway	Energy and environmental economics
Larsen, Bodil Merethe	Research Department, Statistics Norway	Energy and environmental economics
Rosnes, Orvika	Research Department, Statistics Norway	Energy and environmental economics
Storrøsten, Halvor B.	Research Department, Statistics Norway	Energy and environmental economics
de Zeeuw, Aart	Tilburg Sustainability Center	Sustainability, Dynamic game theory, Environmental economics, Environmental policy, Mathematical economics
Gerlagh, Reyer	Tilburg Sustainability Center	Climate Change, Economics, Energy economics, Environmental economics
Smulders, Sjak	Tilburg Sustainability Center	Energy and environmental economics
van der Heijden, Eline	Tilburg Sustainability Center	Energy and environmental economics

Associated Researchers

Baldursson, Fridrik	Reykjavik University	Financial Economics, Industrial Economics, Environmental and Resource Economics
Böhringer, Christoph	University of Oldenburg	Energy Economics
Carbone, Jared	University of Calgary	Environmental and Resource Economics
Eyckmans, Johan	Hogeschool-Universiteit Brussel	Economics of climate change, emissions trading, applications of game theory to the formation of international environmental agreements, cost benefit analysis, general equilibrium and integrated assessment modeling, evaluation of environmental policies, economics of waste management, industrial organization and normative economic theory
Gravir, Anders	Ringerikskraft	Energy markets
Green, Richard	Imperial College London	Energy markets
Isaksen, Elisabeth Thuestad	The Londo School of Economics and Political Science	Environmental and resource economics; Applied econometrics, Efficiency and equity impacts of environmental and climate policies, Behavioral economics
Jensen, Svern	Norewegian University of Life Sciences	Environmental Economics
Liski, Matti	Aalto University School of Economics	
Rosendahl, Knut Einar	Research Department, Statistics Norway	Energy and environmental economics
Spiro, Daniel	Uppsala Universitet, Department of Economics	Environmental and resource economics, Behavioral economics and political economics
van den Bijgaart, Inge	University of Gothenburg web page	Environmental, Climate policy, Growth.

Name	Funding	Nationality	Period	Sex M/F	Topic
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Post Doc with financial support from other sources

Holtmark, Katinka	Department of Economics, University of Oslo	Norwegian	2016-2018	F	Microeconomics, political economy, environmental economics
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PhD students working on projects in the centre with financial support from CREE and other sources

Dalen, Hanne Marit	Research Department, Statistics Norway	Norwegian	2010-2018	F	
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PhD students working on projects in the centre with financial support from other sources

Coelli, Federica	Department of Economics, University of Oslo	Italian	2016-2020	F	International trade, Innovation, Environmental economics, Climate change
Hjort, Ingrid	Department of Economics, University of Oslo	Norwegian	2015-2019	F	Environmental Economics, Political Economy, Resources, Climate Change
Nesje, Frikk	Department of Economics, University of Oslo	Norwegian	2014-2018	M	Welfare economics, environmental economics, development economics

Master thesis CREE

Name	Institution granting degree	Adviser	Year	Sex	Title of thesis
Abrahamsen, Kamila Lund		Spiro, Daniel	2014	F	Elektrisitetspriser: En empirisk og teoretisk analyse av tilbud og etterspørsel
Andersson, Runa Haave		Nyborg, Karine og Holtsmark, Bjart	2013	F	"STABILITY OF INTERNATIONAL CLIMATE TREATIES THE IMPORTANCE OF HETEROGENEITY"
Andenes, Liv Jorunn		Wilhite, Harold Langford	2014	F	Bicycle Commuting in Oslo - Practices, Constraints and new Directions for Policy
Beisland, Christina Stene	CREE	Greaker, Mads	2013	F	From Targets and Timetables to Technology Investments
Birkelund, Henriette	CREE	Halvorsen, Bente	2013	F	Oppvarming og innetemperaturer i norske barnefamilier - En analyse av husholdningenes valg av innetemperatur
Boroumand, Yasaman		Rosendahl, Knut Einar		F	Price Elasticity of Non-OPEC Supply
Elkadi, Nour-Eddine	CREE	Bye, Brita	2017	M	Husholdningenes transport og miljøpolitikk - Modellering og virkemidler
Gavenas, Ekaterina		Rosendahl, Knut Einar		F	On the way to a Cleaner Future: A Study of CO2 Emissions on Norwegian Continental Shelf
Hjort, Ingrid C.	CREE	Greaker, Mads	2015	F	Innovation Prizes for Environmental R&D in Presence of Lobbyism
Jakobsen, Anja Lund		Rosendahl, Knut Einar		F	Does the Polluter Pay in the EU ETS, or does the EU ETS Pay the Polluter?
Jemsek, Misha		Winther, Tanja		M	Heat Pumps and Household Energy Consumption in Norway
Jiang, Shan	CREE	Kverndokk, Snorre	2016	F	Pareto improving Climate Policies for the Main CO2 Emitting Countries/Regions
Landmark, Marie Brun	CREE	Harstad, Bård	2016	F	Environmental effects of international electricity trade
Kontny, C. F.	CREE	Rosendahl, Knut Einar	2017	M	The road to meeting Norway's non-ETS climate goal in 2030 - Is an electric vehicle subsidy the way to go?
Matungwa, Bernard		Wilhite, Harold Langford	2014	M	An Analysis of PV Solar Electrification on Rural Livelihood Transformation: A Case of Kisiju-Pwani in Mkuranga District, Tanzania
Nesje, Frikk	CREE	Ekstern	2013	M	Distrust, but verify?: Theoretical insights into auditing carbon sequestration in tropical forests
Nesvik, Linn Camilla		von der Fehr, Nils-Henrik M.	2012	F	Geografiske kostnads- og prisforskjeller i det norske kraftmarkedet : En tidsserieanalyse av de norske kraftprisene fra 2006 til 2011
Reinlie, Kristine Borgeraas		Brekke, Kjell Arne	2014	F	Er elsertifikatene grønne? En analyse av samspillet mellom det svensk-norske elsertifikatmarkedet og det europeiske kvotemarkedet
Røed, Tiril Salhus		Hoel, Michael	2014	F	Klimagassutslipp og subsidiering av fornybar Energi: En numerisk analyse av klimagevinst ved innføring av grønne sertifikater
Salvesen, Ingerid		Wilhite, Harold Langford	2014	F	Practicing the preaching?: A study of the Transition Movement in Norway and its effort to change energy-related practices
Sletten, Thea Marcellia		Hoel, Michael	2012	F	A Framework for Studying the Environmental Impact of Biofuel Policies
Syrstad, Ragnhild Sjoner	CREE	Golombek, Rolf and Müller, Andreas	2016	F	Climate and Energy Security Policies in the EU: Conflict or Cohesion?
Valseth, Asmund Sunde	CREE	Harstad, Bård	2014	M	Competing Climate Policies
Velten, Cassandra	CREE	Greaker, Mads	2017	M	Network effects and excess inertia: Do Carbon Capture and Storage Technologies Suffer from Technology Lock-In?
Verlo, Kjell Rune	CREE	von der Fehr, Nils-Henrik M.	2015	M	Is low carbon taxation optimal climate policy for a developing country? A numerical simulation of technology adoption
Vik, Martin Andreas		von der Fehr, Nils-Henrik M.	2012	M	Node- eller soneprising i kraftmarkeder: Hvilket markedsdesign løser best markedsmakt ved flaskehals?
Weidle, Maiken Katrine	CREE	Greaker, Mads and Nyborg, Karine	2014	F	Is low carbon taxation optimal climate policy for a developing country? A numerical simulation of technology adoption
Weyer, Ingrid Semb	CREE	Greaker, Mads	2015	F	Directed technical change in clean and dirty technologies: Is it possible to redirect R&D in a multiregion world?

A2 Statement of Accounts

(All figures in 1000 NOK)

Funding

	Amount
The Research Council	6 118
Research Partners (own funding)	
Frisch Centre (Host Institution)	5 433
Statistics Norway	7 492
Department of Economics, UoO	1 000
Tilburgs Sustainability Center	250
User partners	
Statkraft Energy AS	100
Statnett	250
Public partners	
University of Oslo	582
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Total	21 225

Costs

Research Partners

Frisch Centre (Host Institution)*	8 590
Statistics Norway	9 482
Department of Economics, UoO	1 433
Tilburgs Sustainability Center	500
Centre for Development and the Environment, UoO	200
The Faculty of Law - Natural Resources Law, UoO	170
Institute for Energy Technology (IFE)	850

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Total	21 225

* Includes transfer to other research institutions as TØI and NMBU from other project than NFR 209698

A3 Publication

<http://www.cree.uio.no/publications/>

Journal papers

Andersen, J.J. and M. Greaker (2017): Emission Trading with Fiscal Externalities: The Case for a Common Carbon Tax for the Non-ETS Emissions in the EU. *Environmental and Resource Economics*, Vol. 68, pp. 1–21, 2017.

Aune, F. R., A.C. Bøeng, S. Kverndokk, L. Lindholt, K. E. Rosendahl (2017): Fuel efficiency improvements - Feedback mechanisms and distributional effects in the oil market. *Environmental and Resource Economics*, Vol. 68, Issue 1, pp. 15–45, 2017.

Aune, F.R. , K. Grimsrud, L. Lindholt, K.E. Rosendahl and H.B. Storrøsten (2017): Oil consumption subsidy removal in OPEC and other Non-OECD countries. *Energy Economics*, Vol 68, 395–409

Baldursson, F.M. and N.-H. M. von der Fehr (2017): Natural resources and sovereign expropriation. *Journal of Environmental Economics and Management* Forthcoming

Brekke, K. A., R. Golombek, M. Kaut, S.A.C. Kittelsen and S. W. Wallace (2017): Stochastic energy market equilibrium modeling with multiple agents. *Energy*, Vol 134, pp 984-990

Brekke, K.A., J. Konow, K. Nyborg (2017): Framing in a Threshold Public Goods Experiment with Heterogeneous Endowments. *Journal of Economic Behavior and Organization* Vol 138,99-110.

Bye, B. and M. E. Klemetsen (2017): The impacts of alternative policy instruments on environmental performance: A firm level study of temporary and persistent effects. *Environmental and Resource Economics*, Forthcoming

Böhringer, C., B. Bye, T. Fæhn and K.E. Rosendahl (2017): Output-based rebating of carbon taxes in the neighbor's backyard. Competitiveness, leakage and welfare. *Canadian Journal of Economics* Vol 50, 426-455

Böhringer, C., B. Bye, T. Fæhn and K.E. Rosendahl (2017): Targeted carbon tariffs: Export response, leakage and welfare. *Resource and Energy Economics*, Vol 50, 51-73

Böhringer, C., K.E. Rosendahl and H.B. Storrøsten (2017): Robust policies to mitigate carbon leakage. *Journal of Public Economics*, Vol 149, 35–46

Carbone, J. C. and R. S. Gazzale (2017): A Shared Sense of Responsibility: Money Versus Effort Contributions in the Voluntary Provision of Public Goods. *Journal of Economic Behavior and Organization* Vol 139, 74-87.

Carbone, J. C. and N. Rivers (2017): The Impacts of Unilateral Climate Policy on Competitiveness: Evidence From Computable General Equilibrium Models. *Review of Environmental Economics and Policy*, Vol 11, Issue 1, 24-42.

Drupp, M., M. Freeman, B. Groom, R. Nesje (2017): Discounting Disentangled. *American Economic Journal: Economic Policy*, Forthcoming

Fischer, C., M. Greaker and K.E. Rosendahl (2017): Robust technology policy against emission leakage: The case of upstream subsidies. *Journal of Environmental Economics and Management* Vol 84, 44-61

Fæhn, T., C. Hagem, L. Lindholt, S. Mæland and K.E. Rosendahl (2017): Climate policies in a fossil fuel producing country. Demand versus supply side policies. *The Energy Journal*, Vol 38 (1),77-102

Greaker, M., T. R. Heggedal and K. E. Rosendahl (2017): Environmental Policy and the Direction of Technical Change. *Scandinavian Journal of Economics*

Green R., I. Staffell (2017): “Prosumage” and the British Electricity Market. *Economics of Energy & Environmental Policy*

Harstad B. and T. Mideksa (2017): Conservation Contracts and Political Regimes. *Review of Economic Studies*, Vol 84(4): 1708-34.

Hassler, J. , P. Krusell, A. B. Shifa, D. Spiro (2017): Should Developing Countries Constrain Resource-Income Spending? A Quantitative Analysis of Oil Income in Uganda.. *The Energy Journal*, Vol 38 (1), 103-132

Nyborg, K. (2017): Reciprocal climate negotiators. *Journal of Environmental Economics and Management*. Forthcoming,

Piacquadio, P. G. (2017): A Fairness Justification of Utilitarianism. *Econometrica*, Vol 85, Issue 4, pp 1261-1276

Tahvonen, O. and A. Rautiainen (2017): Economics of forest carbon storage and the additionality principle. *Resource and Energy Economics*, Vol 50, p. 124-134

Winther, T. and S. Bell (2017): (In press): Domesticating In Home Displays in selected British and Norwegian households.. *Journal of Science and Technology Studie*

CREE working paper

http://www.cree.uio.no/publications/CREE_working_papers/

Bjørnebye, H. C. Hagem, and A. Lind (2017): Optimal location of renewable power. *CREE WP*, No. 04/2017

Crépin S.A. and E. Nævdal (2017): Inertia in risk; improving economic models of catastrophes. *CREE WP*, No. 02/2017

Drupp, M. A., M.C. Freeman, B. Groom and F. Nesje (2017): DISCOUNTING DISENTANGLED. *CREE WP*, No. 06/2017

Elkadi, Nour-Eddine (2017): Husholdningenes transport og miljøpolitikk - Modellering og virkemidler. *CREE WP*, No. 08/2017

Fæhn, T. and P. E. Stoknes (2017): Significant and plausible futures - Global surroundings of Norway's climate strategies. *CREE WP*, No. 10/2017

Grimsrud, K., L. Lindholt and M. Greaker (2017): Resource Rent in Norwegian Fisheries - Trends and policies. *CREE WP*, No. 01/2017

Kontny, C. F. (2017): The road to meeting Norway's non-ETS climate goal in 2030 - Is an electric vehicle subsidy the way to go?. *CREE WP*, No. 05/2017

Lindholt L. and S. Glomsrød (2017): Phasing out coal and phasing in renewables – good or bad news for arctic gas producers?. *CREE WP*, No. 03/2017

Strand, J. (2017): Unconditional and conditional NDCs under the Paris Agreement: Interpretations and their relations to policy instruments. *CREE WP*, No. 09/2017

Velten, Cassandra (2017): Network effects and excess inertia: Do Carbon Capture and Storage Technologies Suffer from Technology Lock-In?. *CREE WP*, No. 07/2017

Other publications

<http://www.cree.uio.no/publications/>

Bye, B, T. Fæhn, O. Rosnes (2017): Marginal Abatement Costs under EU's Effort Sharing Regulation A CGE study. *Report (spærrefrist) Statistisk Sentralbyrå*

Dengler S., R. Gerlagh, S. Trautman, G. van der Kuilen (2017): Climate Policy Commitment Devices. *FEEM*, WP 49.2017

Greaker M. og M. Kristoffersen (2017): Lading av elbiler: Bør vi godta flere standarder?. *Samfunnsøkonomen*, Nr 4 2017

Greaker, M. A., og K. E. Rosendahl (2017): Petroleumsvirksomhet i Barentshavet sørøst- om klima, økonomi og sysselsetting. *GREENPEACE*

Nesje, F. and G.B. Asheim (2017): Forthcoming, Intergenerational Altruism: A Solution to the Climate Problem? *Handbook on the Economics of Climate Change*, Vol. 2.

Conference and seminar presentations

<http://www.cree.uio.no/outreach/presentation/>

Forfattere	Tittel	Sted, dato
Brita Bye	Teknologiutvikling, markedssvikter og virkemidler: Empiriske analyser	Foredrag på seminar i regi av CREE i Olje- og energidepartementet 31 mars 2017
Brita Bye	Petroleum wealth funding, competitiveness and resource extraction	Foredrag på workshop i regi av Prospects-prosjektet, finansiert av Norges Forskningsråd, SSB 22 May 2017
Brita Bye	Joining a carbon policy coalition: Regional versus sectoral where-flexibility	Foredrag på workshop i regi av WILL-prosjektet, finansiert av Norges Forskningsråd, SSB 31 May 2017
Brita Bye	Teknologiutvikling, markedssvikter og virkemidler: Empiriske analyser	Foredrag på seminar i regi av CREE i Nærings- og fiskeridepartementet 18 september 2017
Diderik Lund	Kalkulasjonsrente og usikkerhet	Presentasjon på CREE dialogseminar. 16 Nov. 2017
Drupp, M.A., M.C. Freeman, B., Groom and F. Nesje	Combining Expert Advice on Social Discounting.	Annual Conference of the European Association of Environmental and Resource Economists (EAERE). Athens, Greece.
Frikk Nesje	Cross-Dynastic Intergenerational Altruism	7th CREE Research Workshop. Oslo, Norway.
Frikk Nesje	Cross-Dynastic Intergenerational Altruism	6th Lindau Meeting on Economic Sciences. Lindau, Germany.
Frikk Nesje	Cross-Dynastic Intergenerational Altruism	EAERE-FEEM-VIU European Summer School on Macroeconomics, Growth and the Environment. Venice, Italy.
Halvor B. Storrøsten	Robuste virkemidler mot karbonlekkasje.	CICEP/CREE brukerseminar, Litteraturhuset in Oslo, Norway. 2017
Halvor B. Storrøsten	Supply vs. demand side policies	Seminar, University of Oslo, Norway. 2017
Halvor B. Storrøsten	On the path towards the low carbon society: Regulation, transition dynamics and intertemporal effects	CREE forskerkonferanse, Oslo, Norway. 2017
Halvor B. Storrøsten	Supply vs. demand side policies: Carbon leakages and the green paradox	Forskerkonferansen, Trondheim, Norway. 2017

Jared Carbone	Comparing applied general equilibrium and econometric estimates of the effect of an environmental policy shock, economics department seminar	University of Wyoming, 2017
Jared Carbone	Modelling equilibrium responses to climate-induced migration	Front Range Energy Workshop, Boulder, CO, 2017
Karen Hauge	The Good, the Bad, and the Conditional: Sorting and Dynamics in a Public Good Game with Endogenous Group Formation	Kingston Business School, London 4 October 2017
Karen Hauge	The Good, the Bad, and the Conditional: Sorting and Dynamics in a Public Good Game with Endogenous Group Formation	University of Bergen, Bergen 14 September 2017
Karen Hauge	The Good, the Bad, and the Conditional: Sorting and Dynamics in a Public Good Game with Endogenous Group Formation	ESA European Meeting, Wien. 6.-9.September 2017
Karen Hauge	Visualizing residential electricity consumption	39th Annual Meeting of the Norwegian Association of Economists, Oslo. 3-4 January 2017
Karina Standal	Hvordan påvirker sosiale og kulturelle faktorer energisystemer og energiforbruk? Klosterenga som undervisningscase	Organiser UiO:Energy, Seminar teaching ENERGI4010. Oslo, 9.11.17
Karine Nyborg	Humans in the Perfectly Competitive Market: a Fictional Field Study	Forskermøtet for økonomer; 3-4 Jan. 2017 UiO
Karine Nyborg	Humans in the Perfectly Competitive Market: a Fictional Field Study	Research seminar; 22 Mar. 2017 UiO
Karine Nyborg	Humans in the Perfectly Competitive Market: a Fictional Field Study	Research Seminar; 4 Apr. 2017 UiO

Karine Nyborg	Humans in the Perfectly Competitive Market: a Fictional Field Study	Workshop in honor of Michael Hoel; 6 Apr. 2017 UiO
Karine Nyborg	On Behavioral Economics and Environmental Policy	Panel participant, Policy session, 23. Annual Conference of the EAERE; 29 Jun. 2017 UiO
Karine Nyborg	No Man is an Island	Invited Plenary talk, 23. Annual Conference of the EAERE; 30 Jun. 2017 UiO
Karine Nyborg	On Social Coordination	NFR's Omstilt-konferanse; 2 Sep. 2017 UiO
Karine Nyborg	No Man is an Island	Lecture for master students in environmental and public economics; 29 Sep. 2017 UiO
Karine Nyborg	On Welfare Analysis with Social Preferences	Workshop on Welfare Analysis in Behavioral Economics; 2-3 Nov. 2017 UiO
Karine Nyborg; Kjell Arne Brekke; Karen Hauge; Jo Thori Lind	The Good, the Bad and the Conditional: Sorting and Dynamics in a Public Good Game with Endogenous Group Formation	Université de Nanterre; 28 Sep. 2017
Karine Nyborg; Kjell Arne Brekke; Karen Hauge; Jo Thori Lind	The Good, the Bad and the Conditional: Sorting and Dynamics in a public Good Game with endogenous Group information.	Nordic Conference of Behavioral and Experimental Economics; 6-7 Oct. 2017
Karine Nyborg; Kjell Arne Brekke; Karen Hauge; Jo Thori Lind	Save the planet or close your eyes? Testing strategic ignorance in a charity context. briq	Workshop on Moral Reasoning in Economics; 23-24 Apr. 2017 UiO
Mads Greaker	Environmental policy with network effects	EAERE Conference, Athens, June 2017
Mads Greaker	Technology shifts, Path dependency and Environmental policy	Umeå University, October 2017
Mads Greaker	Environmental policy with network effects	Oslo University College, October 2017
Mads Greaker	Should environmental R&D receive more public support than other kinds of R&D?	Toulouse School of Economics, November 2017
Mads Greaker	Charging of electric cars: Should we accept several standards?	Ecole Normale, Paris, November 2017

Orvika Rosnes	Energy technology and energy economics: Analyses of energy efficiency policy in two different model traditions.	15th IAEE European Conference, Vienna. September 6, 2017
Orvika Rosnes	SNOW – generell likevektsmodell for norsk økonomi.	NFR workshop: Modellering av energisystemet. 25. april 2017
Paolo Giovanni Piacquadio	The ethics of Intergenerational Risk	NHH (Bergen, Norway), 2017
Paolo Giovanni Piacquadio	A Fairness Justification of Utilitarianism	NES (Moscow, Russia), 2017
Paolo Giovanni Piacquadio	A Fairness Justification of Utilitarianism	HSE (Moscow, Russia), 2017
Paolo Giovanni Piacquadio	A Fairness Justification of Utilitarianism	University of Oregon (US), 2017
Paolo Giovanni Piacquadio	A Fairness Justification of Utilitarianism	Bristol (UK), 2017
Paolo Giovanni Piacquadio	A Fairness Justification of Utilitarianism	University of Melbourne (Australia), 2017
Paolo Giovanni Piacquadio	A Fairness Justification of Utilitarianism	Monash University (Australia), 2017
Paolo Giovanni Piacquadio	A Fairness Justification of Utilitarianism	Mannheim (Germany), 2017
Paolo Giovanni Piacquadio	A Fairness Justification of Utilitarianism	University of Copenhagen (Denmark), 2017
Paolo Giovanni Piacquadio	A Fairness Justification of Utilitarianism	Surrey (UK), 2017
Paolo Giovanni Piacquadio	A Fairness Justification of Utilitarianism	Copenhagen Business School (Denmark), 2017
Paolo Giovanni Piacquadio	Welfare with other-regarding preferences	DIW-Berlin (Germany), 2017
Rolf Golombek	Innovation prizes for environmental R&D	Le Groupe de Recherche en Droit, Economie et Gestion (GREDEG), Nice, mai, 2017
Rolf Golombek	LIBEMOD – analysemuligheter og modeleringsbegrensninger.	Workshop om energisystem-modellering. Norges forskningsråd, 25.4, 2017
Olli Tahvonen and A. Rautiainen	Economics of forest carbon storage and the additionality principle	Athens, Greece. 28 June- 01 July 2017,
Olli Tahvonen	Utilization of forests under climate change	CREE workshop 27-28 October, Oslo, 2017

Tanja Winther	Keynote speaker: "Delaying or enhancing solutions to the Energy Dilemma? Reflections from an Energy Anthropologist".	Organiser: European Association of Social Anthropologists (EASA): 'Why the World Needs Anthropologists: Powering the Planet', Durham University, UK, 28.10.17.
Tanja Winther	Sustainable Energy and Consumption	Organiser: UiO:Energy Forum, University of Oslo, 25.4.17.
Taran Fæhn	Energy technology and energy economics	Det nasjonale forskermøtet, HIOA, 3. jan. 2017
Taran Fæhn	SNoW-modellen som verktøy for samfunnsøkonomiske kostnader ved klimatiltak	Seminar i KLD med eksperter fra KLD, FIN og MDIR 18. jan 2017
Taran Fæhn	The role of economic and energy systems modelling?	Workshop: Energy and the Economy: Pushing the Boundaries, London 2.-3. Feb. 2017
Taran Fæhn	Samspeilet mellom ETS og klimaloven – hva er nytten for klimaet og konsekvensene for grønn vekst i Norge?	Frokostseminar arrangert av Energi Norge, FNI og CREE, 16. mai 2017
Taran Fæhn	Human-capital-channeled spillovers from a declining petroleum industry: Innovative and absorptive capacity effects	PROSPECTS Workshop 22. mai 2017
Taran Fæhn	Joining a carbon policies coalition: Flexible mechanisms, competitiveness and anti-leakage instruments	WILL workshop SSB 31.mai 2017
Taran Fæhn	Klimaloven og klimaomstilling	Lunsjseminar NVE 16. juni 2017
Taran Fæhn	Joining a carbon policies coalition: Regional vs. Sectoral Where-Flexibility	ECOMOD Conference 2017, Ljubljana, July 5-7