

ANNUAL REPORT 2023





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FME NTRANS – NORWEGIAN CENTRE FOR ENERGY TRANSITION STRATEGIES

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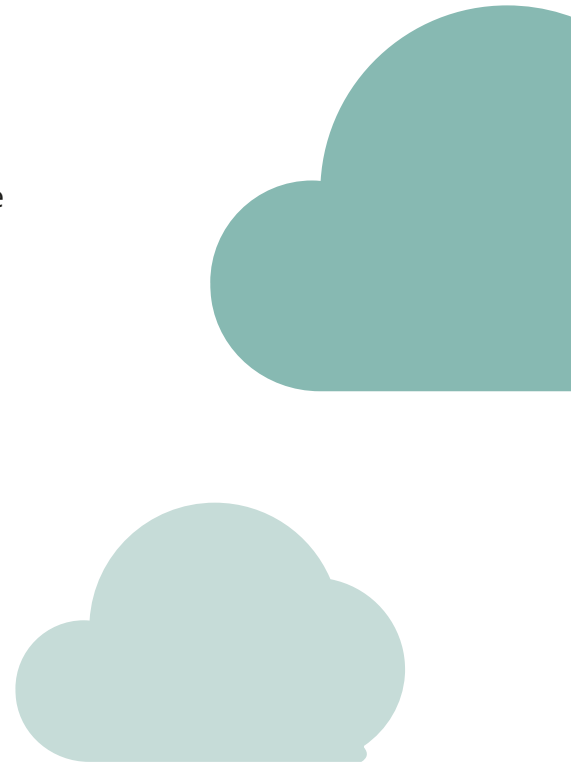
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**Chair of the
NTRANS Board,
Henrik Sætness**

MESSAGE FROM THE CHAIR OF THE BOARD

Despite the backdrop of rising geopolitical tensions, the energy transition continues to advance. Although the transition is accelerating rapidly, it's still not fast enough to realistically achieve the 1.5-degree target. Cost-efficient technologies, or those nearing cost-efficiency, such as onshore wind, heat pumps, electric vehicles, and notably solar PV, are growing rapidly. According to the International Energy Agency (IEA), for every dollar invested in fossil fuels, the world now invests 1.7 dollars in clean energy. However, amidst this forward momentum, challenges such as increased costs have been noted in offshore wind, and the anticipated yet unrealized breakthrough in hydrogen technology remind us of the hurdles still to overcome. With many countries needing to boost defense spending, prioritizing costlier decarbonization measures becomes a more challenging task for governments.

As the effects of climate change become more tangible worldwide, countries are maintaining or even increasing their commitments to combat climate change, regardless of the current geopolitical circumstances.

Norway, a small country with an open economy, finds itself in a unique situation. We have a decarbonized power sector, a substantial fossil fuel export, and high climate ambitions. This combination has sparked international questions about whether we bear enough responsibility, and domestic debates over the implications and prudence of our climate goals. These discussions are essential for societal progress and for balancing diverse considerations in an evolving environment. As the world changes, allies become increasingly important while other nations grow more hostile.

NTRANS' role in enhancing society's understanding of the energy transition and facilitating its navigation remains highly relevant. The center is now effectively producing results. These include tangible outputs like papers, policy briefs, and model output, as well as intangibles such as improved researchers and students. A notable highlight of 2023 was the defense of Kyriaki Tselika's PhD thesis, marking a historic milestone for NTRANS as she became the first scholar within our ranks to achieve this distinction.

As we approach 2024, we will reach the midpoint of our journey at NTRANS. The Board wishes to express its gratitude to Asgeir Tomasgard for his tenure as the center's director. His contributions have been instrumental in shaping our path. We are equally thrilled to usher in a new chapter with Tomas Moe Skjølsvold stepping into the role of director, bringing fresh perspectives and dynamic leadership to propel us forward.



Centre Director,
Tomas Moe
Skjølsvold

REPORT FROM THE CENTRE DIRECTOR

We are proud to present our annual report for 2023! This year was yet another great year for FME NTRANS. This was the year where our first PhD candidate defended her thesis. Congratulations to Kyriaki Tselika from NHH on her *“Essays on energy markets and the environment”*. While NTRANS is a highly interdisciplinary and collaboratively oriented center, our insights rely on the deep research dives conducted by our PhD candidates and post-doctoral researchers. Therefore: keep up the great work, we look forward to celebrating more new doctors soon!

Beyond the PhDs, the centre has yielded impressive output on a lot of different parameters from across all research areas in 2023. We have seen two publications from the center in *Proceedings of the national academy of sciences*. We have published an impressive research report that pulls together insights from across socio-technical and techno-economic research, to showcase different pathways that Norway might embark on to achieve a zero-emission society. We have collaborated closely with our non-academic partners, e.g. on topics such as urban transport logistics, flexible energy resources, and societal aspects of offshore wind, resulting in important policy briefs. We have made sure that there has been a steady stream of public dissemination through open editorials, important events such as our conferences and presence at Arendalsuka. Further, it is nice to note that key Norwegian policy processes such as the climate commission and the technical calculation committee on climate change is now explicitly impacted by the work we have been doing.

On a personal note, this is the first annual report where I feed in content as director of the centre. Asgeir Tomasgard who has been our director since 2019, accepted a new position as director of NTNU Energy, where he started 1.1.2024. Hence, I can take little credit for the achievements reported on in this report, but I wish to thank him for all his hard work over the last years and wish him all the best in the new position. Assuming the role of director of such a well-functioning centre has been a pleasure!

FME NTRANS will have an extremely important role to play over the next years. In 2023 we conducted a co-creation process where we analyzed how the context for transition research and transition practice has changed since we started the centre in 2019. In short, this process showed us that we face an escalating poly-crises (the climate crises, natural crises, and a crisis of socio-economic inequality), a national energy crisis and potential energy deficit, a new geopolitical reality, and the emergence of net-zero as a dominant transition logic. All of this greatly affects our research, as well as the work of actors who seek to transition. Moving forward, this will be an important backdrop for our work. We will push on and continue to be a central voice both within research and broader society over the coming years!

ABOUT NTRANS

We study the role of the energy system in the transition to the zero-emission society.

NTRANS researches the development of environmental-friendly energy from a social science perspective, in the interaction between technology and society.

The research in NTRANS will build a knowledge base for the paths to, and the consequences of, energy and climate change in Norway. The centre will bring together sociology, political science, economics, economic geography, science and technology studies and innovation studies.

NTRANS will work to understand how the transition can be done in a fair and democratic manner, and at the same time give businesses opportunities for innovation and value creation.

In the Paris Agreement of 2015, world leaders committed themselves to reducing greenhouse gas emissions. The goals of rapid and deep decarbonisation will affect all sectors of society. A key challenge is the integration of large amounts of renewable energy through flexibility as well as decarbonising other sectors of the economy.

The main research objective

The main goal of NTRANS is to develop theory, methods, competence and knowledge to support decision-making processes within the energy and climate area.

We apply a whole systems perspective that sees social and technological development as tightly entangled, thus stressing that both changes within the energy system and in related sectors are vital in the transition to a low-carbon society.

New practices, increased involvement of the population and changes in behaviour are all central to stimulating demand for low-carbon solutions, to creating political legitimacy and to mobilising the resources needed for change.

The energy sector is crucial for transitions to low-carbon societies. As variable renewable energy enters a path of sustained growth, key energy transition challenges shift towards integrating large shares of renewables through additional flexibility and by decarbonizing other key emitting sectors, such as transport and industry.

MAIN RESEARCH AREAS



Research Area 1
Deep Decarbonisation and
Wide Societal Changes



Research Area 2
Accelerating the Transition



Research Area 3
Future Energy Markets



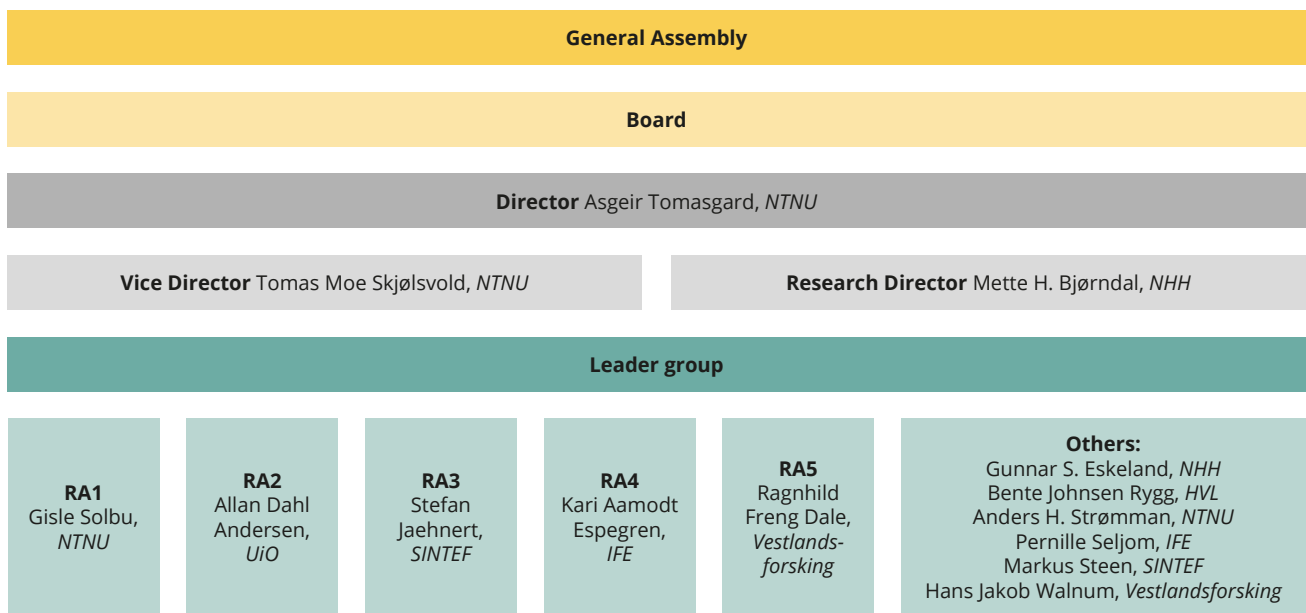
Research Area 4
Pathways to a Sustainable
Future



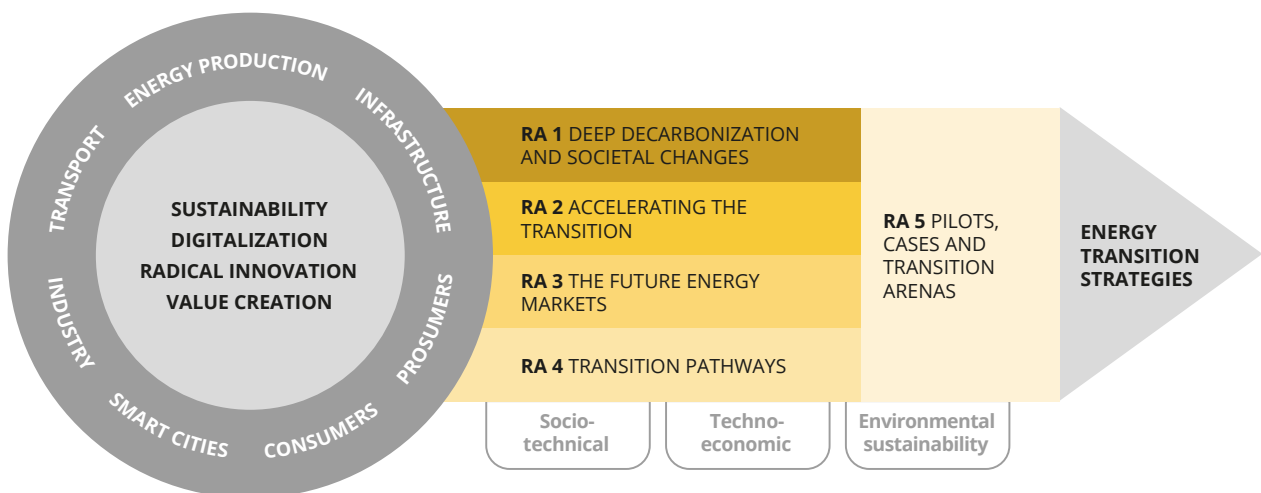
Research Area 5
Use Case and Innovation

VISION: TOGETHER FOR AN EFFICIENT AND JUST TRANSITION

ORGANIZATIONAL CHART



THE ENERGY SYSTEMS OF THE FUTURE AND THE MOST IMPORTANT DRIVERS FOR DECISION



Research areas, user cases and innovation.

NTRANS IN NUMBERS 2023



29 Scientific Publications



105 Conference Presentations



71 Key researchers



28 User Partners



119 Master Degrees



31 Visiting researchers



55 Events - Conference, Webinars and Workshops



18 Plenaries and keynotes

POSTDOCTORAL AND PHD WITH FINANCIAL SUPPORT FROM THE CENTRE BUDGET



4 Postdoctoral researchers

19 PhD students



POSTDOCTORAL AND PHD WORKING ON PROJECTS IN THE CENTRE WITH FINANCIAL SUPPORT FROM OTHER SOURCES



2 Postdoctoral researchers

7 PhD students



THE MANAGEMENT GROUP



Centre director
**Asgeir
Tomasgard**
(NTNU)



Deputy director
**Tomas Moe
Skjølsvold**
(NTNU)



Research
director **Mette
Bjørndal** (NHH)



RA 1 Leader -
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(NTNU)



RA 2 Leader
**Allan Dahl
Andersen** (UiO)



RA 3 Leader
**Stefan
Jaehnert**
(Sintef)



RA 4 Leader
**Kari Aamodt
Espegren** (IFE)



RA 5 Leader
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Dale** (Vestlands-
forskning)



**Joaquin
Zenteno Hopp**
(Vestlands-
forskning)



**Gunnar
Eskeland** (NHH)



**Bente Johnsen
Rygg** (HVL)



Pernille Seljom
(IFE)



Markus Steen
(Sintef)



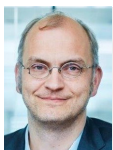
**Geoffrey Sean
Gilpin** (HVL)



**Anders
Hammer
Strømman**
(NTNU)

THE BOARD

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Statkraft

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Public Roads
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PUBLIC PARTNERS



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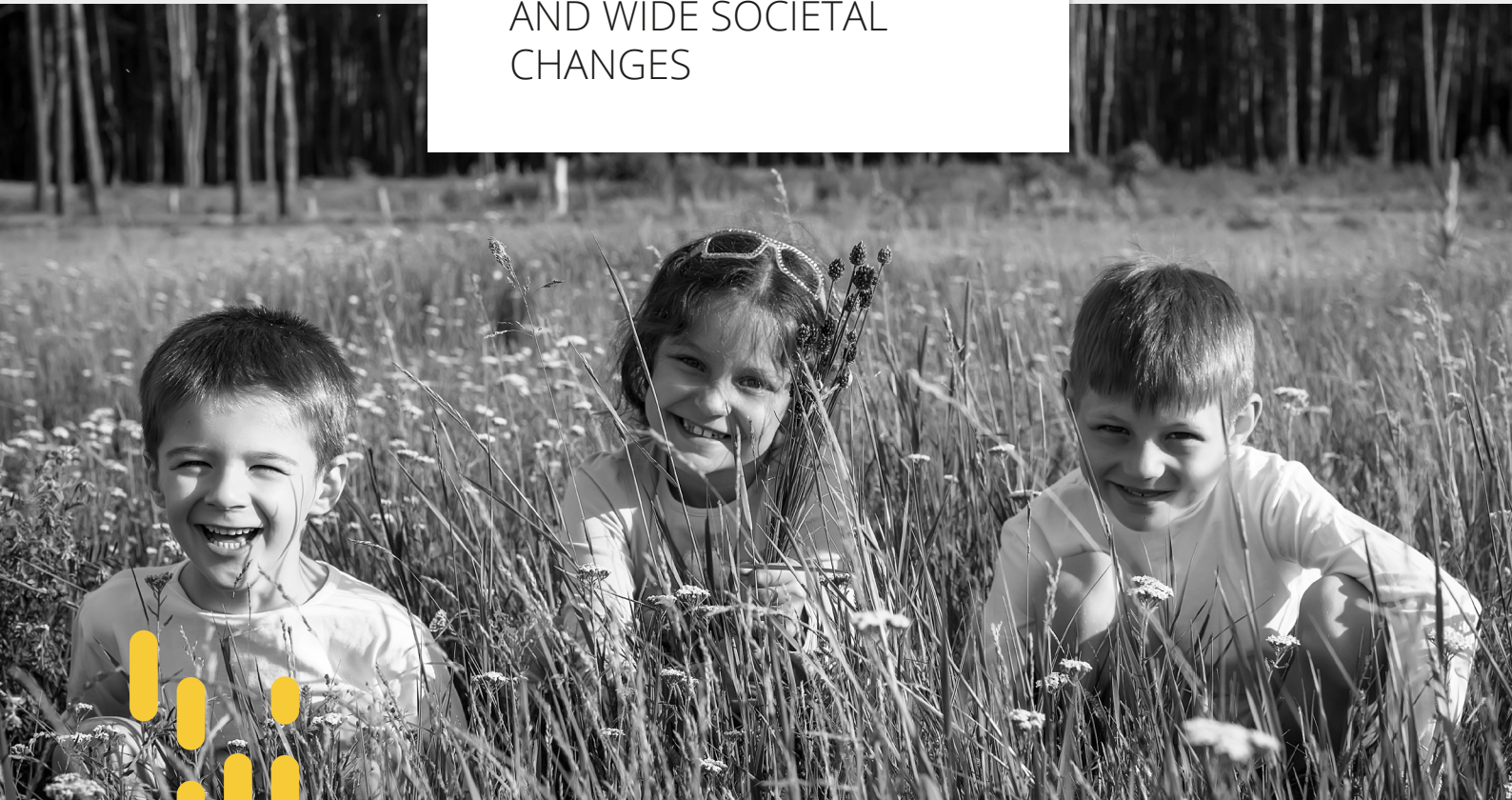






RESEARCH AREA 1

DEEP DECARBONISATION AND WIDE SOCIETAL CHANGES



WHAT IS THIS RESEARCH AREA ABOUT?

Achieving deep decarbonisation and wide changes in society means more than implementing individual technologies for individual sectors. In addition to old and new technologies to achieve a more sustainable society, we focus on: everyday practice, energy cultures, institutions, social relations, consumer behaviour, and political processes.

Development and implementation of new technologies cannot be studied in isolation, but as part of major changes in society. Sustainability transitions in general, and energy transitions in particular, are socio-technical processes.

The transition provides an opportunity to create new and fair systems, institutions and practices. Achieving this will require inclusive and democratic processes, and the development of new forms of community participation.



RESEARCH AREA LEADER:
GISLE SOLBU
NTNU

STEERING TOWARDS SUSTAINABILITY: ENVISIONING NORWAY'S ENERGY FUTURE

The year 2023 brought to the fore many of the key issues that have been central to RA1's research agenda. It is now obvious that we are entering a new phase of the energy transition where the trade-offs and interest conflicts involved in up-scaling and implementing low-carbon solutions are becoming more tangible. The goal of achieving net-zero emissions by 2050 is putting pressure on governments to quickly implement new green energy infrastructure, low-carbon technologies, and green industries. However, conflicts related to land use, nature preservation, socio-economic inequalities, and geo-political tensions are becoming more prominent and need to be addressed. Essentially, this underscores the need for a holistic understanding of the energy transition, with explicit attention to the societal consequences that follow from technological pathways. More importantly, it shows the need to raise questions about the underlying consumption practices driving emissions that would demand interventions beyond technology-oriented policies.

Against this backdrop, RA1 has contributed important research results and input to public debates, which have shown both the urgency and the complexity of these emerging issues. Approaching the energy transition from a psychological perspective, RA1 researchers have explored the psychological factors driving sustainability engagements, climate activism, technology adoption and resistance movements against new energy infrastructure. A key output from this work has been the publication of the book "Disruptive Environmental Communication" by Christian A. Klöckner and Erica Löfstrom, which presents an innovative framework for communication strategies to inspire action on environmental issues. The work

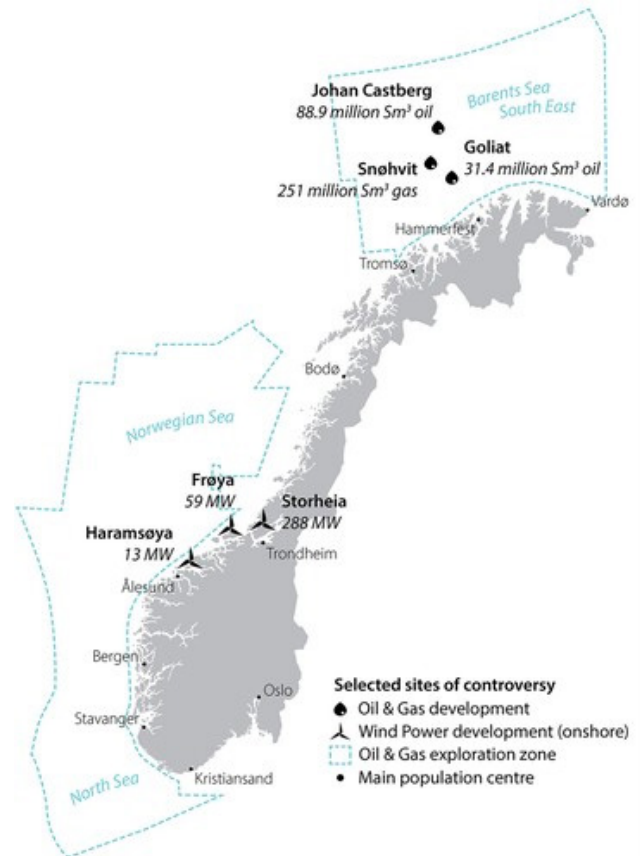


Figure 1. Selected sites of controversy in the Norwegian O&G and onshore wind power sectors.

suggests practical methods for policy implementation and fundamentally challenges the assumption that we can tackle environmental problems without disruption.

From a more sociological and socio-technical perspective, RA1 started in 2023 research activities exploring the broader societal consequences of accelerated energy transitions. This work will have synergies with research conducted in RA2 and will aim to investigate how the strong push for accelerated transitions affects processes like public participation and nature impact evaluations. This will provide an important knowledge basis for the responsible diffusion of new energy production.

Lastly, RA1 has now started to publish results from its work exploring the equity and social inclusion aspects of Norwegian transition strategies. This work has addressed the distributional effects of current policy instruments among different population groups, highlighting how

low-income groups and other vulnerable groups become marginalised within the current landscape of instruments incentivising household implementation of energy efficiency and distributed energy production technologies. A key takeaway from this work is the need to explore alternative instruments that allow for the participation of less affluent citizens and that build on alternative logics for emission reductions than efficiency, like sufficiency and equitable demand reductions. This concern for a socially just transition that creates a willingness to participate across different socio-economic groups was the main message RA1 delivered to leading Norwegian politicians and decision-makers when presenting its research at Arendalsuka. Developing a better sensitivity towards the social dimensions of transition strategies will undeniably be key to achieving a successful energy transition that balances demand for new energy production, concerns for nature impacts, diverging land-use interests and that is able to mobilise broad support in the population.



2023 highlighted the emerging complexities in Norway's energy sector, revealing the need for a more holistic approach to address socio-economic disparities, geopolitical tensions, and environmental concerns as we pursue sustainable energy solutions.





RESEARCH AREA 2

ACCELERATING THE TRANSITION



WHAT IS THIS RESEARCH AREA ABOUT?

Start-up, acceleration and stabilization are the three phases in which change often takes place. Central to the first phase is the establishment and preparation of new niche technologies.

The second phase is characterized by upscaling and massive diffusion of these core technologies. For example, around energy transitions and renewable energy technology that contribute to achieving important environmental goals such as decarbonisation.

In the third phase, a new, socio-technical configuration stabilizes. Most countries and sectors are still in the early stages. The international academic research has so far also focused on these early phases.



RESEARCH AREA LEADER:
ALLAN DAHL ANDERSEN
 UIO

FOSTERING INNOVATION AND COLLABORATION IN THE NET-ZERO TRANSITION

The journey towards a net-zero future is paved with innovation, collaboration, and the relentless pursuit of sustainable solutions. In 2023, Research Area 2 (RA2) stood at the forefront of this endeavor, unraveling the complexities of sector coupling and the multifaceted dynamics of energy transition through novel research and collaborative workshops.

In May, the serene backdrop of Hurdalssjøen Hotel played host to a foundational workshop titled "Exploring multi-system phenomena in net-zero transition." This gathering brought together both early-career and established researchers, fostering a vibrant exchange of ideas and ongoing work. After an international call and many submitted contributions, 20 full-text articles were selected. Over two days, everyone got to present their ongoing work. The workshop's success lay not just in the presentations but in the rich discussions and cross-institutional dialogues it facilitated, birthing an emerging international research network focused on multi-system interactions in transitions which can be a platform for future collaborative ventures. Indeed, there is a follow-up workshop planned for April 2024 which is hosted by Chalmers University of Technology, Gothenburg, and co-organized by RA2 NTRANS researchers. NTRANS researchers also organized a double-session on multi-sector dynamics at the NTNU Beyond Crisis/Beyond Normal conference in September 2023 in Trondheim. NTRANS researchers are also hosting a conference track on "Exploring multi-system dynamics in sustainability transitions" at the yearly International conference on Sustainability Transitions which takes place at Oslo University, June 16-19th 2024, with NTRANS as co-organizer.

PIONEERING RESEARCH IN PRESTIGIOUS JOURNALS

A landmark achievement came with the publication of "[Building multi-system nexuses in low-carbon transitions: Conflicts and asymmetric adjustments in Norwegian ferry electrification](#)" in the prestigious Proceedings of the National Academy of Sciences (PNAS). This study, co-authored by Allan Dahl Andersen, Frank Geels, Markus Steen and Markus Bugge, delves into the intricacies of creating new sector couplings for decarbonisation. It highlights the necessity of not just rapid green innovation implementation (such as electric vehicles, heat pumps, and bio-based products) within individual sectors but also the development of inter-sectoral linkages to support these innovations through resource flows. The research underscores that the establishment of new cross-sector connections is often characterized by conflicts and tensions, as the actors in both sectors have different interests and preferences for technical solutions and regulations. Because early projects often involve pioneering actors, have regulatory exemptions, and are located in ideal places, conflicts and tensions often fully arise only relatively late in the transition process when broad diffusion starts to affect laggard actors, full compliance with regulation is needed, and fit of locations vary more. In the worst case, such conflicts and tensions can slow down or even derail transitions. As a



consequence, policymakers should allocate more attention and resources to the emerging challenges of building productive sector couplings with attention to actor strategies, cross-sector intermediation, new regulations and standards, as well as new technical connections.

The publication is the latest in a series of publications in 2023 analyzing sector coupling dynamics in green transition. The publications include 1) an article by Hilde Nykamp, Allan Dahl Andersen, and Frank Geels published in Environmental Research Letters: "[Low-carbon electrification as a multi-system transition: a socio-technical analysis of Norwegian maritime transport, construction, and chemical sectors](#)", and 2) an article by Allan Dahl Andersen and Frank Geels published in Energy Research and Social Science: "[Multi-system dynamics and the speed of net-zero transitions: Identifying causal processes related to technologies, actors, and institutions](#)". Collectively, the articles introduce new perspectives and analyses on sector coupling that are a significant scientific contribution to the research field on innovation and sustainable transitions.

NTRANS researchers Tuukka Mäkitie and Markus published a book chapter in the Handbook of Industrial Development titled "[The energy sector: an industrial perspective on energy transitions](#)". This chapter mirrors the strong interest in RA2 to improve our understanding of

how energy transitions are also about industrial change and development.

WIND POWER POLICIES AND DIFFUSION IN THE NORDIC COUNTRIES

The book "[Wind Power Policies and Diffusion in the Nordic Countries](#)" offers a comprehensive examination of the conditions facilitating or hindering the widespread adoption of wind power, including considerations of land use conflicts. This comparative study across Denmark, Finland, Norway, and Sweden provides empirical insights and analytical contributions to the literature on transition policy mixes, highlighting the intricate relationship between adopted policies and wind power installation. This work was led by Jon Birger Skjærseth from Fridtjof Nansen Institute, and involved NTRANS-researchers Teis Hansen (SINTEF and University of Copenhagen), Jens Hanson (SINTEF) and Markus Steen (SINTEF).

Extensive diffusion of renewable energy and wind power is central in all scenarios that allow us to reduce climate change. This underlines the importance of understanding the conditions that enable or hinder large-scale diffusion of wind power, including trade-offs with respect to land use, such as nature and military issues. In this book, we specifically focus on policy mixes and diffusion of wind power in the four largest Nordic countries - Denmark, Finland, Norway, and Sweden. Although these

Nordic welfare states have much in common, they have adopted different wind power policies and experienced different diffusion paths. Understanding these patterns across the Nordic countries is the central research task of this book. Empirically, this book provides a first-time comparative study of wind power policies in the Nordic countries. Analytically, we contribute to the literature on transition policy mix techniques that largely remain inflexible in terms of political feasibility.

The key findings are that there is a tight correlation between adopted policies and installed wind power, but the type of demand-side policies has less impact on diffusion rates. There is no single best policy mix. Furthermore, it appears that high-level national policy, from the government and political party leaders, is the main arena for formulating national policies, highlighting that the room for political maneuvering is considerable. Approval procedures and local resistance are increasingly becoming the most crucial limiting factors for the diffusion of wind power, and therefore achieving a good balance between national interests and local needs and acceptance is central to the future development of wind energy.

INNOVATION AND CLIMATE FINANCE WORKSHOP

The "Innovation and climate finance" workshop at Lerchendal Gaard, part of the Energy Transition Week 2023, spotlighted the critical role of investors in funding the energy transition. With a diverse attendance of approximately 40 participants, spanning academia, public administration, and the investment community, including user partner Equinor, by Equinor Ventures, the workshop delved into how investors can contribute

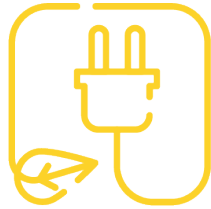


beyond capital to foster a more sustainable energy transition. This event not only offered unique insights into the challenges faced by various stakeholders but also laid the groundwork for further research for NTRANS's part, enriching the academic journey of master's and PhD students.

LOOKING FORWARD

As RA2 continues to navigate the complexities of the net-zero transition, its focus on fostering innovation, understanding sectoral interdependencies, and engaging diverse stakeholders remains paramount. The achievements of 2023, from insightful workshops to influential publications, underscore the critical role of collaborative research in shaping a sustainable future.





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.



RESEARCH AREA LEADER:
STEFAN JAEHNERT
 SINTEF

SHAPING THE FUTURE OF ENERGY: INNOVATIONS IN MARKET DESIGN AND FLEXIBILITY

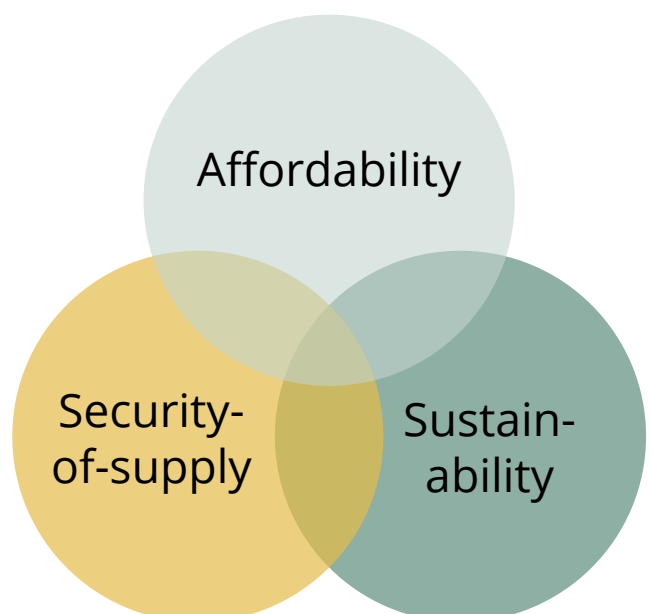
In the aftermath of the energy crisis, security-of-supply and energy security are important topics. To handle these challenges a re-design of the existing energy markets is proposed. Energy markets play a central role in efficiently coordinating supply and demand as well as providing incentives for expansion of new energy resources. Thus, the future market design needs to support a balance within the energy trilemma between security-of-supply, sustainability and economic viability or value creation.

To assess future energy market design, RA3 has its focus on the development, design and implementation of the future energy market in Norway and in Europe. Important topics for energy markets in the framework of the energy transition are flexibility, sector-coupling, market integration and decentralised/local markets. This provides a basis for value creation from renewable Norwegian energy resources.

These three perspectives are the corners of the well-known energy trilemma, becoming more difficult to solve than ever before.

MODELLING CONCEPT FOR ACTORS UNDER DIFFERENT MARKET DESIGNS

The completion of the initial phase on agent-based modelling in the energy system resulted in a comprehensive review article. This review is done in collaboration with national and international partners. This work synthesizes current knowledge and shall provide a foundation for future research and model development within RA3 and the broader NTRANS initiative. By simulating the complex interactions between various market



participants, this modelling approach offers insights into the potential outcomes of different market designs and regulatory frameworks.

INTERNATIONAL WORKSHOPS AND COLLABORATIVE EFFORTS

The research area contributed to an international workshop led by EERA Joint Program e3s, which discussed market mechanisms proposed during the ongoing development of market design in Europe. This event gathered researchers from all over Europe and shared knowledge in addressing the challenges and opportunities presented by the energy transition.

In partnership with KSP PowerDig, RA3 co-hosted a workshop focused on reviewing market designs aimed at enhancing flexibility. This analysis of existing and future market structures provides a foundation for upcoming case studies, particularly in the context of the physical transmission system's representation during market clearing—a highly relevant topic with the introduction of flow-based market clearing in the Nordic region.

NEW KNOWLEDGE FROM THE NEXT GENERATION OF RESEARCHERS

The successful recruitment of new PostDoc and PhD students marks a significant milestone for RA3. These new scholars together with a number of master students are dedicated to exploring flexibility products and market designs that can accommodate the increasing complexity and variability of the power system. Their research will contribute to the development of more resilient and efficient energy markets, which is primarily documented and published in several scientific articles.

PhD candidate Kyriaki Tselika at NHH has been investigating the interplay between the energy sector and environmental sustainability, focusing on optimizing energy production and consumption. Her research, particularly on the impact of renewable energy on electricity prices and the economic conditions for renewables in the European market, culminated in the successful defence of her dissertation in December 2023.

Felipe Van de Sande Araujo, a PhD student at NTNU IØT, has been delving into market flexibility and published studies on contracts in short-term markets and strategies to mitigate market manipulation. Collaborations with master's students under his guidance have also led to forthcoming publications, showcasing the synergistic

potential of academic mentorship. Furthermore, Felipe co-lead Use Case 7 alongside researcher Stian Backe, which investigated markets for trading electricity flexibility.

In 2023 Postdoc Lasya Priya Kotu started working at IEL with research on allocation, utilisation and control of distributed flexibility resources. The project targets flexibility optimization of retail store cooling systems for an existing case. The Postdoc is supervised by Karen Lindberg and Jayaprakash Rajasekharan.

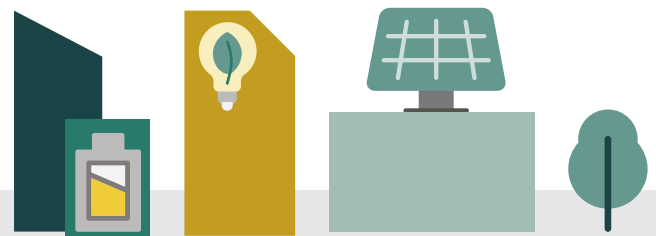
At NTNU IEL a master student has worked on optimization models for operational scheduling of flexibility from distributed electric water heaters in balancing markets. Meta-heuristic optimization strategies are developed for extracting distributed flexibility from residential electric water heaters using machine learning approaches to bid in flexibility markets. This work is followed up by two other master students investigating flexibility aggregation from distributed electric water heaters for frequency reserve markets.

PRACTICAL APPLICATIONS AND INDUSTRY IMPACT

Research in RA3 has not only advanced academic understanding but also had tangible impacts on the energy sector. Studies exploring alternative market layouts and designs, specifically for offshore wind, that have been conducted in 2022 in cooperation with use case 2, have been presented at several scientific workshops and industry meetings. The study gave rise to further direct analyses commissioned by industry players. These insights have contributed to the decision-making processes for applications to offshore wind areas like Sørlige Nordsjø II and Utsira Nord, demonstrating the practical relevance and impact of RA3's research.

LOOKING AHEAD

As RA3 continues to push the boundaries of knowledge in market design and system flexibility, its contributions are vital in navigating the complexities of the energy transition. By fostering innovation, facilitating international collaboration, and nurturing the next generation of researchers, RA3 is not only shaping the academic discourse but also driving practical solutions for a sustainable energy future.



The future market design needs to support a balance within the energy trilemma between security-of-supply, sustainability, and economic viability.





RESEARCH AREA 4

PATHWAYS TO A SUSTAINABLE FUTURE



WHAT IS THIS RESEARCH AREA ABOUT?

We are analysing various transition paths heading towards a low-emission society, with special focus on the Norwegian development, and also on how interaction with Europe can take place within the various alternatives.

The NTRANS researchers are from different disciplines, and the most important research question is: How can we build a bridge between transition studies that include political science, innovation, technology, and techno-economic energy systems analysis, to promote a common understanding of change directions?



RESEARCH AREA LEADER:
KARI AAMODT ESPEGREN
IFE

CHARTING THE COURSE: NORWAY'S LOW-CARBON TRANSITION PATHWAYS

In 2023, Research Area 4 (RA4) of NTRANS embarked on a pivotal journey to define the contours of Norway's future energy landscape. The cornerstone of this work was the report "NTRANS Socio-technical pathways and scenario analysis" (NTRANS Report 02/2023), which presented an interdisciplinary approach to analyze different transition pathways towards the sustainable development of a low-carbon society, focusing on Norway as a case.

The study bridges a socio-technical perspective on sustainability transitions with techno-economic energy systems and regional-economic analyses. Incorporating a socio-technical perspective in the scenario design allows us to envision pathways considering causal processes of technological and socio-institutional change. We have described four socio-technical scenarios based on the degree of change of the existing socio-technical regime and its central actors and institutions.

The qualitative descriptions are discussed to quantify each transition pathway, and the quantification is used in the energy system model IFE-TIMES-Norway and in the regional economic model REMES. The two models have been used to analyse the impacts of the various transition pathways on the energy system and the economy, and the results of the analyses are presented as scenario results. The model analysis show cost-optimal energy system configurations, including varying levels of new renewable capacity needed, new conversion technologies, and fuel substitutions across all sectors leading to different decarbonization pathways for the Norwegian energy system by 2050.

The regional-economy analysis addresses the impacts of these pathways on general economic growth and labor. The results show that higher levels of decarbonization are possible for Norway; however, potential bottlenecks can slow down the transition, while trade-offs in economic growth and development must be balanced out with decarbonization ambitions.

WIDENING THE DIALOGUE

The insights accumulated from the NTRANS transition pathway study have resonated far beyond academic circles, engaging national stakeholders and sparking discussions internally at NTRANS (in the management group, in board meetings, at the summer gathering and annual conference), and have been presented to important national stakeholders externally (such as NFR, OED, KLD). The study was also presented at Arendalsuka, and at an international conference organized by IEA-ETSAP.

The work has been further developed into a scientific publication, which has been accepted as a book chapter by Springer (Aligning the Energy Transition with the Sustainable Development Goals: Key Insights from Energy System Modelling). The book will be released in June 2024. Finally, the NTRANS transition pathways are

also used in various other research projects, such as the competence projects Behavior and Resilient and the Nordic project Nordic Energy Outlook.

EMPOWERING THE NEXT GENERATION

In parallel, RA4 has been instrumental in nurturing emerging scholars through an interactive workshop for PhDs and Postdocs, aimed at honing their skills in communicating research findings to diverse audiences. This initiative not only enhances the dissemination of research but also deepens the understanding of how individual projects contribute to the broader narrative of low-carbon transitions.

The workshop took place 17-18. April 2023 at [Kringler Gjestegård](#). The workshop was organized as part of NTRANS [Research Area 4](#), focusing on transition pathways. Since the PhDs and post doc produce essential research in NTRANS, it is important to bring these insights into broader discussions about low carbon transitions.

The participants trained and improved their practical skills and strategies for communicating research results to different types of audiences outside academia. They were also trained in writing a popular science text to be published in the NTRANS newsletter or at the NTRANS webpage. The participants developed a better understanding of their individual PhD and Post-doc projects contribute to low carbon transitions.

SPOTLIGHT ON SCHOLARLY CONTRIBUTIONS

In the realm of industrial economics, PhD candidate Davood Qorbani stands on the cusp of completing a groundbreaking project that delves into the electric vehicle (EV) adoption patterns among Norwegian households. His meticulous analysis spans the entire spectrum of 2.4 million households in Norway, offering

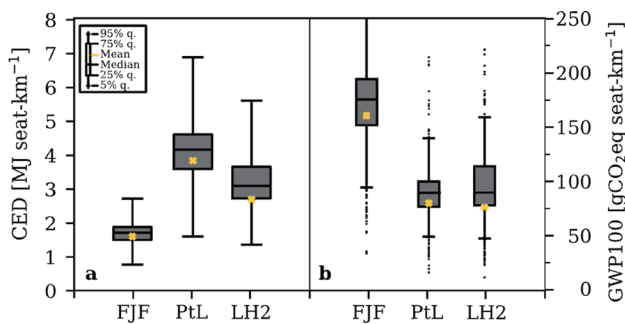


Figure 1: Energy demand and global warming potential of three aviation fuels for Norway. Values calculated with the AviTeam for Norwegian domestic flights and Life cycle assessment for fuel production. (a) Cumulative energy demand (CED) per seat-km flow, considering fuel production and changes to the Norwegian aircraft fleet. (b) CO₂-equivalent emissions per seat-km flow using global warming potential, 100-years time horizon (GWP100) metrics. FJF: Fossil jet fuel, PtL: Power-to-Liquid fuel, LH2: Liquid hydrogen. The figure shows that PtL and LH2 fuel may imply a larger primary energy demand than FJF fuel (a), but hold the potential to cut climate impacts by roughly 50% compared to FJF in the GWP100 metric.

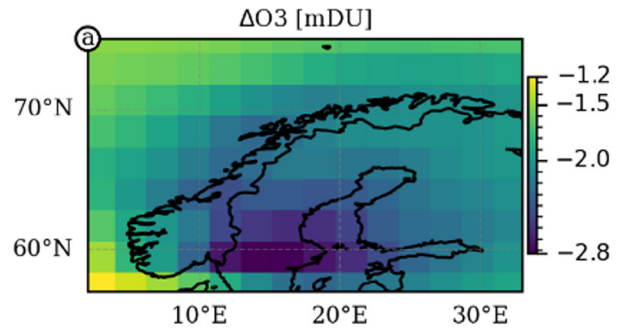


Figure 2: The potential reduction of ozone (O₃) concentrations using liquid hydrogen fuel for Norwegian domestic aviation. Calculated with the AviTeam and OsloCTM3 model using 2019 data. This figure shows that transitioning to alternative fuels may lower O₃ concentrations in Norway and neighbouring countries, with potential benefits for air pollution and global warming.

a comprehensive look at how factors like wealth, household size, and education level influence the shift towards electric mobility. Qorbani's work, which is currently transitioning from the research phase to the publication stage, is set to continue until June 2024, with his doctoral defense anticipated in the last quarter of the year. This research not only contributes to the academic discourse but also provides actionable insights for policymakers and industry stakeholders aiming to accelerate the transition to sustainable transportation.

ECO-INNOVATION IN NORWAY'S AVIATION TRANSITION

NTNU's Industrial Ecology (IndEcol) program is reshaping the environmental landscape of societal transitions through NTRANS RA4, focusing notably on the Norwegian aviation sector. The transition of the Norwegian aviation sector was studied using the Aviation Transport Emissions Assessment Model (AviTeam), developed within the PhD project of Jan Klenner. The cases of synthetic power-to-liquid (PtL) and liquid hydrogen (LH2) fuels for Norwegian aviation were assessed in detail. The potential renewable energy demand, climate change and air pollution benefits were quantified. Importantly, the entire fuel life cycle from production to combustion was considered using life cycle assessment (LCA). Acknowledging the international nature of the sector, the model was also applied in a global context and results are disseminated in three forthcoming scientific articles.

Parallel to this, PhD candidate Maximilian Koslowski has been improving the theory behind the widely used environmental accounting method, environmental input-output analysis. His successful work is reflected in scientific article contributions and was presented at several conferences.

STATKRAFT'S DEEP DIVE INTO NORWAY'S ENERGY TRANSITION TOWARDS 2050

Adding another layer to the discourse, Statkraft unveiled for the first time an analysis of Norway's energy system in 2023, casting light on the nation's path towards its climate goals through three distinct scenarios. This pivotal

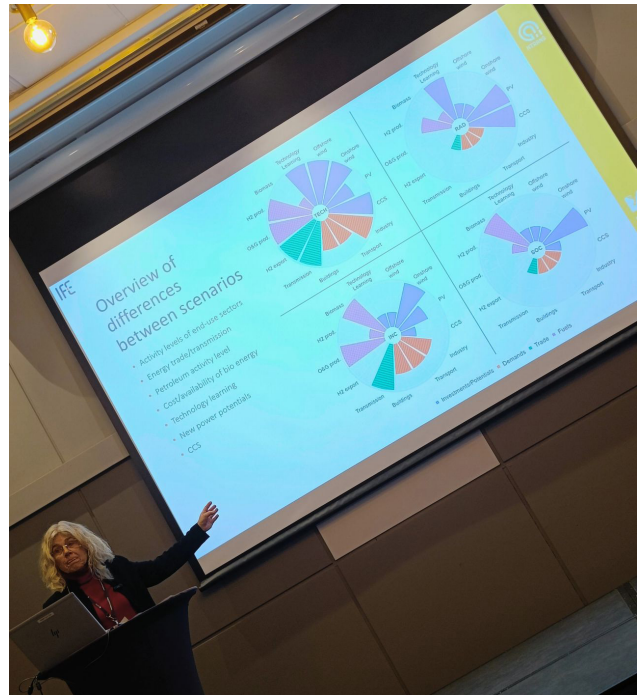
study, enriched by the modeling expertise and analytical tools of IFE researchers, delves into the ramifications of geopolitical unrest, energy crises, and inflation on energy markets, the green transition, and Norway's capacity to meet its climate objectives.

The analysis provides a deep dive into the evolving dynamics of the power market, industrial energy demand, and the spectrum of renewable technologies. In an era marked by profound changes and escalating uncertainties, Statkraft analyzed the effects in three different scenarios, to better understand the future Norway's energy market. However, the findings suggest that only one of the outlined scenarios sets Norway on a trajectory to meet its 2030 climate targets.

Central to these analyses is the IFE-TIMES-Norway energy system model, a sophisticated mathematical representation of Norway's energy ecosystem. This model plays a crucial role in identifying cost-optimal solutions to fulfill the nation's energy needs, factoring in various assumptions and constraints, including climate objectives. By encompassing the entire energy system and integrating energy usage across buildings, industry, and transportation with energy production and infrastructure, the model serves as an invaluable tool. It is adept at exploring potential development paths for Norway's energy system leading up to 2050, capturing the interplay across sectors and pinpointing the need for new investments to facilitate a seamless transition.

LOOKING AHEAD

As RA4 continues to chart the course of Norway's energy transition, its work serves as a beacon for policymakers, industry leaders, and the academic community. By



weaving together socio-technical narratives, economic analyses, and robust modeling, RA4 is not only elucidating the pathways to a low-carbon future but also highlighting the intricate balance required to sustain economic vitality and social well-being in the face of transformative change. As we move forward, the insights from RA4 will undoubtedly play a pivotal role in shaping the strategies and decisions that will guide Norway's journey towards a sustainable and resilient energy future.





RESEARCH AREA 5

USE CASES AND INNOVATION



WHAT IS THIS RESEARCH AREA ABOUT?

Researchers and user partners will collaborate to learn from each other - and create new knowledge. They will present and discuss existing knowledge base and preliminary research results. The collaboration ensures the involvement of the user partners, and facilitates relevant innovation activities.

We will have around ten use cases defined jointly by the user partners and the researchers. Each case lasts for one to two years, and is led by one or two researchers. Sometimes we work closely with other FMEs. User partners offer pilots which reflect on ongoing and planned activities in the energy sector, and which are of general interest to those involved.



RESEARCH AREA LEADER:
RAGNHILD FRENG DALE
 VESTLANDSFORSKING

PIONEERING PARTNERSHIPS: NTRANS' COLLABORATIVE VENTURES IN USER CASES

In the realm of sustainable energy transitions, the power of collaboration is central to unlock new ideas, innovation, and ways of moving forward. Throughout 2023, NTRANS has exemplified this by engaging in multifaceted partnerships with user partners across various sectors. Many of these collaborations are organized through RA5, under the banner of user cases. These user cases involve researchers from across the center who work side-by-side and together with our societal partner on co-defined topics.

ACTIVE USER CASES IN 2023

DECARBONIZING FREIGHT TRANSPORT

The decarbonization of freight transport between major cities is a key transition challenge. This case has brought together a diverse group of stakeholders, including Kystverket, Statens Vegvesen, and Jernbanedirektoratet to analyze the future landscape of Norway's freight transport system over a 20- to 30-year horizon, providing a strategic framework for sustainable logistics.

URBAN GOODS TRANSPORT

Transporting goods in a sustainable and low-carbon way within cities is also a key challenge. This case focuses on "Last mile transition," exploring the implementation of low-emission and zero-emission zones (LEZ/ZEZ) in collaboration with municipalities and national agencies. This research sprint has shed light on the challenges and opportunities in redefining urban goods distribution, contributing to the broader goal of urban sustainability.

CARBON CAPTURE AND STORAGE (CCS)

To reach net-zero CCS and negative emissions is key. Through a series of workshops, this case has

engaged a wide array of stakeholders in a dialogue on the practical, economic, technological and social dimensions of CCS deployment.

INNOVATIVE URBAN DISTRICTS

In collaboration with FME ZEN, this case has focused on the sustainable development of innovation districts within major cities. This partnership has explored the innovation potential in designing sustainable urban areas, contributing to the vision of green, livable cities.

OFFSHORE WIND ENERGY

In partnership with FME NorthWind, this case has conducted a series of workshops addressing public discourse, participation, spatial coexistence, and the political dynamics surrounding offshore wind energy. Recently, the case has zoomed in on local developments around Utsira.

INTEGRATED ENERGY AND FLEXIBILITY MARKETS

In collaboration with FME ZEN and FME CINELDI this case has examined flexibility markets, bringing together energy producers, building sector representatives, and



market actors. The initial workshop attracted 74 participants, highlighting the keen interest in developing integrated markets for energy and flexibility.

ENERGY PROJECTIONS AND CLIMATE GOALS

How to meet future energy demand is a key challenge moving ahead. Case seeks to understand Norway's energy demand under various climate scenarios and policy frameworks. This case closely aligns with the work on transition pathways in RA4, offering insights into the future energy landscape in the context of Norway's climate objectives.

FORGING AHEAD

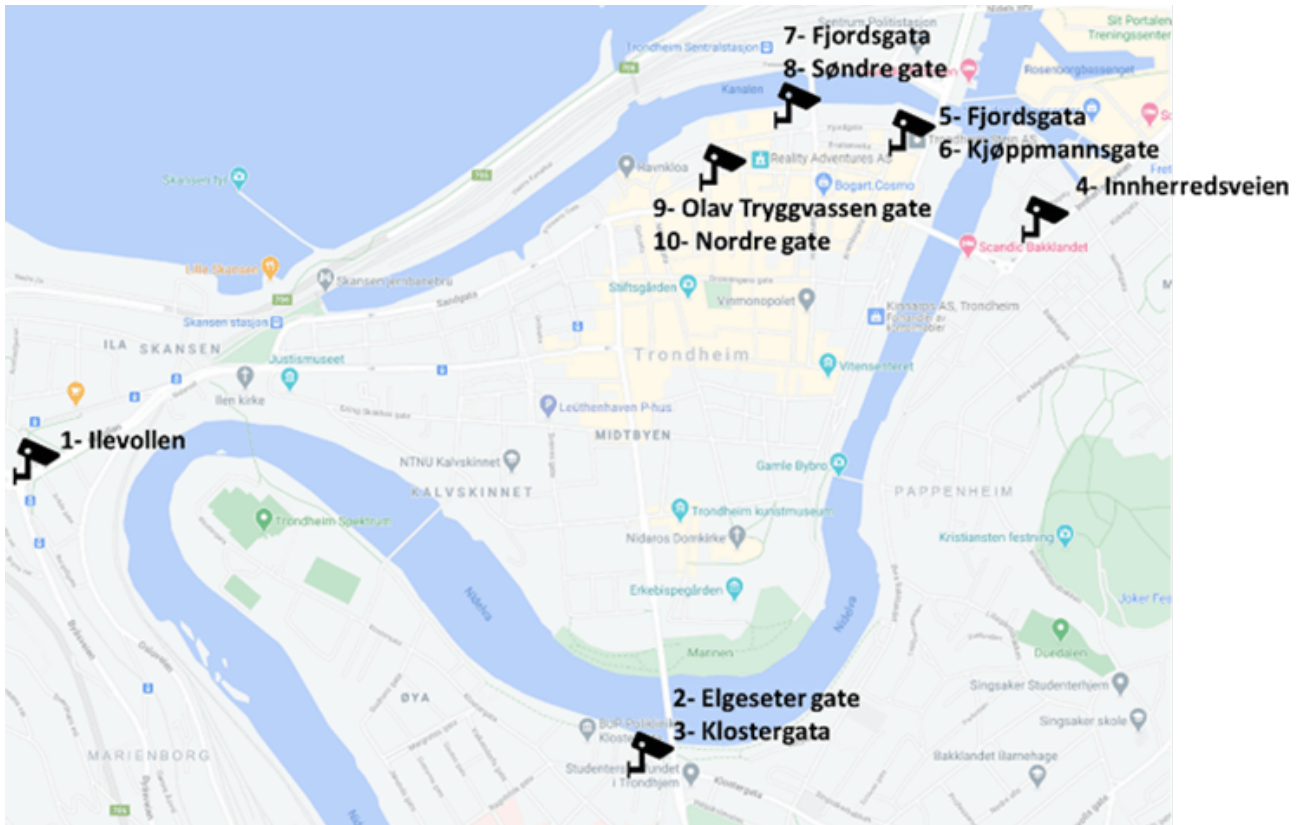
Looking ahead, the horizon is bright with the promise of new challenges and opportunities, as we gear up to initiate 1-2 new user cases in 2024. These forthcoming ventures are not just projects but beacons of hope, signaling our unwavering commitment to driving forward the wheel of sustainable progress. They represent our next steps in a relentless pursuit of knowledge, co-creation, and impact, as we continue to ensure that our collaborative efforts feed into innovation and policy development as we move towards a more sustainable and resilient energy future.



Through strategic partnerships in 2023, NTRANS has tackled key challenges such as decarbonizing freight transport and enhancing urban goods systems, demonstrating the power of collaborative approaches in advancing sustainability goals.



USER CASE 3C: GOODS AND UTILITY TRANSPORT IN CITIES



Figuren viser hvor kameraene ble satt opp

User Case 3c focuses on the transition of goods and utility transport especially in Oslo and Trondheim. It is a pivotal exploration of the complexity of goods and utility transport, with a focus on understanding the dynamics within the sector.

In 2023, a workshop dedicated to User Case 3c delved into the growing climate gas emissions from the transport sector, highlighting that mere technological improvements and electrification might fall short of achieving the 1.5-degree target set by the Norwegian government. The discussions and insights from the workshop, attended by municipal authorities from Oslo, Trondheim, Bærum, representatives from the Norwegian Environment Agency, and industry stakeholders, revolved around the prerequisites for achieving sustainable transformations in goods and utility transport. The workshop's outcomes underline the imperative for a more robust knowledge base concerning the scope and practices of goods and utility transport, particularly in urban settings. This encompasses the need for more data and enhanced information sharing, which are crucial for informed decision-making across the transport ecosystem. A stronger

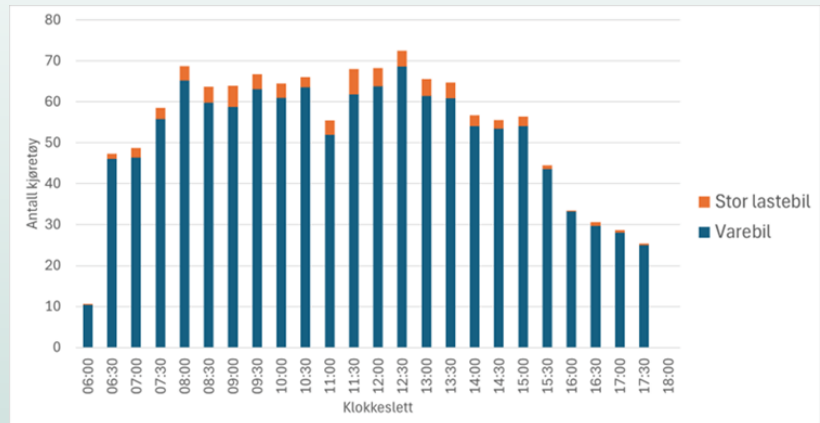
knowledge foundation will also facilitate novel policy development and the design of effective measures considering the transport sector's substantial contribution to urban climate and environmental challenges.

As an effort to address the lack of accessible data regarding goods and utility transport, the Use Case 3c has set its sights on identifying diverse data sources relevant for goods and utility transport, selecting the city of Trondheim as a primary area of study. The adopted methodology involved video recording and advanced image analysis techniques aimed at mapping the extent of goods and utility transport across various entry points into Midtbyen, Trondheim's city center, in October 2020. The figure below gives an overview of the points where the images were collected and analyzed, as well as an observed variation in the volume of goods and utility transport.

This innovative approach has not only shed light on current transportation patterns but also serves as a cornerstone for future decision-making processes regarding the transformation of the transport sector. The findings

from this analytical approach will be published in 2024 as an NTRANS working paper.

Future collaborative effort, involving municipalities such as Oslo and Trondheim and part of a broader research network, aims for a comprehensive approach to city logistics that encompasses all value chain actors. The research-supported segment on reducing emissions from urban goods transport underscores the project's commitment to influencing policy and business strategies, with plans to extend this impactful work into 2024 and beyond. The aim is to use this insight to influence policy and business strategies, and there are plans to continue the work into 2024.



The chart show variation of goods transport over the day. We can also show this for different weekdays and different access roads. Raw data from the analysis can be found on [NTRANS - Results of video analysis \(sintef.no\)](https://www.sintef.no).



USER CASE 7:

INTEGRATED MARKETS FOR ENERGY AND FLEXIBILITY

In 2023, User Case 7 at NTRANS, held their fifth and final workshop on February 10, 2023, focusing on the pivotal role of hydropower flexibility within Norway's broader energy landscape and its implications for the international market. With that said, we are pleased to announce that User Case 7, has now been successfully concluded.

Over the course of User Case 7, we have seen a significant amount of collaboration between our user partners and our dedicated team of researchers. This collaboration has been an integral part of the process and it has culminated in the generation of in particular the following four insightful and practical advices, which we believe will greatly benefit all parties involved.

As more and more of our fossil fuel use is replaced with variable, weather-dependent renewable energy, like wind and solar, the need for flexible energy services to handle the imbalance between production and consumption increases. The utilization of flexible energy resources should be accelerated, and the actors - producers, consumers, network companies, and flexibility providers - must be coordinated through efficient markets.

In Norway, the flexibility discussion is characterized by hydropower and the export of the renewable flexibility potential to Europe, and the consequences of the export for operations, economy, politics, and vulnerable social groups. We have organized five workshops to map the status, opportunities, and challenges related to flexibility services and to point out measures to accelerate the use of flexible energy resources.

IDENTIFIED PROBLEMS AND RECOMMENDED MEASURES

1. Established flexibility services require more actors to assume the aggregator role or establish new flexibility markets

There is potential for more flexibility services, and new services are already under development. Today, this potential can theoretically be offered in existing reserve power markets, subject to pre-qualification and sufficient large bids through aggregators. But there is a need to remove barriers to market access, such as low profitability, inadequate data quality, complex digital infrastructure to automate the administration of bids, and lack of trust in aggregated bids.

The utilization of flexibility services through aggregated bids can be increased by lowering the minimum bid size in the reserve power markets, and standardizing and simplifying the pre-qualification process for aggregated bids.

2. It is unclear which flexible properties will be valuable in the future and thus difficult to develop and invest in the solutions

Today, flexibility services are sold in several markets that may have different response times and durations. New services from resources in the low-voltage network should also represent other properties, for example, more precise location to be able to determine how the resource affects its low-voltage network. At the same time, it is unclear whether today's markets create incentives to cover the more long-term needs for flexibility.

Research on flexibility should focus on specific markets for specific properties to understand which properties of flexibility services will be in demand in the future power system. We also need more knowledge about how flexible properties can be quantified, especially for new services and aggregated portfolios.

3. There is a need for more coordination across flexibility services to prevent one solution from creating new problems later or elsewhere

When flexibility services that solve problems in the high-voltage grid are connected to local low-voltage power grids, they can create problems there. Without coordination between the voltage levels in the power grid, local flexibility markets can create corresponding challenges.

The network companies in Norway are a necessary actor between the local flexibility provider and the system operator. They can take on the aggregator role, but they are not structured to handle the commercialization of local flexibility services, and the small margins of local flexibility providers may be insufficient to compensate yet another intermediary. Regulation and tariff structure should be designed with the aim of increasing coordination and providing incentives for network companies to take on more roles.

4. End users should be given opportunities to provide flexibility services without compromising vulnerable and inflexible end users



End users capable of providing flexibility services comprise a broad and diverse group, from large industrial and commercial actors to individuals in detached houses and apartment buildings. They can offer flexible response time, duration, and price. Some industrial actors, for instance, can provide adjustments to electricity consumption in real-time, while buildings can shift electricity consumption away from critical periods through smart heating.

Research in energy justice shows that a lack of flexibility capital means that some have very little flexibility potential. Complications related to pricing, costs, incentives, and reliability create additional challenges for the commercialization of flexibility from private individuals.

Electricity price agreements that reflect spot price can provide economic gain to flexible end users who shift consumption away from the most expensive hours. The behavior of flexible end users can lead to benefits also for inflexible end users, both in terms of lower prices in the most expensive hours and deferred need for costly upgrades of the network infrastructure. However, inflexible behavior should not be penalized, as penalty measures will hit low-income groups harder. Therefore, it is crucial to preserve market incentives through real-time prices, and simultaneously protect inflexible end users with low income through redistribution policies.

As we wrap up User Case 7, we take with us a wealth of insights and a roadmap for the future of energy flexibility, particularly hydropower's pivotal role. Our collaboration has laid the groundwork for innovative solutions and a deeper understanding of the challenges ahead. Now, as we move forward, the knowledge and strategies developed here will undoubtedly fuel the next steps in our journey towards a more sustainable and adaptable energy landscape. The end of User Case 7 marks not a conclusion, but a beacon for future endeavors in energy innovation and flexibility. Let's harness this momentum and continue to drive change, keeping the dialogue open and the ideas flowing as we navigate the evolving energy paradigm.



CO-CREATING THE FUTURE: RESEARCH AND INNOVATION IN A NEW TRANSITION REALITY

This annual report comes as NTRANS is midway in its centre lifetime. Therefore, we have crafted research plans for the final half of the centre during 2023. Doing so forced us to reflect: *how has the world changed since we started the centre in 2019, and what do these changes mean for transition research and transition practitioners*? To answer these questions, we engaged in a co-creation process where researchers and practitioners worked together. The outcome was a perspective piece which pointed towards four central trends that will affect our research over the coming years, as well as how we think about and engage in collaboration and innovation.

A NEW GEOPOLITICAL REALITY

Back in 2019 it was beginning to become clear that the era of western-driven globalization anchored in free-market liberalism was coming to an end. China and the US was involved in a trade-war, while populism and nationalism

was on the rise in several countries, with Brexit being the most visible example. Since then, Russia's war on the Ukraine have exacerbated the situation. The impact on transition activities is multifaceted. On the one hand, we have seen a stronger green push. On the other hand, Russias weaponization of gas is a chance to strengthen incumbency in the oil and gas industries of other countries.

NET ZERO AS A DOMINANT LOGIC OF TRANSITIONS

Since 2019, the notion of net-zero has become dominant for how actors' reason with respect to energy transitions. Moving from a situation where actors seek reductions of emissions, to a situation where reaching zero is the goal, has strong implications for energy transitions. Reaching zero in hard-to-abate sectors such as industry and petroleum in the Norwegian context is a de-facto push for further electrification, which will require a massive ramp-up of electricity production and distribution grids,



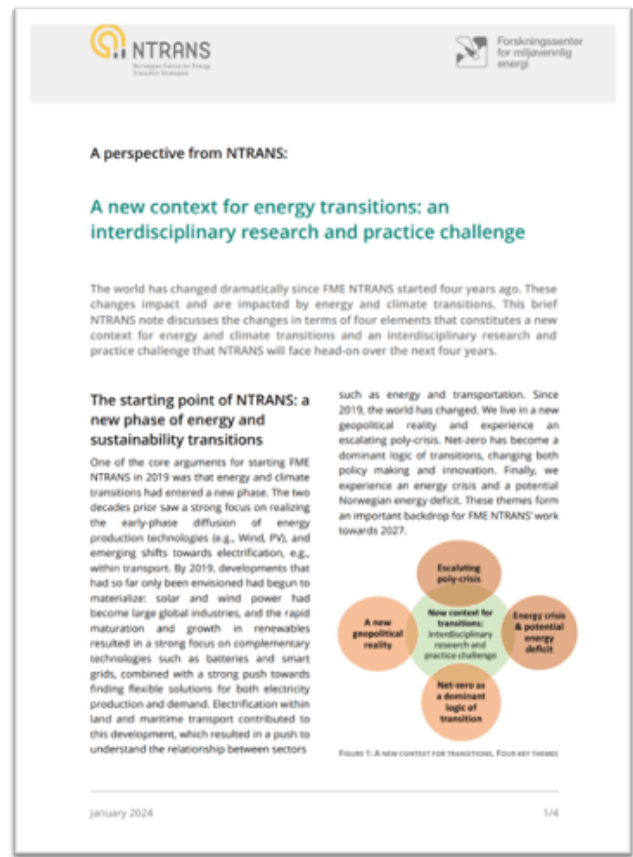
as well as carbon capture and storage at unprecedented scale. Such electrification endeavors also represent unprecedented challenges for sector and systems integration and coordination. Net-zero, then, represents an up-scaling of past challenges.

THE ENERGY CRISIS AND A POTENTIAL NORWEGIAN ENERGY DEFICIT

During 2022, Europe and Norway experienced an energy crisis. Increased economic activity following the COVID pandemic combined with reduced supplies of Russian gas to Europe, the shutdown of nuclear power plants in Germany and low increase in the production of renewable energy in Europe have dramatically increased the prices of both CO₂ and energy. Norway has been exposed to the fluctuations of the European markets. On the one hand, this has had strong effects for households, industry and commercial actors as increased energy prices have dramatically increased the costs of living and doing business. On the other hand, this has coincided with projections stating Norway may experience a power deficit soon if new production of electricity is not dramatically ramped up quickly. Given the social and political contestation of new renewables described in the last section, this is a massive challenge.

POLYCRISIS ESCALATION

Since 2019, climate change and the nature crisis have become increasingly tangible. Heatwaves across Europe, associated droughts and forest fires have become more common, as have reports of high temperatures in the arctic, resulting in reduced ice-levels and thawing permafrost. In Norway, we have seen floods, landslides, and related events with high impacts on Norwegian society. Meanwhile, the political pressure to address the biodiversity crisis has increased significantly. The UN COP15 deal for nature was signed in 2022, signaling a stronger global commitment to nature preservation. These developments have unfolded in parallel with inflation rates rising, debts tightening and growth rates reducing, in effect increasing the division between the world's richest and the world's poorest. We are also experiencing these effects in Norway. In sum, we are up against what has popularly been dubbed a poly-crises, and the effects of these have intensified since 2019.



For more detailed insights, you can access the full note [here](#).

MOVING FORWARD

The themes discussed in this NTRANS-perspective will be central for the work in the centre. Seen all together, these four themes represent a fundamental and massively interdisciplinary research challenge, as well as a set of transition practice challenges. No single discipline can address them alone, nor can any single societal actor. In FME NTRANS, we will continue collaborating to address and understand such challenges.



EXAMPLES OF HOW RESULTS FROM FME NTRANS ARE UTILISED

FME NTRANS maintains a close collaboration with our user partners. This close-knit relationship is one of the cornerstones of our organization, fostering an environment that is conducive to knowledge exchange and mutual growth. We acknowledge that it may sometimes be challenging to tangibly illustrate the advantages of our collaborative efforts. However, we have several examples that clearly demonstrate not only how our user partners significantly benefit from our research activities but also how society as a whole reaps the rewards of our work:

Statkraft's deep dive into Norway's energy transition towards 2050: In 2023, Statkraft published an analysis of the Norwegian energy system for the first time in light of climate goals. Researchers from IFE contributed their modeling expertise. The present era is marked by increased geopolitical unrest, an energy crisis, and inflation. How do these issues affect energy markets, the green shift, and our ability to achieve climate goals? Statkraft utilized the IFE-TIMES-Norway energy system analysis model for their analyses. This tool is well-suited to analyze different development paths for the Norwegian energy system towards 2050, taking into account interactions across all sectors and the need for new investments.

User case 2 as a starting point for new industrial assignments: In 2022, a study was conducted at the intersection of user case 2 and RA3, focusing on alternative layouts and innovative market designs for offshore wind energy production. The findings from this study served as a foundation for more in-depth analyses. These analyses, assigned by various industry actors throughout the year, provided valuable knowledge that significantly influenced decision-making processes, particularly for the Southern North Sea II and Utsira North offshore

wind areas. Therefore, the information and insights from these studies have played a crucial role in shaping the future of offshore wind energy production.

User case 6 as a starting point for groundbreaking work with a focus on local participation: This user case was carried out as a collaboration between FME Northwind and NTRANS, identifying key societal challenges for succeeding with a legitimate and fair offshore wind industry. The general insights from the project are now being further disseminated among actors in the two centers working on offshore wind project development around Utsira, with the goal of developing good participation processes to ensure coexistence and strengthen the projects' legitimacy.

Insights from "license to automate" used in the design of instruments: In 2022, NTRANS and FME Cineldi published a report focusing on how to create social acceptance for the use of automation technologies to realize end-user flexibility. ENOVA has utilized the insights from this work in the further development of support schemes for households interested in investing in price- and effect-controlled energy storage systems for homes.

SPIN-OFF PROJECTS

Over the past year, our team has been incredibly engaged in the exploration and development of various applications. During this productive period, we have initiated several new projects that are of significant impact. Here are some examples to illustrate the scope and diversity of our work:

SusRenew, a project focused on creating sustainable renewable energy futures with low climate risks, is one of our key projects. This project, funded by NFR, will delve into the ongoing transition towards a future renewable energy system that aims for zero greenhouse gas emissions. This commendable effort is spearheaded by Vestlandsforskning, with Sintef, Høgskulen på Vestlandet, and IFE playing crucial roles as partners.

Our collaboration with NTNU in EERA's Joint Programme Bioenergy is another noteworthy project. This project, which commenced in 2023, is also financially supported by NFR.

Looking ahead to 2024, we are excited for the launch of ZEROLOG, a project aimed at zero-emission and sustainable offshore logistics. In this venture, we are proud to be partners with NTNU.

Finally, FAME, a project dedicated to curbing fisheries and aquaculture maritime air emissions, began in 2023 with financial backing from NFR. In this endeavour, we are pleased to work in partnership with NTNU.

ENERGY SITUATION IN EUROPE

The past two years have seen significant unrest in the energy sector, both in Europe and domestically. Throughout this energy crisis, NTRANS has played a crucial role in the national energy debate, with the European energy situation significantly impacting our research.

As NTRANS nears the midpoint of its lifespan this year, we are formulating plans for the remaining four years. This juncture has allowed us to reflect on how vastly different the conditions of the energy transition are today compared to when we began in 2019. We have also analyzed how these changes should influence our future priorities. Over the past year, we have conducted a co-creation process involving both NTRANS' leadership team and the center's board to formulate an "environmental analysis". The analysis highlighted:

- The escalation of the climate crisis, nature crisis, and social inequality crisis.
- The dramatic impact of the European energy crisis and inflation on the energy sector, industry, and households.
- The increased urgency for power, networks, and societal change due to net-zero becoming the dominant transformation logic.
- The new geopolitical reality, including Russian warfare and the US-China rivalry, which makes global value chains vulnerable, strengthens regional strategies, and reduces incentives to phase out Norwegian petroleum activity.

The current circumstances will serve as a significant context for NTRANS research throughout the center's lifetime. As such, what we considered an extraordinary situation in 2021 and 2022 has now become a new normal. This year, we have responded to the situation in several ways.

NTRANS led the initiative when numerous FMEs published the report "[The Energy Crisis in Europe and the Norwegian Power Market](#)". The report concluded that Norway has favorable conditions for power production and that increased production in collaboration with European power trade is beneficial. It's necessary for ensuring supply security and a competitive advantage over time. The report also underscores the need for planning today's energy system and offers recommendations for market design, distribution, energy efficiency, and various forms of power.

Moreover, the situation influences our daily research work, our user cases, and most of our events. For



The report "The Energy Crisis in Europe and the Norwegian Power Market" was created in collaboration with other FMEs.

instance, the situation impacts those working with offshore wind in Norway, who see the [geopolitical situation as a significant upcoming challenge](#). We thoroughly discussed the European situation at our [Arendalsuka event](#). Over the past year, the European situation has also shaped our communication. This is evident when Asgeir Tomasgard advocated for [Hydrogen production in Norway](#), Mette Bjørndal discussed [European influence on Norwegian electricity prices](#), or Tomas Moe Skjølsvold questioned further investment in the fossil industry in Norway when Europe [will eventually shift away from oil](#).

Undoubtedly, the energy situation in Europe will continue to be important to us. As in the previous year, it will serve as a significant [context for our annual NTRANS conference](#) in December.

PATHWAYS TO 2050: CHARTING NORWAY'S ENERGY TRANSITION IN NEW REPORT

Over the past few years, NTRANS researchers from various disciplines have worked to develop an interdisciplinary method to connect different forms of modeling with different forms of social science. This work has now resulted in the report "NTRANS Socio-technical pathways and scenario analysis" ([NTRANS Report 02/2023](#)). The report provides a description of four Norwegian transition paths towards 2050, each characterized by its own set of driving forces, national and sectoral developments, and strategic implementations.

The essence of this report lies in its systematic methodology, providing a comprehensive analysis of transition pathways that could serve as a blueprint for both NTRANS partners and the wider research community. It explores the various possibilities for Norway to maneuver its energy transition, setting a fresh example in interdisciplinary energy research.

The four outlined pathways—each with its unique socio-technical descriptions—are:

1. **Technological Change Pathway:** This approach focuses on using new technologies to update our current energy systems.
2. **Incremental Change Pathway:** This strategy is about making small, continuous improvements to our existing energy setup through minor innovations and policy tweaks.
3. **Social Change Pathway:** This path emphasizes changing how people live and behave to promote more energy-efficient lifestyles.
4. **Radical Change Pathway:** This approach combines major technological breakthroughs with significant changes in how society and institutions operate to completely overhaul the energy system.

Each strategy is thoroughly analyzed to show how it could realistically affect Norway's energy scene and economy. The study uses the models IFE-TIMES-Norway and REMES to assess the impact on power generation, energy consumption, CO2 emissions, GDP and labor, giving a clear picture of what each path might lead to. This helps



Rapport 02/2023 by Kari Aamodt Espegren, Kristina Haaskjold, Eva Rosenberg Sigrid Damman, Tuukka Mäkitie, Allan Dahl Andersen, Tomas Moe Skjølsvold and Paolo Pisciella

identify both the benefits and compromises of different approaches.

The NTRANS report aims to spark well-informed discussions about Norway's energy future by providing a clear link between theoretical ideas and their practical implications. It's designed to support smart decision-making that takes into account the complexity of shifting to new energy systems.

As Norway is on the brink of significant energy changes, this report acts as a guide for what's possible, stressing the need for teamwork and a wide-ranging approach to achieve a sustainable, secure, and thriving energy future by 2050.

NTRANS RESEARCHERS ILLUMINATE ENERGY TRANSITION PATHWAYS IN PRESTIGIOUS PNAS SPECIAL ISSUE

The Proceedings of the National Academy of Sciences (PNAS), is known for its high standing across various fields. One of the standout moments for NTRANS last year, was when its researchers played a key role in a special issue of this highly-regarded journal. This issue aimed to highlight transition studies in socio-technical systems' transition studies, reaching out to a broad audience, especially in the United States and leveraging the journal's wide-reaching influence.

One standout piece by Allan Dahl Andersen, Frank Geels, and Markus Steen focuses on reducing carbon emissions in essential industries, examining the electrification of Norwegian ferries. Their findings emphasize the importance of quickly adopting green technologies such as electric vehicles, heat pumps, and bio-based products within specific sectors. Moreover, they stress the need for creating connections between different sectors to facilitate these innovations through shared resources. The research points out that forming these cross-sector links often leads to conflicts due to varying preferences and interests concerning technical solutions and regulations. These conflicts, initially underestimated, tend to become more apparent later in the transition, signaling the need for policymakers to pay more attention and allocate more resources to address these issues.

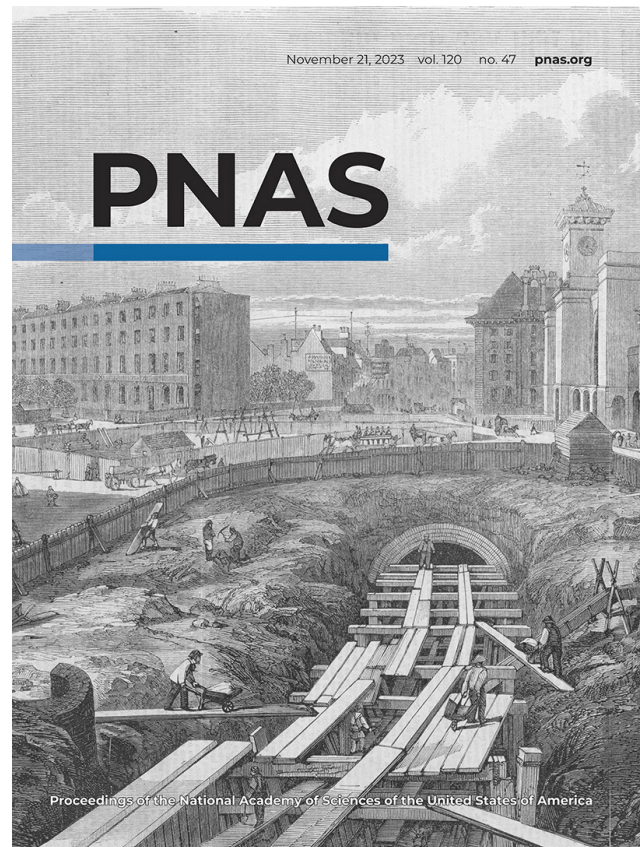
Another significant contribution by Marianne Ryghaug and Tomas Moe Skjølvold examines how electric vehicles (EVs) are becoming more common in Norway. Their research tells the story of how different societal interests can come together around a political strategy for making the transportation sector more environmentally friendly. This study not only sheds light on the complex nature of such transitions but also proposes new ways to lower emissions from transportation. It demonstrates how various, and sometimes conflicting, societal interests can unite behind a policy aimed at reducing emissions in the transport sector, providing useful insights for future sustainable transport and electricity systems.

These contributions to the PNAS special issue highlight NTRANS's influence in the energy transition dialogue. By exploring the complex interactions between sectors and the socio-political aspects of EV adoption, NTRANS researchers are leading the way in developing more informed and effective strategies for change. Their work shows the center's commitment to interdisciplinary research and its role in global efforts to achieve a sustainable, low-carbon future.

NTRANS's recognition in such a prestigious publication not only showcases the center's research excellence

but also underlines the significance of interdisciplinary approaches in tackling the complex challenges of energy transitions. As the world seeks sustainable solutions, the insights from NTRANS researchers provide valuable guidance for policymakers, industry players, and the broader research community, aiding in the collective effort to move towards a sustainable energy future.

Link to issue: <https://www.pnas.org/toc/pnas/120/47>



Cover image: Pictured is *Construction of the Metropolitan Railway*, an 1861 painting depicting the construction of the world's first underground railway in London—an example of sustainability transition. A collection of articles in the Sustainability Transitions in Consumption–Production Systems Special Feature highlights recent research on the contemporary transition of electricity, mobility, and food systems toward sustainable development pathways. Together, the articles explore the multidimensional nature of sustainability transition processes shaped by social, political, economic, and cultural developments. See the Introduction to the Special Feature, [e2206230120](https://doi.org/10.1073/pnas.2206230120). Image credit: Percy William Justyne (artist), Wikimedia Commons/Materialscientist.

ENERGY MARKETS AND THE ENVIRONMENT:

AN INTERVIEW WITH NTRANS FIRST DOCTORAL CANDIDATE, KYRIAKI TSELIKA

In a milestone for FME NTRANS, Kyriaki Tselika became the first doctoral candidate to successfully defend her dissertation titled "Essays on Energy Markets and the Environment." Her work delves into the intricate dynamics between the energy sector and environmental sustainability, shedding light on the impacts of renewable energy on electricity markets, the economic viability of renewable sources in Germany's power sector, and the intricate relationship between green financial instruments and energy markets.

Kyriaki Tselika's journey began during her master's program, where she explored environmental economics, particularly focusing on supply chains. The shift towards her PhD was influenced by her observation of the global climate crisis, including extreme weather events and societal impacts, especially wildfires in her home country, Greece. "These observations steered me towards environmental economics, aiming to contribute to decarbonizing the energy sector and society at large," Tselika shares.

NAVIGATING UNCHARTED TERRITORY

Being the first to defend a doctoral dissertation at NTRANS presented its unique set of challenges and opportunities. Kyriaki Tselika emphasizes that the difficulties stemmed not from being the first but from the inherent challenges of pursuing a PhD. "It's a roller coaster of emotions and intellectual challenges. However, NTRANS provided a supportive platform, offering opportunities for collaboration, feedback, and networking, which were invaluable in navigating these challenges," she notes.

Kyriaki Tselika's research offers critical insights into how renewable energy sources are reshaping electricity market dynamics. "The transition to renewable sources, while essential for sustainability, introduces variability and challenges in balancing supply and demand," she explains. Tselika's work emphasizes the need for innovative solutions, such as improved forecasting, grid modernization, and increased storage capabilities, to mitigate these challenges and ensure the reliability of the electricity system.

ADDRESSING THE 'CANNIBALIZATION EFFECT'

A significant aspect of Kyriaki Tselika's research is the exploration of the 'cannibalization effect' in renewable energy markets, particularly in Germany. "This phenomenon, where the increased presence of wind and solar energy reduces their market value, could potentially deter future investments in renewable energy,"



Kyriaki Tselika, PhD Candidate, Department of Business and Management Science, NHH.

Tselika points out. She suggests that better forecasting, improved grid infrastructure, and storage capabilities are crucial in mitigating this effect and encouraging continued investment in renewable energy.

Kyriaki Tselika also explores the evolving field of green finance, particularly green bonds, and their role in supporting sustainable energy projects. "Green financial instruments are crucial for funding the transition to a greener economy and offer potential returns on investments in green assets," she states. Her research indicates that green finance will play a pivotal role in achieving environmental goals and supporting sustainable energy infrastructure.

MENTORSHIP AND GUIDANCE

Reflecting on her journey, Kyriaki Tselika expresses gratitude for the mentorship of senior researchers Gunnar Eskeland and Leif Kristoffer Sandal. "Their guidance helped me stay grounded and pragmatic about my research. The most valuable lesson I learned was the importance of effectively communicating research findings to make them accessible to a broader audience," she recounts.

With her dissertation behind her, Tselika looks forward to new challenges and opportunities as a research scientist at SINTEF Energy. "I'm excited about learning new methods and techniques and expanding my research in the power market sector, particularly towards hydropower in Norway," she says. Kyriaki Tselika remains committed to contributing to the field of energy and environmental economics and leveraging her position to foster meaningful advancements.

ADVICE TO FUTURE SCHOLARS

To upcoming doctoral candidates at NTRANS, Tselika advises, "Stay curious, pursue research that genuinely interests you, and be kind to yourself through the inevitable ups and downs. Leverage the collaborative and supportive environment at NTRANS to enhance your research and build a robust network."

Kyriaki Tselika which now is Dr. Tselika reflects on her personal growth through her doctoral journey, from feeling lost at the beginning to becoming an independent researcher capable of conducting her research. "This experience has deepened my appreciation for research and its societal value. Every research effort, in some way, contributes to societal advancement," she concludes.

Dr. Kyriaki Tselika's work at FME NTRANS not only sets a precedent for future research but also contributes valuable insights to policymakers and industry stakeholders. Her journey underscores the importance of persistence, collaboration, and effective communication in research. As she embarks on new challenges in her postdoctoral career, her work will undoubtedly continue to inspire and inform both academic discourse and practical policymaking in the realm of energy and the environment.



GREEN ANGELS: ADDING WINGS TO GREEN START-UPS' HYBRID MISSION



In the fast-paced landscape of modern entrepreneurship, a group of investors known as business angels is casting a significant shadow, particularly within the realm of green ventures. These investors are individuals with a keen eye for sustainable innovations, and the study sheds light on business angels' unique role in elevating green ventures towards success, thereby achieving their hybrid mission of both financial success as well as commitment to sustainability.

At the core of green ventures lies a mission beyond profit – a dedication to addressing environmental challenges through innovative and profitable solutions. These ventures are central for the green economy, endeavoring to reduce carbon footprints, enhance energy efficiency, and embrace circular economy principles. Yet, the pathway toward commercializing these innovations is challenging because traditional financial providers often view green start-ups as high-risk ventures, leaving many innovative ideas in the shadows of underfunding. However, the tide is turning with more and more green venture capital providers stepping in to bridge this gap, driven by a blend of altruistic, emotional, and strategic motives.

Diving into the heart of this phenomenon, a study based on interviews with 14 business angels from Germany and the Nordics reveals a fascinating dichotomy within

the angel community. On one side, we have the 'green angels', whose investments are deeply rooted in a personal commitment to the sustainability transition. These individuals are not just investors; they are knowledgeable partners for their start-ups who understand the unique challenges of green innovation, aspiring to act as change agents for a greener future. On the other side, there are 'light green angels', whose motivations and involvement align more closely with traditional investors. Still, they are drawn to the green sector by the possibility to support good causes and the shifting tides of capital towards sustainable ventures.

What sets green angels apart from others is not just their financial investment in green ventures but the diversity of their contributions to the start-ups they support also after the investment. Their involvement goes beyond mere capital injection, encompassing a range of activities designed to ensure and improve the sustainability performance of their ventures. From strategic guidance on sustainability matters and a vast network in relevant green industries to mentoring on the balance of profit and purpose, as well as operational support for sustainability reporting, green angels immerse themselves in the journey of their investees, acting as catalysts for growth and innovation within the planetary boundaries.

This nuanced approach to investment underscores the multifaceted value that green angels bring to the capturable and society. Their impact is not measured solely in financial returns but in the broader effects of their contributions to the sustainability ecosystem. By nurturing green start-ups, they are not only fostering economic growth but also driving the advancement of sustainable practices and technologies.

The significance of this study lies in its illumination of the specific roles and contributions of knowledgeable angels within the green entrepreneurial finance landscape. Start-ups are advised to carefully select their investors depending on their needs and expectations. A combination of them might be fruitful, utilizing individual strengths. The results highlight the diversity within the angel investor community and the varying degrees of commitment to sustainability, without paying judgement for or against one or the other. This insight is crucial for understanding the dynamics of early-stage financing for green start-ups and the pivotal role of business angels in shaping the future of sustainable entrepreneurship.

As we stand at the crossroads of continuous economic growth and environmental stewardship, green angels offer insights into the potential alliance of both. They exemplify how to coalesce the two, and which challenges and opportunities await on the way. Green angels' capability to combine finance with a vision for a better planet might be what is necessary for and impactful investment to take place – a responsibility that should not be neglected.

Full publication here: Business angels investing in green ventures: how do they add value to their start-ups?
by Meike Siefkes, Øyvind Bjørgum and Roger Sørheim
<https://www.tandfonline.com/doi/epdf/10.1080/13691066.2023.2260101?needAccess=true>



NORWAY'S ROAD TO VEHICLE-TO-GRID ADOPTION

Many of our fellows at NTRANS, are in a long home stretch, and they have delivered great publications over the past year. Among these commendable efforts is Milad Mehdizadeh's insightful exploration of [Norwegian attitudes towards Vehicle-to-Grid \(V2G\)](#), a pivotal piece that underscores the evolving dynamics of sustainable energy and electric vehicle (EV) integration within Norway. In delving into this significant shift, we interviewed Mehdizadeh to uncover his insights of Norway's journey towards embracing V2G technology, focusing on the technological advancements, environmental considerations, and the critical role of policy in shaping its widespread adoption.

DELVING INTO V2G RESEARCH

Mehdizadeh's interest in V2G technology was sparked by the DRIVERS project, aimed at understanding the behavior of Norwegian car users in the evolving landscape of electric and automated vehicles. His focus on how both EV users and potential future EV users might engage with V2G programs underscores the inclusive and forward-thinking nature of his research. This study aimed to explore the efficient use of electric cars in energy conservation, positioning V2G as a key player in the sustainable energy ecosystem.

"Concerns about battery degradation and worries about the battery capacity of EVs reduce the likelihood of V2G adoption. Addressing three core V2G elements - batteries, minimum guaranteed charge, and financial incentives - can pave the way for energy and mobility transition," says Mehdizadeh. He believes that if we have more durable and advanced EV batteries, such concerns among end users regarding V2G use may diminish.

With Norway's remarkable adoption rate of electric vehicles, Mehdizadeh emphasizes the potential of V2G technology to act as a large-scale energy storage solution, contributing significantly to long-term energy savings and carbon emission reductions. This aspect highlights the environmental benefits of V2G, aligning with global sustainability goals.

THE ROLE OF GOVERNMENT INCENTIVES AND POLICIES

Government incentives and policies play a pivotal role in fostering the adoption of V2G technology. Mehdizadeh advocates for financial incentives, such as discounts on electricity bills, to encourage car users to embrace EVs equipped with V2G capabilities. These policy-driven initiatives can accelerate the transition to a more integrated and sustainable energy and transportation system.

Looking ahead, Mehdizadeh points to the significance of battery advancements and public perception in shaping the future of V2G technology. The alleviation of concerns regarding battery degradation, coupled with governmental assurances on battery quality, could greatly influence the public's confidence in and acceptance of V2G systems.



Mehdizadeh emphasizes the importance of behavior change campaigns and the clarification of misconceptions about EV batteries. "Addressing misconceptions and integrating smart, user-friendly technologies are pivotal in navigating the challenges of V2G adoption for both current and future EV users," he notes. He believes that these strategies, coupled with the creation of user-friendly smartphone applications for V2G management, are essential for increasing user engagement and trust in V2G systems. Additionally, providing transparency about minimum battery level requirements and using smart systems to manage charging and discharging according to individual usage patterns can greatly enhance user experience and system efficiency.

UPCOMING PROJECTS AND CONTINUED RESEARCH

While the current V2G project is nearing completion, Mehdizadeh acknowledges the ongoing need for research to explore the deeper implications and potentials of V2G technology. This commitment to continued exploration underscores the evolving nature of V2G systems and their role in the future energy landscape.

Mehdizadeh concludes with a forward-looking message, "Embracing V2G technology hinges on three pillars: enhancing battery durability, ensuring a reliable minimum charge, and offering tangible financial benefits to users." This transition is not only about embracing cleaner energy and transportation options but also about contributing to a more sustainable and resilient energy future through innovative solutions like V2G.

Through this comprehensive exploration of V2G technology in Norway, Mehdizadeh sheds light on the current state of readiness, the challenges that lie ahead, and the strategies that could lead to a more sustainable and efficient use of electric vehicles in the energy ecosystem. His insights provide a valuable framework for understanding the complexities of V2G adoption and its implications for the future of transportation and energy in Norway and beyond.



INTERNATIONAL COOPERATION



Photo of Fabienne Sierra

In 2023, NTRANS has had a lot of international activity. As last year, exchanges have been central. Many of our fellows have spent the past year at foreign institutions, and we have had numerous international guests at various stages of their careers at our institutions. The breadth can be illustrated by Pleun Peerenboom (HAS Hogeschool, Netherlands) who had an internship in connection with his bachelor's degree focusing on municipal restructuring, Sierra Fabienne (ZHAW, Switzerland) who had a longer stay in connection with her PhD on energy citizenship and Julia Kirkegard (DTU Wind, Denmark) who had a shorter stay in connection with cooperation around social aspects of wind power related to her new ERC project. At the same time, we have continued our good collaboration with top international researchers like Frank Geels. This yields good results. Among other things, four NTRANS researchers were central when Geels et al. this year edited a guest issue of the absolute top journal PNAS, focusing on energy and climate transition research. Furthermore, we would like to highlight that our researchers consistently publish together with very good and recognized international environments in general.

Researchers in NTRANS are also active internationally, both academically and strategically. We have researchers in key positions within important international forums such as the European Energy Research Alliance (EERA), as members of the Management Board in EERA e3s "Economic, Environmental and Social Impacts of the Energy Transition" (Tomasgard) and in EERA Bioenergy (Jorge). NTRANS is also represented in the European Academies' Science Advisory Council (Tomasgard) and the UN's climate panel (IPCC, Strømman). EERA e3s, which focuses on the energy system and social science issues, is still an important focus area. Tomasgard and Michael Belsnes (SINTEF) are in the leadership group and participate in the work to renew this program's work plan, as well as a task force on clean energy transition set up by EERA centrally. Furthermore, we participate in the

EERA Center of Excellence on Energy Transition Models where in 2023 we contributed to a position paper on "Addressing the energy system modelling challenges". Our researchers also do a lot of strategically important work, for example in IEA's technology programs. Here we can among other things highlight that we are the national representative for Users TCP (Skjølsvold, NTNU), and for ETSAP (Espegren, IFE).

The European Forum for Energy and Climate Transition ([efect.eu](http://efect.eu/)), which NTRANS partners NTNU, SINTEF and IFE have taken the initiative to establish, consists of a number of European and international partners working together on "modelling missions" where data and analyses are shared within transition studies. In 2022, the geopolitical situation in Europe changed significantly as a result of the Russian invasion of Ukraine, and the EU Commission launched the energy plan REPowerEU, with the ambition to contribute to both the production of clean energy and increased energy security in the region. In addition, the summer of 2022 was the hottest ever recorded in Europe, which also affects the energy situation in Europe. This was the starting point for the work in EFACT in 2023, which launched a Call for Contributions: "Climate Change and Energy Security: Modelling extreme climate and geopolitical events".

We also work internationally with education offerings, and international partners in NTRANS are particularly engaged as co-supervisors of scholars. There are also good examples that this opens new opportunities, for example, NTRANS is now cooperating with the UKERC Public Engagement Observatory (via Jason Chilvers) on a comparative study focusing on participation in the transition across England, Germany and Norway. In March, NTRANS researchers organized a winter school with top international researchers as lecturers and with over 40 students. The theme was "Planning under Uncertainty in Energy Markets".

In 2023, NTRANS was heavily involved as a co-organizer of the research conference Beyond Normal/Beyond Crisis. The conference gathered top international researchers such as Keynote speakers (for example Kirsten Jenkins and Stewart Capstick). Furthermore, NTRANS researchers were organizers of sessions like "Soul searching the flexibility concept", "Low-income groups and the super-rich in sustainability transition", "Bridging concerns for justice and speed", and more. As usual, NTRANS was also heavily involved during Energy Transition Week 2023. Here we helped organize a number of workshops with international participation on themes such as "Biofuels and Efuels - Land use, Climate effect", "Good

Engagement in the Energy Transition?", "Future Energy Market Design", "Energy Security in Europe", and "Innovation and Climate Finance" to name a few.

Many NTRANS publications are written by international author teams. An important part of our international work is application work towards the EU and other international sources, and over the past year we have started many international projects. The table below provides an overview of international projects that have been started, funded or applied for in the past year (and does not include ongoing projects).

Project (approved 2023)	Status	Call/funder	NTRANS-partner	Coordinator
MultiFutures (Multidimensional Transition Pathways Analysis for Sustainable Futures: Exploring Alternative Paradigms and Broadening Policy Options through Innovative Scenario Development)	Start 01-01-2024	HORIZON-CL5-2023-D1-01	NTNU	Energy Institute at JKU Linz
Open4cec (Service-oriented Open Platform for Citizen Energy Communities (CEC) – a scalable and extensible platform)	Start January 2024 (tentative)	DUT (Driving Urban Transitions Partnership) call 2022	NTNU	Bucharest University of Economic Studies
Man0EUvRE (Energy System Modelling for Transition to a net-Zero 2050 for EU via REPowerEU)	Start 1.12.2023	CETPartnership Joint Call 2022	NTNU, Sintef, IFE	Sintef
NordicH2ubs (Nordic hydrogen hubs – roadmaps towards 2030 and 2040)	Start 03.10.2023	Nordic Energy Research	NTNU	Sintef
iDesignRES	Start 01.10.2023	HORIZON-CL5-2022-D3-01	NTNU	NTNU
ICARUS (International cooperation for sustainable aviation biofuels)	Start 01.10.2023	HORIZON-CL5-2022-D3-03-02	NTNU	CRES
Nord_H2ub - Rally to the Valley: Establishing Hydrogen Value Chains for the Nordics	Start 01.09.2023	Nordic Energy Research	NHH, NTNU	CBS

Application (applied 2023)	Status	Call/funder	NTRANS-partner	Coordinator
POTENT - Ports as Energy Transition Hubs	Applied Nov. 2023	HORIZON-MSCA-DN-2022	NHH	CBS
Renewable Energy Development Education	Applied Oct. 2023	NORAD	NTNU	NTNU
SPICE (Sustainable no regrets African pellets for efficient and clean cooking in Africa)	Applied Sep. 2023	HORIZON-CL5-2023-D3-02-16	NTNU	LNEG
SYNAF (Synergies in decentralized advanced fuel production)	Applied Sep. 2023	HORIZON-CL5-2023-D3-02	NTNU	TNO
NEEDADAPT	Applied April 2023 - rejection	HORIZON-CL5-2023-D1-01	NTNU	University of Antwerp
CONNECT	Applied March 2023 - rejection	HORIZON-CL5-2023-DEV-01	NTNU	NTNU

CRISIS, CROSSROADS, AND COURAGE: NTNU ENERGY TRANSITION WEEK AND CONFERENCE 2023



Over the last decade, NTNU energy transition week has established itself as a central meeting point at the intersection of academia, industry, and policymaking. NTRANS is a proud co-host of the week. This year's theme, "Crisis, Crossroads, and Courage," captured the essence of our current environmental predicament but also embodied the resilient spirit of those at the forefront of the energy transition.

The conference was structured around three pivotal themes: transitioning industries and global trade, the role of infrastructure and storage, and future technologies and lifestyle changes. These themes reflect the pressing issues that stand in the way of achieving a zero-emission society. The opening session set the tone with keynotes from distinguished figures such as Dimitri Lorenzani from the European Commission, Andreas Bjelland Eriksen from the Ministry of Petroleum and Energy, and Anne Borg, rector of NTNU. Their messages were clear, framing the discussions that would unfold in the days to come.

The first theme, "Transitioning Industries and Global Trade," delved into the complex interplay between economic forces and environmental imperatives. In a world grappling with energy crises, geopolitical instability, and the urgent need to decarbonize, speakers like Daria Tagliani from The World Bank and Helge Haugane from Equinor shared their visions for a sustainable future.

They explored how industries could navigate the transition, the implications of carbon border adjustment mechanisms, and the potential for renewable energy and carbon capture and storage (CCS) technologies.

Infrastructure and storage took center stage as the second theme, highlighting the critical role of resilience in the energy transition. The recent disruptions to major infrastructure projects underscored the importance of this discussion. Experts like Frode Leversund from Gassco and Magnus Korpås from NTNU debated the viability of repurposing existing infrastructure for hydrogen transport and the need for innovative storage solutions for CO₂ and fuels. This session illuminated the challenges and opportunities in ensuring energy security while fostering sustainable development.

The dialogue on "Climate Finance" bridged the gap between ambition and action, with leaders like Francis O'Sullivan from MIT and Egil Madsen from the NTNU Business School examining the financial mechanisms that could support climate policies and adaptation projects. This conversation was crucial in understanding the intricacies of funding the transition and the role of financial institutions in facilitating change.

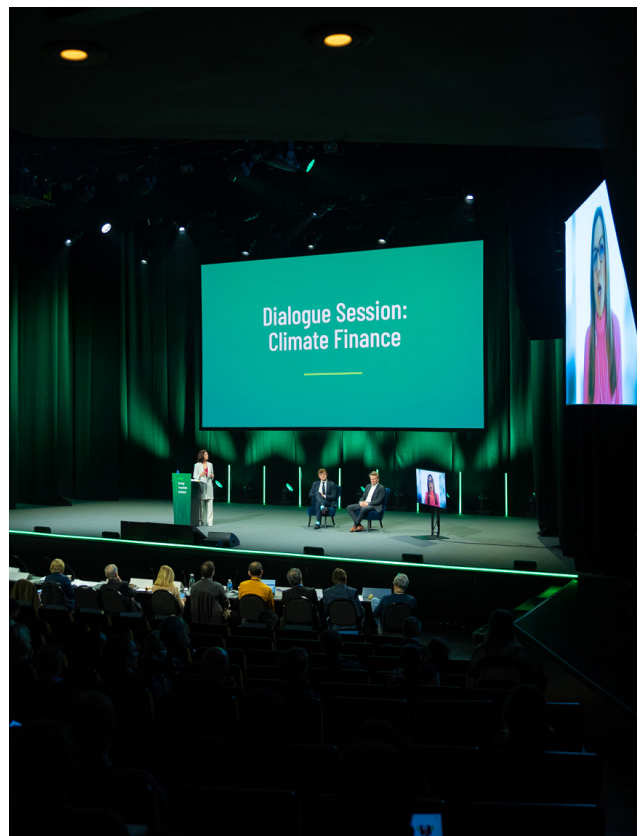
The conference's final theme, "Future Technologies & Lifestyle Changes," ventured into the realm of possibilities. It was a forward-looking discussion that embraced



the potential of new technologies and the significance of individual and collective actions in shaping a sustainable future. Speakers such as Linda Steg from the University of Groningen and Henrik Sætness from Statkraft presented innovative solutions and emphasized the importance of citizen engagement and policy adaptation.

Beyond the conference, the NTNU Energy Transition Week was enriched with workshops and networking events, each designed to foster collaboration and knowledge sharing. From the "Solar Scale Up and Energy System Integration" workshop to the "Renewable Energy Systems on the Norwegian Continental Shelf," participants engaged in deep dives into specific aspects of the energy transition, leaving no stone unturned.

As the curtains fell on the NTNU Energy Transition Week 2023, it was evident that the journey to a net-zero society is fraught with challenges. Yet, the collective wisdom, courage, and innovation showcased throughout the week offered a glimpse into a promising future. The event not only provided a platform for dialogue and discovery but also served as a call to action for all stakeholders to play their part in this monumental transition. As we look ahead, the lessons learned and the connections forged during this pivotal week will undoubtedly fuel the momentum towards a sustainable and resilient energy future.



NAVIGATING THE FUTURE: UNPACKING NORWAY'S ENERGY TRANSITION AT ARENDALSUKA 2023

It has become a tradition for NTRANS to be present at Norway's key political area of impact, Arendalsuka. 2023 was no exception. This time, we focused on the tensions between ambitions and practice, with the challenges for offshore wind, battery production and CCS as a backdrop. Here, industry experts, policymakers, and researchers convened to dissect the intricacies of Norway's journey towards a sustainable, low-emission society.

The discussions at Arendalsuka 2023 were centered on the resilience of Norway's energy strategies, particularly as the nation pivots from its traditional oil and gas foundations to embrace renewable ventures such as wind power and green industrial innovations. This transition is fraught with both opportunities and hurdles, from technological breakthroughs to economic and social equity considerations.

Mette Bjørndal from NHH kicked off the event by addressing the volatile energy markets and the important role of decarbonization in maintaining stability. Her insights laid the groundwork for a broader discussion on the adaptability required in Norway's energy ambitions.

Kari Aamodt Espegren from NTRANS and IFE presented four scenarios that envisioned Norway's energy future, each hinging on the pace of technological innovation and societal adaptation. These scenarios opened a spectrum of possibilities, from gradual shifts to transformative leaps in energy practices.

Tomas Moe Skjølsvold, Deputy Director at FME NTRANS, brought the conversation to the public sphere, examining how energy debates, such as the one surrounding electrification of the LNG production at Melkøya, influence and are influenced by societal acceptance and engagement.

Gisle Solbu's discourse on social justice in the context of climate transition highlighted the uneven distribution of climate impacts and the imperative for inclusive policies that ensure fairness in the energy shift.

Gunnar Eskeland's provocative take challenged the audience to rethink the balance between energy production and consumption, advocating for a nuanced approach to sustainability.

The ensuing panel discussion was a testament to the diversity of thought and approach within the Norwegian



energy sector. The debate around the oil and gas industry's future role in Norway was particularly animated, reflecting a national dialogue torn between tradition and innovation. While critiques of the industry's influence were vocal, others argued for a pragmatic, phased transition that leverages Norway's existing strengths.

Representatives from Hydro and Statkraft underscored the centrality of renewable energy in the green transition, pointing to the necessity of a sustainable and predictable energy landscape. The economic ramifications of a hasty transition were also debated, alongside the critical role of education in preparing a skilled workforce for the evolving energy sector.

Arendalsuka 2023 culminated in a consensus on the need for a cohesive, transparent strategy to navigate Norway's energy future. As Norway stands at this critical crossroads, the insights from Arendalsuka 2023 will undoubtedly fuel the ongoing debate and help chart a course toward a greener, more resilient future.

INSIGHTS FROM THE NTRANS SUMMER CONFERENCE 2023



This year's NTRANS Summer Conference took place at the Thon Conference Center in Oslo, bringing together a focused group of researchers, industry experts, and academics. The event was structured around critical discussions on energy demand and supply, the role of offshore energy systems, the transport sector's challenges, and potential new use cases for energy technologies.

The conference opened with Asgeir Tomasgard from NTRANS setting the stage. Key presentations included insights from Kari Espegren of IFE on the uncertainties surrounding future energy demand and Tomas Skjølvold from NTNU discussing upcoming energy controversies in Norway. The discussions extended to the future of the transmission system and renewable energy production challenges, highlighted by Anders Kringstad from Statnett and Toril Christensen from Eviny.

A significant portion of the day was dedicated to exploring the need for new infrastructure, the impact of population growth, and alternative solutions like battery technology to traditional network approaches.

In the afternoon, the focus shifted to offshore energy systems with contributions from Michel Myhre-Nielsen of Equinor and Caroline Østlie from Statkraft, among others. The role of transportation in addressing climate challenges was also a key topic, with insights from Christine Maass from the Environmental Directorate and others.

The conference concluded with sessions on new use cases for energy technology, featuring talks from representatives of Statkraft, IFE, and NTNU, and inputs from the municipalities of Oslo, Bergen, and Trondheim on urban energy transition themes.

The event wrapped up with a networking dinner at Bølgen & Moi, Tjuvholmen.

REFLECTIONS FROM THE NTRANS ANNUAL CONFERENCE 2023



Frank Geels (Universitetet i Manchester) på Årskonferansen.

Wrapping up the NTRANS-year, our annual conference was held in Oslo during December. Gathering nearly a hundred researchers, industry partners, policymakers, and other stakeholders, the conference mobilized critical engagement with the shifting conditions that are reshaping the landscape of energy transitions: geopolitical tensions, economic fluctuations, and the evolving energy scenario globally and in Norway.

The overarching theme of the conference, reflecting on these changing conditions, set the stage for a series of presentations and discussions that delved into the complexities of moving towards a net-zero society by 2050. The insights shared by speakers like Martin Skancke on the climate committee's vision, Kari Espegren's exploration of NTRANS pathways, and Asgeir Tomasgard's analysis of Norway's interaction with Europe.

Frank Geels from the University of Manchester painted a vivid picture of the global transition, acknowledging the turbulence of the current period while also highlighting significant technological advancements. This global perspective was complemented by a closer look at the local level, where the roles of municipalities and counties in the transition were scrutinized. Presentations from Oslo, Bergen, Trondheim, and Trøndelag revealed common challenges such as electrification, network capacity, and the need for flexibility, alongside the critical issue of ensuring a just transition in the face of limited resources. The conference's afternoon sessions zoomed in on research within NTRANS, with a marathon of presentations from both seasoned and new researchers. These sessions showcased the breadth of inquiry and innovation that characterizes the work being done within the energy and climate transition fields.

A deep dive into consumer roles in the transition, particularly focusing on end-user flexibility, brought forward discussions on vehicle-to-grid acceptance by Milad Mehdizadeh and smart charging research by Mette Bjørndal. Stian Backe's recommendations from the

integrated markets for energy and flexibility user case, and Tomas Moe Skjølvold's exploration of social dilemmas in consumer flexibility, underscored the importance of addressing social and ethical considerations in achieving a just and legitimate transition.

The conference's final discussions centered on the future, with Statkraft and Equinor presenting their analyses for the path towards 2050. The commentary by Anders Bjartnes from the Climate Foundation added depth to the discussion, highlighting the diverse perspectives and approaches needed to navigate the path ahead.



LUNCH BOX WEBINARS ON ENERGY TRANSITION

In 2023, NTRANS continued its tradition of meeting on Wednesday for "Lunch Box Webinars". The webinars have become an important arena for exchange within the centre, where researchers, industry and the public sector meet to showcase their work and discuss. Since the start of the centre, we have hosted more than 70 lunch box webinars - not bad, for what is essentially a spin-off of some of the new ways we learned to work during the Covid-19 pandemic.

The webinars of 2023 covered a broad spectrum of topics. From exploring energy system flexibility and the

pioneering efforts of cities like Oslo towards achieving zero emissions to delving into the security implications of emerging micro mobility trends. We also invited external actors such as the scientist's rebellion to discuss the tensions of being a researcher in a time of climate crisis: should we take on an activist's role, or are we bound to observe at a distance? All in all, the lunch box webinars continue to be a friendly site of engagement and reflection where we above all value and nurture good discussions. See you next time?



GREEN SHIPPING FUTURES: STRØMMAN'S INSIGHTS AT COP28



'Global Context for 2050 - Energy Transition in an Uncertain World' panel with David Shukman, Anders Hammer Strømman, Francesco La Camera, Jens Meier and Lord Adair Turner. Photo: International Chamber of Shipping (ICS)

The shipping industry, which transports over 80% of the world's trade goods, stands at a crucial turning point in the face of climate change. Professor Anders Hammer Strømman at the program for Industrial Ecology and representative for FME NTRANS at COP28, pointed out the shipping industry's dual challenge: to maintain global trade efficiency while reducing its environmental footprint.

Innovation in ship design, operations and fuel use is crucial to meet these challenges, emphasizes Strømman who has noticed a significant shift in the shipping industry in recent years. From being perceived as a sector that was difficult to decarbonize, to now striving to be part of the solution. The new leadership in the International Maritime Organization (IMO) has brought new life to the work of reducing emissions by setting stricter environmental goals and promoting a proactive agenda for sustainable development. Strømman highlights international cooperation, focus on effective and practical tools and regulations, such as IMO 2020, as essential steps towards cleaner maritime operations. This signals an important step forward and underscores the necessity of embracing radical solutions to ensure significant reductions in greenhouse gas emissions.

CONSENSUS AND CLARITY THROUGH SCIENTIFIC SYNTHESIS

Anders Hammer Strømman emphasizes the importance of creating consensus and clarity in the shipping sector

through scientific synthesis. By gathering and evaluating research on the various alternatives for decarbonization, Strømman and his colleagues work to build a common understanding and certainty about the most viable choices. This work is crucial to ensuring that the sector can set a common and well-informed course towards a sustainable future. The role of the Climate Panel in qualifying knowledge and giving an indication of the degree of "confidence" in various findings is central to this work, emphasizing the importance of broad consensus and high quality of the scientific insight that underlies decisions in the sector.

In light of Anders Strømman's considerations about the future of shipping, he emphasizes the importance of green corridors and infrastructure innovation to promote the use of green fuel. Strømman points out the challenges involved in establishing a sustainable route infrastructure, where ships can operate efficiently between ports with access to green fuel. He emphasizes the "chicken or the egg" problem, where the necessity of fuel availability, port infrastructure, and ships that can use these fuels must be developed in parallel. Strømman suggests that the first success in establishing such systems will provide significant competitive advantages. Furthermore, he highlights the potential for electrification along river traffic on the continent, where freight transport could benefit from en-route charging, and opens up new perspectives on how the shipping infrastructure can be adapted for a more sustainable future.

NORWAY'S PROMINENT ROLE AS A MARITIME PIONEER AND CHOICE OF FUEL ALTERNATIVES

Norway has long been recognized as a maritime nation, with deep roots in seafaring and a rich history of maritime innovation. In this new climate regime, Norway has positioned itself as a leader in the development of greener maritime solutions. Strømman speaks of Norway's commitment to research and development in green shipping, with projects such as the world's first all-electric car ferry, "Ampere", and the development of autonomous ships. He highlights these projects as examples of how Norwegian engineering and innovation can guide the global industry towards more sustainable practices.

The transition to electricity and hydrogen as fuel in the maritime sector is central to the decarbonization of shipping. Strømman discusses how electrification has already revolutionized short-distance transport in Norway, with an increasing fleet of electric ferries and small boats. He sees hydrogen as a promising alternative for longer and more energy-demanding journeys, where battery operation is not practical. Strømman emphasizes the importance of developing reliable infrastructure for hydrogen production and distribution, as well as safety and regulation to support wider adoption of these technologies.

When it comes to choosing the right path for future investments, shipping companies face a diversity of fuel alternatives, each with its advantages and challenges. Strømman explores how shipping companies can navigate this landscape, from traditional fossil fuels to biofuels, LNG, ammonia, and beyond. He points to the need for a thorough assessment of lifecycle emissions, availability, costs, and existing infrastructure. Strømman argues for a balanced approach, combining short- and long-term strategies to achieve sustainable operation.

THE IMPACT ON SHIP DESIGN AND FUTURE INVESTMENTS

This transition also has profound implications for ship design and building. Strømman discusses how new types of fuel and technologies lead to rethinking around ship design, from drivelines and fuel storage to energy efficiency improvements and advanced control systems. He emphasizes that the ships of the future will be designed with a much greater degree of flexibility to accommodate various operational requirements and enable a smooth integration of future technological advances.



Illustration of potential innovation in sail technology, such as wind-assisted propulsion and sails.

Strømman hints at a future where ships with narrow, energy-efficient hulls and potentially autonomous features may dominate, assuming the port infrastructure is adapted to support these new designs. This includes challenges such as larger port space for more energy-efficient, slimmer ships.

Innovation in sail technology, such as wind-assisted propulsion and sails as an energy efficiency measure or complete replacement for conventional propulsion methods, represents a historical return to emission-free sailing across the ocean. Strømman also highlights other energy-efficiency measures, such as reducing friction by introducing a "bubble blanket" under the hull to create an air cushion that reduces water resistance.

These technological advances require a rethinking of how ships are constructed from the ground up, with a greater emphasis on flexibility and energy efficiency. The collaboration between shipbuilders, ship owners, and technology suppliers will become even more important, along with necessary adaptations to new safety standards and operational procedures, to realize the ships of the future.

INSIGHTS FROM COP28 AND NAVIGATING UNCERTAIN WATERS: THE FUTURE OF SHIPPING

In the face of a future filled with uncertainty, Strømman emphasizes the importance of collective effort and clarity in the choices for shipping. COP28 has highlighted the international community's commitment to tackling the sector's climate challenges. Discussions at the conference highlighted both the challenges and opportunities inherent in reducing the sector's greenhouse gas emissions, as well as the importance of setting ambitious, but achievable, goals.

The new leadership in IMO has revitalized work on stricter environmental goals. To succeed, the sector must unite around a common course, supported by scientific synthesis and a deeper understanding of the various alternatives available. This not only requires innovation and international agreements, but also an integrated approach to policy development that acknowledges the woven role of shipping in the larger climate effort. By embracing this multi-dimensional challenge, shipping can not only overcome today's obstacles but also contribute significantly to a sustainable global future.



Professor Anders Hammer Strømman at the conference area during COP28 in Dubai. Photo: private

UNGKLIMA AND UNGENERGI'S JOURNEY IN 2023

UNGKLIMA AND UNGENERGI'S JOURNEY IN 2023

Throughout 2023, UngKlima and UngEnergi, under the umbrella of the research center NTRANS, have continued their significant work equipping young people with knowledge and understanding of climate change and renewable energy. Through a variety of activities, including school visits, development of educational resources, and events such as "Researchers' Night," these projects have communicated scientific concepts in an understandable and relatable way, influencing young people's perspectives on climate and energy.

PIONEERING WORK THROUGH COLLABORATION

The collaboration between UngKlima and UngEnergi has been a central element in their success this year. With joint projects such as the development of new websites, they have effectively coordinated their resources to maximize the reach and impact of their message. This collaboration has not only strengthened their individual initiatives but also created a more unified approach to climate and energy education.

"By uniting forces, we have achieved much more than would have been possible individually," reflects Anahita Koushan, who works in the UngKlima editorial office. "This collaboration has given us a unique opportunity to share knowledge and experiences across our projects, and in this way develop more engaging and content-rich programs for the young people we reach out to."

INNOVATION IN EDUCATION

UngKlima and UngEnergi have placed great emphasis on innovation in their pedagogical approach. Throughout the year, they have introduced new interactive elements in their workshops and school presentations, including hands-on demonstrations like the potato battery experiment and the use of gamified elements like climate and energy quizzes. These approaches have not only made learning more engaging, but also reinforced understanding of complex topics through practical experience.

Anahita shares feedback from "Researchers' Night", an event where UngKlima and UngEnergi had a booth: "We were very pleased to see young people's curiosity and engagement when they experimented with potato batteries and discussed energy sources, it really underscores the value of hands-on learning. It's exciting how effective interactive and playful methods can be in climate and energy education."

PERSONAL GROWTH AND COMMUNITY

Anahita, who represents the passion of UngKlima and UngEnergi, speaks warmly about how her involvement in the projects has contributed to personal growth and



development. "Being a part of UngKlima has not only given me the opportunity to contribute to a cause I am passionate about, but has also been a tremendous source of learning and personal development," she says. "From improving my public presentation skills to understanding the value of interdisciplinary collaboration, each step in this journey has expanded my horizon."

She also emphasizes the unique atmosphere of community and support within UngKlima and UngEnergi: "Our community is driven by a shared passion for climate and sustainability. Working side by side with like-minded individuals has created an environment where we continuously inspire and learn from each other. This sense of belonging and common purpose is truly what makes this experience so rewarding."

INSPIRING YOUTH IS THE WAY FORWARD

Anahita's story and experiences in UngKlima and UngEnergi are not merely a personal testimony, but also a reflection of the positive impact these projects have on individual lives and society as a whole. Focusing on bridging the gap between scientific knowledge and young people's everyday lives, the goal is clear: to inspire and equip the next generation with the tools they need to navigate a world where climate change and energy transition are central challenges.

In a world that is increasingly becoming more digital, UngKlima and UngEnergi see opportunities to engage youth on the platforms where they spend most of their

time. From improving their social media presence to developing interactive online experiences, these projects recognize the importance of meeting youth where they are. Anahita emphasizes this point by noting that "adapting our communication and content to digital platforms is crucial to effectively reach out and engage youth."

COMMUNITY AND COLLABORATION AT THE CORE

Through thick and thin, the community within UngKlima and UngEnergi has been a cornerstone of their operation. This community has not only been a source of support and inspiration, but also a forum for the exchange of ideas and perspectives. "Being part of a community where everyone shares a common goal of sustainable development has truly reinforced my belief that we can make a difference," Anahita says with conviction.

Looking ahead, it is clear that UngKlima and UngEnergi are on the cusp of new and exciting opportunities. With plans to expand their educational programs and explore new methods of youth engagement, these projects are well positioned to continue their important work. "Our greatest dream," notes Anahita, "is to see a generation of young people who are not only informed about climate and energy issues, but who are also active participants in shaping a more sustainable world."

UngKlima and UngEnergi have shown that through dedication, innovation, and community, youth can be inspired to take the lead in the climate and energy debate. Anahita's journey and experiences underscore the power of youth engagement and the significance of education as a catalyst for change. As we look ahead, it is clear that these projects will continue to play a pivotal role in enlightening, engaging, and inspiring the next generation to take action for our planet's future.



PHD AND POSTDOC EVENTS IN 2023



Students and lectures at Herøya Industry Park.

In 2023, we conducted several events involving our PhD and Postdoc students. FME NTRANS led three significant educational initiatives last year, with a focus on fostering collaboration, innovation, and practical insight into the energy transition and sustainability sectors. These events brought together a diverse group of PhD students, post-docs, and experts, facilitating a rich exchange of ideas and strategies for a low-carbon society. One such event was a retreat at Kringler Gjestegård for fellows and post-docs, focusing on popular science communication. This resulted in chronicles like the one by Krisjanis Rudus, who argued that [Farmers must be able to share self-produced power with others](#).

The retreat at Kringler Gjestegård was more than an academic gathering; it was an immersive experience designed to bridge the gap between complex scientific research and the general public's understanding. Participants engaged in hands-on sessions where they learned to distill their intricate work into compelling stories that captivate and educate a wider audience. This exercise in science communication was crucial, as it emphasized the need for researchers to be storytellers, able to share their insights in a manner that's not only accessible but also actionable. The retreat fostered a collaborative spirit, encouraging attendees to view their work through the lens of societal impact, thus broadening their perspective on the role of science in driving sustainable change.

At the Winter School in Geilo, the serene snow-covered landscape provided the perfect backdrop for intense intellectual exploration. The event delved into the volatile nature of energy markets, presenting a platform for a multidisciplinary approach to understanding and

solving these complexities. Participants were exposed to advanced analytical techniques and models, empowering them with the tools to navigate and make sense of the uncertainties that characterize the energy sector. The integration of leisure activities, like skiing, with academic rigor, facilitated a unique learning environment where informal interactions led to the cross-pollination of ideas, fostering a community of learners eager to contribute to the energy transition narrative.

The NorRen Summer School in Langesund Bad offered a comprehensive exploration of the renewable energy landscape, emphasizing the interconnectedness of various elements within the sector. The curriculum was meticulously designed to cover a broad spectrum of topics, ensuring participants gained a holistic understanding of the challenges and opportunities in renewable energy. The industrial visits were a highlight, offering a rare glimpse into the practical application of theories discussed in the classroom. These excursions not only enriched the learning experience but also served as a powerful reminder of the tangible impact that innovative solutions can have on the industry. The summer school was an embodiment of the idea that effective learning is a blend of theory and practice, fostering an environment where future leaders in renewable energy could thrive.

These initiatives reflect FME NTRANS's commitment to equipping the next generation of researchers and professionals with the tools and perspectives necessary to drive the transition to a sustainable future. By fostering an environment of collaboration and practical learning, FME NTRANS is contributing to the development of solutions that address the multifaceted challenges of sustainability and energy transition.

NEW SOCIAL SCIENCE AND HUMANITIES CONFERENCE: BEYOND CRISIS/BEYOND NORMAL

On 27-29. September 2023 FME NTRANS was heavily involved in hosting, organizing, and participating in the Beyond Crisis/Beyond Normal conference. This conference welcomed hundreds of social science and humanities scholars working broadly with sustainability, climate, energy, and environmental issues. Guests from far and wide were very happy, enjoyed Trondheim, and found the conference stimulating. The conference sported sessions on diverse topics such as multi-system interactions in transitions, flexibility, just transitions and citizen involvement, to name a few. In addition to ordinary academic conference sessions, we had a series of alternative sessions. This included speed dating between academics and civil society, training in non-violent action by Scientist rebellion, an outdoor session on the understanding of place and space.



Keynote Kirsten Jenkins.



Tomas Moe Skjølsvold opening the Beyond Normal/Beyond Crisis Conference.

FME NTRANS RESEARCHERS LEAD THE ENERGY DIALOGUE

FME NTRANS researchers have been at the forefront, shaping conversations and policy through dynamic media engagements. From Stefan Jaehnert's deep dive into future energy market models to Gunnar S. Eskeland's insights on power sustainability, our team has sparked crucial dialogues. Asgeir Tomasgard's strategy for zero emissions and Tomas Moe Skjølsvold's innovative solutions to energy crises have pushed the envelope further, emphasizing the need for multifaceted approaches in the energy transition.

The participation of Asgeir Tomasgard and Nils Røkke at Arendalsuka was a testament to the impactful advice our researchers can offer to policymakers. Their advice on averting a power deficit in Norway has been a significant contribution to the national energy debate.

This year has also seen our researchers engage in various other platforms, offering their expertise on topics

ranging from the potential of nuclear power to the societal implications of climate actions and the strategic importance of local collaboration in renewable energy development.

Their voices have resonated across numerous publications, including NRK, EnergiAktuelt, Adresseavisen, Nettavisen, Gemini, DN, ABC Nyheter, and Altinget, among others.

Through interviews, columns, opinion pieces, and media appearances, our researchers have hopefully influenced both public understanding and political agendas. Their contributions reflect FME NTRANS's commitment to leading the discourse on energy transition, climate solutions, and sustainable development, reinforcing our role as a key knowledge partner in addressing some of the most pressing challenges of our time.

ENERGI Slik utvikler vi neste generasjons markedsmodeller for energisystemet

AV STEFAN JAEHNERT
NOVEMBER 29, 2023

KOMMENTARER

I dag gjennomgår det europeiske kraftsystemet en rask og omfattende omstilling, drevet av overgangen til fornybare energikilder og elektrifisering. Forsyningsikkerhet, spesielt energisikkerhet, har derfor blitt en sentral samfunnsutfordring.

På grunn av energikrisen i Europa er det nå økt oppmerksomhet og engasjement blant energiforskere, inkludert meg selv, for å sikre pålitelig og konkurransedyktig tilgang til kraft i fremtidens fornybare energisystem.



For å møte energitfordringene og best mulig utnytte fornybare energiresurser, er det viktig å tilgjengeliggjøre beslutningsstøtteverktøy. Disse verktøyene skal bistå aktører som kraftprodusenter, eierne og operatørene i det stadig utvidende markedet for





Espen Moe

Professor | Institutt for sosiologi og statsvitenskap | NTNU

NTNU og SINTEF på Arendalsuka: – Vi må samarbeide lokalt for å bygge ut fornybar kraft i Norge nå

Alle politikere vil klippe snorer til nye fabrikker med nye arbeidsplasser. Men ingen vil klippe snoren til ny kraftutbygging. Hvordan skal vi klare å få til nye grønne arbeidsplasser om vi ikke har nok strøm til en fornuftig pris?



Asgeir Tomasgard

Professor | Institutt for industriell økonomi og teknologiledelse | NTNU



Makt og muskler med Melkøya-beslutningen – det kan være smart. Men man kan ha begått en taktisk brøler ved å ikke ha løst Fosen-floken først, skriver NHH-forsker Gunnar Eskeland. Foto: Melkøya, Wikimedia (C)

INNLEGG
9. august 2023 14:41
Klimaøkonomi Energi

MELKØYA-STRØM: MAKTDEMONSTRASJON UTEN STRATEGI?

Jonas Gahr Støre tøffer seg og viser makt og muskler med Melkøya-beslutningen – det kan være smart. Men man kan ha begått en taktisk brøler ved å ikke ha løst Fosen-floken først.



GUNNAR S. ESKELAND
Gunnar S. Eskeland er professor ved Institutt for foretaksøkonomi og tilknyttet blant annet ENE og skattecenteret NoCeT.

På områder som krever statsmakt – som bygging av kraftanlegg og

COOPERATION BETWEEN CENTERS

NTRANS closely collaborates with other FME centers in two ways. Firstly, we collaborate on research and user cases. In 2023, we have collaborated with FME ZEN on a user case on [sustainable development of innovation districts](#). Our user case focused on [societal aspects of offshore wind](#) with FME NorthWind was concluded in 2023. The interest in the topic was so great that a new user case was started in collaboration between the centers, and this will proceed in 2024.

Secondly, we collaborate with other FMEs on **events, education, and guidance**. NTRANS has participated in the [NORREN summer school](#) with students, teachers, and the program committee. In 2022, NTRANS was in the lead for a large workshop series focusing on the energy crisis, together with technology-FMEs, as well as FME Include. In 2023, a final report was produced summarizing the knowledge in collaboration with the centers and DNVA and NTVA. NTRANS is a co-organizer in the NTNU energy transition week, where we organized several workshops where several of the FME centers participate, for example [Solar Scale Up and Energy System Integration](#), [Biofuels and Efuels - Land use, Climate effect, Zero Emission Cities and Neighborhood](#) and [Renewable Energy Systems on the Norwegian Continental Shelf](#). Another example is the collaboration with FME Include on the event [Reduced and fair consumption - actually possible or just greenwashing?](#)

For a social science center like NTRANS, collaboration with other FMEs is very important, as we are entirely

dependent on understanding the breadth of the restructuring work. At the same time, we believe our contribution is very important for these centers, as we help to raise awareness and put ongoing activity in specific areas into a larger context.

Collaboration with national infrastructures:

As of today, FME NTRANS is not connected to research infrastructure funded by FORINFRA.

Collaboration with clusters:

Through the MAREN II project, SINTEF (Energy, Digital, and Community) collaborates with the renewable energy cluster RENERGY. The project connects Nordic actors within maritime conversion, renewable energy, research and innovation, with goals including developing a roadmap for maritime energy conversion.

Collaboration with catapults:

An HVL delegation consisting of 4 researchers/professors and 17 MSc engineering students visited Sustainable Energy - Norwegian Catapult (SENK) - Energy House, Stord (Facilities | Sustainable Energy) in August. Presentations of relevant research activities and study programs at HVL were held, as well as tours and presentations from SENK and Wartsila. The focus of the visit was to learn more about SENK's role in decarbonizing the maritime sector, and HVL's potential contribution in R&D work, especially MSc theses (2024-25).

SECTOR MOBILITY

NTRANS is a multidisciplinary center that thrives on collaboration between academia, industry, and government sectors. Our approach doesn't specifically aim to promote movement between these sectors, but it's clear that our community, including researchers, post-docs, PhD students, and especially master's students, develop skills that prepare them well for various roles in society. Similarly, we attract people from different professional backgrounds, fostering an environment of mutual exchange that is key to our center's growth and the development of new partnerships.

In the past year, we've seen several examples of this kind of mobility. For instance, one of our researchers moved on to a position as a climate advisor in a local municipality, and another researcher took up a role as a social planner in a regional county.

At the same time, we've welcomed new members from outside academia into our center. One individual from the energy sector started a public-sector PhD with us, bringing valuable insights from their previous experience. Another person, with a background in the renewable energy industry, joined us to work on offshore wind research, enhancing the collaborative spirit that's vital to our work.



GENDER EQUALITY AT NTRANS

At NTRANS, our commitment to gender equality and inclusion is a cornerstone of our organizational ethos. We believe in the power of a balanced workforce to drive innovation and excellence in the energy sector. Our efforts in this domain are multifaceted, focusing on recruitment, research, and community engagement to foster an environment where everyone, regardless of gender, can thrive. Moreover, gender perspectives are part of our research focus, particularly in our focus on just an participatory inclusion in the transition.

STRIVING FOR BALANCE ACROSS THE BOARD

In our management group, we currently have a gender distribution of 5 women to 10 men, highlighting an area for improvement in promoting gender diversity at the highest levels of our organization. Conversely, our board presents a more balanced picture, with a majority of women (8 women to 7 men), showcasing our commitment to female representation in decision-making roles.

The gender balance among our PhD and Postdoctoral researchers is nearly equal, with 10 women and 11 men, reflecting our dedication to supporting emerging scholars irrespective of gender. However, we recognize

the need for greater female representation among our Key Researchers, where women currently constitute just over 40% of the cohort.

In our master's programs, we are proud to showcase a near-equilibrium in gender distribution, with 58 students identifying as female and 61 as male. This parity exemplifies our dedication to nurturing a diverse academic community that values and promotes gender equality. These bright minds, engaged in 86 unique research topics, are not only advancing the frontiers of energy research but also embodying the inclusive spirit we strive for at NTRANS.

LOOKING FORWARD

As we move forward, NTRANS remains committed to enhancing gender equality within our organization and the wider energy research community. We recognize the challenges ahead but are invigorated by the progress we have made and the journey that lies before us. Our goal is clear: to create a more inclusive, equitable, and diverse environment that not only reflects our values but also drives us toward groundbreaking discoveries and innovations in the energy sector.



MANAGEMENT GROUP

67 % men, 33 % women



BOARD

47 % men, 53 % women



KEY RESEARCHERS

58 % men, 42 % women



PHD AND POSTDOCTORAL

52 % men, 48 % women



MASTER STUDENTS

51 % men, 49 % women

PHDS AND POSTDOCS

Here is a short presentation of the PhD Candidates and Postdocs who joined NTRANS. Their project topics and supervisors are also listed.



PhD
Davood Qourbani
NTNU, ØK

Tentative title: *"Pathways to sustainable mobility systems: Balancing social, technical, and environmental aspects while transforming."*

Supervisor: Ruud Egging (NTNU-IØT)



Postdoc
Ehsan Rahbar
IOT department

Title: *"Integration of gate-based intraday trading into current Norwegian electricity market chain."*

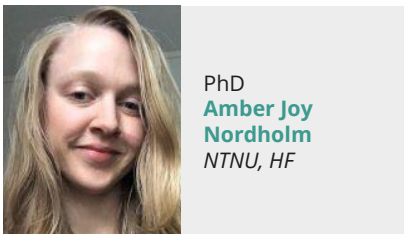
Supervisors: Pedro Crespo Del Granado



PhD
Celine Pagnier
Department of Industrial Economics and Technology Management

Title: *"Optimizing integrated transport and energy system models"*

Supervisors: Steffen J.S. Bakker, Pernille Seljom (IFE), Asgeir Tomasgard



PhD
Amber Joy Nordholm
NTNU, HF

Tentative title: *"Barriers to accelerated diffusion: Socializing, learning and up-scaling of urban pilots."*

Supervisors: Marianne Ryghaug (NTNU-KULT), Allan D. Andersen (UiO-TIK), Tomas M. Skjølvold (NTNU-KULT)



Postdoc
Lasya Priya Kotu
NTNU

Topic: *"Characterisation and business assessment of business management."*

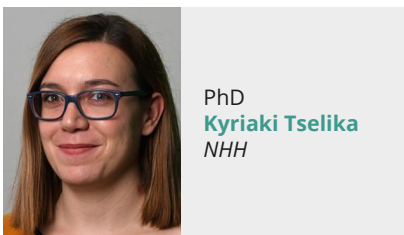
Supervisors: Karen Biskov Lindberg



PhD
Felipe Van de Sande Araujo
NTNU, ØK

Tentative title: *"Electricity Flexibility Market Analysis - Understanding the sources, motivations, risks, and viable solutions."*

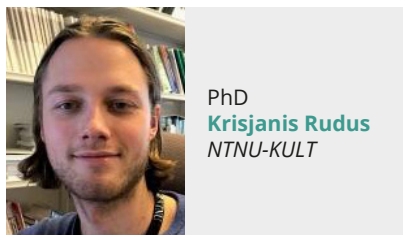
Supervisors: Stein-Erik Fleten NTNU-IØT)
Co-supervisors: Mette Bjørndal and Endre Bjørndal (NHH)



PhD
Kyriaki Tselika
NHH

Tentative title: *"The distributional effects of renewable energy on electricity prices: A panel approach."*

Supervisors: Gunnar Eskeland (NHH)
Co-advisors: Leif Kristoffer Sandal (NHH), Evangelos Kyritsis (Statkraft)



PhD
Krisjanis Rudus
NTNU-KULT

Topic: *"Power, inclusion and exclusion in the Norwegian energy transition. Exploring tools for increased engagement and participation across sectors."*

Supervisors: Tomas Moe Skjølvold (NTNU), Marius Korsnes (NTNU), Jason Chilvers (University of East Anglia)



PhD
Jan Klenner
NTNU-EPT

Topic: *"Climate change and air pollution mitigation in the aviation sector"*

Supervisors: Anders Hammer Strømman (IndEcol, EPT-NTNU), Helene Muri (IndEcol, EPT-NTNU)



PhD
Mario Blazques de Paz
NHH

Title: "Guarantees of origin and market power in the electricity market"

Supervisors: Mette Bjørndall (NHH)



PhD
Jørgen Finstad
UiO - TIK

Title: "The effect of new user sectors on carbon capture and storage's innovation system."

Supervisors: Allan Dahl Andersen (UiO - TIK), Taran Thune (UiO - TIK)



PhD
Jarand Hole
NTNU & NVE

Tentative title: "Integration of solar power in the Norwegian power system"

Supervisors: Magnus Korpås (NTNU-IEL), Steve Vøller (NTNU-IEL), Harald Endresen (NVE)



PhD
Milad Mehdizadeh
NTNU-IPS

Title: "The role of citizens in a transition of the mobility system: An agent-based modelling approach"

Supervisors: Christian A. Klöckner, main supervisor (NTNU-IPS), Trond Nordfjærn, co-supervisor (NTNU-IPS)



PhD
Meike Siefkes
NTNU-IØT

Title: "The transition towards the zero-emission society from the energy market's perspective"

Supervisors: Øyvind Bjørgum, main supervisor (NTNU-IØT), Roger Sørheim, co-supervisor (NTNU-IØT)



PhD
Britta Ekløf
NTNU-IPS

Tentative title: "Citizen engagement and participation in the energy transition - an application of Agent-Based Modelling"

Supervisors: Christian A. Klöckner, main supervisor (NTNU-IPS), Erica Löfström, co-supervisor (NTNU-IPS)



PhD
Maximilian Koslowski
NTNU-EPT

Working title: "Scenarios to guide the reduction of environmental footprints"

Supervisors: Edgar Hertwich & Richard Wood (both NTNU-EPT, IndEcol)



PhD
Martina Fantini
KULT, NTNU

Title: "Sustainable Aviation Futures in Norway: Visions and Trajectories."

Supervisors: Tomas Moe Skjølsvold, Julius Paul Wesche



PhD
Nils Oskar Tronrud
NTNU

Title: "The potential for and implications of accelerating the Norwegian energy transition"

Supervisors: Tomas Moe Skjølsvold, Gisle Solbu



Postdoc
Kejia Yang
UiO-TIK

Tentative topic: "Accelerating low-carbon energy transition: speed and directionality"

In close cooperation with Allan Dahl Andersen (UiO-TIK)



PhD
Negar Safara
HvL

Topic: "Approaching context in transition studies; The case of energy-hub-ports"

Supervisors: Bente Johnsen Rygg (HvL), Geoffrey Sean Gilpin (HvL) & Rune Njøs (HvL)



Postdoc
Hilde Nykamp
TIK UiO

Topic: "Electrification / the role of the power grid / green industry"

Supervisors: Allan Dahl Andersen and Frank Geels (UiO)

STATEMENT OF ACCOUNT

FUNDING

(All figures in 1000 NOK)

Funding 2023	Funding	In-kind	Total
The Research Council of Norway	13 077		13 077
User partners	5 162	1 248	6 410
Research partners		13 957	13 957
Total funding 2023	18 239	15 205	33 444

COSTS

(All figures in 1000 NOK)

Costs 2023	Funding	In-kind	Total
NTNU	7 235	9 520	16 755
HVL	783	1 295	2 078
IFE	2 508	229	2 737
NHH	1 896	1 042	2 938
UIO	1 384	989	2 373
SNF	479		479
SINTEF AS	1 499	299	1 798
SINTEF Energiforskning	1 314	264	1 578
VF	1 141	319	1 460
User partners in-kind		1 248	1 248
Total costs 2023	18 239	15 205	33 444

PERSONNEL

KEY RESEARCHERS

Name	Institution	Main research area
Rune Njøs	HVL	RA2 Accelerating the energy transition, RA5: User cases and innovation
Bente Johnsen Rygg	HVL	RA1 Deep decarbonization and wide societal changes, RA2 Accelerating the energy transition
Kristin Linnerud	HVL	RA2 Accelerating the energy transition
Geoffrey Gilpin	HVL	RA5: User cases and innovation
Dejene Hagos	HVL	RA2 Accelerating the energy transition
Erling Holden	HVL	RA5: User cases and innovation
Eva Rosenberg	IFE	RA4 Transition pathways, RA5: User cases and innovation
Kari Aamodt Espegren	IFE	RA4 Transition pathways, RA5: User cases and innovation
Kristina Haaskjold	IFE	RA4 Transition pathways
Mari Lyseid Authen	IFE	RA5: User cases and innovation
Miguel Chang	IFE	RA4 Transition pathways
Pernille Seljom	IFE	RA4 Transition pathways, RA5: User cases and innovation
Ville Olkkonen	IFE	RA3 The future energy market
Endre Bjørndal	NHH/SNF	RA3 The future energy market
Gunnar Eskeland	NHH/SNF	RA2 Accelerating the energy transition, RA3 The future energy market
Mette Bjørndal	NHH/SNF	Research director, RA3 The future energy market
Tomas Moe Skjølsvold	NTNU HF	Deputy centre director
Bård T. Haugland	NTNU HF	RA1 Deep decarbonization and wide societal changes, RA2 Accelerating the energy transition, RA4 Transition pathways, RA5: User cases and innovation
Marius Korsnes	NTNU HF	RA1 Deep decarbonization and wide societal changes, RA2 Accelerating the energy transition, RA4 Transition pathways, RA5: User cases and innovation
Sara Heidenreich	NTNU HF	RA1 Deep decarbonization and wide societal changes, RA2 Accelerating the energy transition, RA4 Transition pathways, RA5: User cases and innovation
Gisle Solbu	NTNU HF	RA1 Deep decarbonization and wide societal changes, RA2 Accelerating the energy transition, RA4 Transition pathways, RA5: User cases and innovation
Ida Marie Henriksen	NTNU HF	RA1 Deep decarbonization and wide societal changes
Bradley Loewen	NTNU HF	RA1 Deep decarbonization and wide societal changes, RA2 Accelerating the energy transition, RA4 Transition pathways, RA5: User cases and innovation
Marianne Ryghaug	NTNU HF/ SINTEF AS	RA1 Deep decarbonization and wide societal changes/RA5: User cases and innovation
Edgar Hertwich	NTNU IV	Cross cutting area 3
Anders Hammer Strømman	NTNU IV	Cross cutting area 3

Name	Institution	Main research area
Stein-Erik Fleten	NTNU OK	RA3 The future energy market
Steffen Bakker	NTNU OK	RA5: User cases and innovation
Paolo Pisciella	NTNU OK	RA4: Transition pathways, RA5: User cases and innovation
Pedro Crespo del Granado	NTNU OK	RA5: User cases and innovation
Ruud Egging-Bratseth	NTNU OK	RA4: Transition pathways, RA5: User cases and innovation
Anne Neumann	NTNU OK	RA4: Transition pathways
Asgeir Tomasgard	NTNU OK	Centre director
Christian Klöckner	NTNU SU	Citizen behaviour and attitudes in energy transition processes
Astrid Bjørgen	SINTEF AS	RA5: User cases and innovation
Frode Rømo	SINTEF AS	RA5: User cases and innovation
Gerardo A Perez-Valdes	SINTEF AS	RA4 Transition pathways, RA5: User cases and innovation
Hampus Karlsson	SINTEF AS	RA5: User cases and innovation+C70
Jens Hanson	SINTEF AS	RA2 Accelerating the energy transition, RA5: User cases and innovation
Kirsten Svenja Wiebe	SINTEF AS	RA2 Accelerating the energy transition, RA5: User cases and innovation
Kristin Ystmark Bjerkan	SINTEF AS	RA5: User cases and innovation, RA2 Accelerating the energy transition
Lisa S. Græsleie	SINTEF AS	RA2 Accelerating the energy transition
Markus Steen	SINTEF AS	RA1 Deep decarbonization and wide societal changes, RA2 Accelerating the energy transition, RA4 Transition pathways, RA5: User cases and innovation
Meron Assefa	SINTEF AS	RA4: Techno-economic and sustainability analysis
Sahar Babri	SINTEF AS	RA5: User cases and innovation
Sigrid Damman	SINTEF AS	RA4: Transition pathways
Teis de Francqueville Hansen	SINTEF AS	RA2 Accelerating the energy transition
Tuukka Mäkitie	SINTEF AS	RA1 Deep decarbonization and wide societal changes, RA2 Accelerating the energy transition, RA4: Transition pathways, RA5: User cases and innovation
Tuva Grytli	SINTEF AS	RA1 Controversies, conflicting visions, and value trade-offs
Nikki Lttikhuis	SINTEF AS	RA2 Accelerating the energy transition, RA5: User cases and innovation
Vibeke Stærkebye Nørstebø	SINTEF AS	RA4 Transition pathways, RA5: User cases and innovation
Michael Belsnes	SINTEF EF	RA3 The future energy market
Stian Backe	SINTEF EF	RA5: User cases and innovation
Ingeborg Graabak	SINTEF EF	RA3 The future energy market
Odd Andre Hjelkrem	SINTEF EF	RA4: Transition pathways
Stefan Jaehnert	SINTEF EF	RA3 The future energy market
Vegard Kallset	SINTEF EF	RA3 The future energy market
Siri Gulaker Mathisen	SINTEF EF	RA3 The future energy market
Kyriaki Tselika	SINTEF EF	RA3 The future energy market
Hilde Nykamp	TIK	RA2 Accelerating the energy transition
Caroline Veldhuizen	TIK	RA2 Accelerating the energy transition
Kejia Yang	TIK	RA2 Accelerating the energy transition

Name	Institution	Main research area
Frank Geels	UIO	RA2 Accelerating the energy transition
Allan Dahl Andersen	UIO	RA2 Accelerating the energy transition, RA4 Transition pathways, RA5: User cases and innovation
Helge Ryggvik	UIO	RA2 Resource mobilization
Benjamin Sovacool	VF	RA1 Deep decarbonization and wide societal changes, RA2 Accelerating the energy transition
Hans Jakob Walnum	VF	RA1 Deep decarbonization and wide societal changes
Ragnhild Freng Dale	VF	RA5: Usercases and Innovation, RA1 Deep decarbonization and wide societal changes
Stefan Gøssling	VF	RA2 Accelerating the energy transition
Joaquin Zenteno Hopp	VF	RA1 Deep decarbonization and wide societal changes, RA2 Accelerating the energy transition, RA4: Transition pathways, RA5: User cases and innovation
Fredrik Johnsen	VF	RA1 Controversies, conflicting visions, and value trade-offs

VISITING RESEARCHERS

Name	Affiliation	Nationality	Gender	Duration	Topic
Pleun Peerenboom	HAS Hogeschool, Netherlands	Dutch	F	04.02.2023-17.07.2023	Climate adaption and municipal governance
Cat Acheson	University of East Anglia	Northern Irish	F	11.04.2023 - 30.06.2023	Grassroot action, intersectionality and sustainability transitions
Sierro Fabienne	ZHAW	Swiss	F	15.08.2023-07.10.2023	Energy citizenship and PV solar panels
Julia Kirch Kirkegaard	DTU	Danish	F	25.-29. september	Wind power/societal contestation/innovation
Sophie Nyborg	DTU	Danish	F	25.-29. september	Wind power/societal contestation/innovation
Tom Cronin	DTU	UK	M	25.-29. september	Wind power/societal contestation/innovation
Emil Nissen	DTU	Danish	F	25.-29. september	Wind power/societal contestation/innovation
Marina Dietze Monteiro	PUC Rio	Brazilian	F	24.8.2023 - 28 Feb 2024	Research collaboration
Marianne Petersen	DTU	Danish	F	25.09.2023 - 31.01.2024	Visiting PhD student
Christoph Weber	Univ Duisburg-Essen	German	M	2.5.2023-28.6.2023	Research collaboration
Selina Kercher	Universidad de Oviedo	German	F	15.10.22 - 15.02.23	Participate in PhD course IØ8814 and research visit
Nick Koning	Erasmus University Rotterdam	Dutch	M	16 - 17 February 2023	Research collaboration
Alexandra Lüth	CBS Copenhagen Business School	Danish	F	13 - 24 March 2023	Energy Systems modelling and collaboration on the NordNett project

Name	Affiliation	Nationality	Gender	Duration	Topic
Jan Martin Wilhelm Zepter	CBS Copenhagen Business School	Danish	M	13 - 24 March 2023	Energy Systems modelling and collaboration on the NordNett project
Jens Weibezahn	DTU	Danish	M	13 - 24 March 2023	Energy Systems modelling and collaboration on the NordNett project
Malvina Marchese	Bayes Business School	British	F	6 - 8 March 2023	Participate in PhD course IØ4317
Claudia Nunes	Instituto Superior Tecnico, University of Lisbon	Portuguese	F	15-16 May 2023	PhD short course, research collaboration and discussions about teaching financial engineering topics
Ahlmahz Negar	Northwest public power association	American	F	6.3-30.5.2023	Energy Systems and grid cost.
Lennart Hagemann	U Duisburg-Essen, visiting master student	German	M	January - june 2023	Master thesis
Selva Nadarajah	University of Illinois	American	M	22 May - 1 June ??	Teaching IØ8815 COMPAMA project
Jan Cools	University of Antwerp / Visiting Senior Researcher	Belgian	M	January - June 2023	Energy Systems and hydrogen
Selina Kerscher	Universidad de Oviedo	German	F	22 May - 4 June 2023	CIRED 2023
Anthony Britto	Karlsruhe Institute of Technology	German	M	12 April - 8 July 2023	Working on real options
Antonia Golab	TU Wien	Austrian	F	01.06.23- 15.09.23	Visiting PhD student (supervisor Hans Auer), transport/decarbonization/ NTRANS
Pedro Carvalho	Tecnico University of Lisbon	Portuguese	M	05.09.2023 - 17.09.2023	Visiting PhD student
Juan Jesus Jerez	DTU	Danish	M	Mid-Nov 2023 - Feb 24	Visiting PhD
Hans Auer	TU Wien/ proff II NETI	Austrian	M	20 - 31 March 2023	NTNU Energy Transition Conference and Week 2023 (Trondheim) & Winterschool (Geilo)
Steven Gabriel	University of Maryland/proff II NETI	American	M	21 - 31 March 2023	NTNU Energy Transition Conference and Week 2023 (Trondheim) & Winterschool (Geilo)
Jae Edmonds	Pacific Northwest National Laboratory (PNNL)	American	M	21 - 24 March 2023	NTNU Energy Transition Conference and Week 2023
Ramteen Sioshansi	Carnegie Mellon University	Indian	M	21 - 31 March 2023	NTNU Energy Transition Conference and Week 2023 (Trondheim) & Winterschool (Geilo)
Reinhard Madlener	RWTH Aachen University/proff II NETI	German	M	19 - 25 March 2023	NTNU Energy Transition Conference and Week 2023

POSTDOCTORAL RESEARCHERS WITH FINANCIAL SUPPORT FROM THE CENTRE BUDGET

Name	Nationality	Period	Gender	Topic
Bradley James Loewen	Canada	20201101-20231031	M	Innovation, contestation and social change: exploring radical ideas in the Norwegian energy transition
Kejia Yang	Kina	20220110-20250109	F	RA2, Accelerating the energy transition, Topic: Theory review + EV in China
Hilde Nykamp	Norwegian	20230614-20231216	F	RA 2
Caroline Veldhuizen	Australian	20240115-20270201	F	RA 2

PHD STUDENTS WITH FINANCIAL SUPPORT FROM THE CENTRE BUDGET

Name	Nationality	Period	Gender	Topic
Kyriaki Tselika	Greece	20200101-20230814	F	Energy Prices
Amber Joy Nordholm	American	20201001-20230930	F	Power, inclusion and exclusion in the Norwegian energy transition. Exploring tools for increased engagement and practice change across sectors
Jan Klenner	German	20201102-20231101	M	Climate Change Mitigation in the Aviation Sector
Felipe Van de Sande Araujo	Brasilian	20200901-20230831	M	Analysis of flexibility markets for electricity
Davood Qorbani	Iranian	20200801-20230731	M	The transition to sustainable mobility from a systems perspective
Krisjanis Rudus	Latvian	20210111-20240110	M	Power, inclusion and exclusion in the Norwegian energy transition. Exploring tools for increased engagement and participation across sectors
Meike Siefkes	German	20210816-20240815	F	The transition towards the zero-emission society from the energy market's perspective.
Maximilian Koslowski	German	20210802-20240801	M	Scenarios to guide the reduction of environmental footprints
Britta Eklöf	Swedish	20210801-20240731	F	Collective action and climate change: drivers and barriers to climate engagement
Milad Mehdizadeh	Iranian	20210801-20240731	M	The role of citizens in a transition of the transportation system
Negar Safara	Iranian	20220101-20241231	F	Approaching Contexts in Transition Studies-The case of energy-hub-ports
Mario Blazques de Paz	Spanish	20210801-20230731	M	RA3, Designing Electricity Markets for the Energy Transition
Jørgen Finstad	Norwegian	20220101-20221231	M	RA 2 "Accelerating the energy transition", topic: accelerating electrification processes, an organisational perspective
Jarand Hole	Norwegian	20221001-20250930	M	RA3, Designing Electricity Markets for the Energy Transition, topic: Integrasjon av solkraft i det norske kraftsystemet
Ehsan Rahbar	Iranian	20231101-20271101	M	RA3
Celine Pagnier	French	20231101-20261031	F	Developing and optimizing integrated transport- and energy system models
Lasya Priya Kotu		20230901-20260831	F	Characterization and Business Assessment of Flexibility Management
Martina Fantini	Italian	20230821-20260820	F	Decarbonization within and away from aviation
Nils Oskar Tronrud	Norwegian	20231001-20260930	M	Temporal and justice aspects of transitions

POSTDOCTORAL RESEARCHERS WORKING ON PROJECTS IN THE CENTRE WITH FINANCIAL SUPPORT FROM OTHER SOURCES

Name	Funding	Nationality	Period	Gender	Topic
Isabel Montero Hovdahl	NoCeT Norwegian Centre for Taxation	Norway	2023-2023	F	Environmental Economics, Climate Change, Econometric Modeling, Machine Learning, Technological Change
Ruben van Beesten	Mozees	Netherland	2022-2023	M	Omstilling av transportsektoren, men fokus på håndtering av usikkerhet og risiko i verdikjeder for nullutslipp transport.

PHD STUDENTS WORKING ON PROJECTS IN THE CENTRE WITH FINANCIAL SUPPORT FROM OTHER SOURCES

Name	Funding	Nationality	Period	Gender	Topic
Parinaz Aliasghari	NTNU	Iran	2021-2024	F	Flexibility in Energy Systems
Raquel Alonso Pedrero	BEYOND (EU) / FlexBuild (RCN)	Spain	2020-2024	F	End-user flexibility, local markets and design of flexible power systems
Goran Durakovic	Clean Energy Exports (RCN)	Norway	2020-2023	M	Clean energy strategies for Norwegian exports
Shamim Homai	NCCS	Iran	2021-2024	F	PhD Candidate in stochastic optimization at FME NCCSNorwegian
Vibeke Hvidegaard Petersen	FME NorthWind	Danmark	2022-2026	F	Predictive maintenance planning of offshore wind farms – PhD position connected to the research centre FME Northwind
Siva Sankar	Bru21	India	2021-2024	M	Data driven stochastic optimization for natural gas .
Sarka Stadlerova	Mozees	Tsjekkia	2020-2023	F	The optimal transition towards a zero-emission fishing and aquaculture fleet

MASTER DEGREES

Name	Gender	Topic
Juberg, Eirin Østbø	F	What explains the recent focus on blue hydrogen in Norwegian politics?
Haugan, Anna Hansen	F	Et grønt skifte med en blå horisont? En casestudie av gassaktørers innflytelse på tysk energipolitikk etter Ukrainasjokket
Karlsen, Sandra Schultz	F	Attitudes Towards Development of Wind Power Plants in Norway
Clara Edwards	F	Exploring Wind Power Conflicts and Energy Justice in Sweden: An analysis of Stakeholder's Perspectives
Nahid Zoubin	F	Techno-economic assessment of key hydrogen production and distribution technologies in Western Norway
Tora Eidsmoen	F	A Comparative Cradle-to-Gate Life Cycle Assessment of Titanium Slag Production with Hydrogen and Coal based Pre-Reduction
Anders Melbye	M	Fremtiden flytter inn
Ann Mathea Wollan	F	Alternative boformer i Norge: En studie av mikrohuset, naturhuset og gjenbrukshuset
Anna-Laila Danielsen	F	Rein klimaendring: En kvalitativ studie om reindriften i møte med klimaendringene
Eline Gotaas	F	Å kaste penger inn åpne dører - En fortelling om Enova sin støtteordning for smart strømstyring
Nora Sivertsen Møstre	F	Forestillinger og forbruk: En studie av virkemidler for smart strømstyring. - En inkluderende eller ekskluderende fortelling?
Kristina Nydal	F	Legitimitet og hydrogen
Nils Oskar Tronrud	M	Captured Waste: Drivers and barriers to the Implementation of Carbon Capture and Storage in the Waste-to-Energy Industry
Susanne Magnus	F	Brokers and Bottlenecks- A qualitative case study on how grid bottlenecks are delaying the sustainability transition in Western Norway
Alv Øidvin	M	From cell to system - The role of battery cell manufacturers as system builders in the Norwegian Lithium-Ion Battery Technological Innovation System
Anders Graff Nygård	M	Sunny Collaborations: Unleashing Public-Private Partnerships to Supercharge the Solar Photovoltaics Diffusion in Norway
Marius Hofgaard and Tage Ringstad	M/M	Determinants of Variable Renewable Energy Developer's Financial Performance
Knut Jørgen Kirkeberg	M	Headwind & Tailwind: Norwegian Industrial Developers Entering the Italian Offshore Wind Market
Anton Lohne Hamer	M	Cleantech Venture Capitalists: Are They Really Financing the Green Transition?
Gustav Haaland	M	
Hannah Blanke	F	Staying True to the Mission: Exploring Mission Drift in Green Start-ups
Philip Dervedde	M	
Franziska Maisack	F	
Lars Skjelbred Nygaard	M	Investments in Low-Carbon Power Generation and Energy Storage under Uncertainty
Emilie Birgitte Marskar	F	Optimizing hydrogen pathways using Norwegian energy resources dominated by offshore wind
Hanna Skirstad Grini	F	The Effect of Electricity Prices on Low-Carbon Energy Technologies
Julie Nærestad *	F	
Kristjan Osaland	M	The Role of Central Bank Monetary Policy on Green Innovation
Anders Rasmussen	M	
Sebastian Bergseth Borgen	M	Hva lærer vi av økte strømpriser?

Name	Gender	Topic
Peder Kleppe	M	
Ashmita Shrestha	F	Gender Diversity in the Norwegian Energy Sector and its Development: A descriptive and explanatory study
Marius Martinsen Tandberg	M	
Alina Wildau	F	What factors and policies drive the shift toward sustainable urban mobility
Ida Marie Skarheim Magelssen	F	EUs taksonomi i prosessindustrien
Hedda Rysjedal	F	
Signe Flaa	F	The profitability of proactive investments in the Norwegian electricity distribution A profitability and efficiency analysis of self-funded capacity increases for new industry
Åsne Helene Hustad Holsen	F	
Angelique Nies	F	Sustainable Supply Chain Management in the Face of Climate Change - Estimating the Impact of Temperature and Precipitation Changes on Brazilian Soybean Yield
Brayan Leonardo Gutierrez Chavez	M	Profitability Analysis of Battery Energy Storage Systems in Vertically Integrated Electricity Markets : Assessing System Value and Project Viability in Mozambique
Runar Haukås Johnston	M	Green ammonia shipping : Adapting established value-chains to fuel the future of clean maritime transport
Amandine Massant	F	
Leonora Leine Skorpen	F	Effects of Uncoupling the North Sea Link
Axel Østby	M	
Imre Tøllefsen Søndrol	M	Arbitrage Trading Opportunities with Bidirectional Charging
William Woie	M	
John Kristian Eilertsen	M	Flexible Production of Green Ammonia: An Optimisation Approach to Cost-Efficient and Adaptable Power to Ammonia Production in Denmark
Sondre Gunnar Haugen	M	
Solveig Hegstad Krüger	F	A TCO Analysis of the Transition to Battery Electric Trucks in Norway
Jenny Heggen Thiis	F	
Petter Skjensvold Bellamy	M	Assessing the Market Efficiency of Carbon Prices in the European Union Emissions Trading System: A Forecasting Approach
Andreas Nordstrand Torgersen	M	
David Jamissen	M	Estimating Demand Response by Small Natural Gas Consumers in Germany
Johanne Øderud Vatne	F	
Sander Haugen	M	Impact of Industrial Size Battery Storage Systems on Electricity Price Distribution
Nicolai Andreas Bugge Lyså	M	Production scheduling and investment in pumped-storage hydropower under uncertainty
Victor Sætre Aasvær	M	Designing a Zonal Flexibility Market and Modelling Strategic Behaviour in Combination with the Intraday Market: Combining Optimization and Machine Learning Approaches
Anders Strand Ryssdal	M	
Tølløv Trønsdal Lyngstad	M	Flow-Based Market Coupling in Europe: Implications for the Nordic Power Market
Ivar Refsdal	M	Impact of Production Technology Flexibility in a Multi-horizon Stochastic Hydrogen Facility Location Problem

Name	Gender	Topic
Tobias Spinnangr Sindre	M	
Kristoffer Strand Bergem	M	Multi-Product, Multi-Period Supply Chain Network Optimization for Offshore Wind Projects under Uncertainty
Olav Loennechen	M	Optimal maritime fleet composition under future greenhouse gas emissions restrictions and uncertain fuel prices
Peter Elias Halle Stai	M	Optimizing and Evaluating Distributed Flexibility for Fast Frequency Reserve Provision and Demand Response: A case Study of a Norwegian Prosumer
Ivar Borge Nore	M	Optimizing Hybrid Hydro-Solar Power Systems Using Two-Stage Stochastic Programming
Kristoffer Winther	M	
Helle Villmones Haug	F	Planning Annual Delivery Programs in the Liquefied Natural Gas Industry
Sigrid Hallem Solum	F	
Sanna Marie Baug Warholm	F	Planning Annual Delivery Programs in the Liquefied Natural Gas Industry
Fredrik Malt Arnstad	M	Production scheduling and investment in pumped-storage hydropower under uncertainty
Thomas Bruun Karud	M	
Eivind Andreas Falk	M	Stochastic Short-Term Optimization of Energy Systems with Offshore Hydrogen Production
Frederik Løkka Hansen	M	
Helle Hagli Sønnervik	F	Strategic Fleet Renewal of Norwegian Fisheries with Environmental Considerations
Viktor Magnus Berg	M	Strategic Planning for Optimal Zero-Emission Passenger Vessel Services
Aksel Kristiansen Borgmo	M	
Steinar Søvik Opheim	M	
Lea Bertram	F	Local Electricity Market Design for Peer-to-Peer Trading between Interconnected Nanogrids in Madagascar
Ann Miriam Dreyer	F	Unlocking Offshore Bidding Zones in Europe: Investigating the Influence of Different Market Designs on Germany
Marie Götz	F	
Sara Linowski	F	Assessing the Long-Term Economic Implications of Decarbonization Ambitions and Hydrogen Exports in Norway until 2050: A CGE Modeling Approach considering Income Distribution through Population Segmentation
Jan Niklas Ohler	M	
Xenia Anna Leonie Ritzkowsky	F	Flexibility with utility-scale battery storage in a 100 % renewable power system in Bolivia in 2035
Rennie Babwah	M	A regionalized scenario-based impact assessment of battery raw materials production
Øistein Farnen	M	Ammonia as an Alternative to LNG
Leire Juaristi Urrutibeaskoa	K	An experimental study of the performance of a wind turbine model with swept blades, for different inflow conditions
Amanda Malene Eide Buan	K	"Analysis of ground-source heat pump and hybrid PVT for Norwegian conditions"
Kaja Stamer Ekerholt	K	CO2 Emissions by Land Cover Change of Peatlands in Trondheim Municipality
Yann Studle	M	Comparison of biogas production in France and Norway
Teymur Gogiyev	M	Driving Industrial Decarbonisation in Norway: Hydrogen Use for Pre-reduction in Ferromanganese Production

Name	Gender	Topic
Andrine Fardal	K	Energy and climate concept for the development of a zero emission residential area - determination of energy demands in the area
Synne Mo Samuelsen	K	
Inga Volle Sørensen	K	Energy and climate concept for the development of a zero emission residential area - determination of energy demands in the area
Maximilian August Windingstad Sletbakk	M	Energy and Climate Concept for the Development of a Zero-Emission Residential Area – Analysis of Energy Supply Solutions
Eskil Kvålsvold	M	
Jonas Dalby	M	
Adam Hadley	M	Energy Use and Energy Efficiency Measures for a Passenger Ferry
Sean Kristian Condon	M	Environmental aspects of offshore H2 production from offshore wind farms
Lærke Lindgreen Lauritsen	K	"Environmental impacts of treating e-waste in Norway "
Ida Nilsen Aure	K	Feasibility of Establishing a Solar PV Power Plant in the Existing Wind Farm at Smøla
Andre Haugen Norum	M	Fremtidsrettet energiforsyning for kommunale næringsbygninger i Oppdal sentrum
Jonas Sundby	M	
Robert Blaszkiewicz	M	Green methanol
Anneli Sørland Torper	K	Greenhouse Gas Reduction Potential in Norwegian Coastal Shipping: A Well-to-Wake Analysis of Alternative Shipping Fuels
Haiping Shen	K	Holistic economic and environmental optimization of future energy systems
Alejandra Galeano Galan	K	"Impact of powertrain electrification on CO2 emissions of the passenger light-duty vehicle fleet in Colombia "
Wara Fatima	M	Life Cycle Assessment of Recycling Lithium-ion Cells
Lene Dahl Jacobsen	K	Mid-scale hydrogen distribution chains
Erik Eikeng	M	"Power to Ammonia - A Computational Framework for Optimizing Green Ammonia Production from off-grid Wind and Solar Energy"
Manith Randula Attanapola	M	Power-to-Gas Methanation of Carbon Dioxide
Maria Giosuè	K	Project and Design of a Digital Twin for Gas Turbines for Power Generation in the Offshore Field
Sofie Nørgren	K	Scenario analysis for greenhouse gas emissions of the energy system at a zero emission neighbourhood, Campus Evenstad
Emilie Østmo	K	Steel in-use in Trondheim's residential building stock: quantification, embodied GHG emissions and mitigation options
Karla Leticia Prieto Camarillo	K	Sustainability of widespread last-mile drone delivery systems: A comparative urban case study in the U.S. based on real-world data
Yu-Ching Wang	K	Technological options for climate change mitigation in the aviation sector: a case study
Marte Kristiane Mohn Solberg	K	Towards a more climate-resilient agricultural sector in Norway
Kristin Reed Lone	K	Understanding the role of second life batteries in energy storage in Norway
Cecilie Torp Dahl	K	Utilization of surplus heat from the organic dairy at Røros
Magnus Elias Fjereide Enge	M	Waste heat recovery from a data center at CERN

EVENT ORGANIZED BY FME NTRANS

Title	Organizer	Date	Target group	Number of attendees
Kraft i Vest 2023	Sogn og Fjordane Energi (hoved), Sparebank Sogn og Fjordane, Innovasjon Norge, FME NTRANS (HVL), Vestland Fylkeskommune	20-21.09.2023	næringsliv, offentlig org., akademia, politisk miljø	300
International Autumn School on prospective modeling and climate change: energy and water issues	ETSAP	06-11.11.2023	Energy system modellers	33
Post.doc and PhD samling	NTRANS RA4	17-18.04.2023	PhD og post.doc	15
NTRANS UC5 WS "Grønn utbygging, gjenbruk og nullutslippsbyggeplasser"	FME NTRANS, FME ZEN	17.10.2023	forskere, brukerpartnere	~20
NTRANS UC5 WS "Innovative offentlige anskaffelser "	FME NTRANS, FME ZEN	13.04.2023	forskere, brukerpartnere	
NTRANS UC5 WS "How to plan our cities to best tackle future sustainability challenges? "	FME NTRANS, FME ZEN	23.03.2023	forskere, brukerpartnere	
Workshop on best modelling practices on human dimension in energy system models	IEA-ETSAP, FME NTRANS, GCEP, UCL, VITO, LTU, PSI, VTT	21.03.2023	Internasjonale forskere	20
Workshop on best modelling practices on energy trade in energy system models	IEA-ETSAP, FME NTRANS, GCEP, UCL, VITO, LTU, PSI, VTT	22.03.2023	Internasjonale forskere	20
Beyond crisis/Beyond normal	NTNU energy team society/NTNU Sustainability/NTRANS	27.09-28.09	Forskere, virkemiddelapparat	200
NTRANS PhD & Post doc gathering	FME NTRANS	17.04-18.04	Stipendiater, postdocs	15
NTRANS Lunch box webinars	FME NTRANS	Bi-weekly	forskere, brukerpartnere	20-40 hver gang
Good engagement in the energy transition	FME NTRANS, RA1	22.03.2023	Forskere, brukerpartnere, virkemiddelapparat	50
CCS: A societal challenge for Europe? Talk by Dr. Elisabeth Dütschke	KULT/FME NTRANS	08.03.2023	Forskere	15
Fra eventyr til luftsloft? Norske energiambisjoners robusthet. Arendalsuka	NTRANS	16.08.2023	Politikere, forskere, offentligheten	70

Title	Organizer	Date	Target group	Number of attendees.
Redusert og rettferdig forbruk – faktisk mulig eller kun grønnvasking?	FME NTRANS/FME Include	08.02.2023	forskere, politikere, næringsliv	50
CC(U)S in ports	FME NTRANS, CaptureX, ACES	21.08.2023	Industri, havnesektor, FoU, myndigheter	ca. 40
STCA in transitions research	Gemini center Sustainability Transitions, FME NTRANS, INTRANSIT	26.09.2023	Forskere	ca. 20
Multi-sectoral transitions: mechanisms, processes and agency (NTNU Beyond crisis/ Beyond normal conference)	FME NTRANS, INTRANSIT	28.09.2023	Forskere	ca. 25
"Exploring multi-system phenomena in net-zero transitions workshop			"	NTRANS
Energy and Climate Seminar - Interdisciplinary research on rebound effects. State-of-art and emerging research needs	Universitetet i Sussex i samarbeid med Vestlandsforskning	06.06.2023	Forskere	25
Workshop on climate finance	FME NTRANS, RA2	23.03.2023	Forskning, industri og politikk	40
UC7 workshop: Hydropower flexibility	FME NTRANS, FME HydroCen	10.02.2023	Brukerpartnere, forskere	~30
JP e3s & ES workshop: Mechanisms of the power market and how they can come back and hunt us	EERA Joint Program e3s	16.06.2023	forskere	
NTNU Energy Transition Conference - Crises crossroads and courage	NTNU Energy Transition Initiative og FME NTRANS	21.03.2023	politikere, industri, akademia og studenter	346/30294
ETW WS: Solar Scale Up and Energy System Integration	NTNU Energy Transition Initiative og FME NTRANS	20.03.2023	politikere, industri, akademia og studenter	54
ETW WS: Biofuels and Efuels - Land use, Climate effect	NTNU Energy Transition Initiative og FME NTRANS	20.03.2023	politikere, industri, akademia og studenter	26
ETW Network meeting: Green Energy Shifters	NTNU Energy Transition Initiative og FME NTRANS	20.03.2023	politikere, industri, akademia og studenter	64
ETW WS: Good Engagement in the Energy Transition?	NTNU Energy Transition Initiative og FME NTRANS	22.03.2023	politikere, industri, akademia og studenter	58
ETW WS: Future Energy Market Design	NTNU Energy Transition Initiative og FME NTRANS	22.03.2023	politikere, industri, akademia og studenter	45
ETW WS: Innovation and Climate Finance	NTNU Energy Transition Initiative og FME NTRANS	23.03.2023	politikere, industri, akademia og studenter	25

Title	Organizer	Date	Target group	Number of attendees.
ETW WS: Zero Emission Cities and Neighbourhood	NTNU Energy Transition Initiative og FME NTRANS	23.03.2023	politikere, industri, akademia og studenter	37
ETW WS: Renewable energy systems on the Norwegian Continental Shelf: resources, use, and sharing	NTNU Energy Transition Initiative og FME NTRANS	24.03.2023	politikere, industri, akademia og studenter	50
ETW WS: Energy Security in Europe	NTNU Energy Transition Initiative og FME NTRANS	24.03.2023	politikere, industri, akademia og studenter	44
Winter School 2023 Planning under Uncertainty in Energy Markets	NTRANS / NHH / NTNU	26.-31.03.2023	PhD-studenter	~60
BEEER Bergen Economics of Energy, Environment and Resources Conference	NTRANS / NHH	5.-6.06.2023	Forskere, brukerpartnere	36
European Electricity Market Design for the Future	NTRANS / NHH / Bergen Energy Lab	02.11.2023	Masterstudenter, forskere, industri	44 + 55(online)
Finance and Sustainability Workshop	NTNU/NTNU Energy Transition Initiative og FME NTRANS	27-28.2.2023	Forskere (vekt på ph.d.-stud) innen finance/ sustainability	14

PLENARY OR KEYNOTE SPEAKER

Dato	Name of NTRANS researcher	Tittel	Event	Organizer/type of event	Location
11.05.2023 32:19	Kari Espegren	Experience from the energy system modelling community ETSAP	Energy Future in Industry 2023	IETS conference	Gøteborg, Sverige
01.02.2023	Tomas Moe Skjølvold	STS and sustainability transitions	NEST webinar	NEST	Online/ Amsterdam
20.03.2023	Tomas Moe Skjølvold	Hvem skal redde klimaet	Trøndersk klimatoppmøte	Adresseavisen/ NTNU	Trondheim
20.03.2023	Ragnhild Freng Dale	Energiomstilling og lokal motstand	Trøndersk klimatoppmøte	Adresseavisen/ NTNU	Trondheim
20.03.2023	Asgeir Tomasgaard	Apell for Europeisk samarbeid	Trøndersk klimatoppmøte	Adresseavisen/ NTNU	Trondheim
10.02.2023	Tomas Moe Skjølvold	Energi- og klimaomstilling som samfunnsomstilling	Miljødirektoratets Kunnskapsmøte	Miljødirektoratet	Trondheim
25.04.2023	Tomas Moe Skjølvold	Sustainability transitions and civil society?	We make transitions!	Trøndelag fylkeskommune	Trondheim/ Online

Tittel	Arrangør	Dato	Målgruppe	Antall deltakere	
2023	Teis Hansen	Energy and Circular Economy – next steps and funding through the Just Transition Fund.	The Regional Council of Ostrobothnia, Finland		Finland
26.11.2022	Endre Bjørndal	Hvordan fungerer de europeiske kraftkablene?	UiB Innsikt (paneldebatt)	UiB	Bergen
10.03.2023	Mette Bjørndal	Strømnettutvalget; får vi nok nett i tide?	Framtidens energiforsyning i Oslo (hovedinnlegg og paneldebatter)	Oslo Kommune	Oslo, Norge
20.04.2023	Mette Bjørndal	Analysis of Zonal Design	CEER Specialised Training on Electricity Market Design and Implementation of the European Green Deal	CEER Council of European Energy Regulators	Online
14.09.2023	Mette Bjørndal	Modeling Congestion Management and Locational Pricing	Price volatility in hydro-dominated power systems	Network meeting for power market modelling	Oslo, Norge
26.10.2023	Endre Bjørndal	You can't just build a wind farm	Energetic Futures Conference (paneldebatt)	Norwegian-British Chamber of Commerce m.fl.	Newcastle, UK
19.09.2023	Asgeir Tomasgaard	Transition to Zero Emission for European Industry and Transport	AMPS 2023 Conference	IFIP	Trondheim
28.03.2023	Asgeir Tomasgaard	Transition to a zero-emission European power system	PhD Winterschool 2023	NHH	Geilo
12.01.2023	Asgeir Tomasgaard	Kraftmarkedet - har vi nok strøm og satser tilstrekkelig på fremtiden?	Teknas årsmøte	Tekna	Gardermoen
16.12.2022	Stein-Erik Fleten (semiplenary)	Offering of storage-backed power into short-term electricity markets	CEECT 2022 4th International Conference on Electrical Engineering and Control Technologies	Shanghai University of Electric Power and Asia Pacific Institute of Science and Engineering	Shanghai/ Online
14.03.2023	Stein-Erik Fleten	Strømmarkedet: Høye priser gir utbyggingspress	Møte	Motvind Trøndelag	Trondheim

PROJECTS AND APPLICATIONS IN NTRANS

Project (granted 2023)	Status	Call/funder	NTRANS-partner	Coordinator
MultiFutures (Multidimensional Transition Pathways Analysis for Sustainable Futures: Exploring Alternative Paradigms and Broadening Policy Options through Innovative Scenario Development)	Oppstart 01-01-2024	HORIZON-CL5-2023-D1-01	NTNU	Energieinstitut an der JKU Linz
Open4cec (Service-oriented Open Platform for Citizen Energy Communities (CEC) – a scalable and extensible platform)	Oppstart januar 2024 (tentativ)	DUT (Driving Urban Transitions Partnership) call 2022	NTNU	Bucharest University of Economic Studies
Man0EUvRE (Energy System Modelling for Transition to a net-Zero 2050 for EU via REPowerEU)	Oppstart 1.12.2023	CETPartnership Joint Call 2022	NTNU, Sintef, IFE	Sintef
NordicH2ubs (Nordic hydrogen hubs – roadmaps towards 2030 and 2040)	Oppstart 03.10.2023	Nordic Energy Research	NTNU	Sintef
iDesignRES	Oppstart 01.10.2023	HORIZON-CL5-2022-D3-01	NTNU	NTNU
ICARUS (International cooperation for sustainable aviation biofuels)	Oppstart 01.10.2023	HORIZON-CL5-2022-D3-03-02	NTNU	CRES
Nord_H2ub - Rally to the Valley: Establishing Hydrogen Value Chains for the Nordics	Oppstart 01.09.2023	Nordic Energy Research	NHH, NTNU	CBS
POTENT - Ports as Energy Transition Hubs	Søkt Nov. 2023	HORIZON-MSCA-DN-2022	NHH	CBS
Renewable Energy Development Education	Søkt Oct. 2023	NORAD	NTNU	NTNU
SPICE (Sustainable no regrets African pellets for efficient and clean cooking in Africa)	Søkt Sep. 2023	HORIZON-CL5-2023-D3-02-16	NTNU	LNEG
SYNAF (Synergies in decentralized advanced fuel production)	Søkt Sep. 2023	HORIZON-CL5-2023-D3-02	NTNU	TNO
NEEDADAPT	Søkt April 2023 - avslag	HORIZON-CL5-2023-D1-01	NTNU	Universiteit Antwerpen
CONNECT	Søkt Mars 2023 - avslag	HORIZON-CL5-2023-DEV-01	NTNU	NTNU

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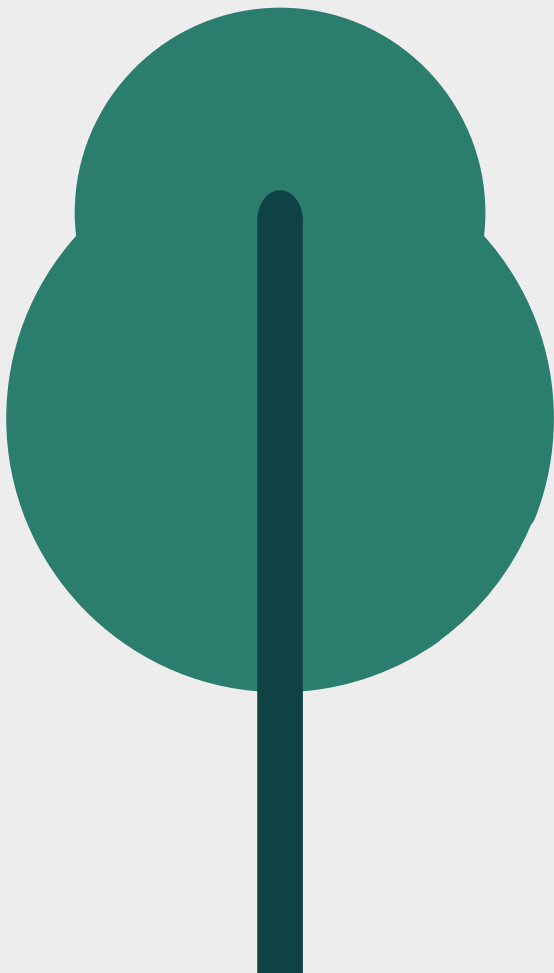
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