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Welcome to
Renewable Energy Systems –
master program!

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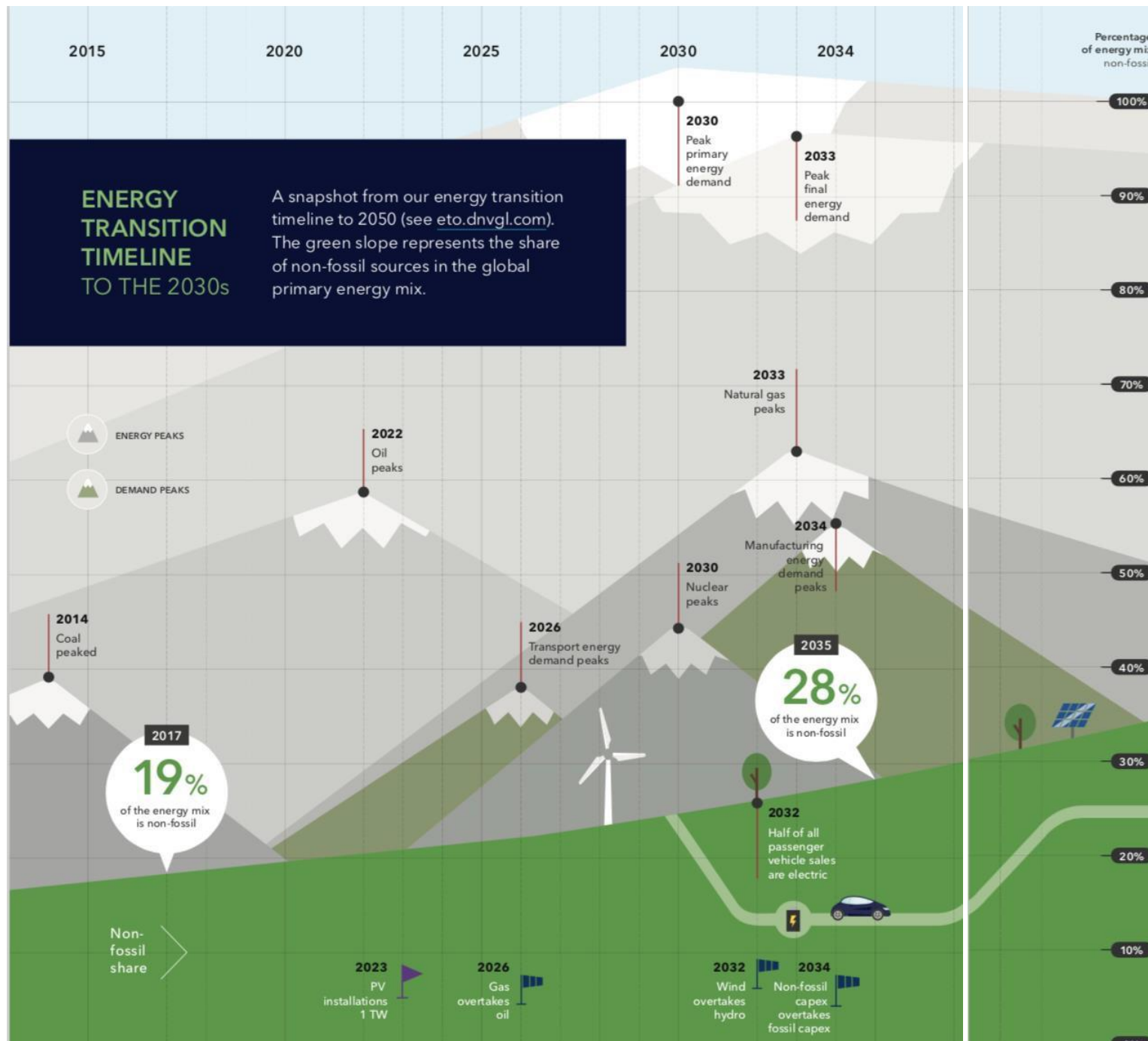
Master Program in Renewable Energy Systems



In everything from sun and wind to tidal waves, we have energy that is renewable and widely available

This Master's programme aims to provide you with a solid foundation for developing the use of renewable energy systems in society

Transition towards low carbon energy systems with shift in the energy mix



Technologies that matter for the energy transition

Battery storage
improving both energy
density and charging rates



Solar PV



Synthetic fuels

Wind offshore
to avoid competing
with land and food
production



Blue hydrogen
Carbon capture and storage

Technologies that matter – digital technologies



Autonomy

enables distributed and remotely operated solar PV, wind farms, and grids



Artificial intelligence and machine learning

can support the implementation of a stable power



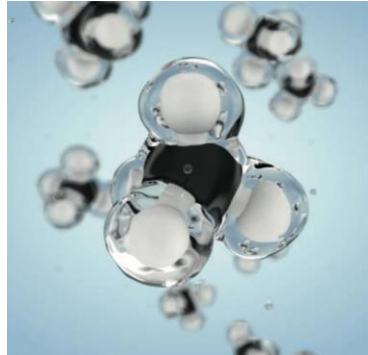
Blockchain (decentralized shared database) could transform and enable local markets



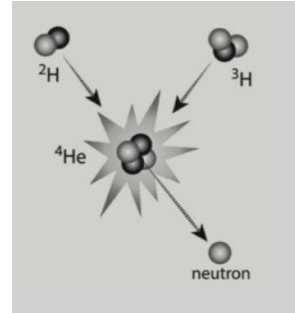
IOT

Sensors and communication networks

Technologies that matter – potential breakthrough



Green hydrogen
Electrolysis from
renewables,
and **ammonia** for
shipping



**Small scale
nuclear reactors**



New battery storage chemistry
More efficient and cheaper
batteries based on earth-abundant
materials



Ultra-efficient heat pump
with integrated systems
capturing the waste heat

MSc Renewable Energy Systems – Energy systems section

What will you experience and gain?

- Relevant up-to-date topics for your education and master thesis
- Theoretical subject/field knowledge
- Experience on how to apply the knowledge in real life scenarios, with connection to business and industry
- Ability to think broad, to ask proper questions

Energy Systems section – staff

We combine expertise in:

- Energy systems modeling
- Hydrogen production and storage
- Energy Sustainability & Justice
- IoT, digitalization
- Grid/smart grid
- Data management and control
- Systems optimization
- Climate modeling



Matylda Guzik



Mathias
Hudoba de
Badyn



Josef Noll



Sabrina Sartori



Jan Wohland



Xi Yang



Marianne Zeyringer

Energy Systems section – adjunct staff

Hanne F. Andersen (IFE)



Tor Håkon Jackson Inderberg



Pernille Seljom (IFE)



Julia Wind (IFE)



Matin Bagherpour (Nord Pool AS)



Erik Marstein (IFE)



Øystein Ulleberg (IFE)



Shujun Zhang
(Høgskulen på Vestlandet)



Renewable Energy Systems – master program structure today

4. semester	Master's thesis		
3. semester	Specialisation course	Specialisation course	Elective course
2. semester	Specialisation course	TEK5380 - Project course 	Elective course
1. semester	TEK5300 – Renewable Energy: Science and Technology 	TEK5350 - Energy markets and regulation 	TEK5370 - Grid and smartgrid  
	10 ECTS credits	10 ECTS credits 	10 ECTS credits

- Mandatory courses, 40 ECTS credits
- Specialisation courses, 30 ECTS credits
- Elective courses, 20 ECTS credits
- Master's thesis, 30 ECTS credits

Master thesis with companies:
Ruter, IFE, FFI...
Collaborations with Equinor, Siemens...

Possible specialization from other Programs/study directions at ITS (non-exhaustive)

Specialisation courses, primarily chosen from the courses listed below. Other relevant courses may be substituted/chosen in consultation with your master thesis supervisor:

- TEK4090 – Modern Control Systems and Cybernetics
- TEK400 – Systems Engineering
- TEK5110 – Building and Monitoring Communication Networks
- TEK5330 – Solar Energy Systems
- TEK5340 – Energy Systems Analysis: Modelling, Methods and Scenarios
- TEK5390 – Hydrogen Technology
- TEK5530 – Measurable Security for the Internet of Things
- TEK5410 (5 ECT) – Energy Markets and Regulation - Modelling and Analysis
- TEK5420 (5 ECT) – Norway's Energy Transitions: Policy Directions and Challenges
- TEK5430 (5 ECT) – Innovation in Energy Technologies
- TEK5440 – Batteries: Technology and Systems
- TEK5600 – Visualization of Scientific Data

Possible specialisation/Elective courses from other Departments (non-exhaustive)

ECON1210 - Mikroøkonomi (***Social Sciences, Dept. of Economics***)

ECON4170 - Data science for economists

MENA3100 - Characterization of Materials

MENA3201 – Energy Materials

KJM3110 – Electrochemistry (***Dept. of Chemistry***)

KJM-MENA5110 - Inorganic Structure Chemistry

KJM4310 - Physical Chemistry III - Statistical Thermodynamics for Chemistry

GEO4300 - Geophysical Data Science (***Dept. of Geosciences***)

STK4900 - Statistical Methods and Applications (***Dept. of Mathematics***)

FYS-STK4155 - Applied Data Analysis and Machine Learning (***Dept. of Physics***)

FYS4231 - Sensors and Measurement Technology

FYS4240 - Data Acquisition and Control

FYS5210 Solar Cells

IN5160 - Digital Leadership (***Dept. of Informatics***)

IN5410 – Energy Informatics

MSc in Renewable Energy Systems

Possible semester abroad

2nd or 3rd semester

University of Utrecht University (the Netherlands); Aalborg University (Denmark); Tecnico Lisboa (Portugal); other can be explored

Internships and extra Events

From UiO:Energy & Environment
From UiO Blindern, from IFE...

Master thesis 30 or 60 credits

Independent work with supervision from ITS, research institutes, companies

Example: past master thesis topics

- Modelling and Validation of a Fuel Cell Electric Bus
- How will different politics affect the energy system? An energy political analysis of the political parties in Norway.
- $\text{Ti}_{1.1}\text{CrMn}$ and its hydrides for the application in thermal hydrogen compression
- Safety issues of Li-ion batteries – a methodology for determination of heat release during thermal runaway
- Analysis of Battery Integrated Fast-Charging Station for Electric Vehicles
- Combined Hydrogen and Offshore Wind Production - Design and Market Value
- Hydrogen from offshore wind - The role of life cycle assessment in the optimal infrastructure design
- Hydrogen production modelling of a water electrolyser with PV data as input
- The Effect of Water Availability on the European Green-Hydrogen Based Power System
- Cycle Life prediction of Lithium-ion Batteries Using Machine Learning
- Proton Exchange Membrane Water Electrolyzer Modeling
- Norwegian electricity demand toward 2050
- Norway's Offshore Wind Potential Considering Socio-environmental and Technological Factors - A GIS Based Approach
- Building-integrated photovoltaics in Norway, challenges and standards
- Using ray tracing to model agri-PV greenhouse energy production and PAR levels
- Antimony selenide based solar cells

Which career is waiting?

- Analyst/Planner and/or manager
- R&D Scientist/Technologist
- Advisor/consultant

at private and public companies (e.g. DNV, NEL, Aker Solutions, Norconsult, Statkraft), at research institutes (e.g. Sintef, IFE...), at organizations (e.g. at The Norwegian Water Resources and Energy Directorate - NVE)...

- Doctoral degree (PhD)
- Academic career

Welcome to our MSc Renewable Energy Systems!

