



THE JOINT BALTIC-NORDIC ENERGY RESEARCH PROGRAMME

BALTIC-NORDIC ROADMAP FOR CO-OPERATION ON CLEAN ENERGY TECHNOLOGIES

Background and method

BALTIC-NORDIC ROADMAP
FOR CO-OPERATION
ON CLEAN ENERGY
TECHNOLOGIES

Background

Determine which clean energy-related technologies (CET) are most relevant in the Baltic and Nordic countries, in terms of Baltic-Nordic co-operation for decarbonising the energy system from now to 2030, 2050 and beyond.

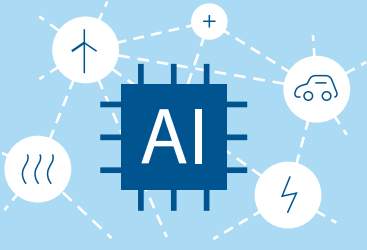
5 step method

- 1 International and EU CET overview**
 - Identifying broad spectrum of relevant clean energy technologies
- 2 Assessing needs for CETs from the Baltic energy systems perspective**
 - Key CET needs in the Baltic states based on national energy and climate plans and existing scenario studies
- 3 Baltic CET stakeholder overview**
 - Analysis of literature and stakeholder information
 - Interviews and surveys
- 4 Technology-needs matrices**
 - Strengths, limitations and stakeholders of most relevant CET solutions with respect to challenges and time perspective
 - Potential key R&I activities on national and Baltic levels
- 5 Development of Baltic-Nordic Roadmap for Co-operation on Clean Energy Technologies**

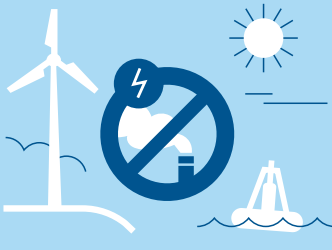
CET category framework

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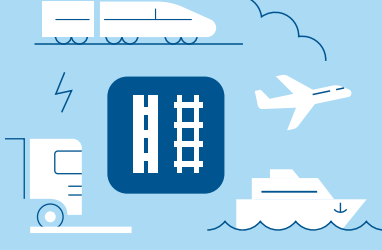
Clean Energy Related Technologies (CET)



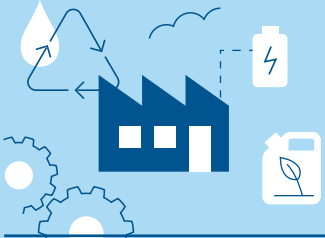
Integrated power and energy systems



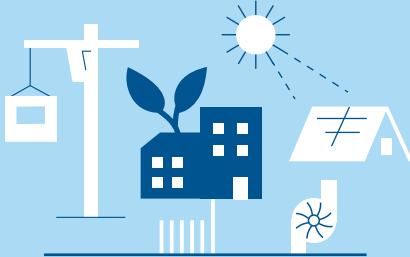
Zero emission power generation technologies



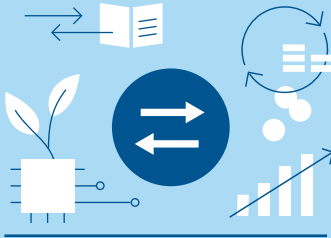
Low emission transport systems



Industrial energy systems



Urban and built environments



Cross-cutting technologies

Common needs of Baltic and Nordic energy systems

Now

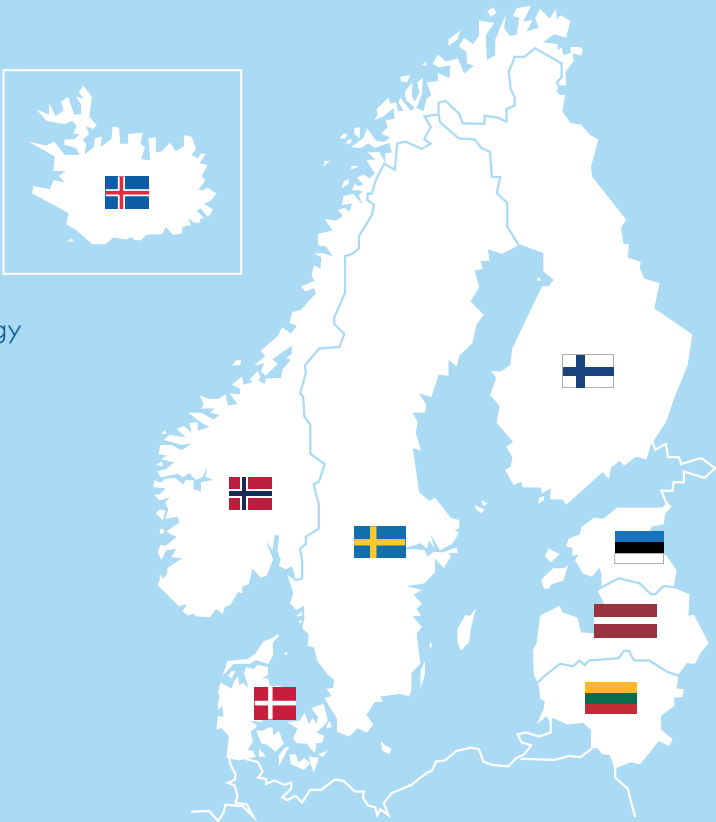
- Increased production and use of renewable energy for electricity
- Further reduce dependence on fossil fuels in district heating
- Decarbonise transport sector
- Energy efficiency in all sectors
- Increase energy independence and interconnections for electricity and natural gas systems

2030

- Near term needs still relevant, with shift in focus towards electrification advanced bioenergy, hydrogen, and carbon capture and storage and utilisation (CCS/CCU)
- Increased efforts for transition of hard-to-abate sectors, such as transport and some industrial sectors

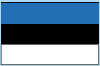
2050+

- Continued and strong electrification of the energy system
- Cross-sectorial integration
- Smart production and demand side management
- Integration of hydrogen in the energy system
 - as energy carrier
 - for energy storage, stabilising renewable power generation
 - for electrofuel production



Country-specific needs and opportunities for Baltic energy systems

Estonia



Now

- Abate shale oil in energy sector
- Heating/cooling, enabling smart urban areas

2030

- Mitigating remaining shale oil use
- Unlocking potential for CCU/PtX applications with bioenergy and hydrogen
- Opening up for deep decarbonisation in industry

Latvia



Now

- Reduce natural gas use in energy systems
- Large biomass potential
- Hydropower for storage/balancing
- Solar heat in district heating

2030

- Opportunities for biogas and hydrogen, through existing gas infrastructure
- Biomass potential in biorefineries/ bioeconomy

Lithuania



Now

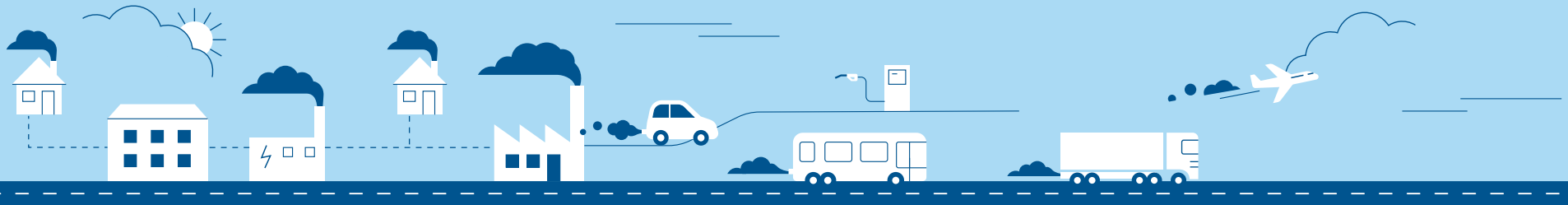
- Increase domestic renewable electricity generation
- Reduce natural gas use in energy systems
- Increasing share of biogas
- Strong photovoltaic (PV) stakeholders

2030

- Opportunities for biogas and hydrogen, through existing gas infrastructure
- PV at larger scale, new materials, system integration, use in multiple sectors (e.g. building-integrated)

Co-operation Roadmap

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Now



Continue & Strengthen

- Sustainable and integrated power systems
- Large-scale deployment of offshore wind power
- Zero emission buildings



Initiate New

- Efficient industrial waste heat utilisation in district heating
- Future biorefineries for the bioeconomy
- Electrification of private transport

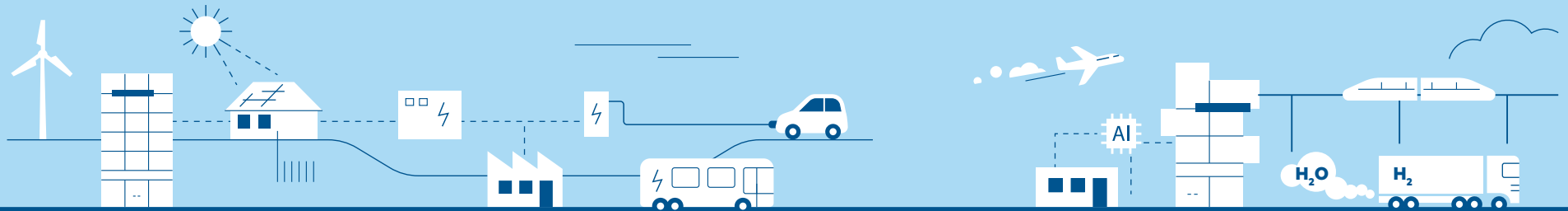


Exploratory

- Baltic-Nordic implementation of CCS and CCU
- Digitalisation in the energy system
- Deep decarbonisation of energy intensive industry
- Potential role of distributed energy systems

Co-operation Roadmap

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2030



Continue & Strengthen

- Developing zero emission power systems
- Positive energy buildings and smart cities
- Efficient waste heat utilisation in district heating
- Future biorefineries for the bioeconomy
- Deep decarbonisation of energy intensive industry
- Electrification of transport



Initiate New

- Hydrogen society – demand-side aspects
- Deep decarbonisation of energy-intensive industry
- CCS/CCU technologies and infrastructure
- Distributed energy systems



Exploratory

- Exploring new advanced technologies within renewable energy sources (RES) power generation, energy storage, CCS/CCU/PtX and hydrogen production

2050+



Continue & Strengthen

- Zero emission transport system
- Hydrogen society
- CCS/CCU/BECCS for net zero/negative emissions
- Integration of flexible power generation, storage and demand side



Initiate New

- Development/implementation of new advanced technologies within RES power generation, energy storage, CCS/CCU/PtX and hydrogen

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Baltic-Nordic Roadmap for Co-operation on Clean Energy Technologies was a collaborative effort between Nordic Energy Research, who administered the project, and CIT Industriell Energi AB, who lead the project with support from Tallinn University of Technology (TalTech). The work was jointly funded by Nordic Energy Research, the Ministry of Economic Affairs and Communications of the Republic of Estonia, the Ministry of Economics of the Republic of Latvia, and the Ministry of Energy of the Republic of Lithuania, within the Joint Baltic-Nordic Energy Research Programme.

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Read the full report: pub.norden.org/nordicenergyresearch2022-03