Energi21 strategy 2022

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director | Energi21|

Statnett's RD&I Conference, 25th October 2022

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Oil and Energy Minister Terje Aasland
receives revised Energi21 strategy 30 June 2022.

NORWEGIAN MINISTRY
OF PETROLEUM AND ENERGY

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- Established by the Ministry of Petroleum and Energy in 2008. It is a permanent strategy body with its own industry-driven board appointed by the Ministry of Petroleum and Energy.
- Gives strategic advice directly to the Minister of petroleum and energy. Advice on thematic and financial commitment to research and innovation in renewable energy and climate-friendly energy technologies.
- The goal is increased value creation and efficient resource utilisation in the energy sector through investment in research and innovation.
- Prepares Norway's national strategy for research, development and commercialisation of new climate-friendly energy technology.
- Contributes to common goals and measures for increased engagement in the business sector for research and innovation.

Public R&D activity within the Ministry of Petroleum and Energy

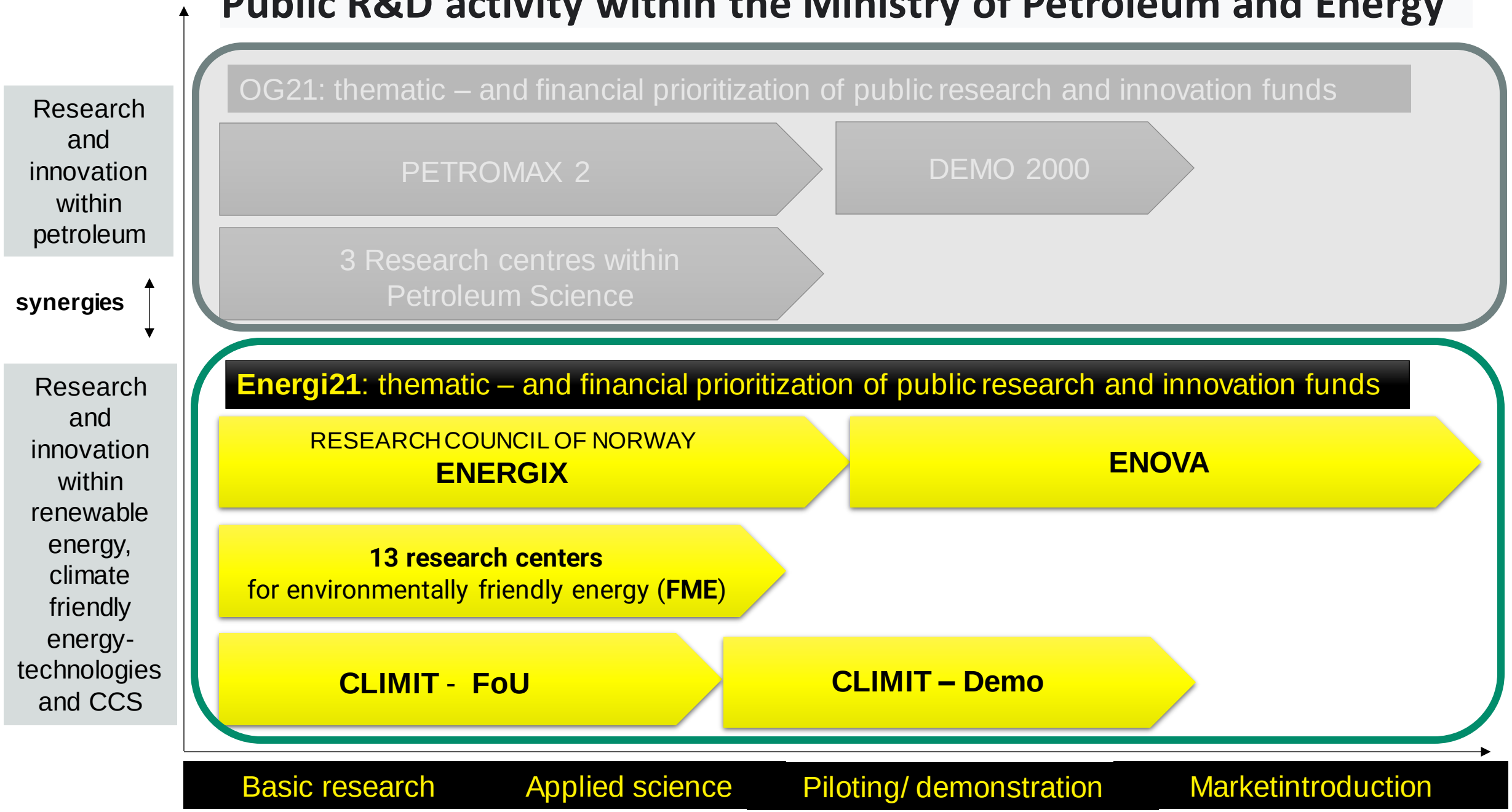
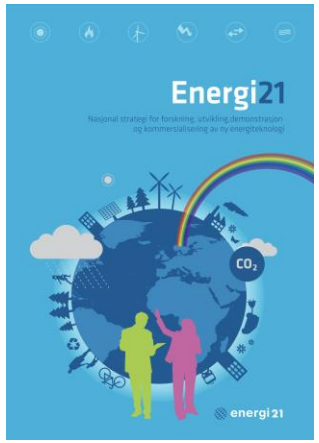


Illustration from the Government's proposal for the state budget Prop. 1s. (2022-2023)

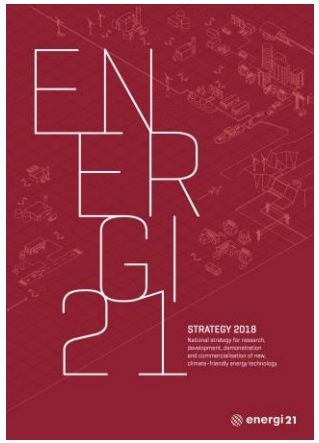
Energi21 strategies

2008

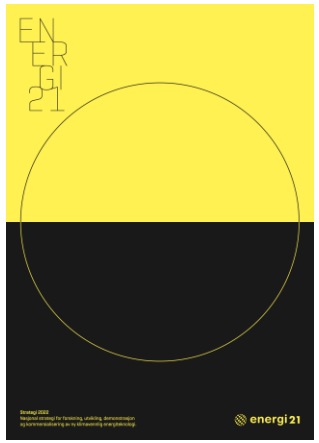


June
2011

September
2014



June
2018



June
2022

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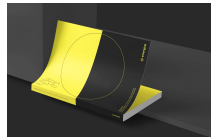


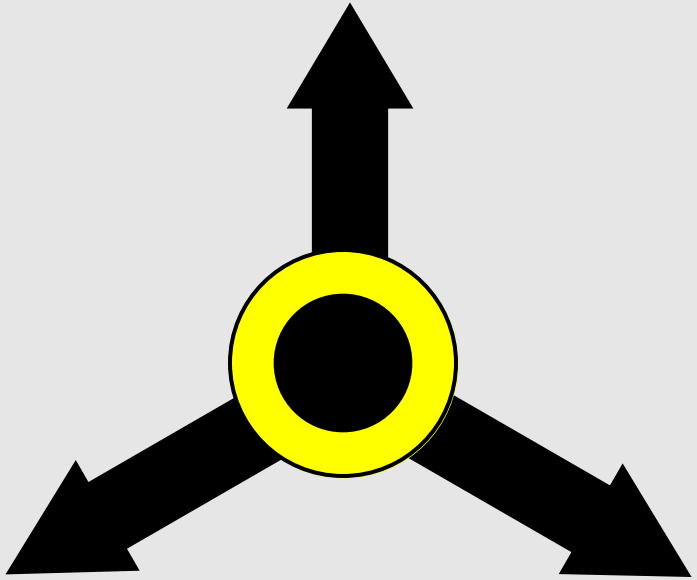
The strategy is based on an extensive body of knowledge
– great co-operation and highly valuable contribution

Body of knowledge:	Solid and comprehensive process
Engagement and contribution:	Close to 700 stakeholders from business sector, research – and innovation institutes, academia , NGOs
Workshops	Evaluation of 25+ technology and thematic areas
Cross sectoral co-operation	Analysed need of interaction and potential of knowledge transfer and synergies between sectors.
Public consultation	Overwhelming respons

THE ENERGY TRILEMMA AND SUB - DIMENSONS

ENERGY SECURITY

- CAPABILITY
- RESILENCE
- DEPENDENCY

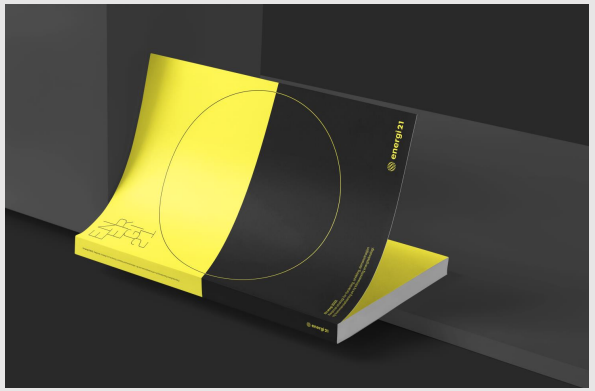


ENVIROMENTAL SUSTAINEBILITY

- DECARBONISATION
- RESOURCHE PRODUCTIVITY
- EMISSION & POLLUTION CONTROLL

ENERGY EQUITY

- AFORDABILITY
- QUALITY
- ACESSIBILITY



The Energy21:
Describes the necessary RD&I efforts to meet the challenges of the energy trilemma.

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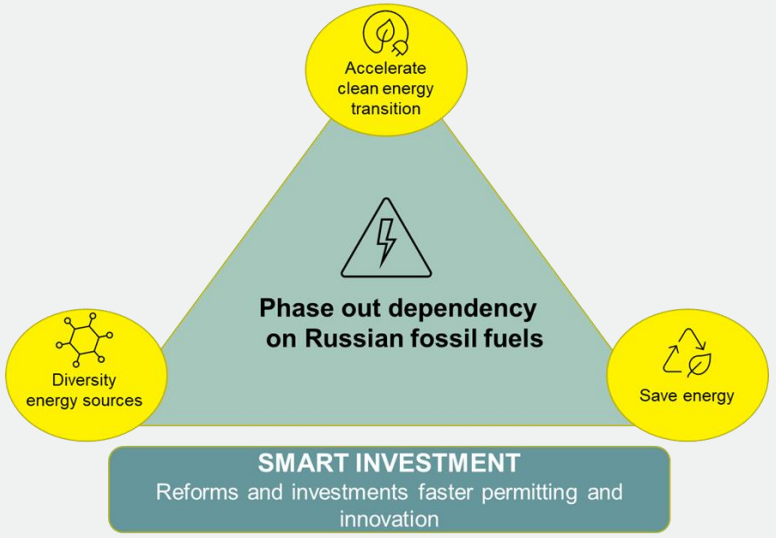
Energi21 strategy is aligned with national energy – and climate policies, and the challenges adressed in EU.

Energy – and climate policies	EU policies and Horizon Europe	Sense of urgency
▪ Energy and climate policies seek solutions to the energy trilemma. ▪ The national and nordic energysystems and energymarkets have strong interaction with the EU and UK. ▪ The Energi21 strategy describes knowledge and technology needs that must be met in order to achieve ambitions for emission reductions, value creation and security of supply.	▪ EUs Green Deal ▪ Fit for 55 ▪ REPower EU ▪ Horizon Europe	▪ Russia's invasion of Ukraine address the current price and security crisis. ▪ The REPower EU strategy accelerates the green energy transition. ▪ Need of rapid integration of renewable power production and measures for energy savings. ▪ Need to a speed up upscaling of industries and to support rapid deployment of technologies.



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Sector connection and cooperation between different industries

Energy sector is the hub of the transition to climate-neutral society

Building and construction
- Electricity
- Hydrogen
- Bioenergy

Agriculture and aquaculture
- Electricity
- Bioenergy

Transport
(maritime, aviation, landbased)

- Bioenergy
- Ammonia
- Methanol
- Hydrogen/LH2
- Electricity

- Bioenergy
- E-kerosene
- Hydrogen
- Electricity

- Electricity
- Hydrogen
- Bioenergy

Industri
- Electricity
- Hydrogen (blue and green)
- Biomass
- CCS
- Energy efficiency
- Heat pump technology

Oil and gas
- Electricity
- Hydrogen
- Energy efficiency
- CCS

Buildings
- Energy efficiency
- Heat pump
- Geothermal energy
- Bioenergy
- Electricity

Climate-friendly restructuring in all sectors will lead to increased need for electric power, climate-friendly energy technologies and increased transmission capacity.

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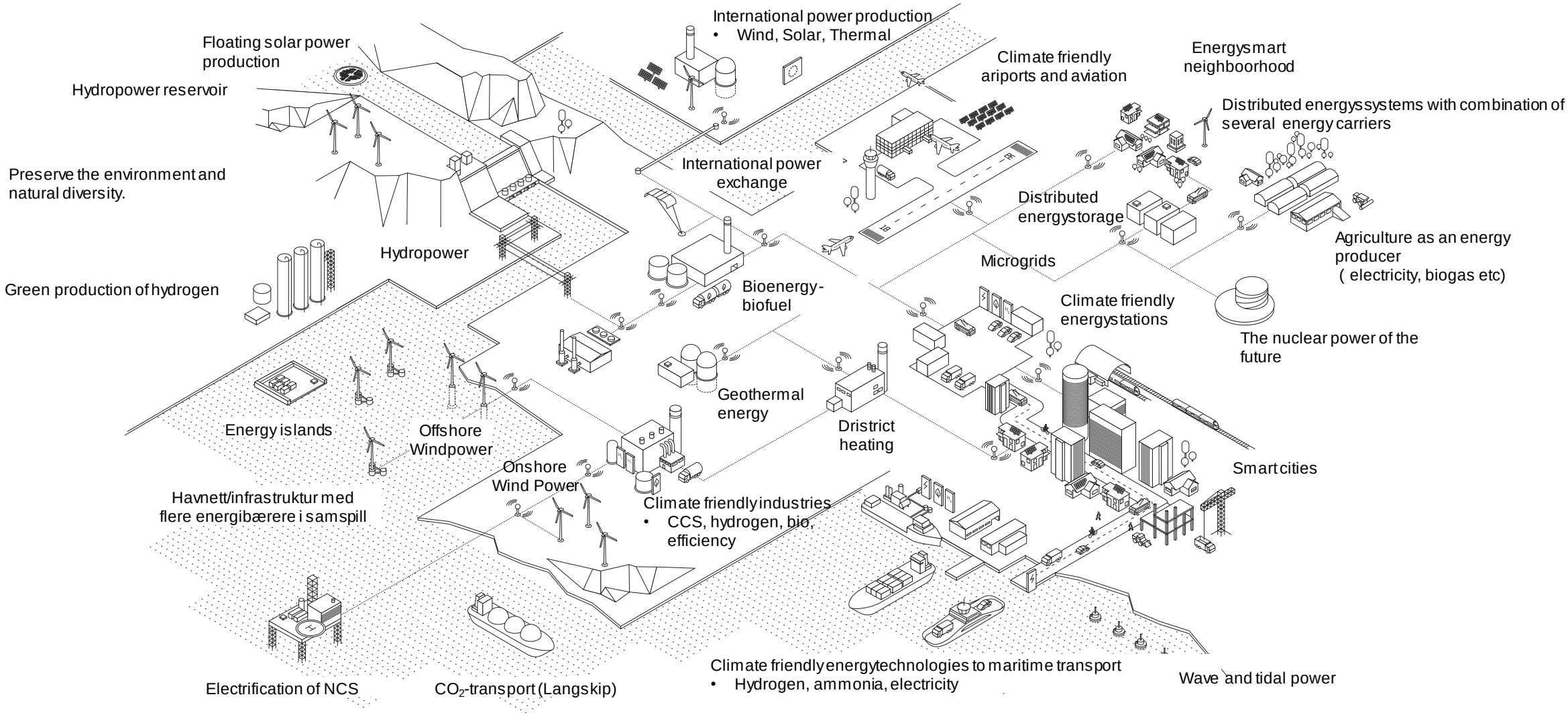
The digital, flexible and integrated energy system of the future:

high degree of complexity, consumer driven and interaction between several energy carriers



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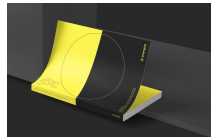


Vision

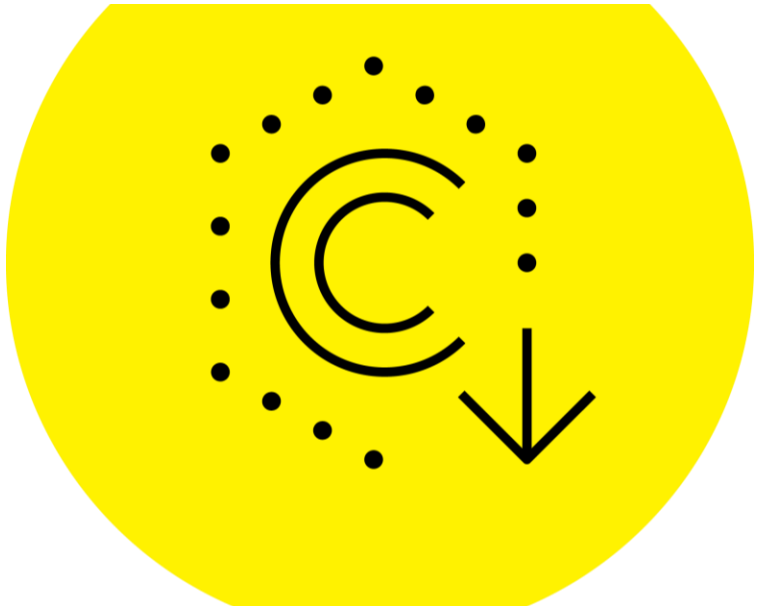
As an energy nation with national and international opportunities Energi21 has adopted the following vision:

Further develop Europe's best energy system

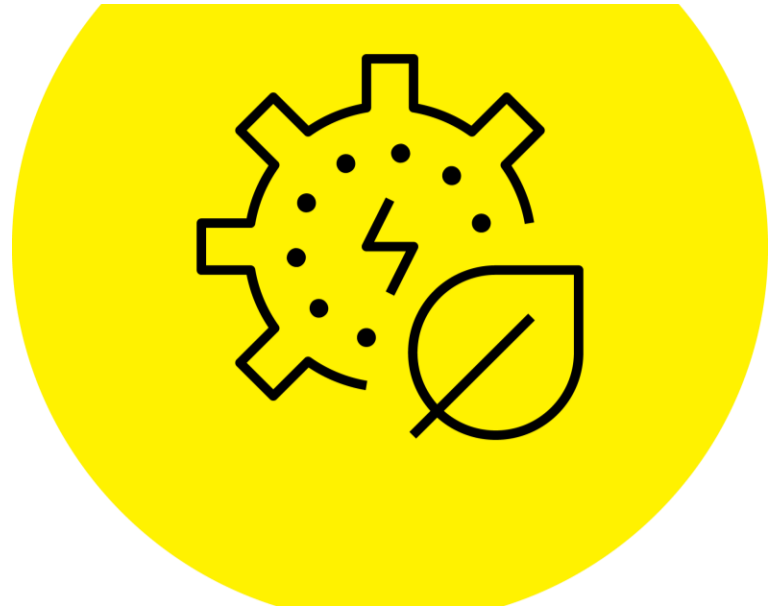
- Contributions on national – and international level:
  - renewable energy
  - industrialisation
  - business development
  - an energy system with a reliable supply and the right quality

Key challenges must be resolved in order to meet the vision and mission of the OED.

Decarbonising transport and industry



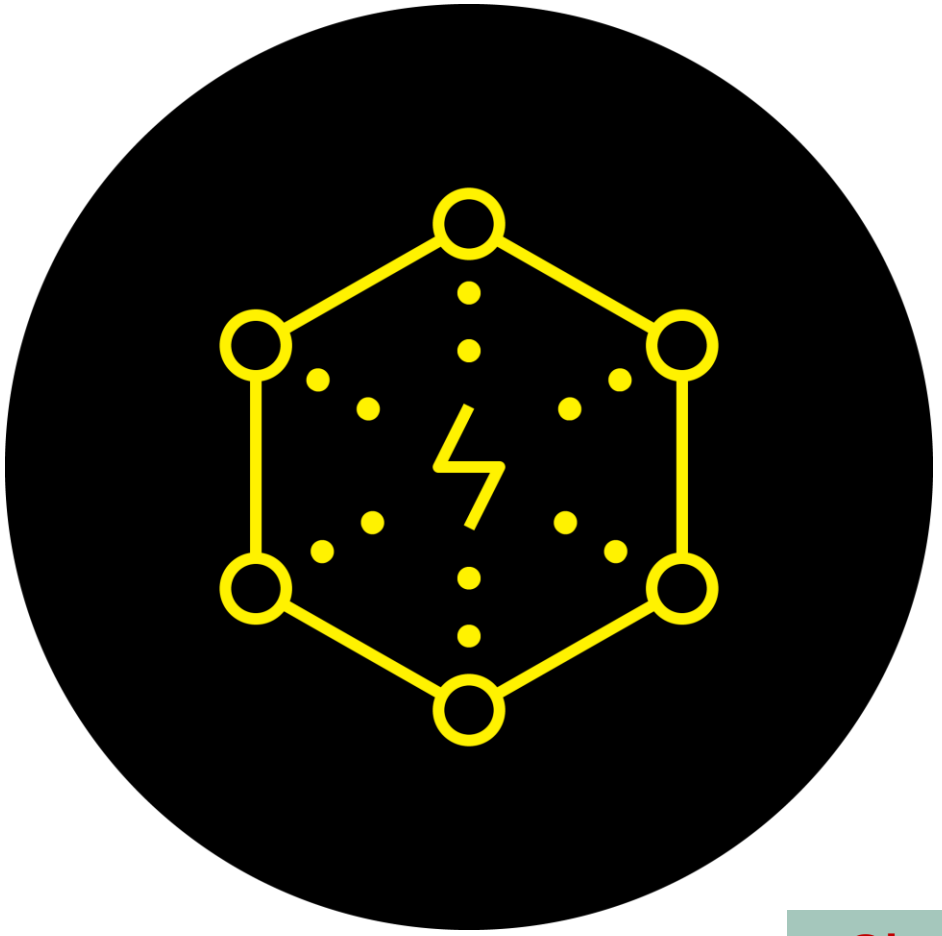
Safe,competetive and environmentally friendly energy supply



Develop new green industries and marine energy technologies

INTEGRATED AND EFFICIENT ENERGY SYSTEMS

Onshore – and offshore infrastructure



- Efficient and integrated energy systems are vital to achieving energy and climate goals and cut greenhouse gas emissions, boost industrialisation and achieve cost- effective utilisation of our energy sources.
- **Selected key resarch – and innovation topics:**
  - Efficient and felxible interaction between different energy infrastructures, climate friendly energy carriers and end-users
  - Next – generation components and systems
  - Multidisciplinary analysis- and simulations models
  - Digitalisation and cyber- security
  - Nature and environmental consequences

Given special attention

Energy markets and regulations

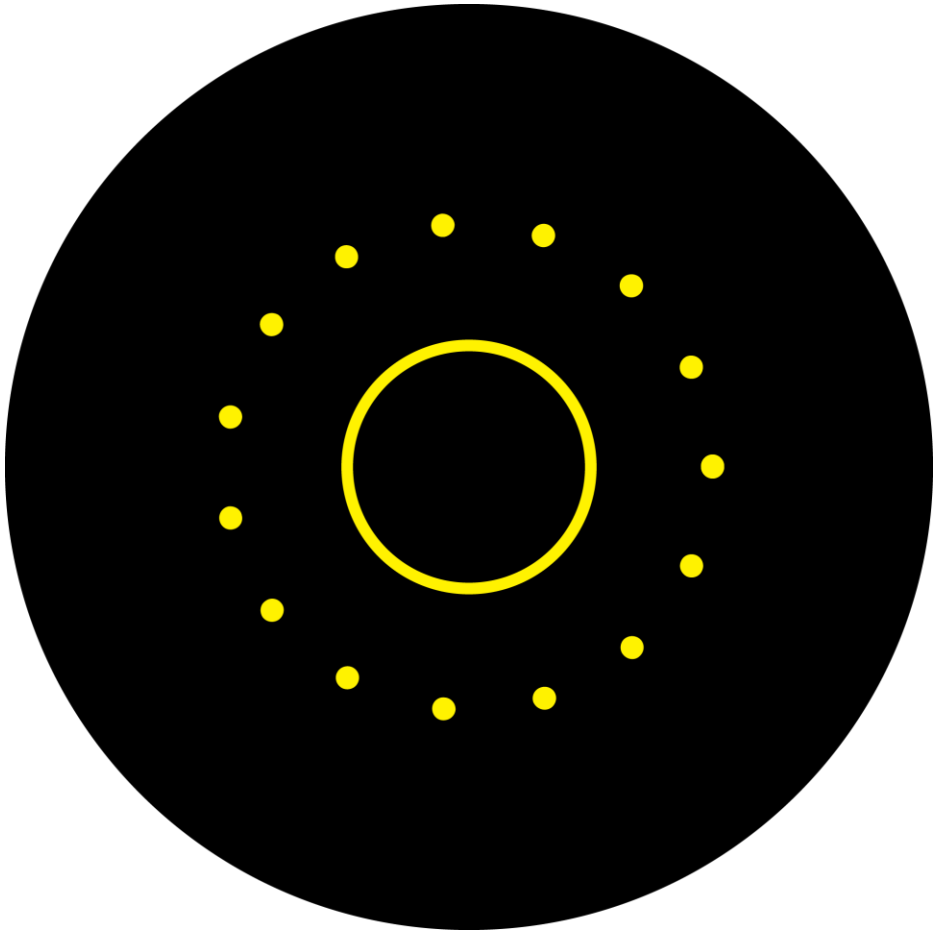
- Framework for action and decisions relating to the timely transition of the energy system.
- **Selected key research and innovation topics:**
  - Market design
  - Energy regulations
  - Legal and economic issues
  - Decision- making processes
  - Social innovation
  - Business and marketmodels
  - Consumer behavior and involvement in the energy transition

Given special attention

OFFSHORE WIND POWER

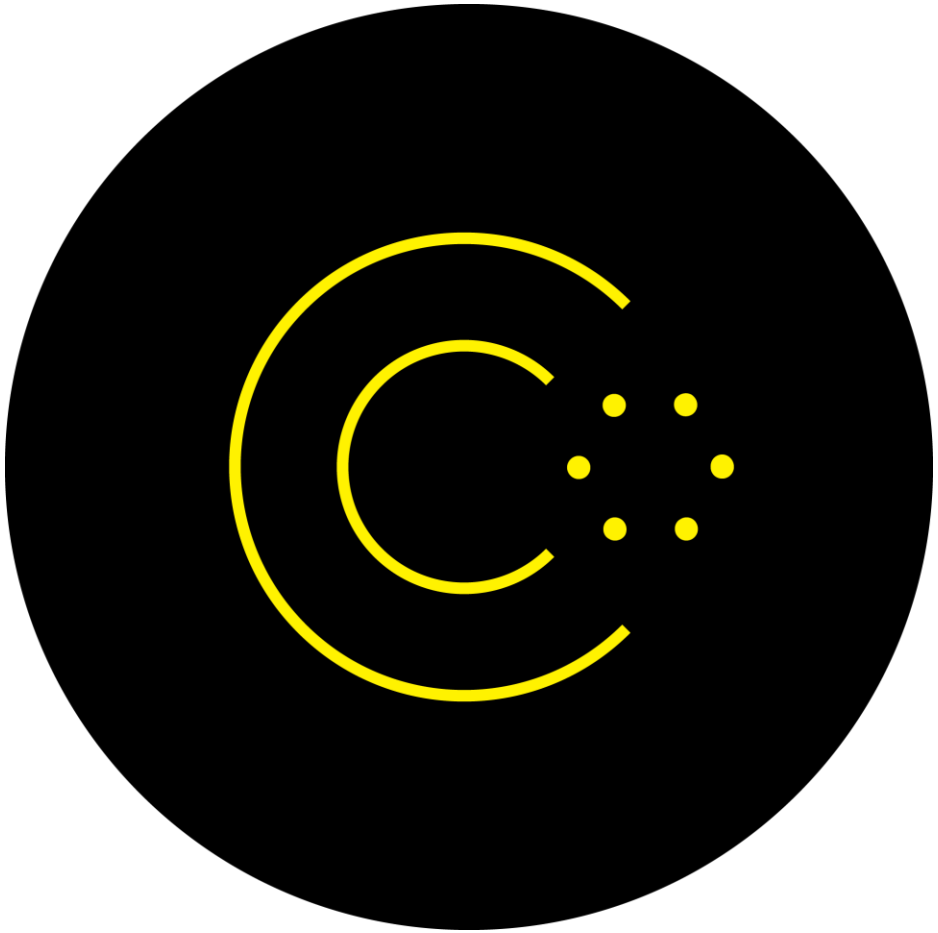
- Norway has opportunites to take market shares in the offshore wind power market – both floating and fixed wind turbines.
- There is potential for further develop the supplier industry and contribute to power supply for electrification of the society.
- **Selected key research- and innovations topics:**
  - Efficient production, operation and maintenance of floating and fixed turbines.
  - Offshore infrastructure and integrated systems – flexible grids with upscaling opportunities and solutions for system integration – and interaction with storage, production and transmission technologies.
  - Digitalisation and cyber- security
  - Nature and environmental consequences

SOLAR ENERGY



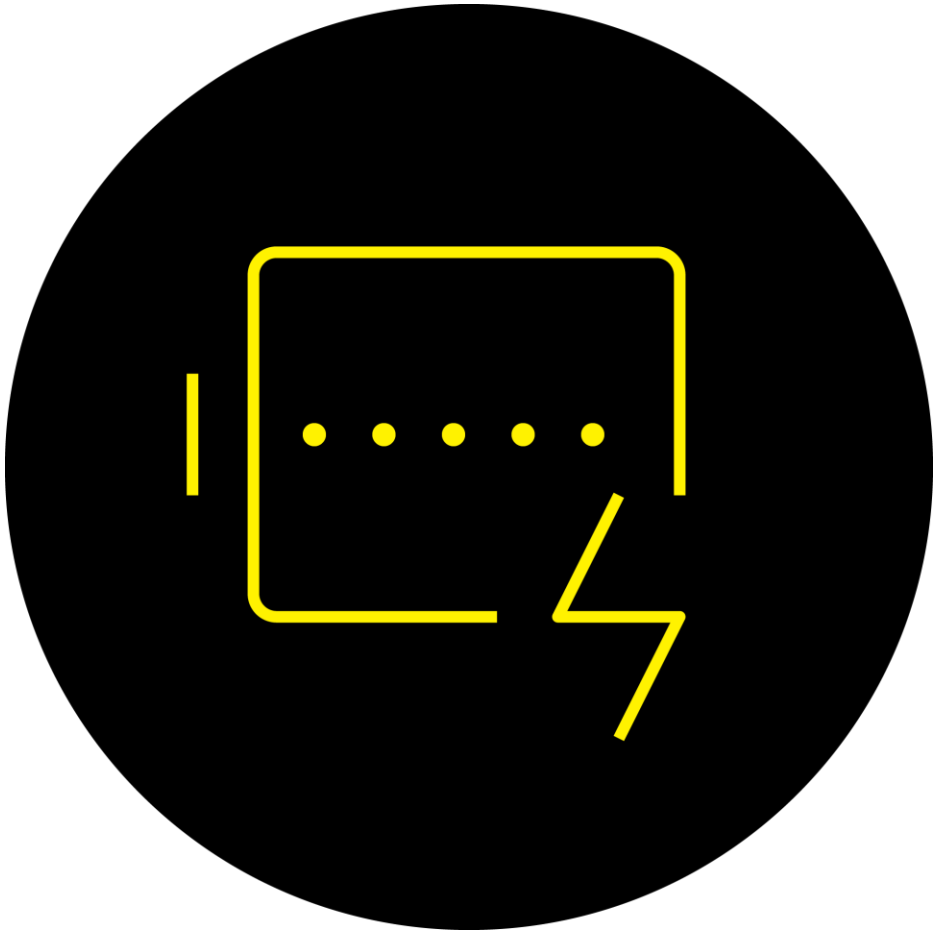
- Norway has opportunites to take market shares in the national solar power market – both landbased and floating installations.
- There is a potential for export of low- emission materials as, silicon.
- **Selected key research topics:**
  - Solar power in the system and digitalisation – local solar power and heat systems.
  - New concepts of technologies
  - Building – integrated solar power concepts and hybrid power plants.
  - Society and environment – framework conditions.

CARBON CAPTURE AND STORAGE (CCS)



- The world is dependent on large scale carbon capture and storage to reach the 1.5^{0}C – especially sectors without good decarbonation options.
- Norway has strong global position in CCS and will be futher consolidated when Longship project becomes reality in 2024.
- There is a potential for exporting capture, storage and transport technologies and valuecreation for Norwegian suppliers.
- **Selcted key research topics:**
  - New technologies and upscaling into a commercial valuechain.
  - Business and market models and frameworks for CCS.

BATTERIES



- Developing an applying electric batteries are crucial to the decarbonisation of transport , and also presents an opportunity for developing new green industry in Norway.
- Development a national battery chain will recquire investments in education and competence buliding – and access to renewable power supply.
- **Selected key research – and innovation topics**:
  - Materials- and raw materials
  - Battery utilisation – integration in the power grid and adaption of battery properties for different end user applications.
  - Reliability, reuse and recycling
  - Digitalisation – digital traceability, robotisation and automation throughout the value chain.

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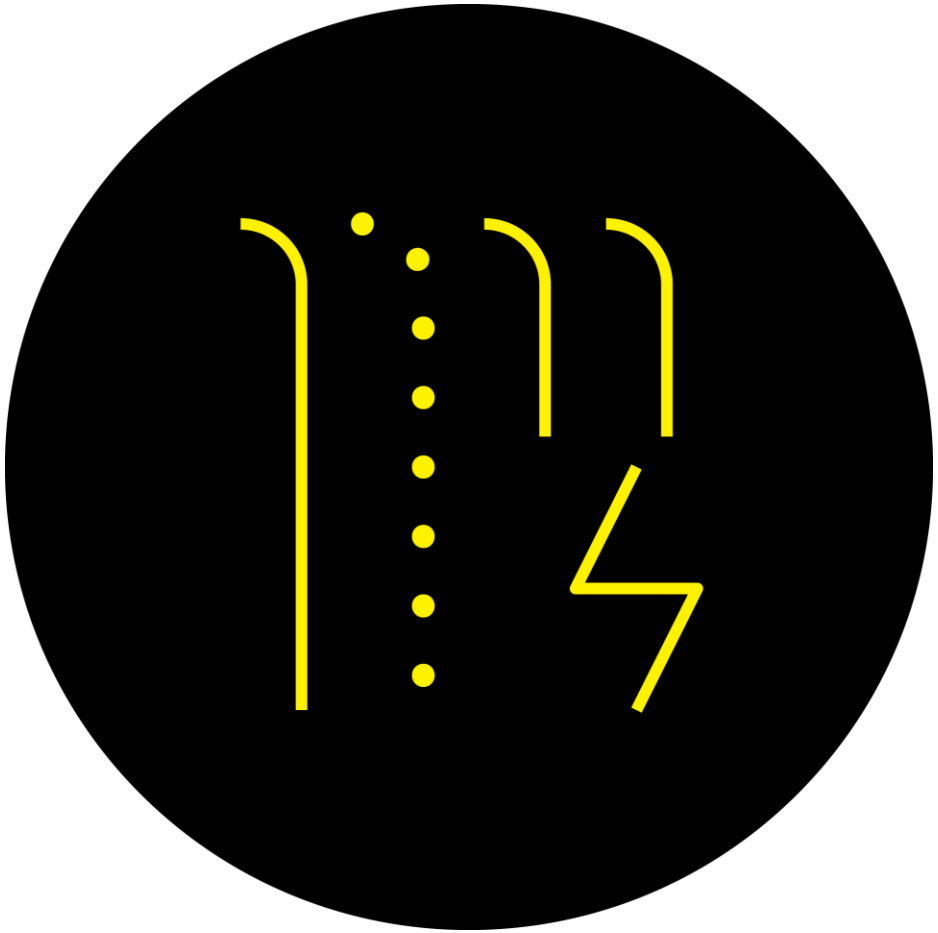
HYDROPOWER



- Hydropower is the bacbone of the Norwegian energy suply and a competetive advantage in the transition to the climate netural society.
- Hydropower reservoirs represent both access to renewable power supply and flexibilty services.
- Hydropower is important for security of supply and green industrialisation.
- **Selected key research- and innovation topics:**
  - The flexible role of hydropower in the national and European power system of the future.
  - Upgrade existing hydropower plants.
  - New technology in hydroelectric power production – machine learning methods – better desicion models.
  - Climate change and effects
  - Nature and environment consequenses

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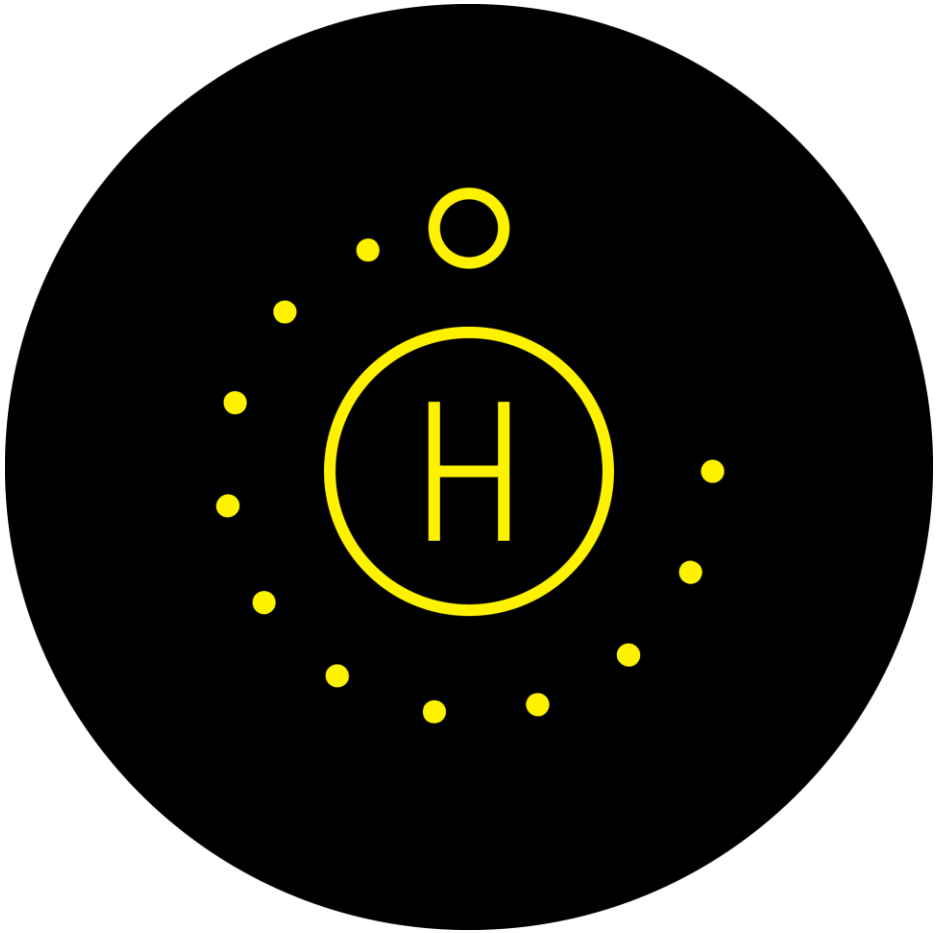
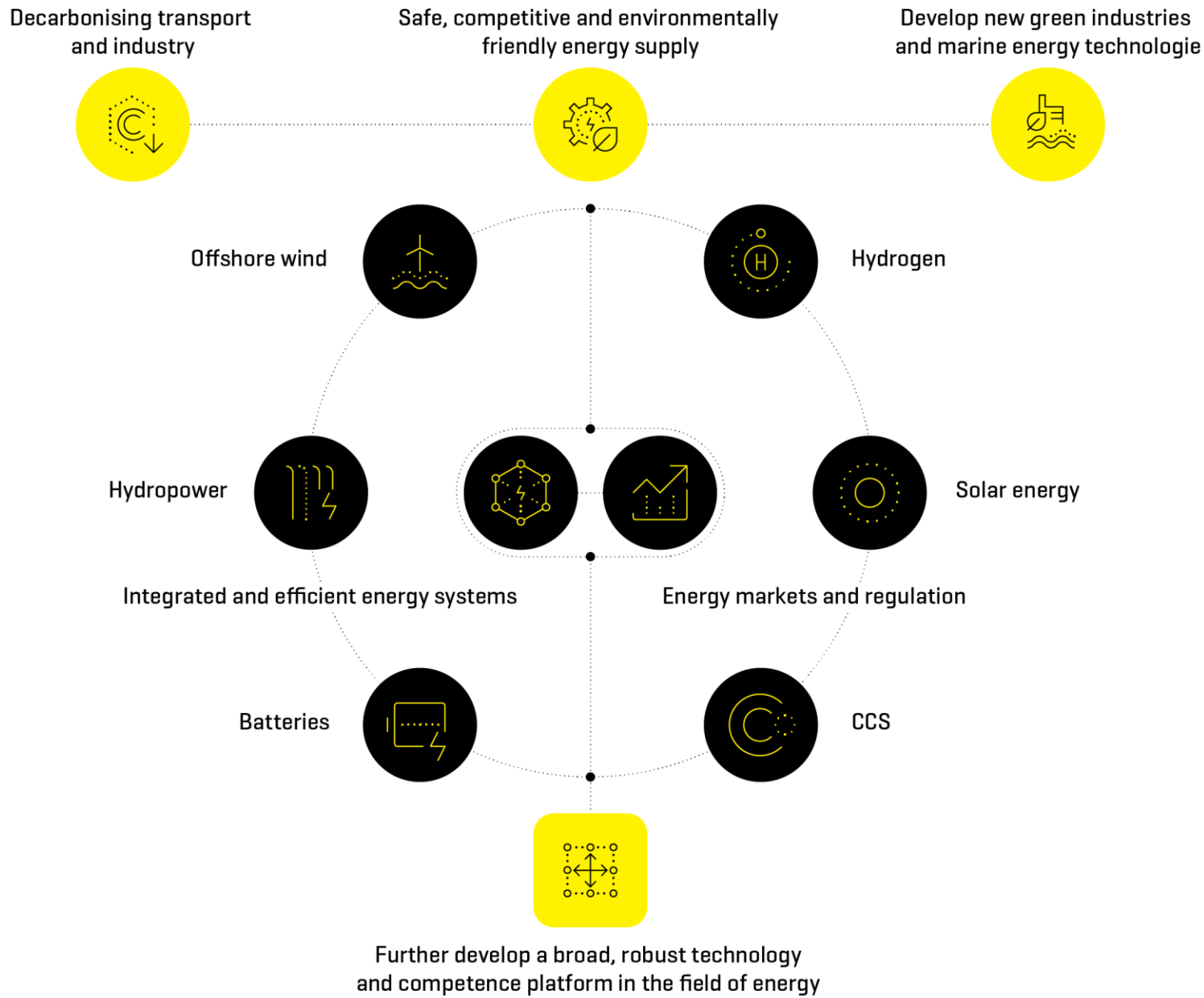
HYDROGEN



- Hydrogen plays (hydrogen- derivatives) a vital role in decarbonising the world's energy consumption (transport and industry).
- EU, Norway's bigges export market for natural gas assigns hydrogen a key role in achieving the zero-emission goal for 2050.
- Hydrogen has properties to store and transfer energy – and contribute to reduced emission from industry.
- **Selected key research and innovation topics:**
  - Secure use of hydrogen and hydrogen – derivatives
  - Cost- and energyefficient hydrogen value chains
  - Integration of hydrogen value chains in the existing energy systems.
  - Framework conditions for establishing markets


Decarbonising transport and industry
Safe, competitive and environmentally friendly energy supply
Develop new green industries and marine energy technologie
Offshore wind
Hydrogen
Hydropower
Solar energy
Integrated and efficient energy systems
Energy markets and regulation
Batteries
CCS
Further develop a broad, robust technology and competence platform in the field of energy

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Thank you for your attention !

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