

M⊕ZEES

Mobility Zero Emission Energy Systems



The Research Council of Norway

MoZEES Overview

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Open for distribution

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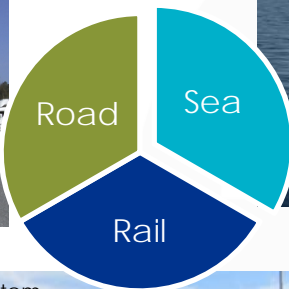
MoZEES – A Research Center on Zero Emission Mobility

FME MoZEES – 1 of 8 National Centers



Heavy Duty Transport

– New Areas for Innovation & Value Creation



Battery & Hydrogen – Technology Value Chains



Materials

Components

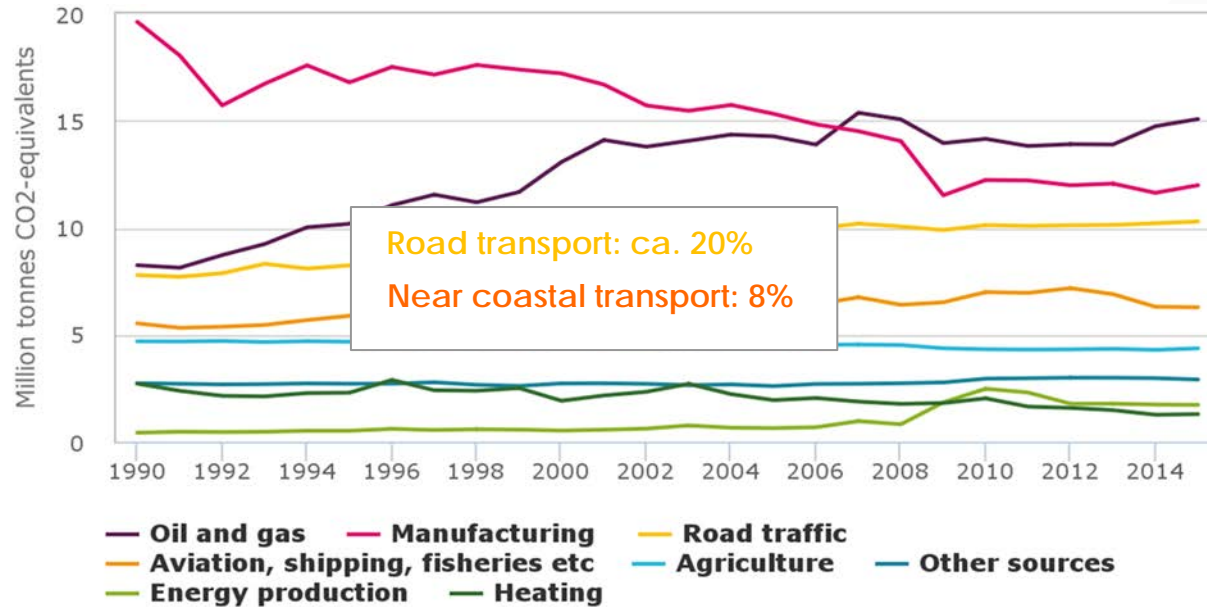
Batteries &
Fuel Cells

Modules

Systems

Motivation – National reduction of GHG-emissions

- Example / Norway: 54 million tonnes of CO₂-equivalents per year → **30% from Transport**



Source: SSB (2015)

Motivation – Regional reduction of GHG-emissions

- Example / Oslo: GHG-emissions → **ca. 50% from Heavy Duty Transport**

PRIVATE CARS  39%

TAXI  3%

PUBLIC TRANSPORT  3%

LEIGHT FREIGHT VEHICLES  10%

HEAVY DUTY VEHICLES  15%

CONSTRUCTION MACHINERY  30%

Source: NFR/PILOT-E (2017)

Overall Goal & Scope of Work

- Perform **Research for Development & Innovation** on new battery and hydrogen materials, components, and technologies for existing and future **transport applications on Road, Rail, and Sea.**



Battery & Hydrogen Technology for Transport

MoZEES – Partners & Budget

7 Research Partners

- Research institutes: IFE (host), SINTEF, TØI, FFI
- Universities: UiO, NTNU, HSN

28 Commercial & Industrial Partners:

- **Battery** & **hydrogen** materials, components, and system suppliers; developers; end users

7 Public Organizations:

- Norwegian Road, Rail, and Coastal authorities; Akershus and Sør-Trøndelag counties; Oslo Port authority, Enova

Project

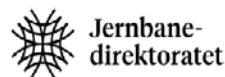
- Period: 2017-2024
- Budget: **260 MNOK (26 MEUR)** **13 PhDs & 5 Post.Docs**

260 MNOK (2017-2023), 40 partners
9 PhDs, 5 postdocs ++

Research Partners



Public Partners



Private and Industrial Partners



MoZEES – Research Topics

- **New materials and processes** that enable industrial User Partners to compete in niche markets in the battery industry
- **Battery and hydrogen key components and technologies** for export-oriented products
- **Battery and hydrogen systems for application** by User Partners into near to medium term transport markets (road, rail, and sea), with a particular focus on maritime applications
- **Integrated zero-emission energy and transport solutions and services**, including battery charging and hydrogen refueling infrastructures

MoZEES – Innovation Areas

- Heavy Duty Transport Systems, with focus on Maritime Applications



- Battery & Hydrogen Technology Value Chains

Materials

Components

Batteries &
Fuel Cells

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MoZEES – Research Areas

Administration (IFE)

- Center leadership, coordination

RA 1: Batteries (NTNU)

- Materials & components for battery: anodes, cathodes, electrolytes
- Increased performance, capacity and rate capability
- New fabrication methods
- Lower costs of production

Performance
criteria

RA 2: Hydrogen (SINTEF)

- Materials & components for water electrolyzers, fuel cells and membranes: anodes, cathodes, electrolytes
- High performance catalysts
- Durable bipolar plates
- Lower costs of production

Efficient
components

RA 3: Systems & Applications (IFE)

- Battery and fuel cells systems; hybrids
- H2 production & supply systems; water electrolysis
- Battery & H2 safety; battery & fuel cell life-time
- Optimization of system design & operation
- Design specifications of selected applications (case studies)

Design
Guidelines

New
Applications
& Systems

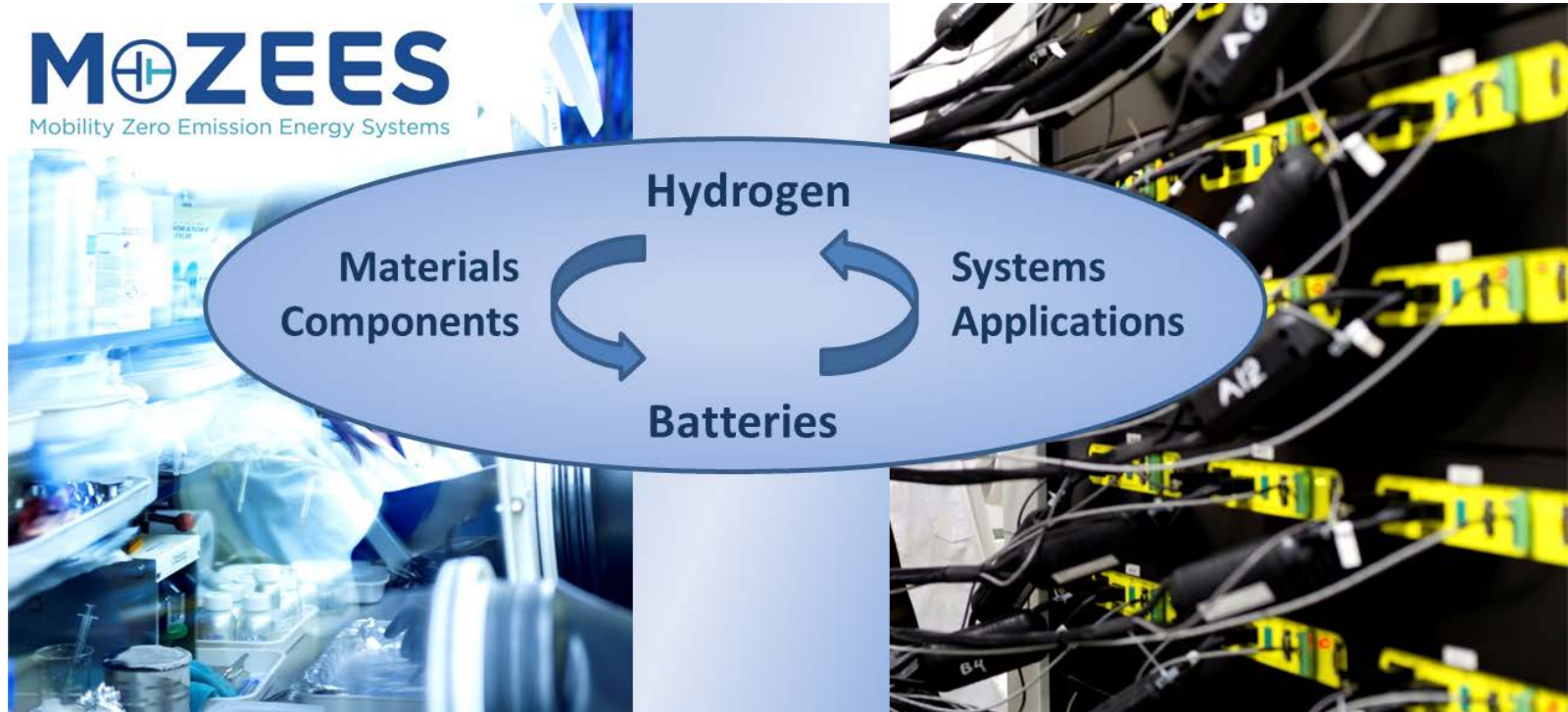
RA 4: Policy & Techno-economic Analysis (TØI)

- Screening of new concepts and business models
- New concepts and business models (case studies)
- Transport & energy methods; models with supporting ICT solutions
- Integration into a common framework of analysis
- Roadmaps on policy, business, and technology

Education & Dissemination (UiO)

- Education, conferences, dissemination
- Collaboration with other Centers and programs

Research Approach in MoZEEES



www.mozees.no

MOZEES

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