

Odne Burheim  
Professor



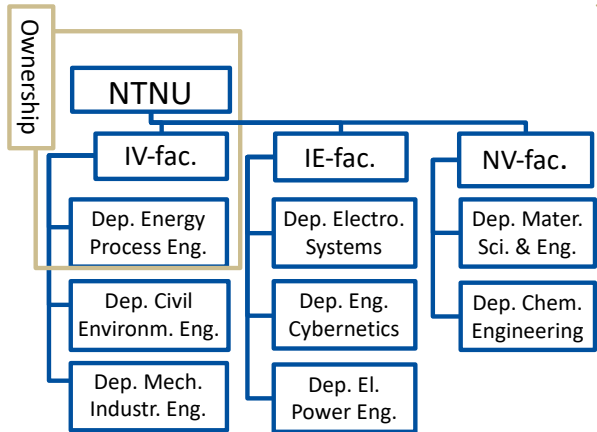
Anders Strømman  
Professor

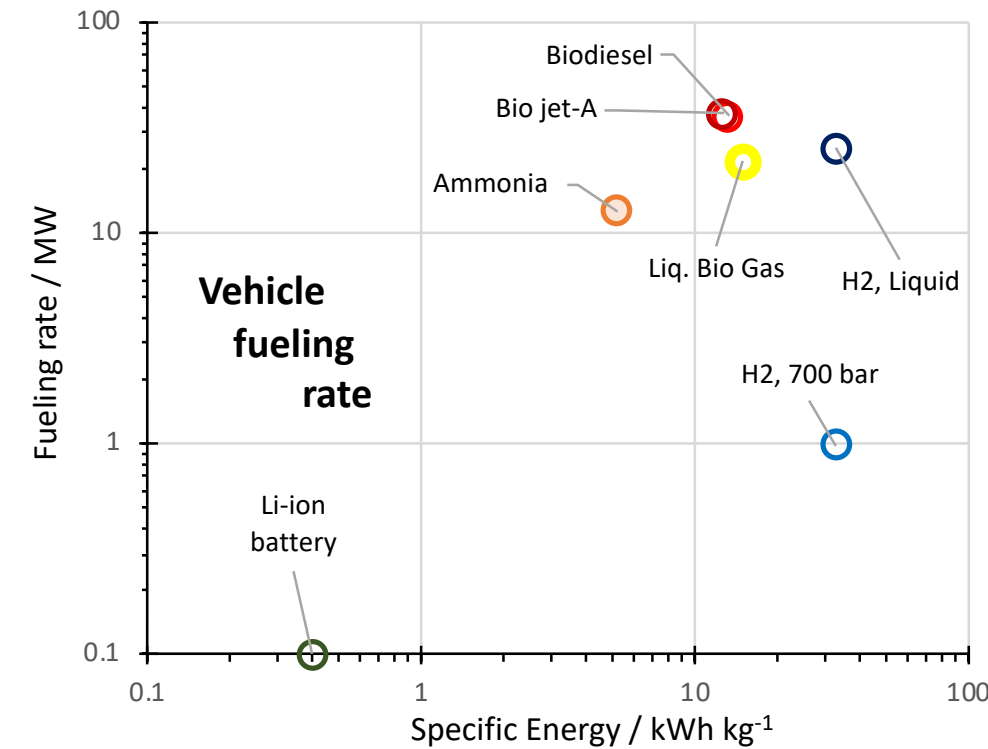
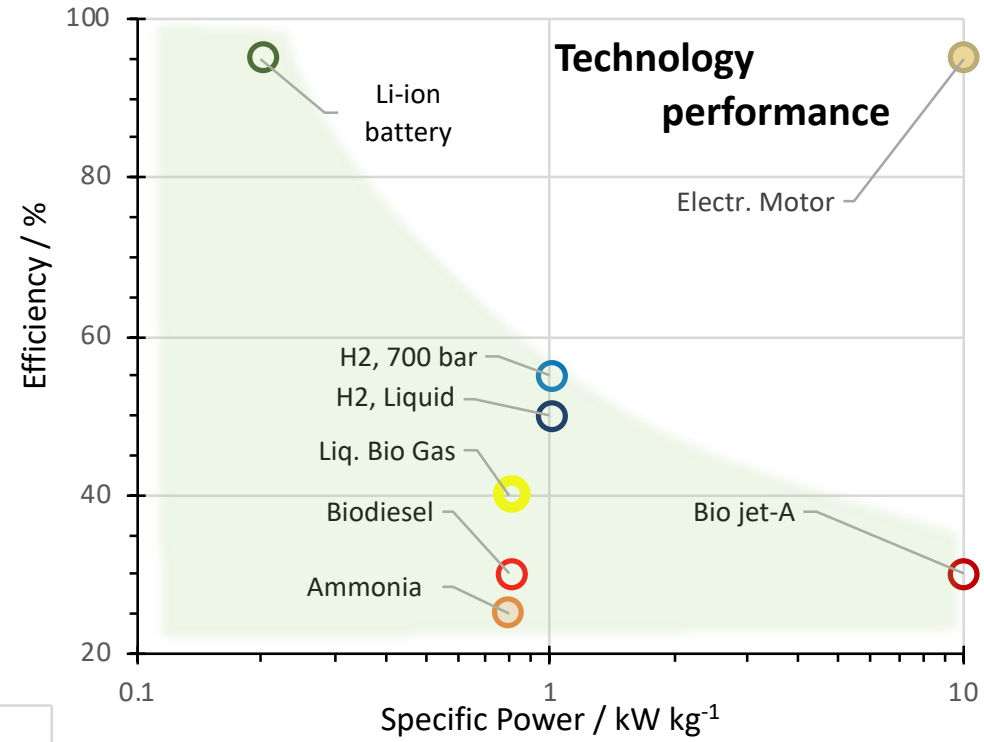
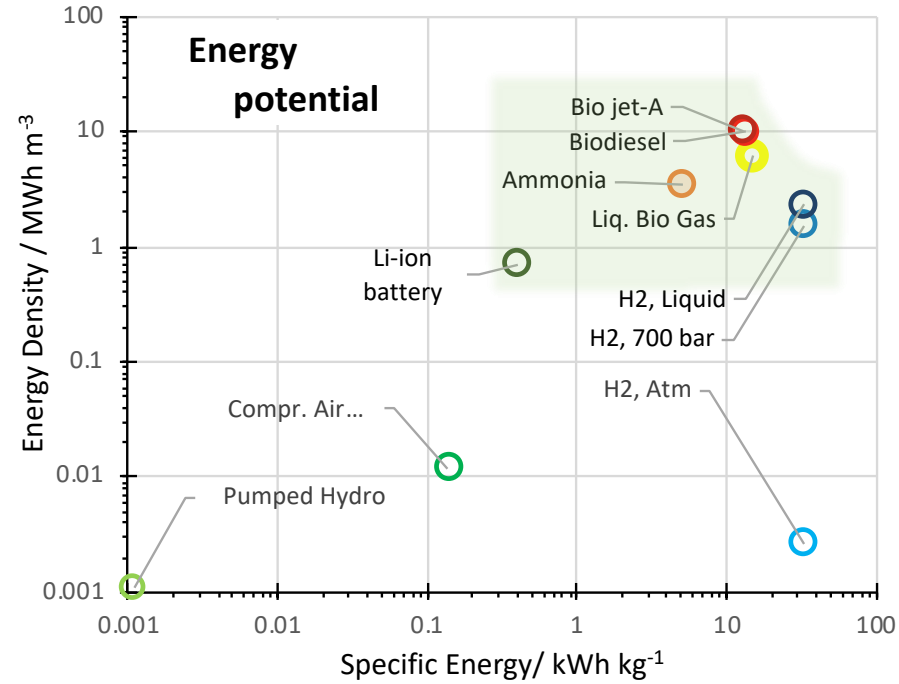


Jacob J. Lamb  
Researcher

# NTNU leads research to accelerate ZETA from day one!

”sensors” ”carbon cycles”  
 ”hydrogen” ”batteries”  
 ”Building technology” ”bioenergy”





Possible Renewable Energy Carriers  
quality assessment

On ammonia:

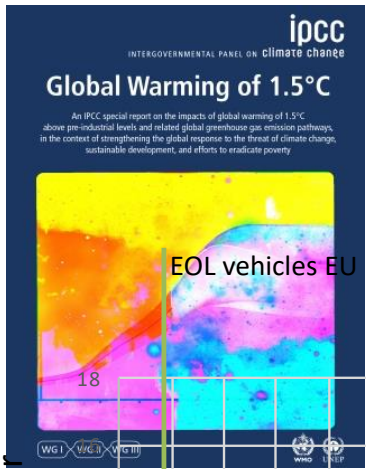
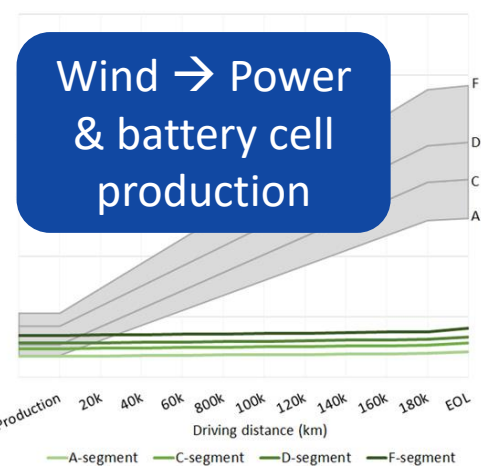
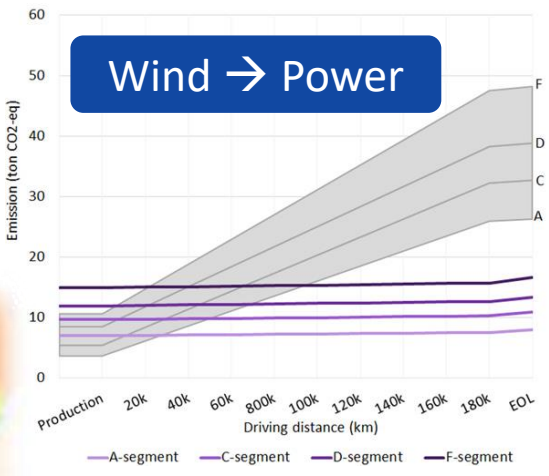
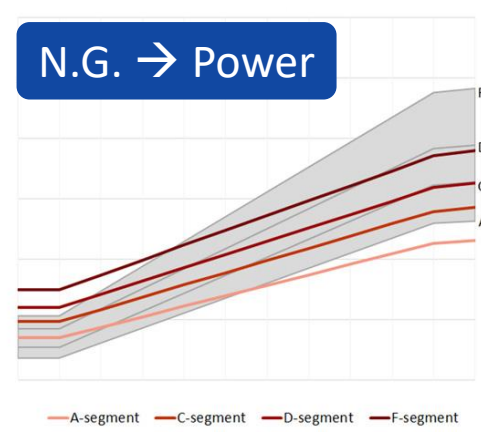
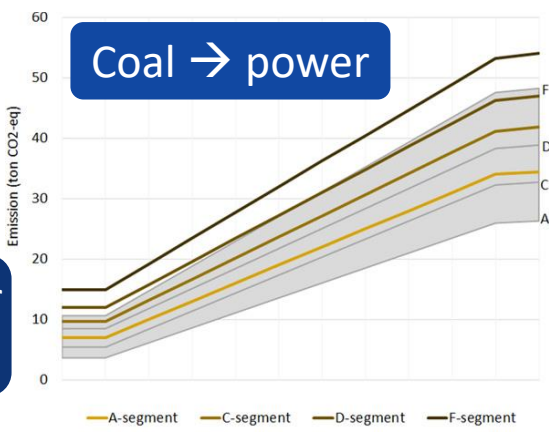
Apparently no obvious quantifiable benefits, but:

- One can order a truck load today.
- No CO<sub>2</sub> or NO<sub>x</sub> emissions from conversion
- Mobil fueling installation for construction sites

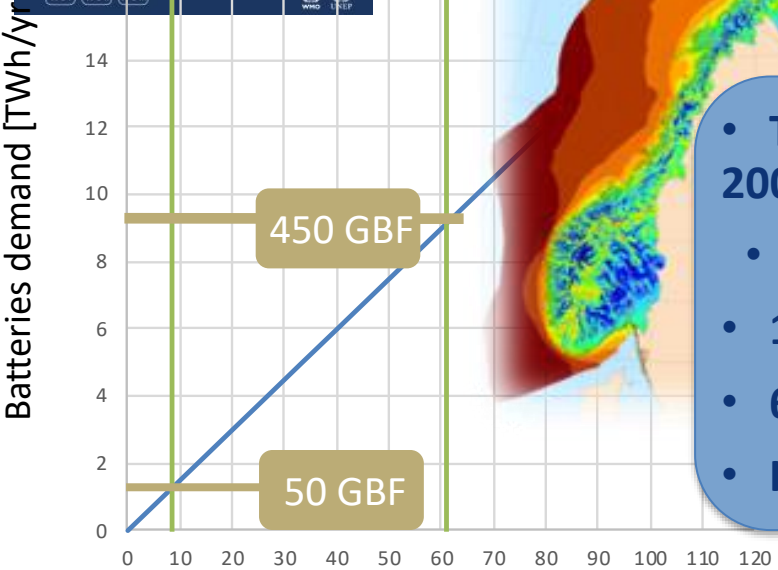
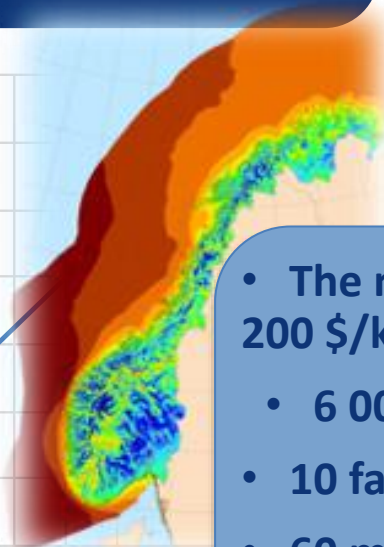
# Norwegian Industry

Conventional diesel ICE →

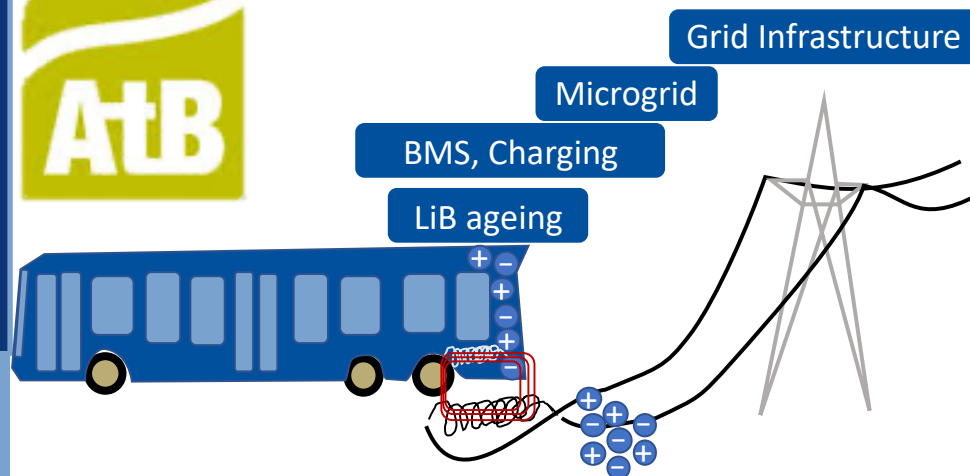
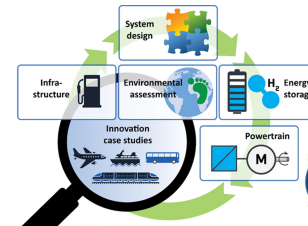
1.5 °C target → ice free arctic every 100 yr  
 2 °C target → ice free arctic every 10 yr



We should do this big time in Norway!  
 Like we did with aluminum production!



- The math:  
 200 \$/kWh times 30 GWh/yr (or 30 000 000 kWh/yr)
- 6 000 000 000 \$/yr
- 10 factories around 2030?
- 60 mrd \$/yr → 500 000 000 000 nok/yr (500 Gnok/yr)
- In 2018 the export value of oil&gas was 534 Gnok



# Research and Demonstration of Key Technologies for Reliable and Efficient Application of New Energy Vehicles in China and Norway

## Bakgrunn:

For å gjøre offentlig transport billigere må batteribussene kjøre mer og lade mindre. Dette kan oppnås ved å utvikle induksjonsladere som har ti ganger høyere effekt enn dagens, og gjennom åpne løsninger. I tillegg trenger man bedre forståelse av aldring, temperatur, hurtiglagring og batterikontrollsystemer.

## Mål:

Å komme frem til robuste ladesystemer og batterisystemer som gjør at busser får 30% lengre rekkevidde uten å måtte tas ut av drift for ekstra ladning. Dette skal skje gjennom å erstatte pantograf ladere med superinduksjonsladere.

**Ansvarlig organisasjon:** NTNU, Prosjektleder Prof. Odne Burheim ([burheim@ntnu.no](mailto:burheim@ntnu.no))

**Partnere:** NTNU, IFE, SINTEF, FREYR, Beyondr, AtB AS

**Prosjektperiode:** 2020-2023

**Type:** Bilateralt forskerprosjekt Norge-China

**Offentlig finansiering:** 25 mill. kroner

**Nettside:**

**Prosjektnummer:** 304213

# Norwegian Giga Battery Factories

## BEYONDER



 NTNU

Kunnskap for en bedre verden

 IFE

 Hydro

 NORSIRK



 NORDIC MINING



SINTEF

 FREYR  
RENEWABLE ENERGY STORAGE

## Bakgrunn:

Flere norske bedrifter utarbeider i disse dager planer for store batterifabrikker med sikte på å produsere battericeller som en egen ny eksportindustri i Norge. Slike fabrikker vil omsette for titalls milliarder årlig. I dag har Norge mye kunnskap om materialutvikling og prosesskontroll som er relevant for slik industri, men heller lite innen produksjon direkte

## Mål:

Å endre kompetanse fra materialutvikling til battericelleproduksjon, og særlig den eksisterende forskningskompetansen for å skape verdensledende forskningsmiljø innen industriell batteriproduksjon.

**Ansvarlig organisasjon:** NTNU, Prosjektleder Prof. Odne Burheim  
([burheim@ntnu.no](mailto:burheim@ntnu.no))

**Partnere:** NTNU, IFE, SINTEF, FREYR, Beyonder, Nordsirk, Nordic Mining og Hydro

**Prosjektperiode:** 2020-2023

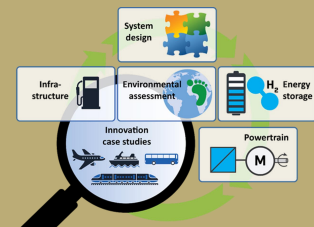
**Type:** Kompetanseprosjekt for næringslivet

**Offentlig finansiering:** 16 mill. Kroner

**Industry funding:** 5 mill. kroner

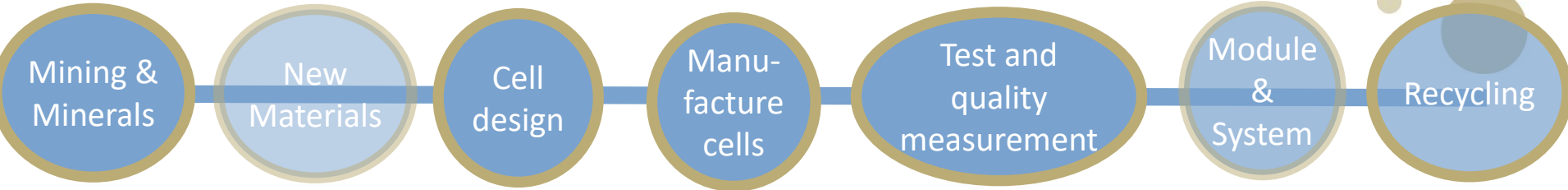
**Nettside:**

**Prosjektnummer:** 306400



# KPN for battery cell production research:

NFR ++ KPN; NorGiBatF



PhD – KPN - NTNU  
LCA supply of mineral & energy  
2020-2023

PhD – KPN - NTNU  
Energy in anode drying processes  
2020-2023

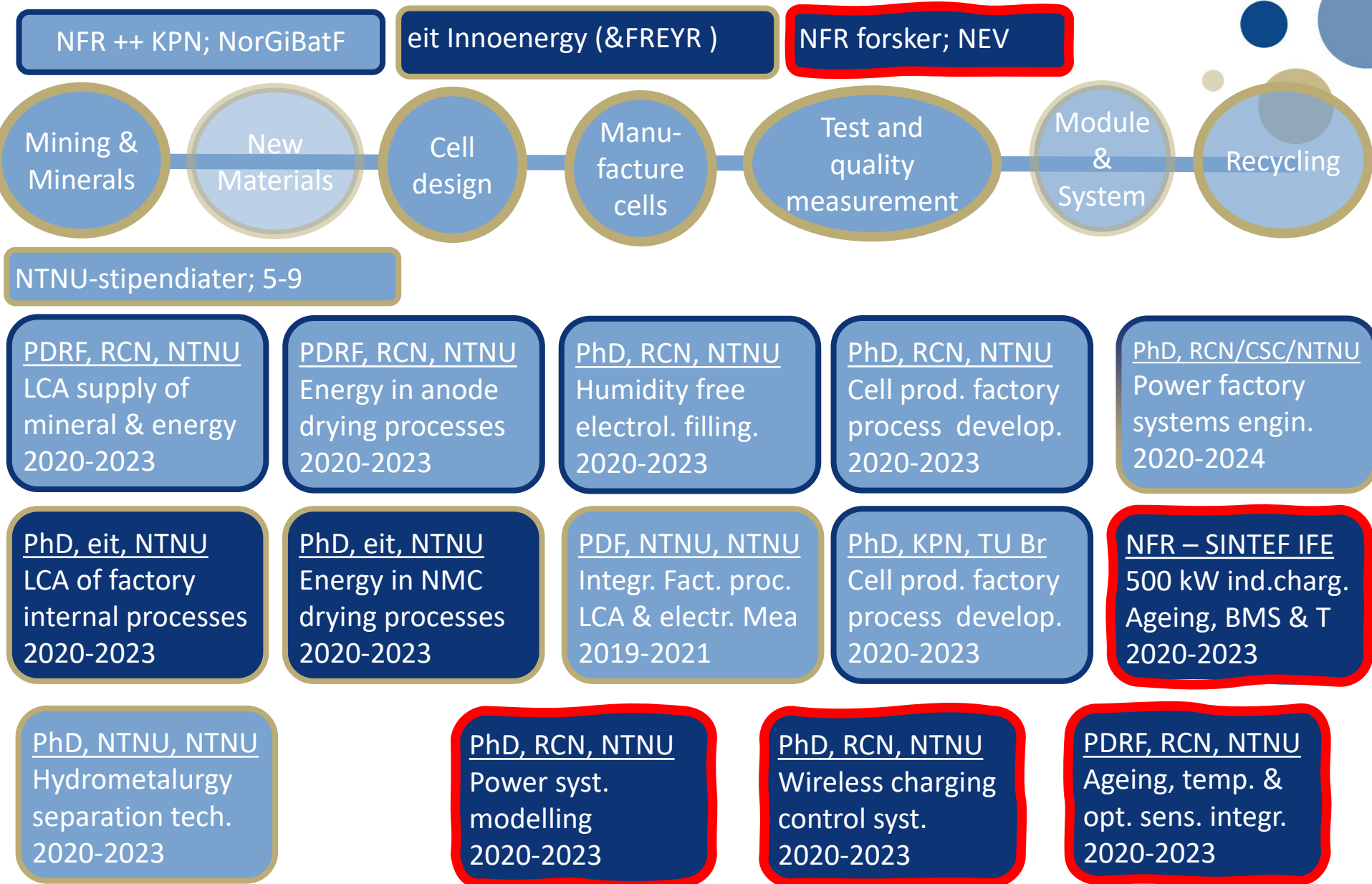
PhD – KPN - NTNU  
Humidity free electrol. filling.  
2020-2023

PhD – KPN - NTNU  
Cell prod. factory process develop.  
2020-2023

PhD – KPN ???  
Power factory systems engin.  
2020-2024

PDF – KPN – TU Br  
Cell prod. factory process develop.  
2020-2023

# More research on battery production and charging infrastrucutre:



# Recent intitated PhD/pdf research will boost innovation activities in ZETA from day one!

Prof. Burheim, EPT



Prof. Andreassen, IKP



PDRF, RCN, NTNU  
LCA supply of mineral & energy  
2020-2023

PhD, RCN/CSC/NTNU  
Power factory systems engin.  
2020-2024

PDF, NTNU, NTNU  
Integr. Fact. proc.  
LCA & electr. Mea  
2019-2021



Prof. Svensson, IMA

PDRF, RCN, NTNU  
Energy in anode drying processes  
2020-2023

PhD, RCN, NTNU  
Humidity free electrol. filling.  
2020-2023

PhD, RCN, NTNU  
Cell prod. factory process develop.  
2020-2023

NFR – SINTEF IFE  
500 kW ind.charg.  
Ageing, BMS & T  
2020-2023

Adj. Prof. Shearing, EPT/UCI

Adj. Prof. Vie, EPT/IFE

Adj. Prof. Suul, ITK/sintef



PhD, eit, NTNU  
LCA of factory internal processes  
2020-2023

PhD, eit, NTNU  
Energy in NMC drying processes  
2020-2023

PhD, KPN, TU Br  
Cell prod. factory process develop.  
2020-2023

PDRF, RCN, NTNU  
Ageing, temp. & opt. sens. integr.  
2020-2023



SINTEF

Prof. Zadeh, IMT

Prof. Strømman, EPT

PhD, NTNU, NTNU  
Hydrometalurgy separation tech.  
2020-2023

PhD, RCN, NTNU  
Power syst. modelling  
2020-2023

PhD, RCN, NTNU  
Wireless charging control syst.  
2020-2023



Prof. Fosso, EPE





Recent intitated PhD/pdf research will boost innovation activities in ZETA from day one!  
 Better user case studies  
 Better research trasnition  
 Accelerating «ZETA»

