



IFE Allmøte
28.02.2019

Battery technology

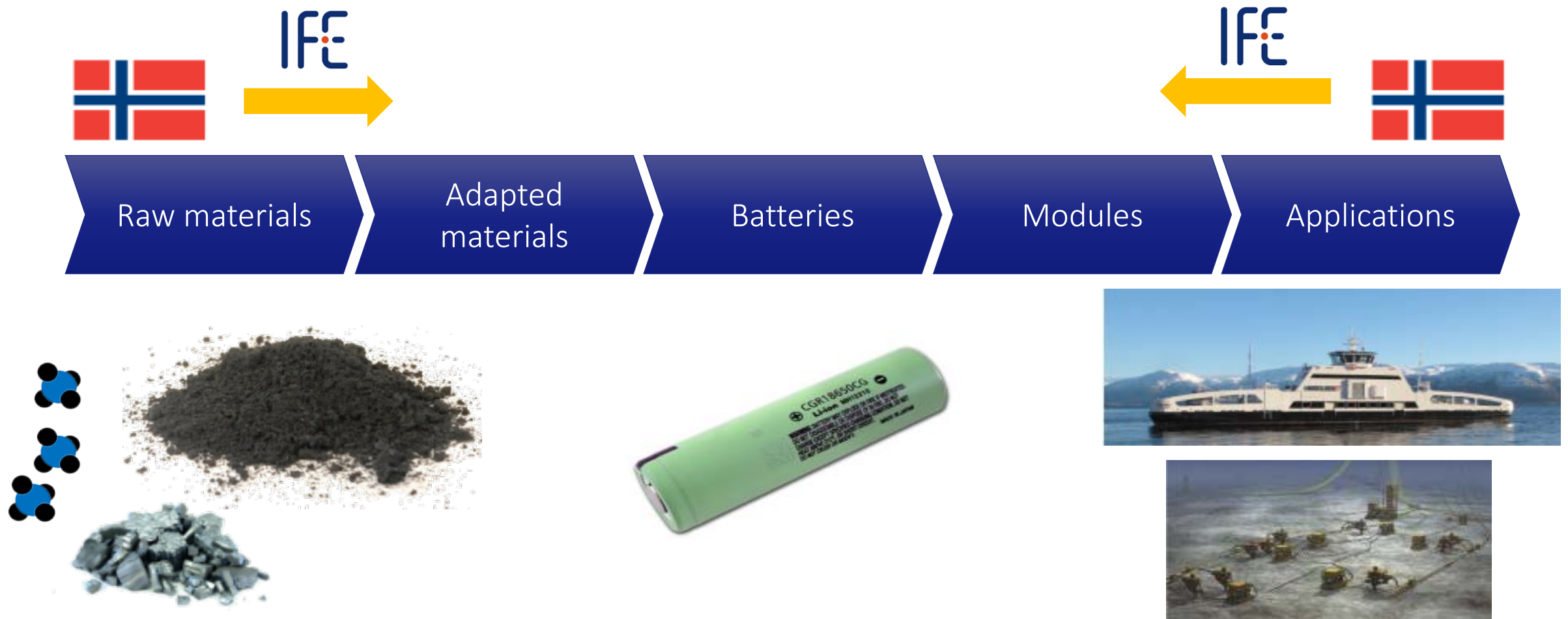
Hanne Flåten Andersen



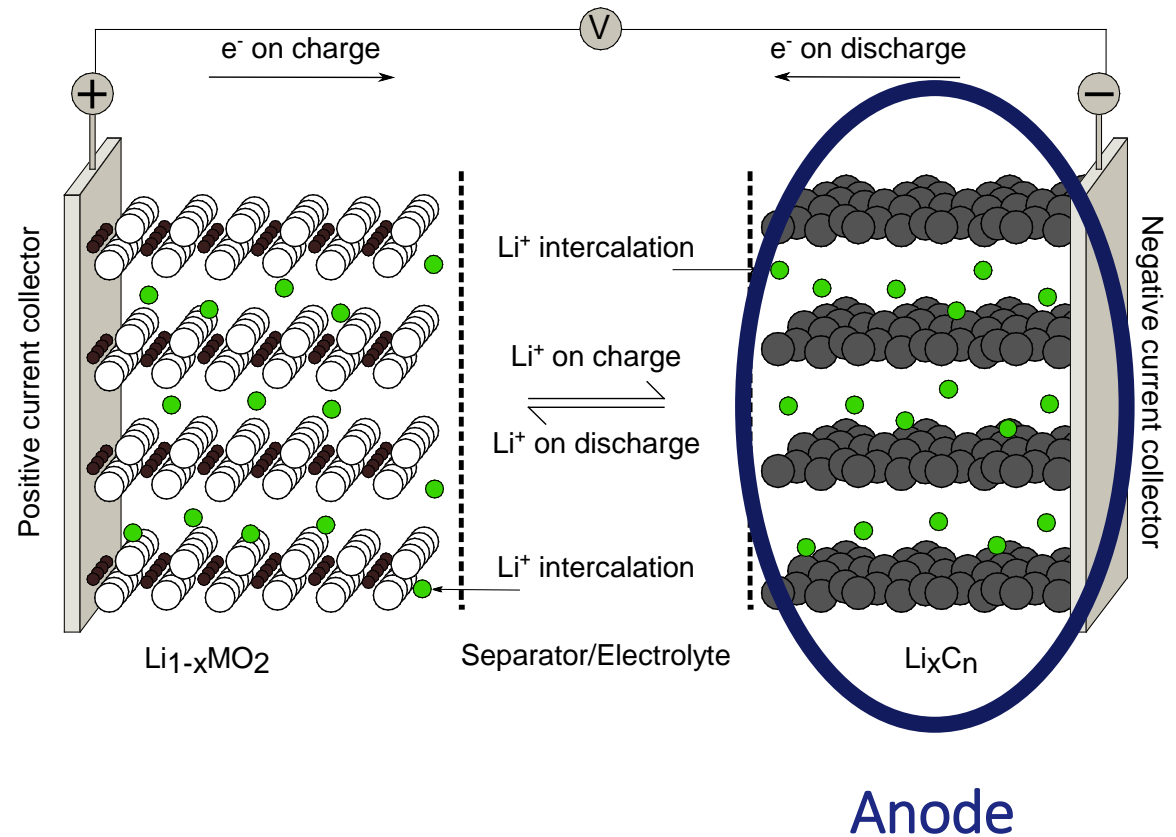
Better batteries
- what are the
challenges?



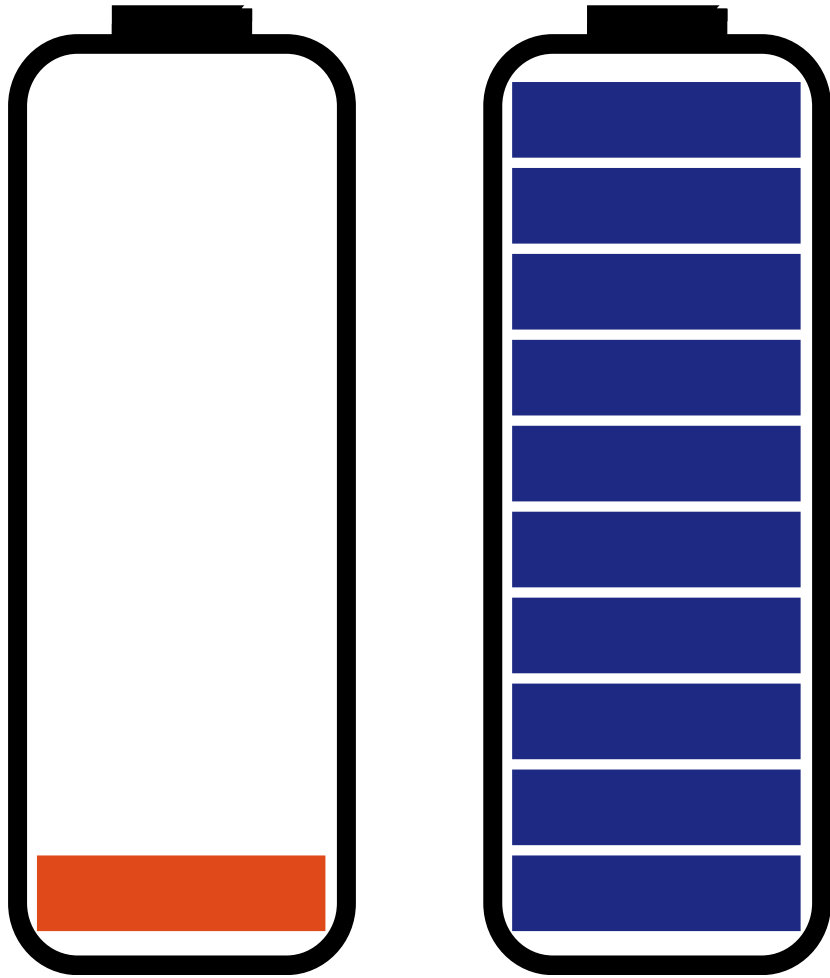
Battery value chain – where are we?



How does the battery work?



LI-ION STORAGE CAPACITY



Commercial
material

Silicon

Silicon

Silicon market

"It's a race among the battery makers to get more and more silicon in"

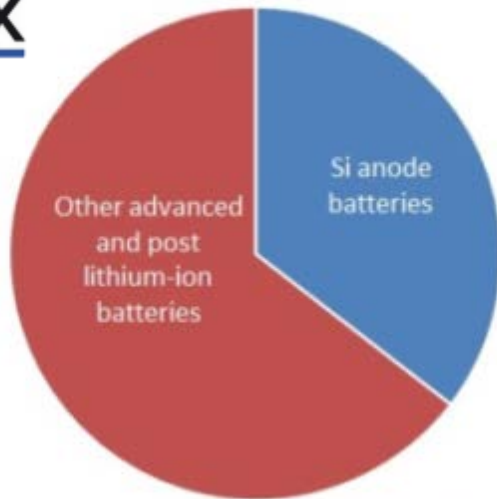
- Jeff Dahn, 3M and Tesla



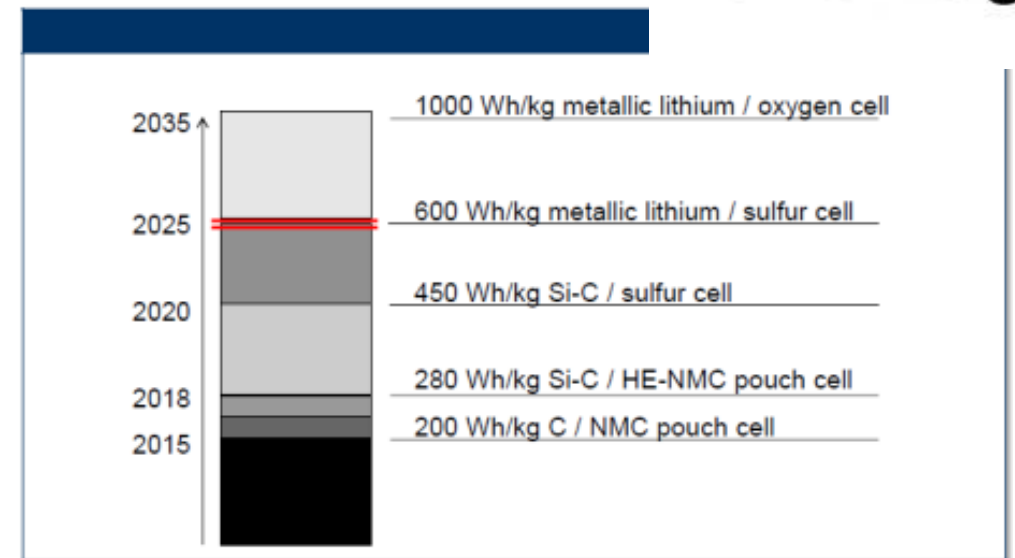
Volkswagen

IDTechEx

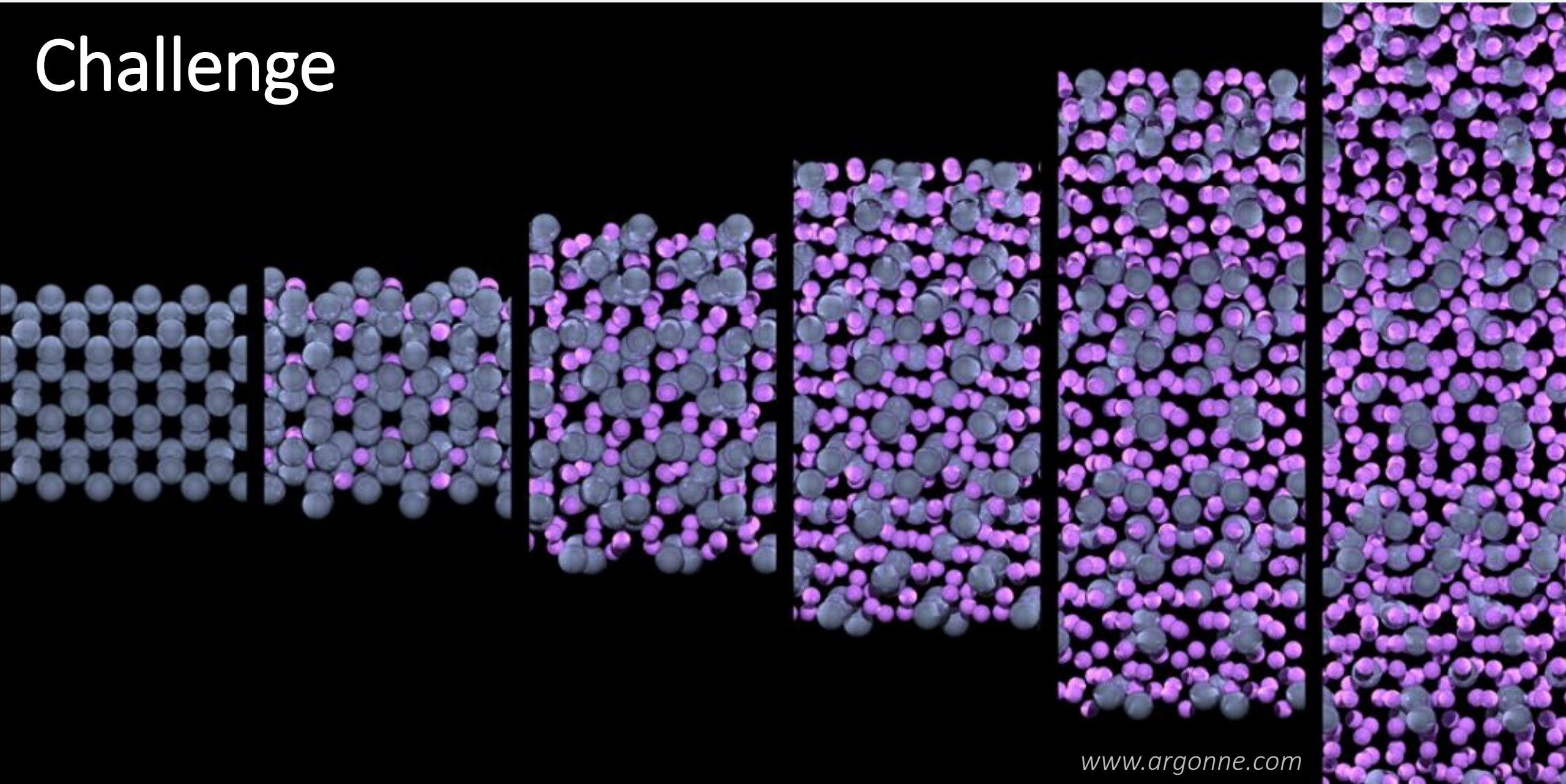
Advanced and Post Lithium-ion Battery
Market Split in 2026



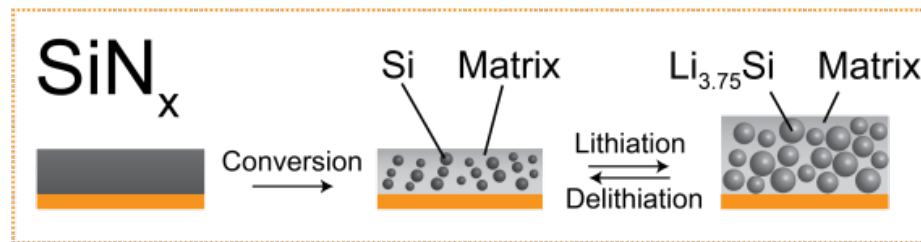
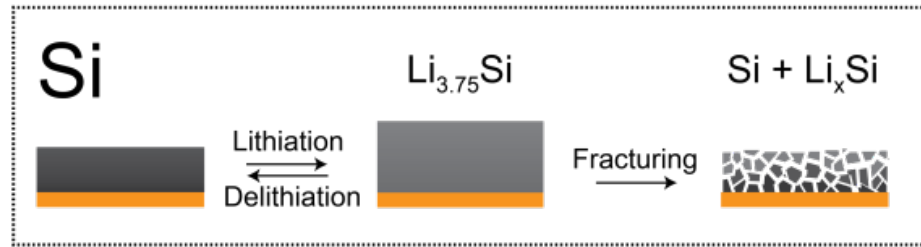
Technology steps of battery cells



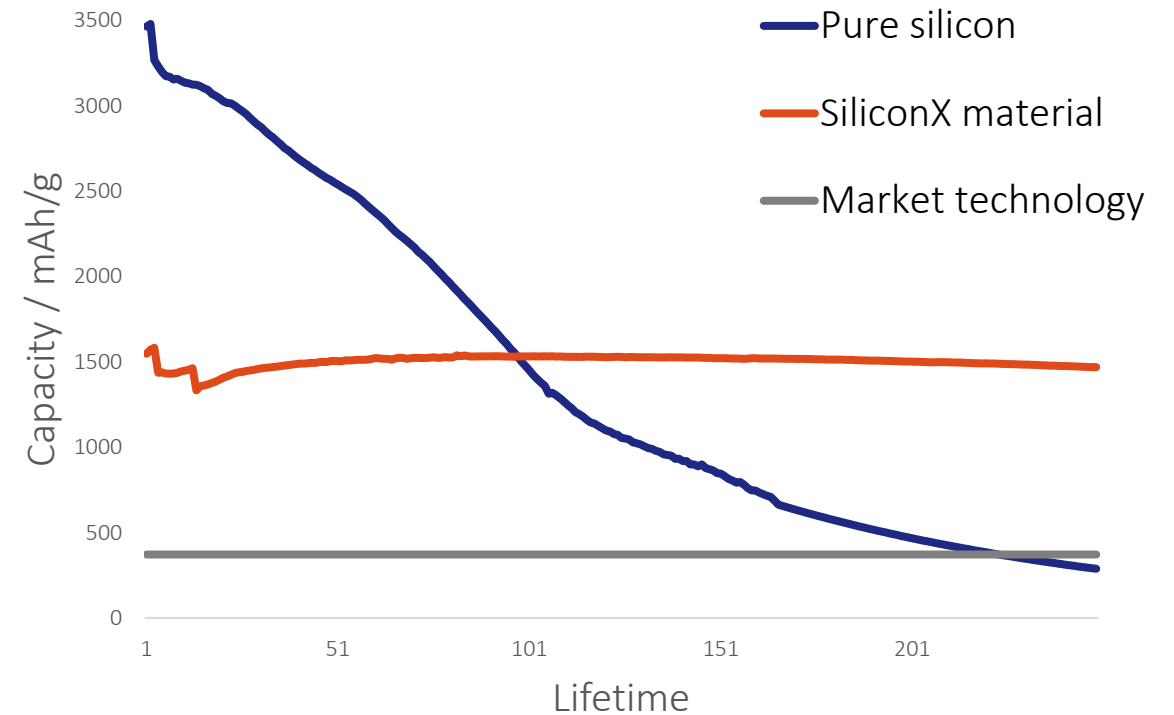
Challenge



Recent developments - SiliconX



- Using silicon nitrides
- Improvement of both capacity and lifetime



A close-up photograph of a laboratory setting. A hand wearing a bright blue nitrile glove is holding a small, clear glass vial and pouring a dark, granular substance into a clear petri dish. The substance appears to be a fine powder or small particles. In the background, two other vials are visible, one containing a dark liquid and the other a brownish substance. The text "Battery laboratories" is overlaid in the center of the image.

Battery laboratories

Silicon production laboratory

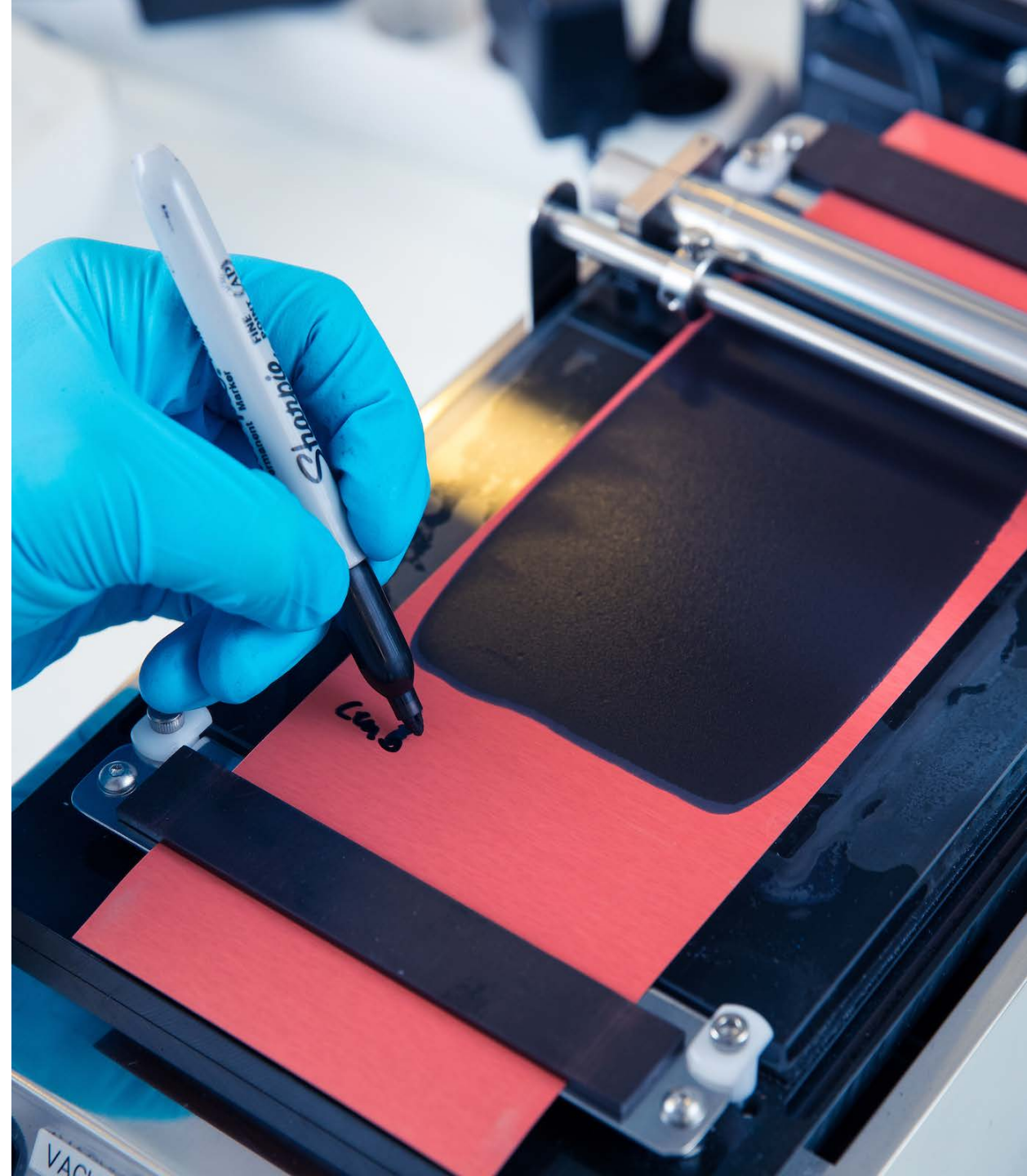
- Producing silicon based energy materials
- Free space reactors
- Gas-phase silane polymerization
 - Understanding the chemistry of silane
 - Production control
 - Flexibility in composition
 - Up-scaling



Battery development laboratory

How to optimize the battery

- Testing different Si sources
- Preparing electrodes
- Research on all components in anode (binder, carbon)
- As well as other battery components such as electrolyte, cathode
- Electrochemical testing of cells
 - Largest lab scale facility in Norway



Commercial battery laboratory

Battery research for end-users

- Strong cooperation with norwegian maritime industry
- Predicting life time of commercial battery cells and packs
- Evaluation of battery ageing through experiments and modelling



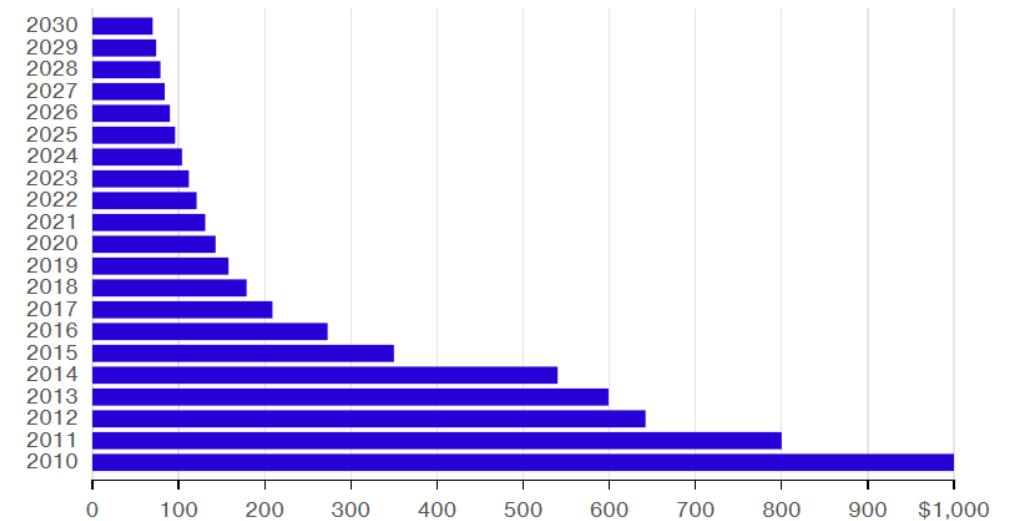
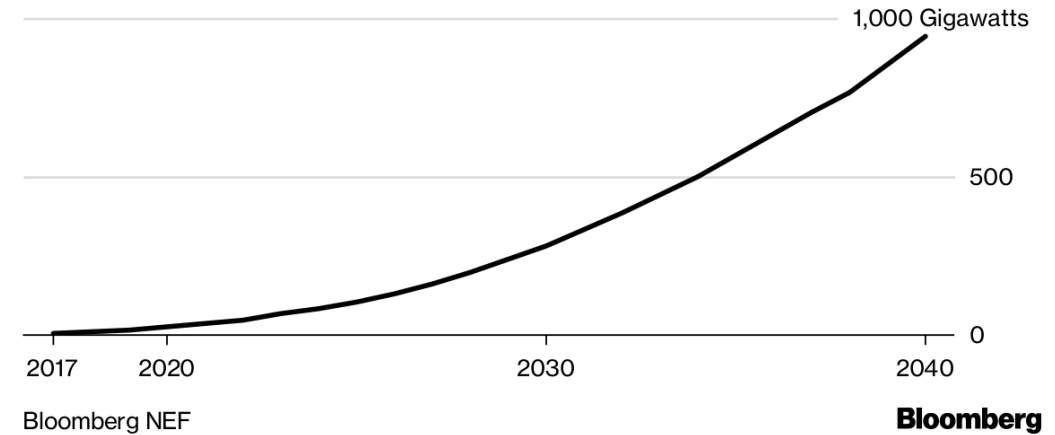
Future battery market

- Battery boom
- Giga factories
- Battery prices dropping

- New areas opening up with market developments:
 - Stationary storage
 - Recycling/urban mining
 - 2nd life batteries

Battery Bonanza

Global energy storage rising to one terawatt in two decades

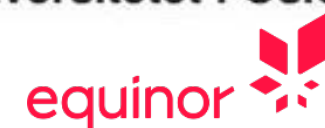


Source: BNEF

Note: Figures for 2018 and beyond are projections

Projects and partners

- Most of our projects are funded via Norwegian Research Council calls
 - EnergiX
- Larger focus on EU-calls
- Some direct projects with industry



Thank you!

Hanne Flåten Andersen
Battery Technology



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