
SODIUM/NICKEL-CHLORIDE BATTERY - BACK IN MARKET

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AGENADA OF TALK

- Fraunhofer IKTS in figures
- The Sodium/Nickel-Chloride Battery
 - Na/Ni-Cl₂ battery in a nutshell
 - Prospects of Na/Ni-Cl₂ Batteries for stationary energy storage
 - Current status of IKTS developments – The R-CUBE project
- Summary & Outlook

Fraunhofer IKTS in figures



Branches and sites	Head- quarters	Hermsdorf branch	Dresden- Klotzsche branch	Total
Personnel (full-time equivalents)	310	145	125	580
Operating budget in million €	26.3	10.8	13	50.1
Industrial revenues in million €	9.2	5.1	4.3	18.6

Latest update: April 2015

Institute Director:

Prof. Dr. Alexander Michaelis

Fraunhofer IKTS in figures



Headquarters

- Dresden, Winterbergstraße



Other sites

- Hermsdorf, Thuringia
- Dresden-Klotzsche



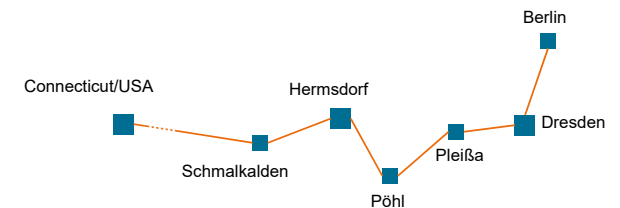
Fraunhofer Center

- for Energy Innovation CEI, Connecticut/USA



Application Centers

- Battery Technology Pleissa, Saxony
- Bioenergy Pöhl, Saxony
- Membrane Technology Schmalkalden, Thuringia



Na/Ni-Cl₂ battery in a nutshell

The Na/Ni-Cl₂ High
Temperature Battery (ZEBRA)

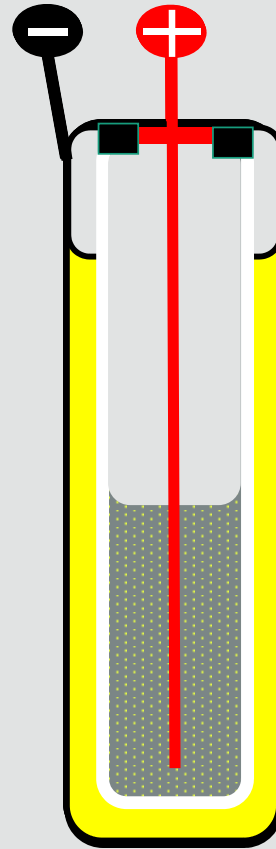
Operation Temperature:
250°C - 350°C

40Ah Cell
IKTS/R-CUBE
development

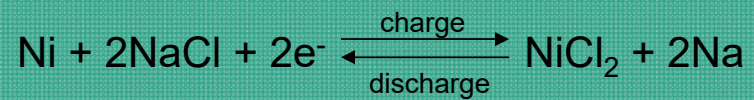


Na/Ni-Cl₂ battery in a nutshell

Cell Operation
Charging & Discharging



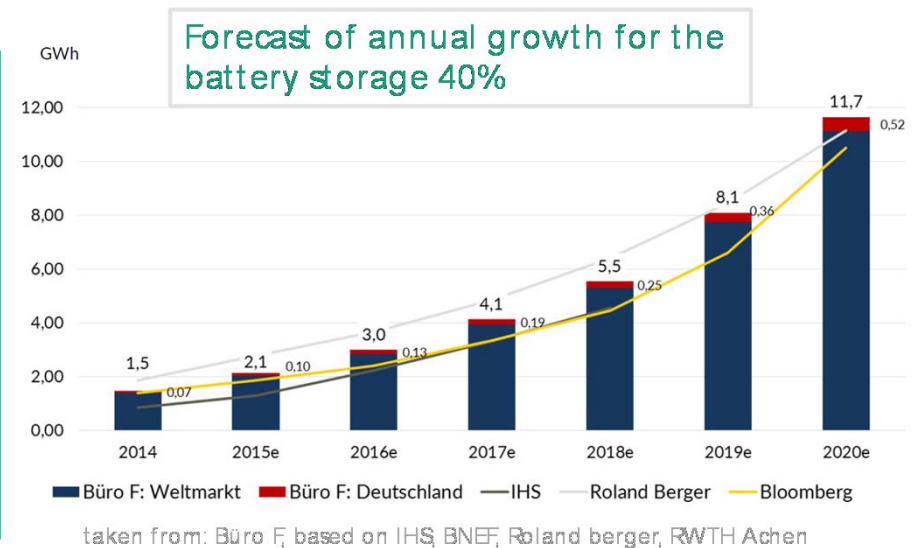
The Overall Cell Reaction:



Prospects of Na/Ni-Cl₂ Batteries for stationary energy storage

■ Business cases with batteries for stationary storage (more an European view)

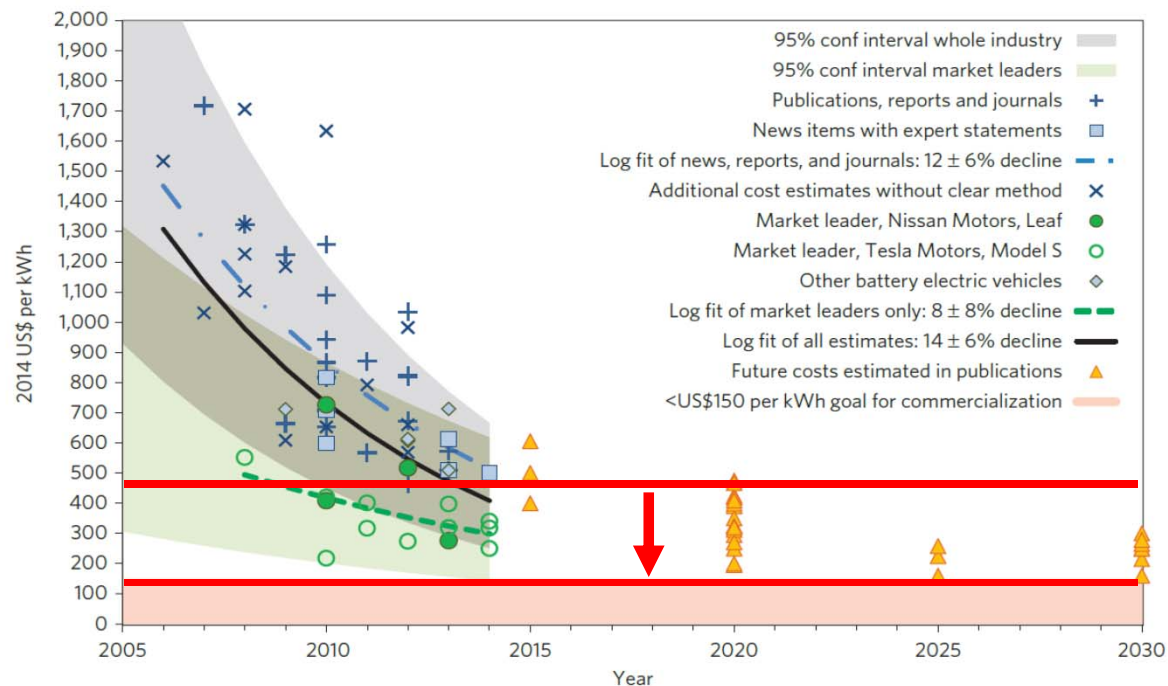
- Backup power & off grid power
- Self-consumption
- Demand charge reduction
- Electricity price arbitrage
- Renewable generation peak shifting
- Primary and secondary control reserve (grid stability)



Prospects of Na/Ni-Cl₂ Batteries for stationary energy storage

**Show-
Stopper**

Starting business at cell costs below 150 US\$/kWh for e-mobility
For stationary storage even lower cost targets



Nykvist et Al. 2015;
Cost of Li-ion battery packs in
Battery Electric Vehicles

Prospects of Na/Ni-Cl₂ Batteries for stationary energy storage

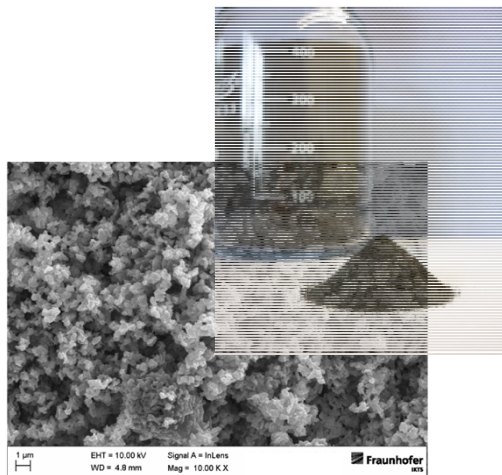
- The “**Holy Grail**” of batteries with high energy and power density, save operation, low costs,
- **Na/Ni-Cl₂ Technological benefits**
 1. Abundant and low cost materials
 2. Intrinsic safe, non toxic, non explosive and flammable
 3. Robustness (no cell balancing, no maintenance)
 4. Independent from ambient conditions
 5. Proven technology (since 1990’s)



Na/Ni-Cl₂ a cost efficient battery with reachable target costs < 100 €/kWh

Current status of IKTS developments – The R-CUBE project

- Joint development of Na/Ni-Cl₂ battery for Indian Market with R CUBE ENERGY STORAGE SYSTEMS LLP
- Project currently running
- ... from Materials to Components and Processes to Systems



Current status of IKTS developments – The R-CUBE project

- Development and Competencies along the complete value chain



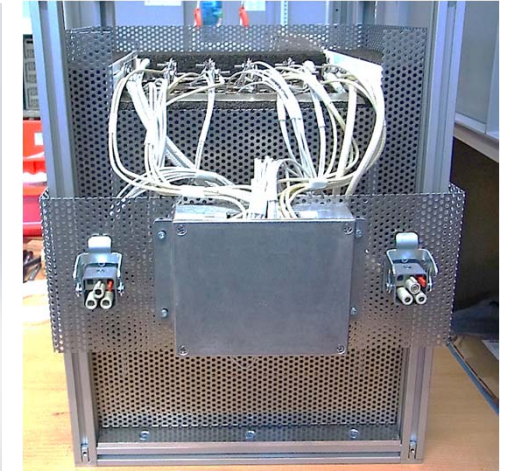
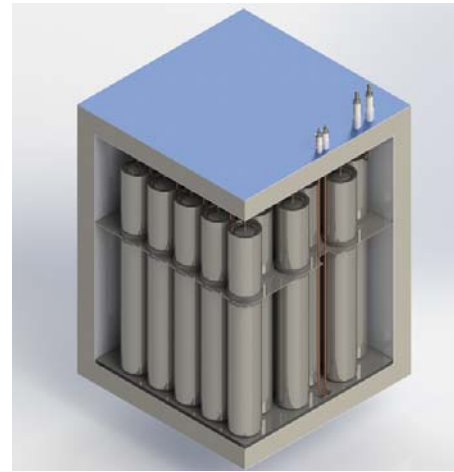
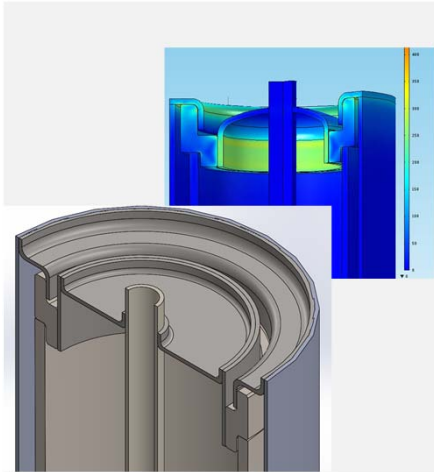
Materials

Components

Processes

Current status of IKTS developments – The R-CUBE project

- Development and Competencies along the complete value chain



Cell design, Modeling, Set Up, Testing

System design
&Modelling

Set up of
Prototypes

Summary & Outlook

- Business with batteries for stationary energy storage will start 100 €/kWh (cell level)
- Sodium Nickel Chloride batteries are an excellent candidate for
 - Economic
 - Efficient
 - Sustainable Energy storage
- IKTS provides know-how for joint developments
- IKTS commercializes Na/Ni-Cl₂ technology with partners from Industry
- There is (in minimum) one competitive battery technology beside Li-Ion!