
Powering the energy transition in the safest, most sustainable way

# In brief


Factory and RnD in Gävle, Sweden

HQ in Täby, Stockholm, Sweden

Nickel based battery technology

200 employees

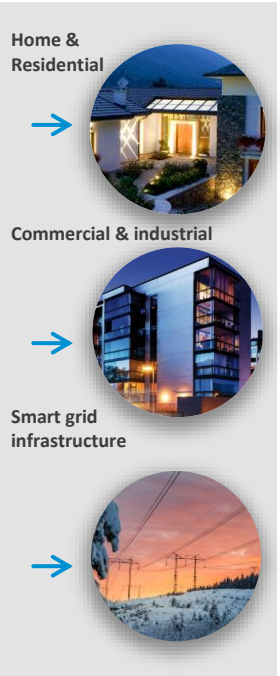
Unique production process

4 production lines

110+ patents

# Our offer


End customers



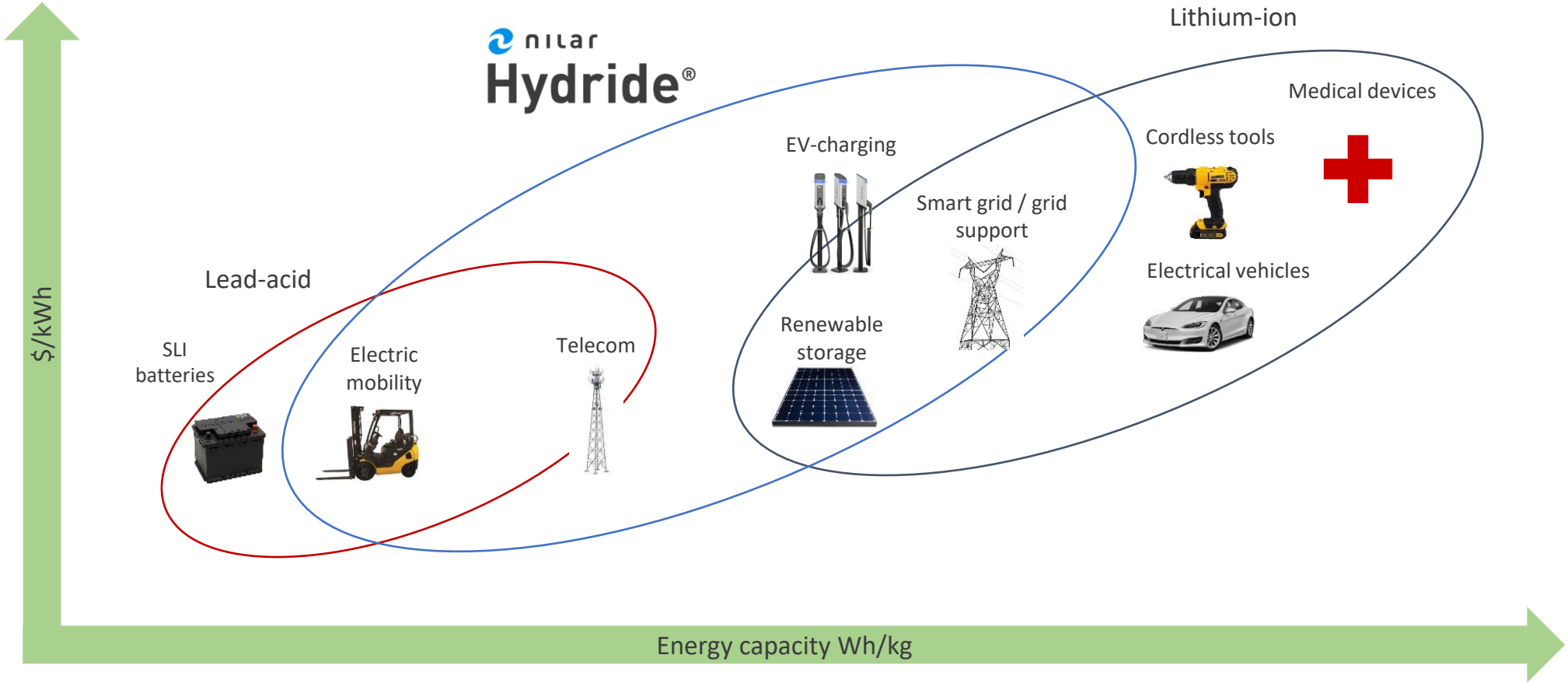
# Nilar provides a product portfolio for a wide range of needs

| | Battery pack | Home Box | Cabinet solution | Rack solution |
|---|---|---|---|---|
| |  Building block |  4x Battery Pack |  8x-20x Battery Pack |  40 Battery Pack |
| **Description** | Designed to meet different time shifting, buffering and peak shaving needs. The battery pack can be connected in a series to achieve system voltage of up to 600 V | Enables storage of excess solar energy and allows homeowners to become more energy independent by reducing peaks in power consumption and minimising grid fees | An ideal solution for energy storage in houses, buildings, apartment blocks and large estates. Can be scaled over time to meet increasing energy storage requirements | Developed for industrial applications, it can be scaled incrementally to meet increasing peak shaving and load shifting requirements |
| **Energy (kWh)** | 1,44 kWh | 5,8 kWh | 11,5-28,8 kWh | 57,6 kWh |

***All batteries can be integrated into custom solutions by system integrator customers within a broad range of applications and locations***

# Advantageous applications for Nilar Hydride®

Different applications suitable for different battery chemistries



ENERGY MANAGEMENT SYSTEM

ENERGY STORAGE

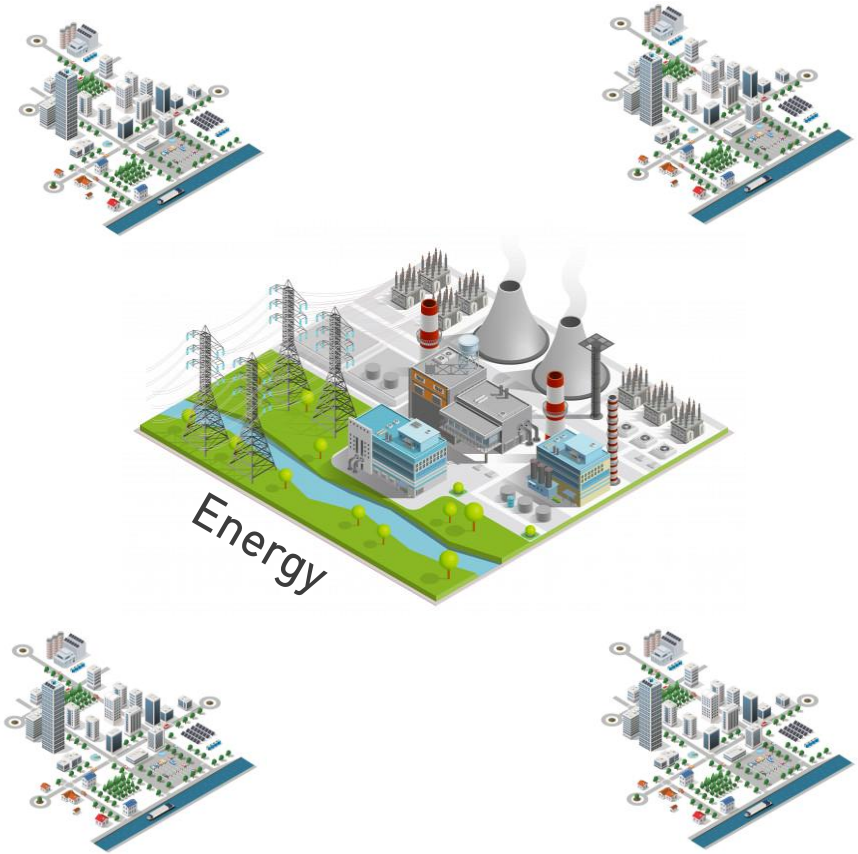
ENERGY PRODUCTION

USER LOADS

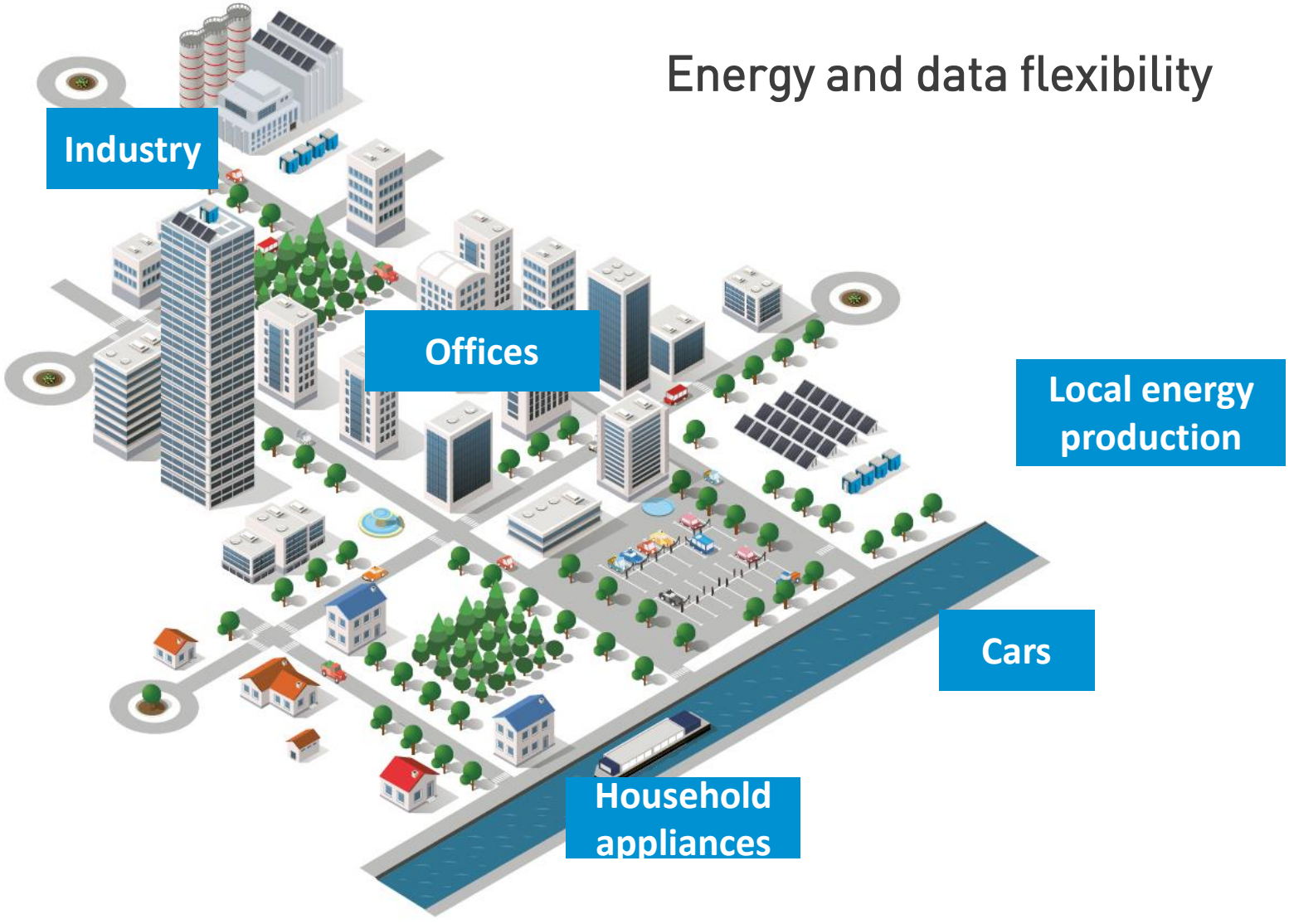
POWER CONVERSION UNITS

# Management today

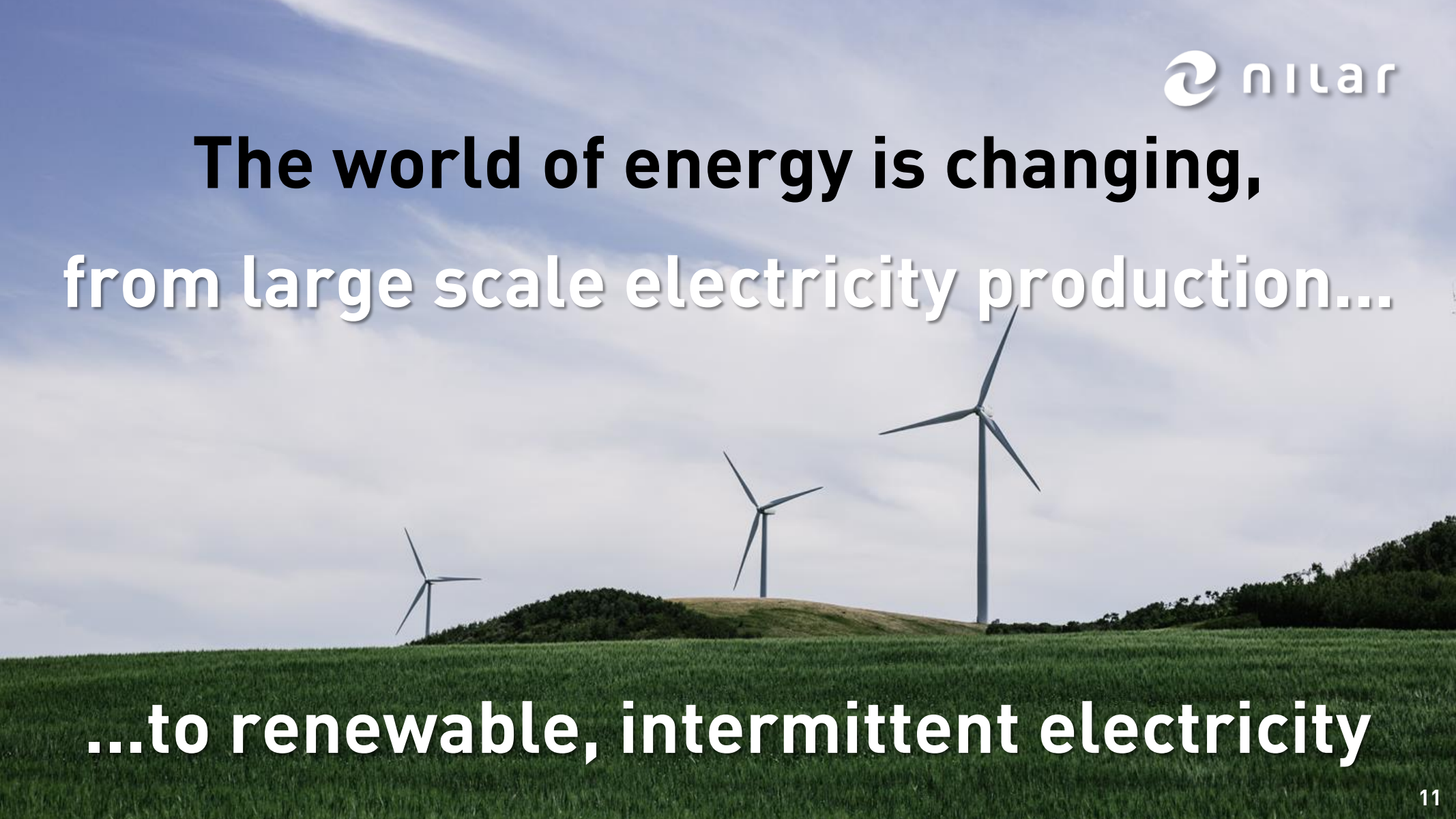
# Energy and data management today




# Energy and data flexibility




nilar
The battery that
makes you sleep well


nilar
The world of energy is changing,
from large scale electricity production...
...to renewable, intermittent electricity

CLEAN ENERGY WIRE

Journalism for the energy transition

ABOUT CLEW

09 Aug 2019, 13:54 Freja Eriksen

# Germany's grid management costs soar as high winds overstrain capacity

*#Grid #Renewables #Wind*

MERCOM India | clean energy news and insights

SOLAR

# Lack of Transmission Capacity a Growing Concern for Solar and Wind Companies

Growing skepticism on the strength of India's transmission system amid the influx of renewable projects

MAY 07, 2018 / SAUMY PRATEEK / GRID, GRID OPTIMIZATION

JLL

Article

# Renewables investors challenged by ageing infrastructure

**Investors in Australia's highly attractive renewable energy sector may turn elsewhere if challenges are not addressed**

October 22, 2019

Share:

Bloomberg

Business

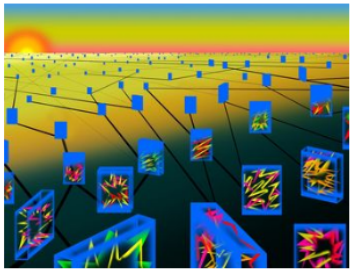
# Sweden's Lack of Electricity Capacity Is Threatening Growth

A shift toward renewables is overwhelming the nation's grid, leaving a potential Olympic Games in 2026 relying on reserve generators.

By Jesper Starn
3 maj 2019 06:00 CEST

LIVE ON BLOOMBERG
Watch Live TV >
Listen to Live Radio >
Bloomberg Television

European utilities are suffering as a boom in renewable energy squeezes margins at coal, gas and nuclear plants. *Photographer: AFP via Getty Images*

Bloomberg

Markets

## A Deluge of Batteries Is About to Rewire the Power Grid

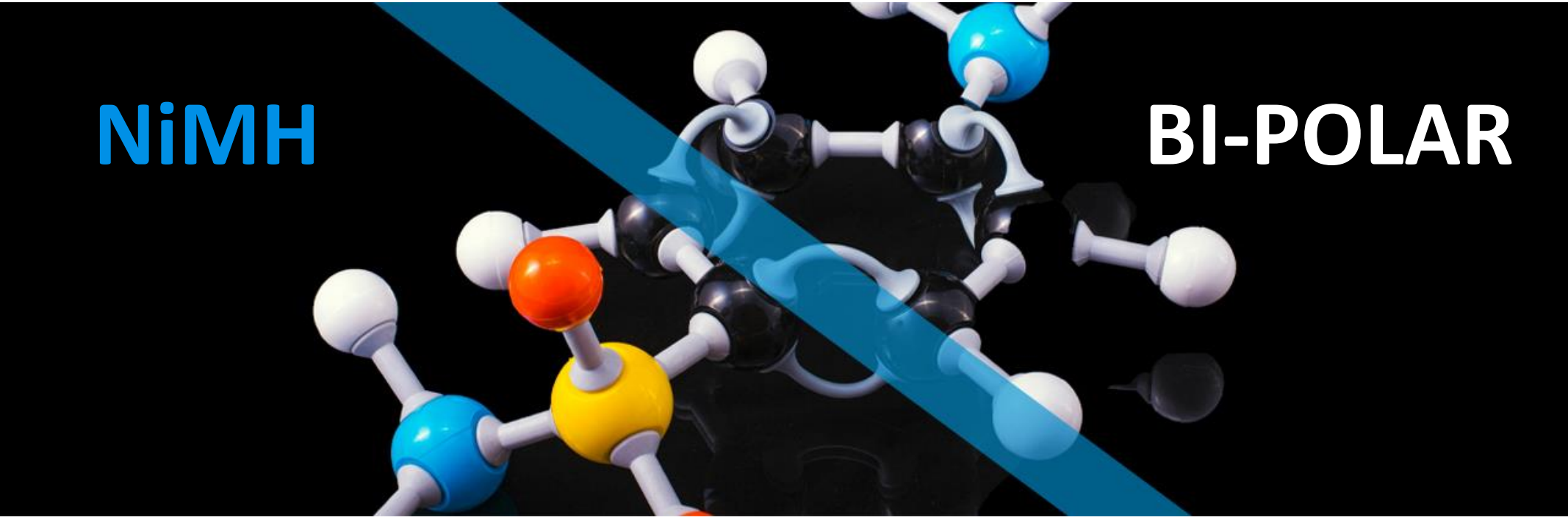
By David Stringer

Breakthroughs in energy storage are turning cars and homes into electricity providers.

August 2, 2019

# The two keys of success

How one plus one becomes three



# Safe and environmentally sound chemistry

**A nickel-based battery chemistry allows for the use of water based electrolyte**

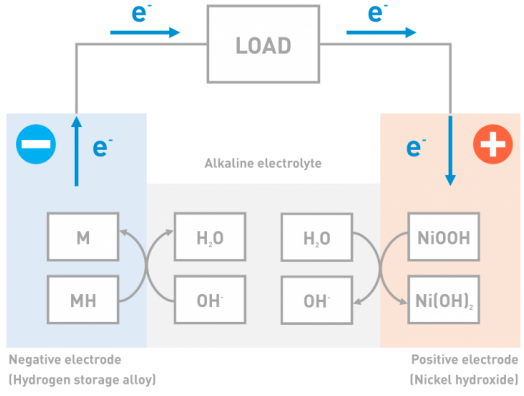
- Strong safety benefits as the electrolyte possesses attractive features such as non-combustibility and energy-absorbing capability
- Li-Ion batteries cannot use water based electrolyte

**Four metals used; a nickel base, nickel hydroxide, nickel alloy and cobalt**

- Nilar's batteries only contain 0.2% cobalt (which is less than other batteries)
- There are also environmental benefits due to recyclability

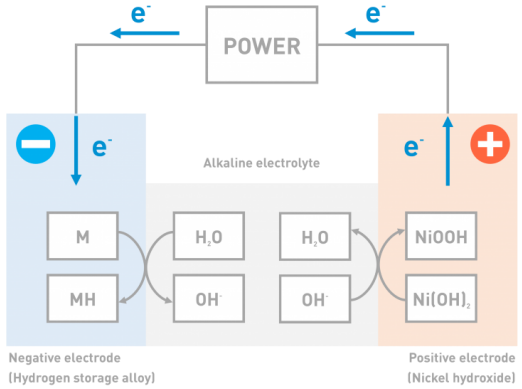
| | Charge product | Discharge products |
|---|---|---|
| **Positive material** | Nickel (III) oxhydroxide (NiOOH) | Nickel (II) Hydroxide ($Ni(OH)_2$) |
| **Negative material** | Metal hydride (MH) | Metal alloy (M) |
| **Electrolyte** | KOH | KOH |

DISCHARGE




- During charging, hydrogen moves from the negative active material (MH) to the positive active material (NiOOH)
- The metal hydride (MH) is drained of hydrogen and the positive active material is reduced to Nickel hydroxide ($Ni(OH)_2$)

CHARGE




- During charge, the hydrogen moves in the opposite direction as compared to the discharged
- During charge, Nickel hydroxide ($Ni(OH)_2$) in the positive electrode lose hydrogen and the metal alloy (M) take up hydrogen to form a metal hydride (MH)
- When losing hydrogen, the Nickel hydroxide oxidises and the positive active materials becomes Nickel oxyhydroxide (NiOOH)

# Bi-polar design

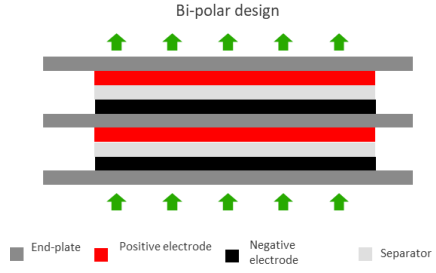
Providing unique characteristics

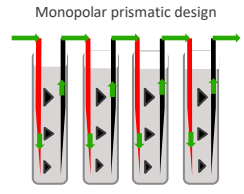
## Bi-polar design

- Anode and cathode are laid horizontally and stacked on top of one another with separator in between, enabling an easy assembly and gain maximum space efficiency
- Whole cell area is used for charge transfer, offering resilience to high current operation
- Uniform charge transfer over surface results in less resistance, lower heat and longer battery life

## Monopolar design

- Higher resistance due to longer paths for electric current
- Charge transferred between cells needs inter cell connector
- Resistance in connectors may generate efficiency loss



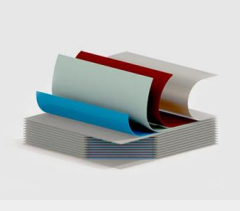




*In a prismatic cell, the current must flow through cables in each cell, as shown in the figure. This is not necessary with Nilar NiMH bi-polar Modular Battery Energy Storage.*

### BI-POLAR DESIGN

Bi-polar battery and bi-plate assembly

- The core technology of our battery.



Grouping of primary cells into a bi-polar battery

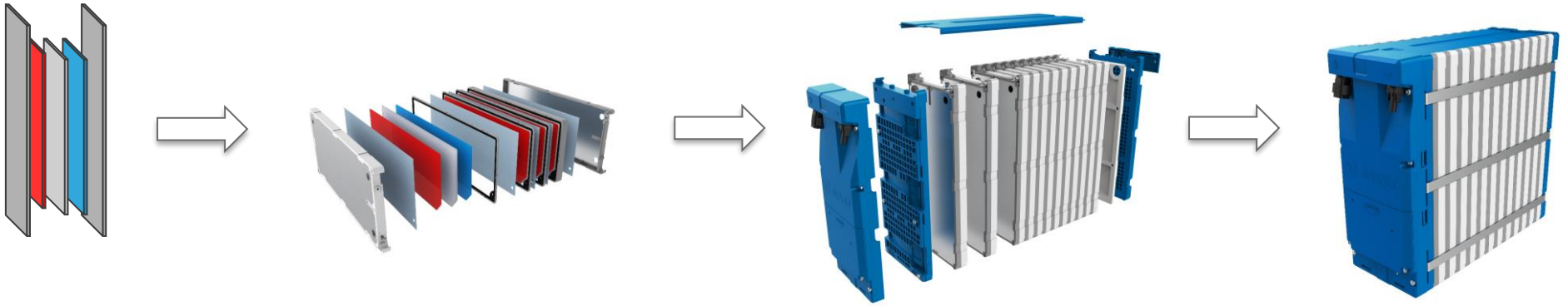
- Simple and automated process to lower costs.

Method for manufacturing electrodes

- Low-cost dried powder process for manufacturing electrodes.

# Nilar battery

From cell to pack



Cell

10 cells = 1 module

12 modules = 1 pack*

Each cell has voltage of 1,2 Volt
In a pack* this means:
1,2 Volt x 10 x 12 = 144 Volt



*Other amounts of modules could be used in a pack.

# BMS overview

- Components and functionality

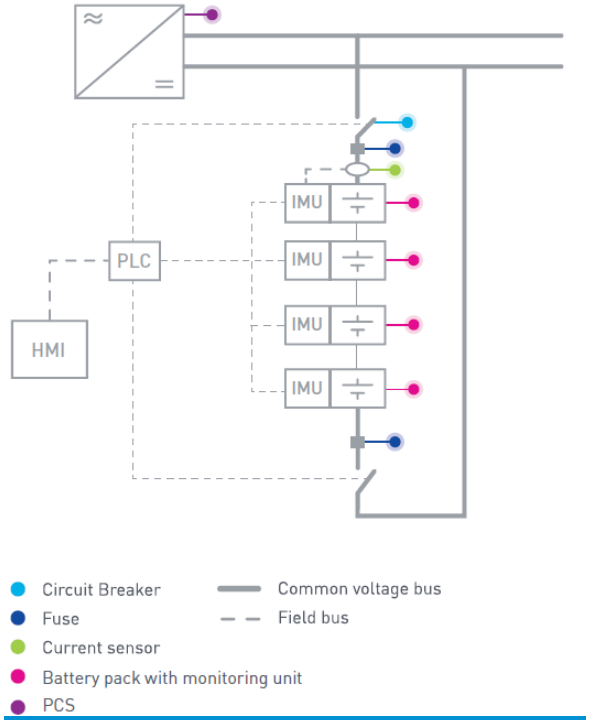
The Electrical Energy Storage is controlled by a BMS that protects and controls the batteries to maintain a long service life. The BMS includes:

- Programmable Logic Controller (PLC)
- Human Machine Interface (HMI)
- Fuses
- Contactors

Nilar BMS is based on specific characteristic of Nilar battery packs and is developed to optimise utilisation of installed battery capacity and service life.

- Issues warnings or alarms to higher level EMS when battery conditions are out of range.
- If critical conditions are detected in a string, the BMS will disconnect the string.
- Settings optimised by Nilar - depending on the system and application.

Each battery has its own Integrated Monitoring Unit (IMU) that communicates via an isolated communication bus to the PLC system. The IMU is placed on each battery pack and connected to the PLC by insulated



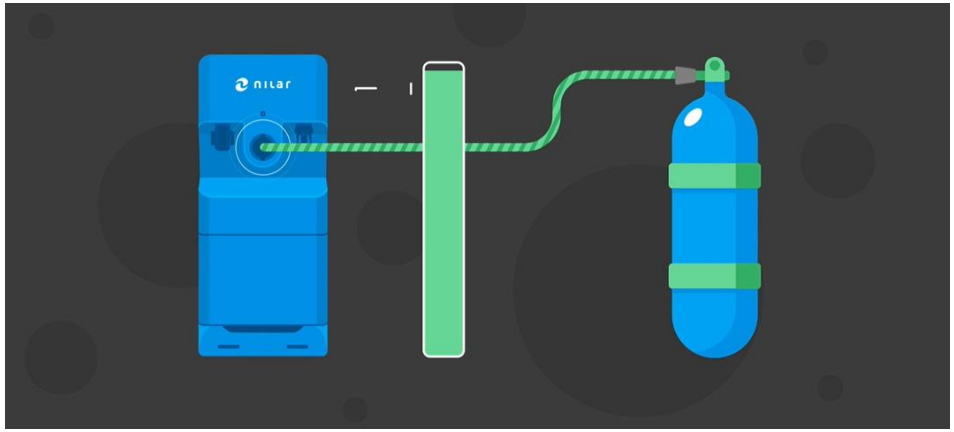

**Communication interfaces supported by BMS:**

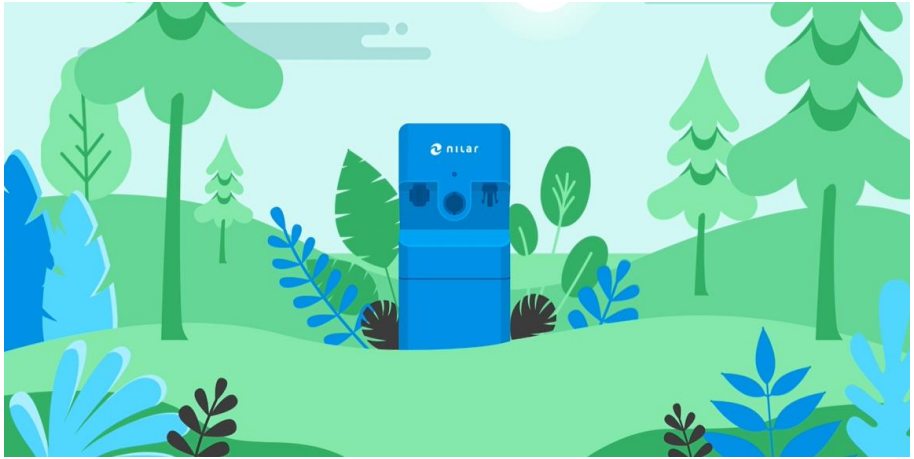
- Modbus TCP/IP
- Modbus RTU
- CANopen (custom integrations)

# Nilar Hydride® Re$O_2$™

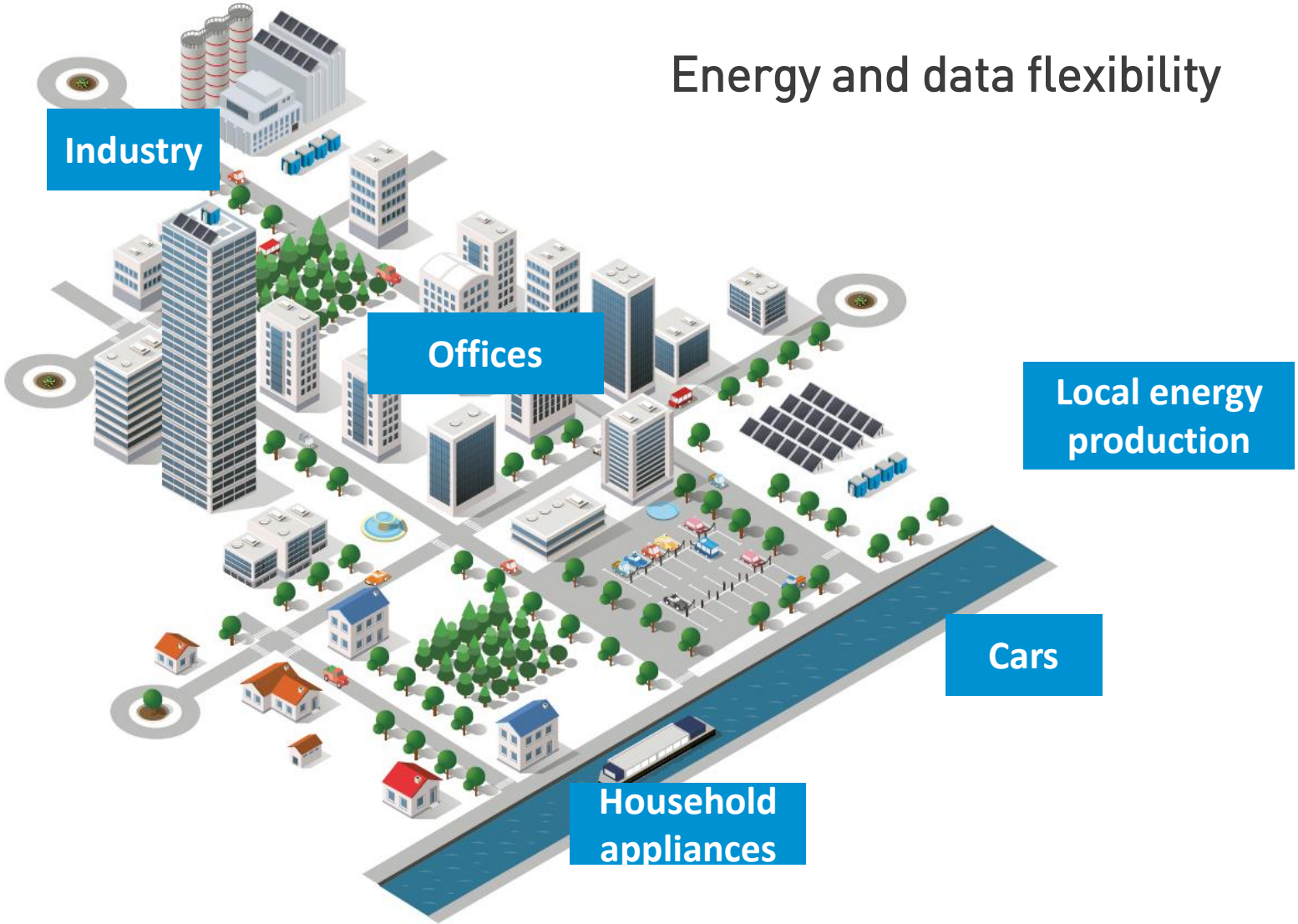
| Other battery | New battery | New battery |
|---|---|---|
| nilar | Re-$O_2$ | Re-$O_2$ |

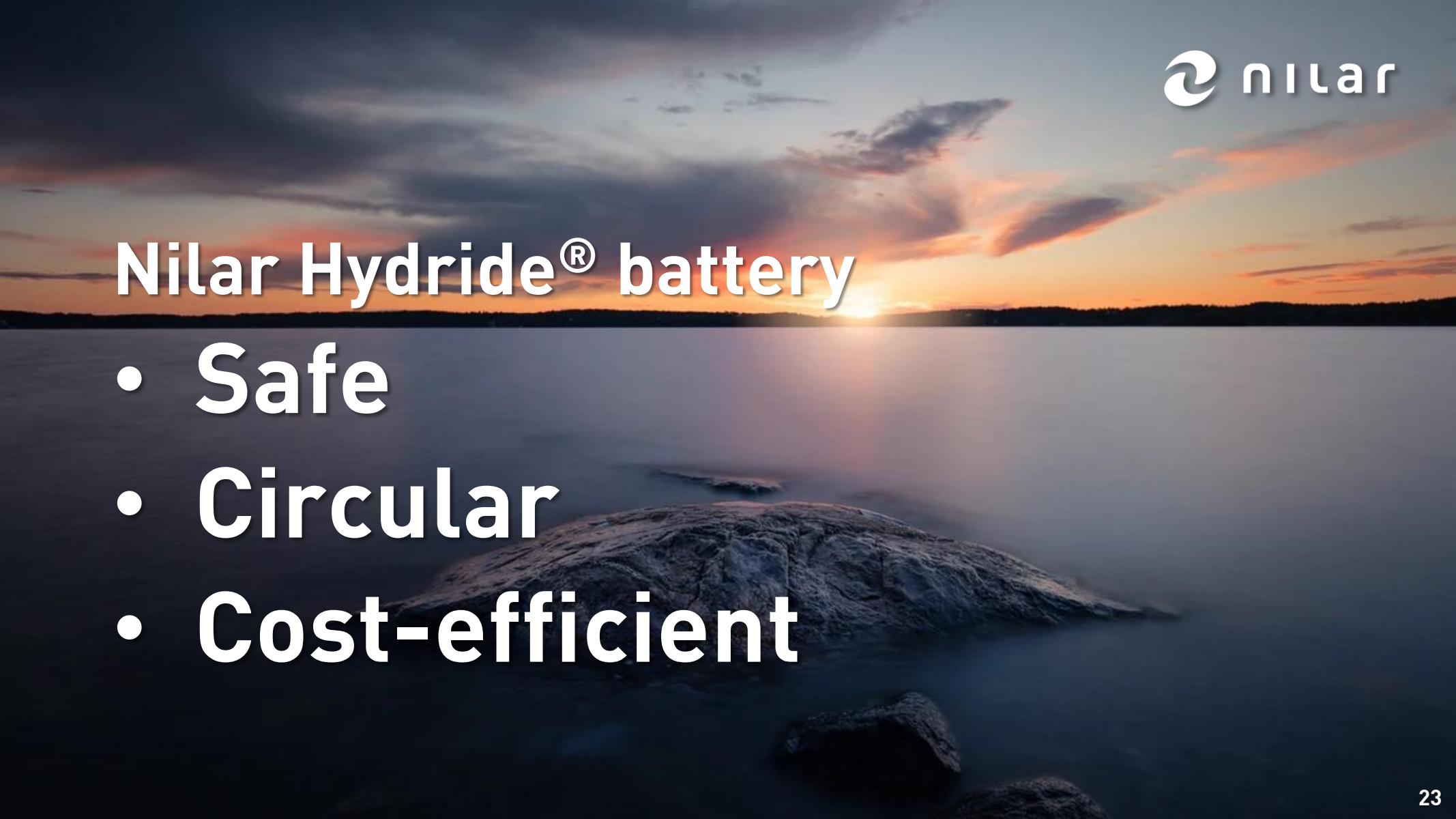
# A circular battery



# Energy and data flexibility




nilar
Nilar Hydride® battery
• Safe
• Circular
• Cost-efficient


nilar
The battery that
makes you sleep well

# NILAR.COM

**Martin Holsner**
Nordic Sales Manager
Martin.holsner@nilar.com
0737 - 04 04 15