Electriq

Hydrogen Powder: A revolution in *Hydrogen storage and release*

The Hydrogen Value Chain Course, June 2024

Dmitry Lisitsin, Ph.D.
Head of Fuel R&D group

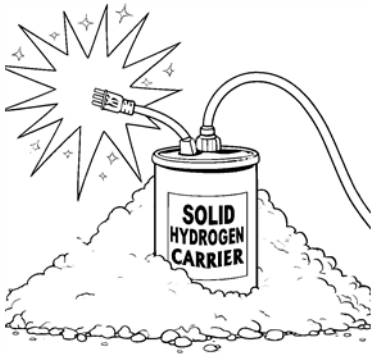
HYDROGEN ISRAEL

Electriq in Hydrogen Eco System

H_2 Production → **H_2 Storage** → **H_2 Distribution** → H_2 Utilization

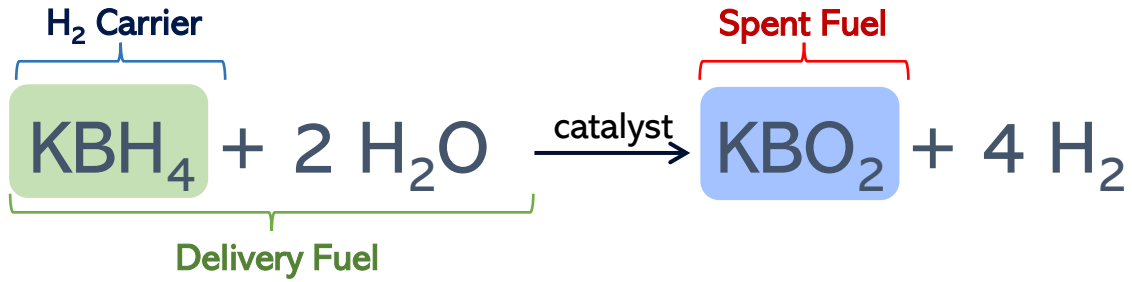
- **Electrolysis**
- **Reforming**
- **Thermal**

Electriq



- **Chemical**
- **Combustion**
- **Fuel Cell**

Our Solid Carrier Technology

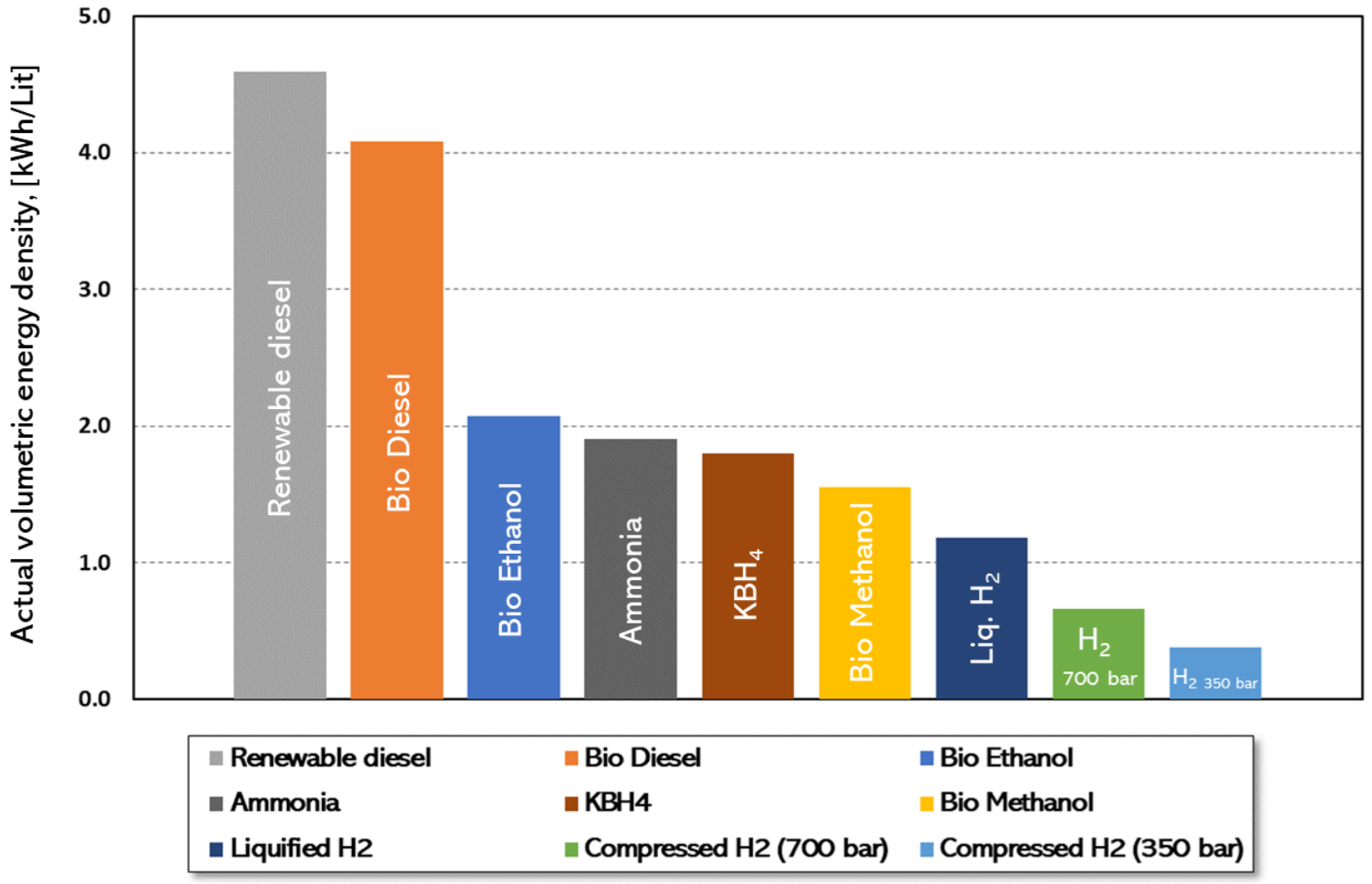


- KBH_4 hydrogen density is ~ 7.5 %wt (kg_{H2}/kg_{KBH4})
- Highly water soluble with almost no spontaneous H_2 release at room temp.
- 50% of the H_2 derived from the B/H and the additional 50% from the H_2O
- Fuel (KBH_4+H_2O) hydrogen density is ~ 15%wt (kg_{H2}/kg_{KBH4})
- 99.999% H_2 is produced
- KBO_2 (spent fuel) has high solubility in water

7 kg_{KBH4} = 1 kg_{H2}

1 kg_{KBH4} = 2.35 kWh_e

Volumetric Energy Density of KBH_4



Electriq powder: transportation advantages

Liquid Hydrogen

- Requires transportation in dedicated liquid H_2 tankers
- Maximum tanker capacity 37,500 m^3 H_2 ➔ 2,700 ton H_2

Ammonia

- Requires transportation in fully refrigerated ammonia tankers
- Maximum tanker capacity ~ 100,000 m^3 ➔ 12,000 ton H_2

Solid Powder (KBH_4)

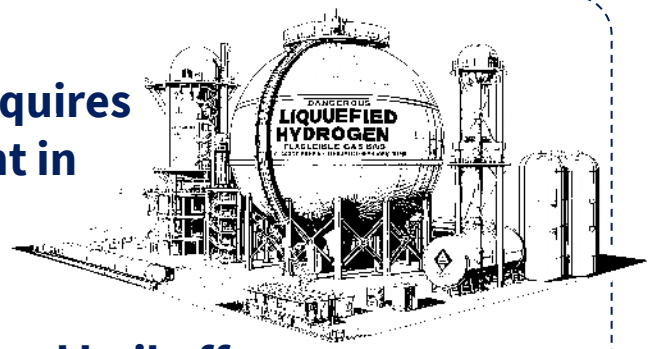
- Allows marine shipping via standard container ships
- Container ship capacity > 350,000 ton KBH_4 ➔ 50,000 ton H_2

Electriq powder: storage advantages

- Leakage risk
- Pressure & Temp. control
- Storage capacity limitations
- Regulatory compliance
- Risk of corrosion
- Risk of explosion
- Special space consuming equipment

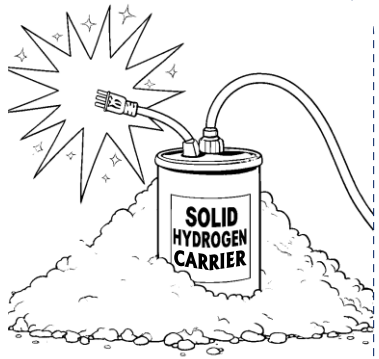
Hot Spot Application: Backup Power Supply

Unique *DIS*advantages of Hydrogen



- Space consuming, requires expensive investment in safety
- 24/7 investment in prevention of leaks and boil offs
- Regulatory restrictions hamper usage in sensitive areas
- Continuous investment in storage combined with rare backup power use dramatically increase the actual Hydrogen cost

Unique advantages of Electriq's technology



- Safe and space saving storage
- No investment required until the release process is initiated
- Since the hydrogen is chemically bounded, no single molecule will escape KBH_4 after years of storage
- No external power source is needed for spontaneous release process

Electriq's Circular Solution

Powder production & Recycling

Electriq Powder is safe for transportation and storage; inert and non-flammable

Powder Transport & Storage

Spent Fuel for recycling

Release System

Low temperature, low pressure release system optimal for off-grid applications

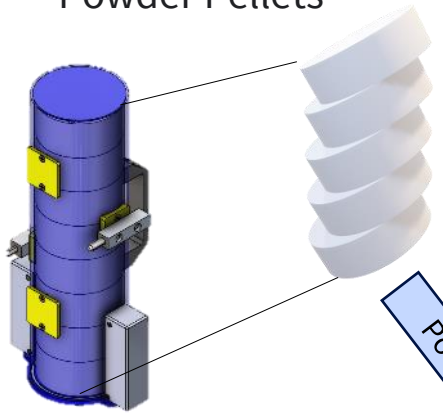
End to End IP Coverage

Powder Production and Recycling, Hydrogen Release Tech & System

How does it work?
Electriq's Hydrogen Release Solution Essentials

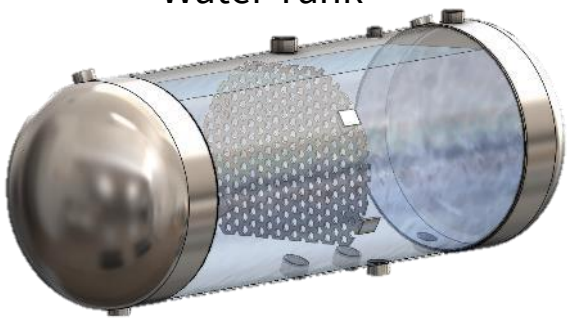
Fuel Preparation

Compressed Electriq Powder Pellets



Pellets Loading Unit

Water Tank



Powder

H_2O

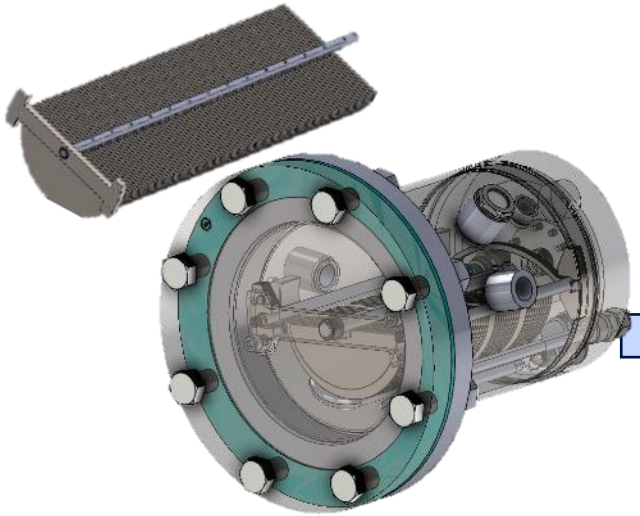
Blender (Powder+H_2O)

Fuel

Fuel Realization

No H_2 Release

Max H_2 Release



H_2

Reactor + Catalyst Pack

H_2 Conversion to Electricity

e^-

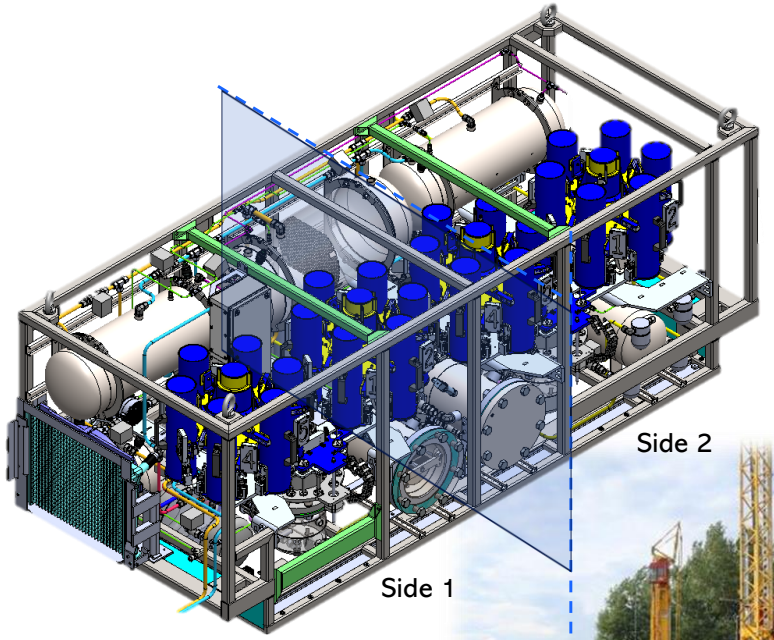
3rd party Fuel Cell

Powder to Power
Electriq's Hydrogen Release Systems

3 kW system

- More than 1,000 working cycles
- Serves Electriq's lab since 2022

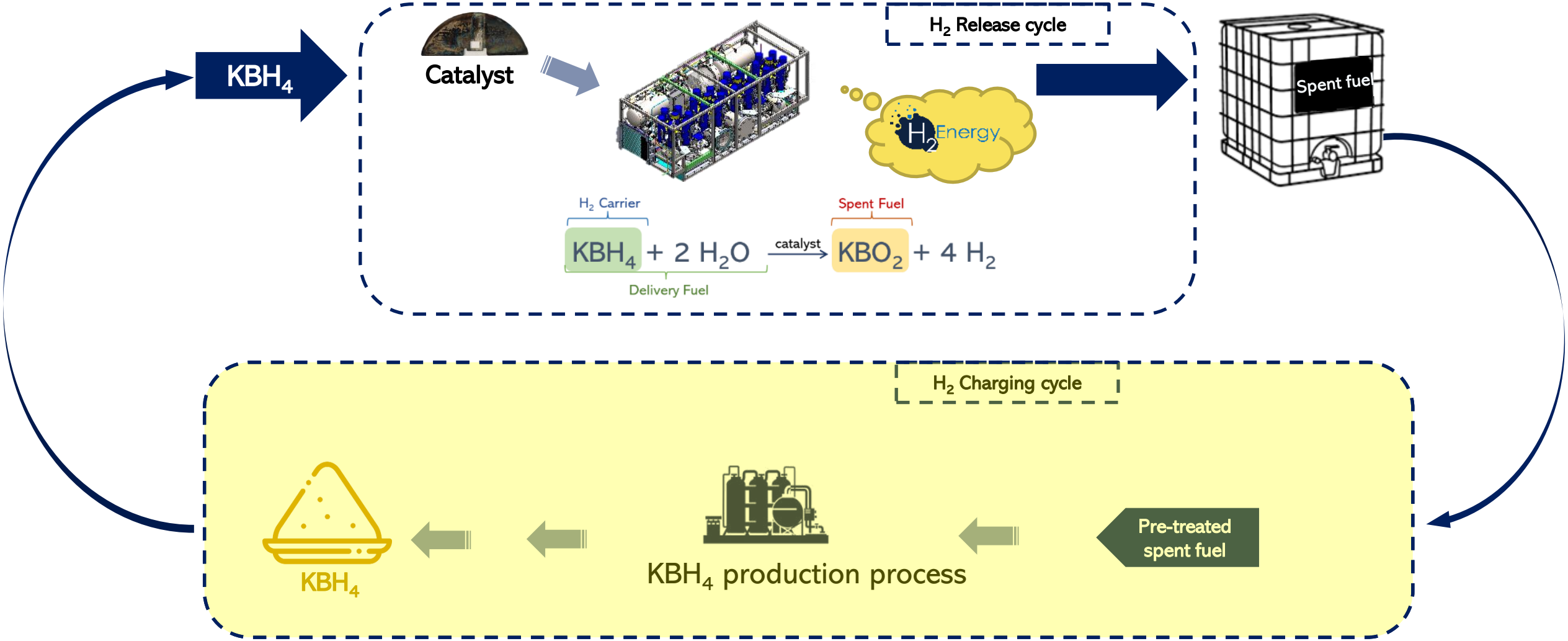
2 x 8 kW system



- First commercial installation

- Serves RKB Rotterdam

Powder to Power Charging Cycle



Powder to Power Charging Cycle

- The technology is based on a well-known industrial KBH_4 production process
- Electriq adapted the process to work with spent fuel as a source for KBH_4
- Few process improvements were implemented to:
  - Drastically reduce the energy consumption
  - Drastically reduce chemical consumption

	DIESEL	Brown KBH_4*	Green KBH_4
CO_2 footprint	2.68 kg_{CO_2}/lit	2.59 kg_{CO_2}/lit** (Density 0.7 kg/lit)	< 0.48 kg_{CO_2}/lit** (Density 0.7 kg/lit)
Practical Carbon index**	0.89 kg_{CO_2}/kWh (247 gr_{CO_2}/MJ)	1.49 kg_{CO_2}/kWh** (413 gr_{CO_2}/MJ)	< 0.28 kg_{CO_2}/kWh** (< 77 gr_{CO_2}/MJ)

* - KBH_4 currently available on the market

** - Carbon index is calculated according to *"Argonne GREET1_2021 Model"*

Thank you

Contact us
Danny Weber, VP Business Development
Email: danny.weber@electriq.com
Phone: +972-54-2312643