

Keynote Energy Industry

*The role of lightweight in the transition towards a fossil-free energy system:
Lightweight construction and advanced materials supporting new energy solutions
- a case study.*

Magdalena Sandström

EVP BU Wind
Diab International AB
Sweden



Bernt Erik Westre

Chief Technology Officer
Minesto AB
Sweden



Thursday June 8

Lightweight Construction and Advanced Materials Supporting New Energy Solutions – A Case Study



European Lightweighting Network Conference
Stockholm, 8th of June, 2023

Magdalena Sandström – EVP BU Wind, Diab
Bernt Erik Westre – Chief Technology Officer, Minesto



MAKING PRODUCTS
MORE COMPETITIVE,
CIRCULAR AND
SUSTAINABLE

ALWAYS AT THE CORE
OF YOUR ^{SUSTAINABLE} SOLUTION

www.diabgroup.com

The leader of sustainable composite core material development for over seventy years

The broadest range of stronger, lighter and recyclable structural core materials

Founded in the 1950's

Global company with 6 manufacturing sites, 14 sales companies and global distributors

About 800 coworkers

Owned by Ratos

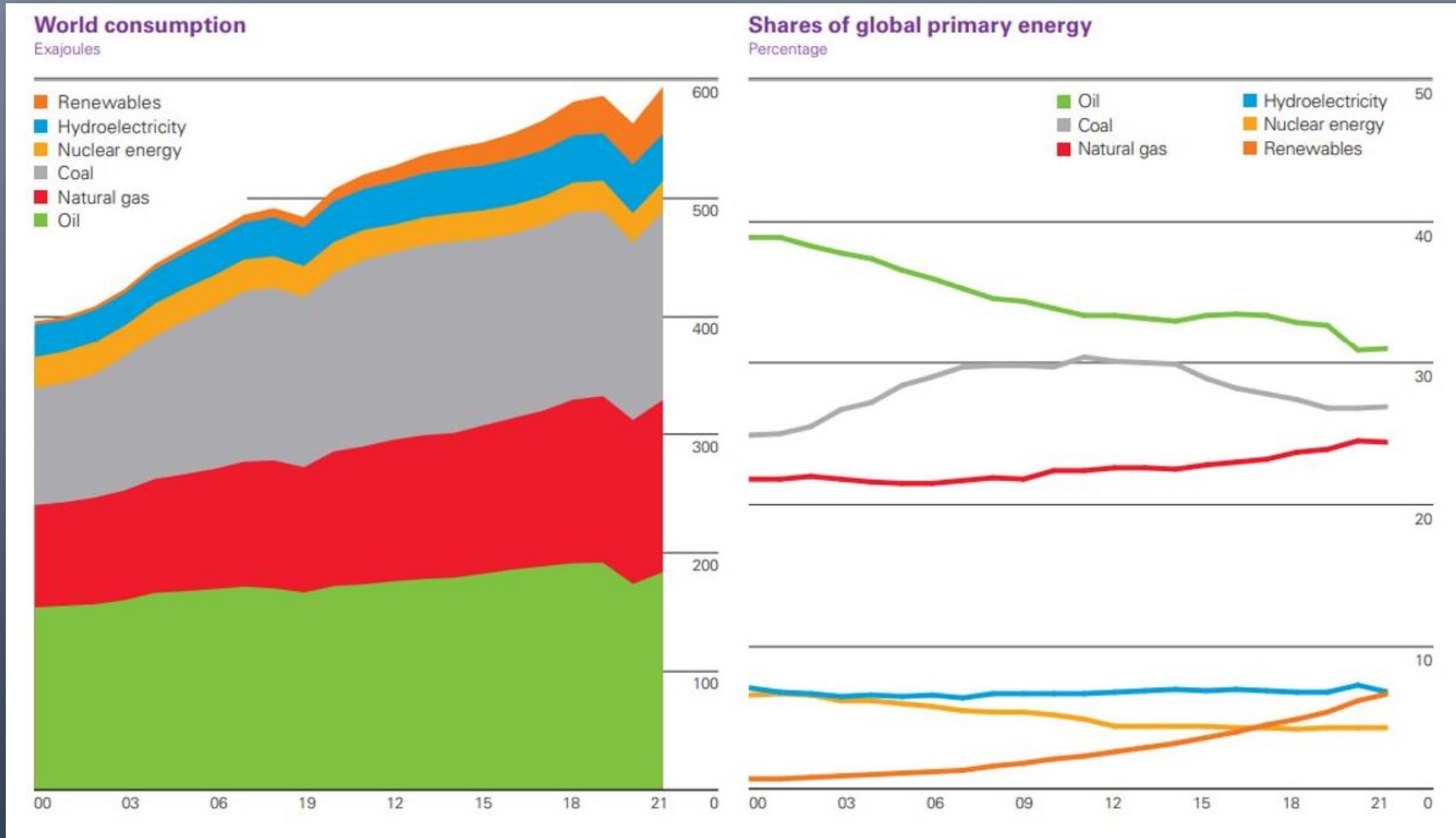
Within our business units, we focus on four application areas:

BU Wind

BU MIA - Marine, Industry, Aerospace

Diab is the only company in the industry reducing our carbon footprint in line with Science Based Targets

World Energy



Source: BP Statistical Review of World Energy 2022

Wind Turbines



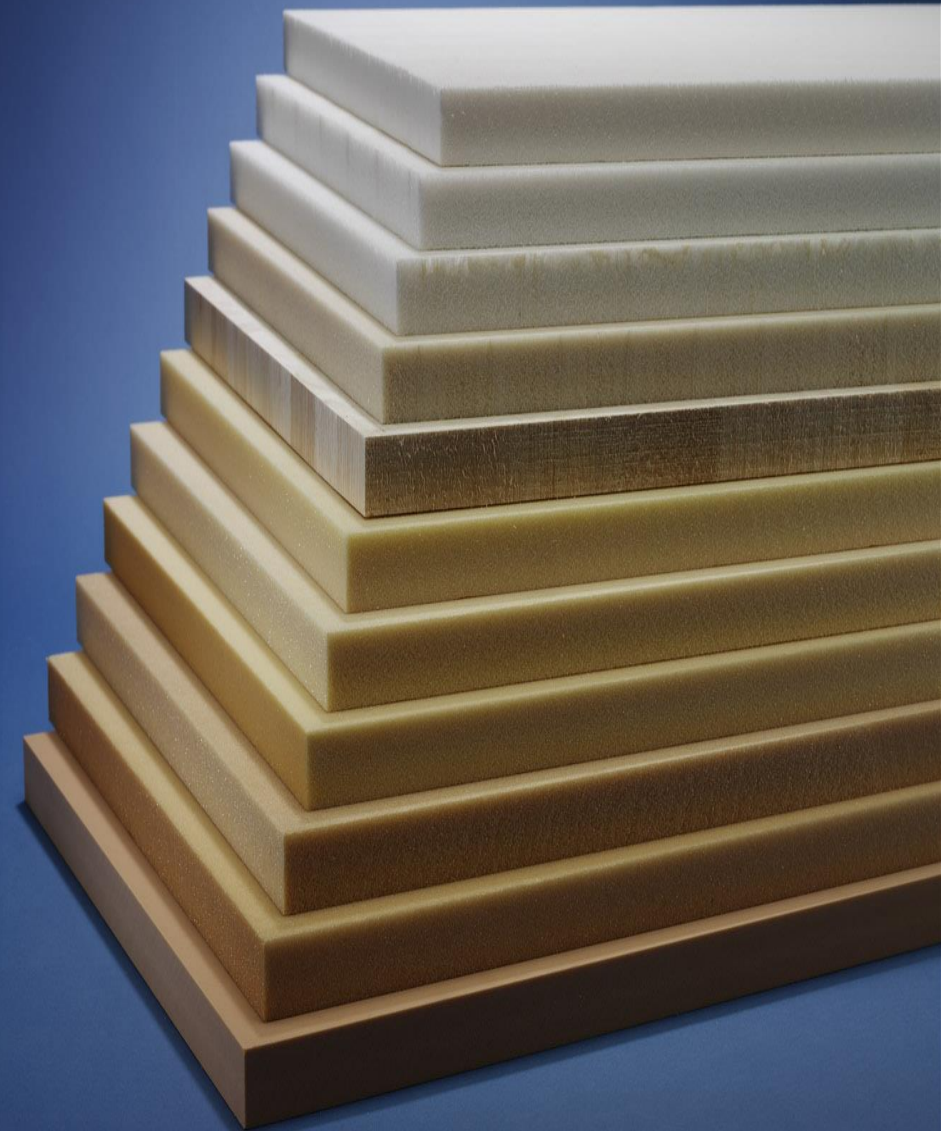
Open Hydro



CorPower Ocean



Diab



A high-tech impact company



Founded 2007 – SAAB Group spinoff

60 employees – operations in Sweden, UK, Taiwan, Faroe Islands

€115m invested in & awarded to the Deep Green technology to date

First electricity to grid with commercial-scale unit 2020

Listed on Nasdaq First North GM

Market cap: c. €240m

Main owners: BGA Invest and Corespring New Technology

As seen on



Tidal streams and ocean currents

Predictability of

100%

Potential installed
capacity of

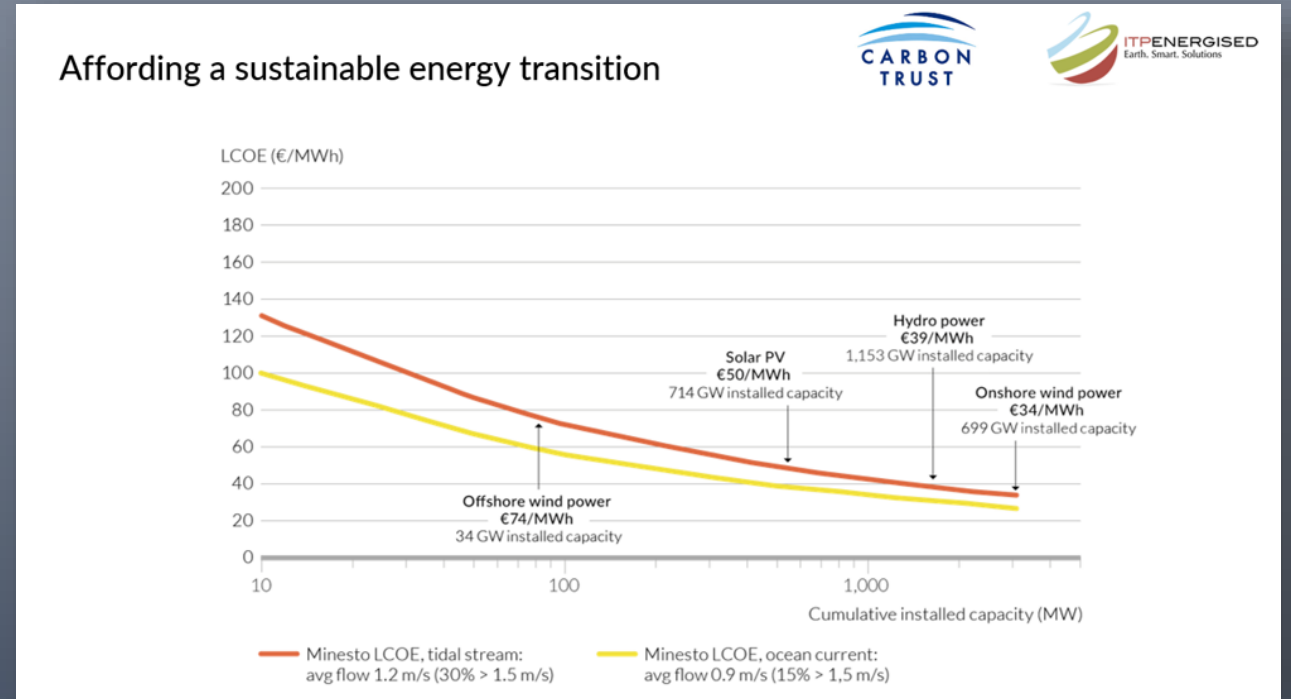
600GW

The most valuable unexploited natural
resource on earth?

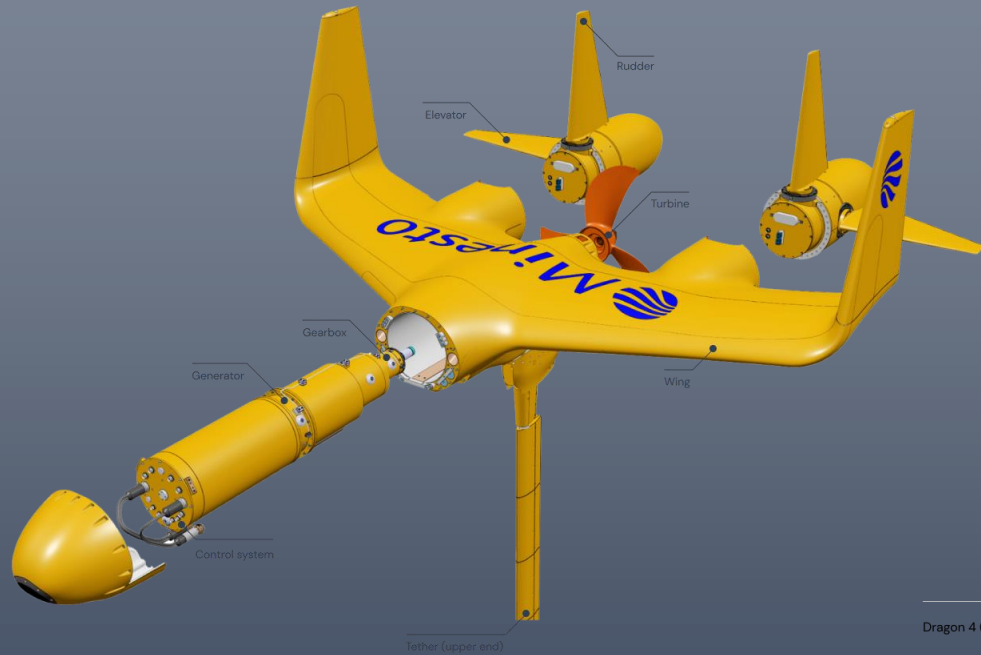
Tidal Energy: Key cost reduction factors

- ✓ Material Consumption
- ✓ Marine Operations
- ✓ Service and Maintenance
- ✓ Flow Speed

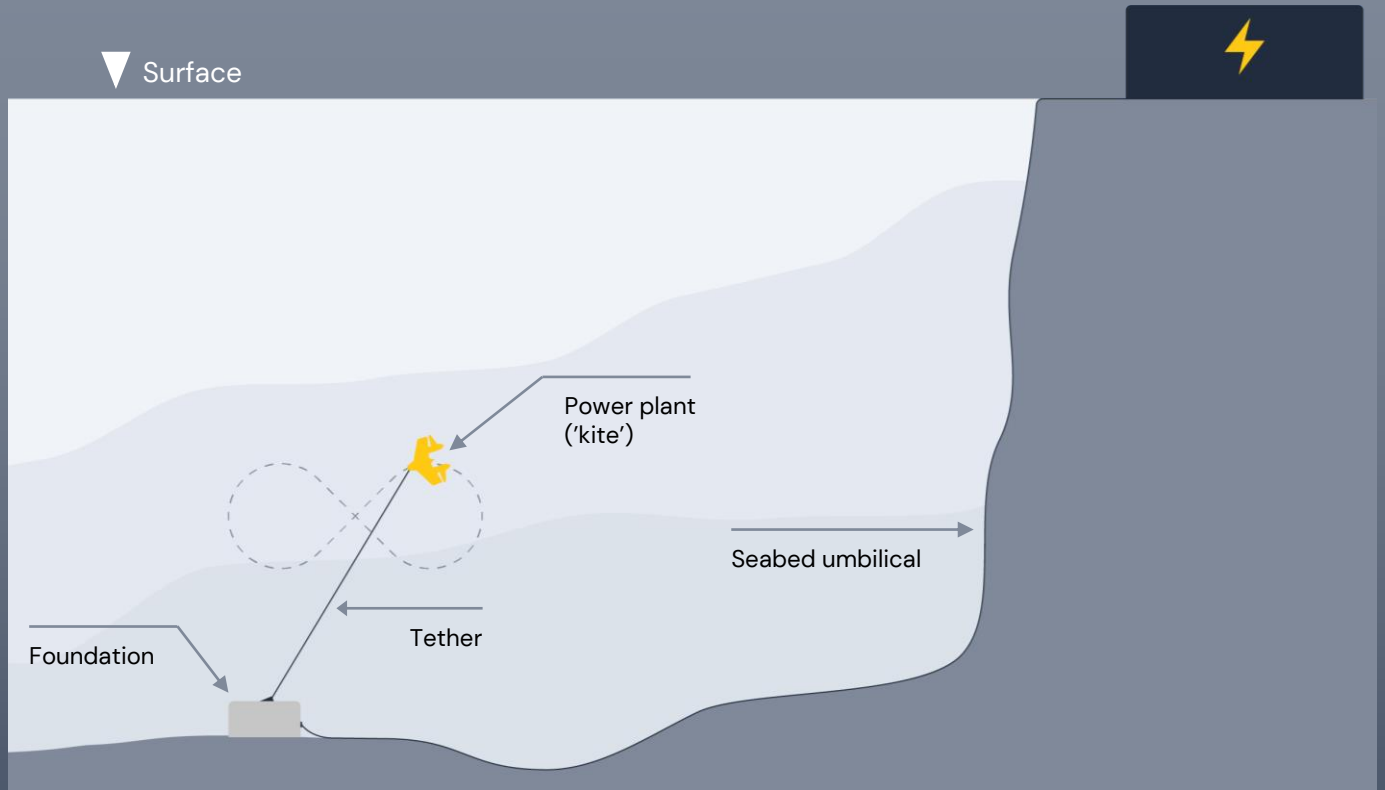
Common denominator: Weight



From Stream to Grid:



Dragon 4 (



Wing creates lift force – pulls the turbine through the water

Steered in a 'figure-of-8' by control system, about 35 m under the surface

Onboard conventional generator

Cables transfers the electricity to the onshore connection

High Performance Wing

– made possible by Advanced Materials

- ✔ Creates lift force
- ✔ Carries and transfer loads from all modules
- ✔ Tether attachment
- ✔ Balancing system buoyancy and mass
- ✔ Conveys cooling water
- ✔ System handling
- ✔ External geometry: performance is king



Cost Efficient Operations and Handling

– made possible by being light, small and floaty



- Low-cost O&M procedures verified
- Proprietary unique (LARS) Launch and Recovery concept
- Small work-boat approach a key driver for flexibility and cost-efficiency

- Scalable, lightweight kite systems that are easy to transport and handle
- Dragon 4 fits in 20 ft container

Converting slow to fast

Sea water is 832 times heavier than air
Substantially higher kinetic energy content than air



Power generation is proportional to the water speed cubed (v^3).
The flying kite multiplies the water current flow through the on-board turbine



Cost-effective exploitation of a so far untapped energy source.
Commercially viable electricity generation with compact, fast and lightweight systems

Dragon 4



Length 4 meters / 13 ft

Rated power 100 kW

Dragon 12



Length 9.8 meters / 32 ft

Rated power 1.2 MW

Current models, can scale further

First Commercial Array (10+20 MW): Hestfjord (Faroe Islands)

- Export Cable
- ⚡ D12 Hestfjord Phase 1A
- ★ D12
- ▭ Site Boundary



Site development in progress

Environmental studies, sea-bed profiling, grid route configurations

Service assets on shore in Vestmanna and nearby Gamlerat

Export cable route to SEV grid connected onshore substation

The Distribution grid upgrade to main city of Torshavn (10km away) by SEV is in progress

Total tidal farm capacity at 30 MW (minimum)

In sum:

– A Lighter approach to Marine Energy

- ✔ No performance compromises
- ✔ Handling, service and maintenance made easy
- ✔ Utilize local fleet of small vessels
- ✔ Mass production friendly
- ✔ Unlocks a new dimension of renewable electricity generation
- ✔ Invisible, predictable, plannable, scalable



Thank You!
– Questions?

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Thank you

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