



Hydro-Pneumatic Energy Storage for Offshore Applications

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FLASC B.V.

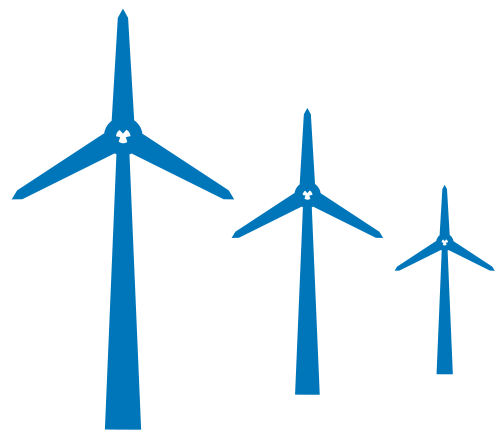
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The Problem

- **Renewable energy supply and consumer demand do not match**, causing major **pain-points** across the energy system:



Utility-scale renewables suffer curtailment and negative pricing



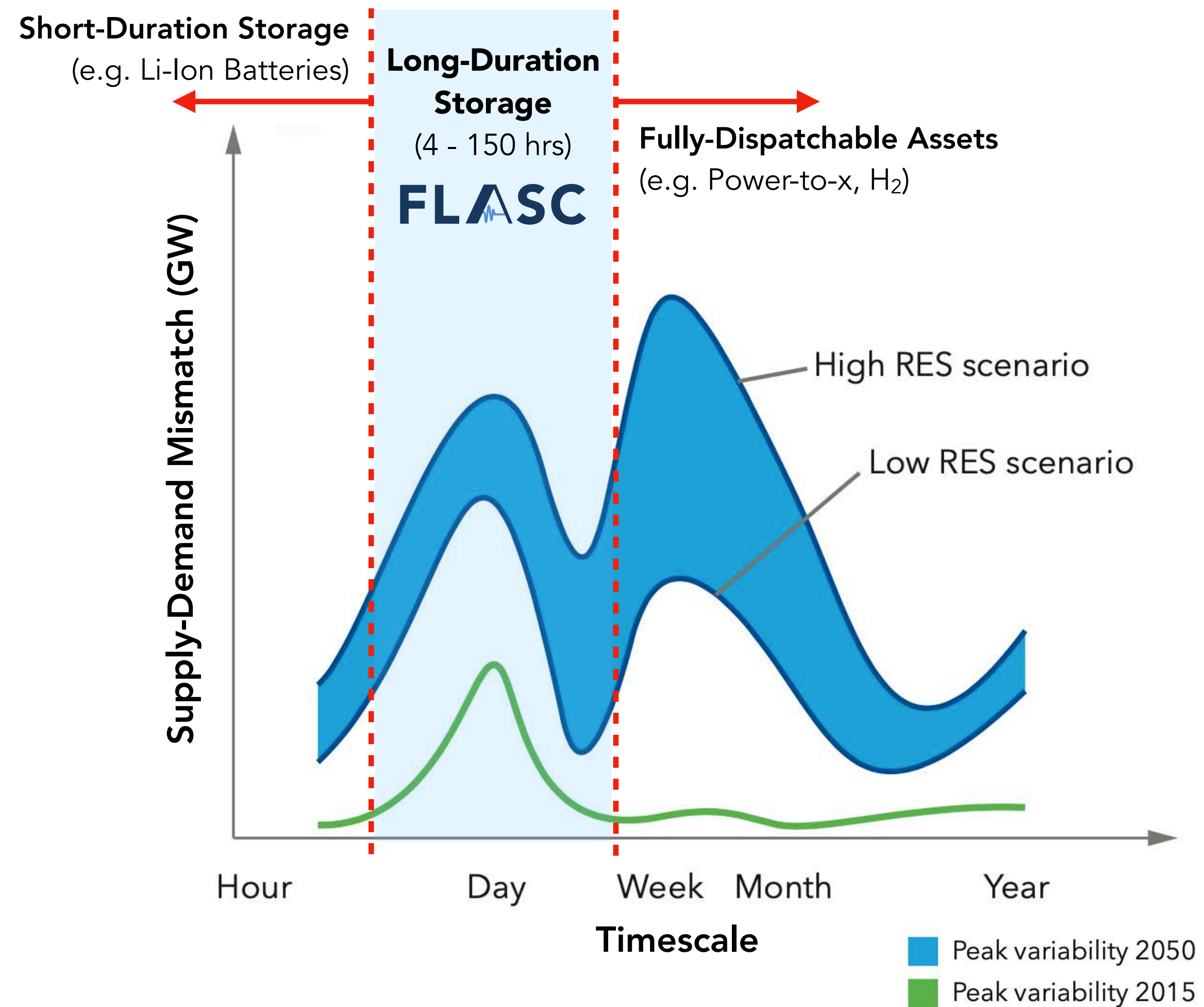
Heavy industries need reliable clean power to fully decarbonise



Off-grid applications need more flexibility but space for energy storage is often limited



An Ocean of Opportunity



Peak variability of *residual load* at different time scales in a European electricity grid in 2015 and expected in 2050 (source: DNV-GL)





(photo: Nicholas Doherty)



(photo: Hawaii Tourism Authority)

Delivering value by storing energy at sea

1. New Generation + Storage Projects
2. Small-Islands and Sensitive Regions
3. Decarbonisation of Heavy Industry
4. Green Hydrogen Production
5. Repurposing Existing Infrastructure



(image: Equinor)

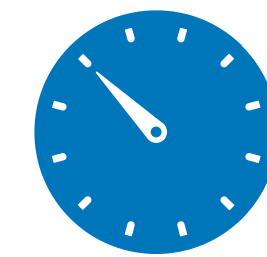


(image: Fuel Cell Works)

Hydro-Pneumatic Energy Storage

Combining pressurised **seawater** and **compressed air**

► Patented Innovations:



Pneumatic Pre-Charging

→ Shallow-Water Energy Density



Ocean as a Natural Heatsink

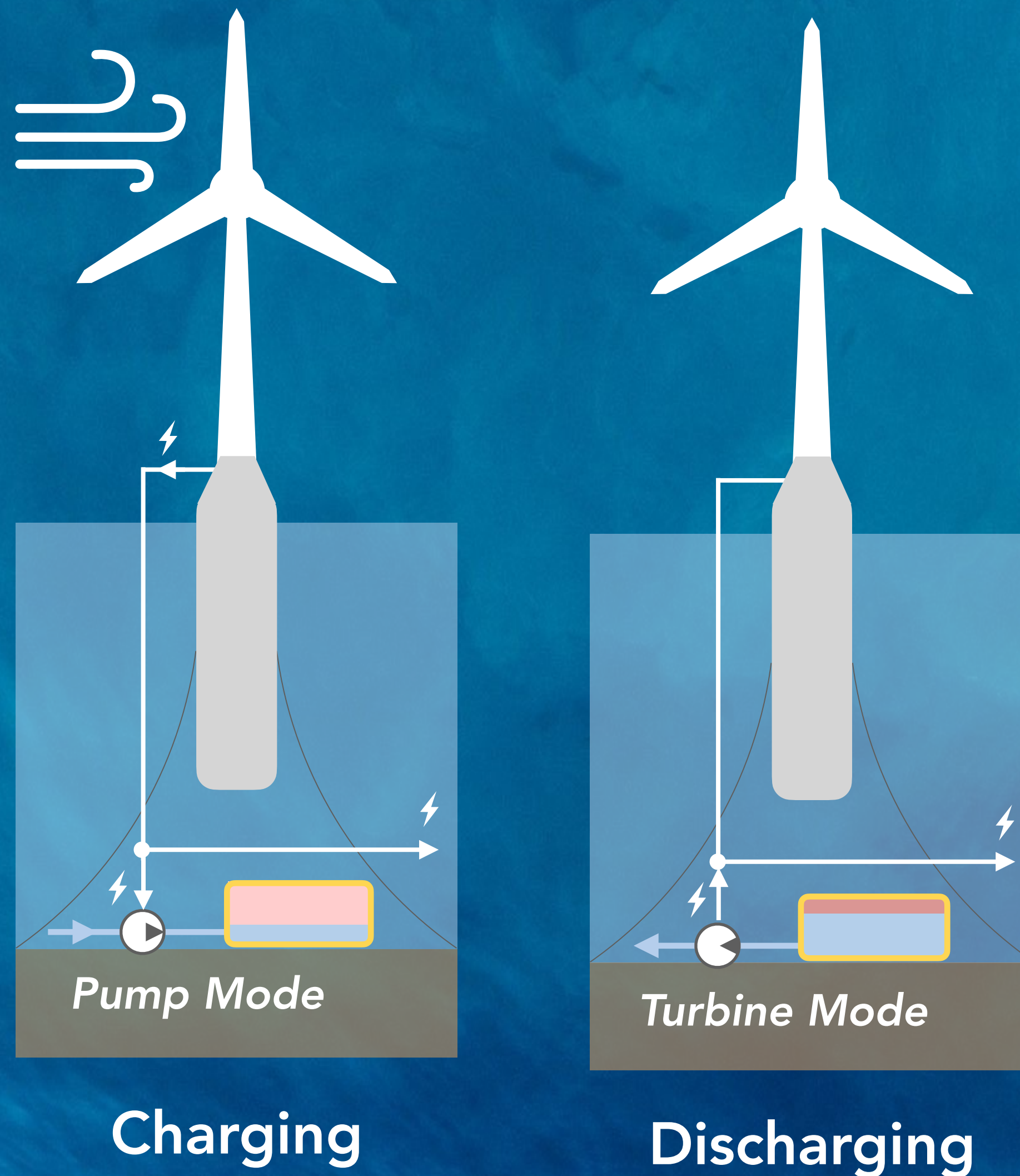
→ High Efficiency

► Scalability: **>100 MWh**

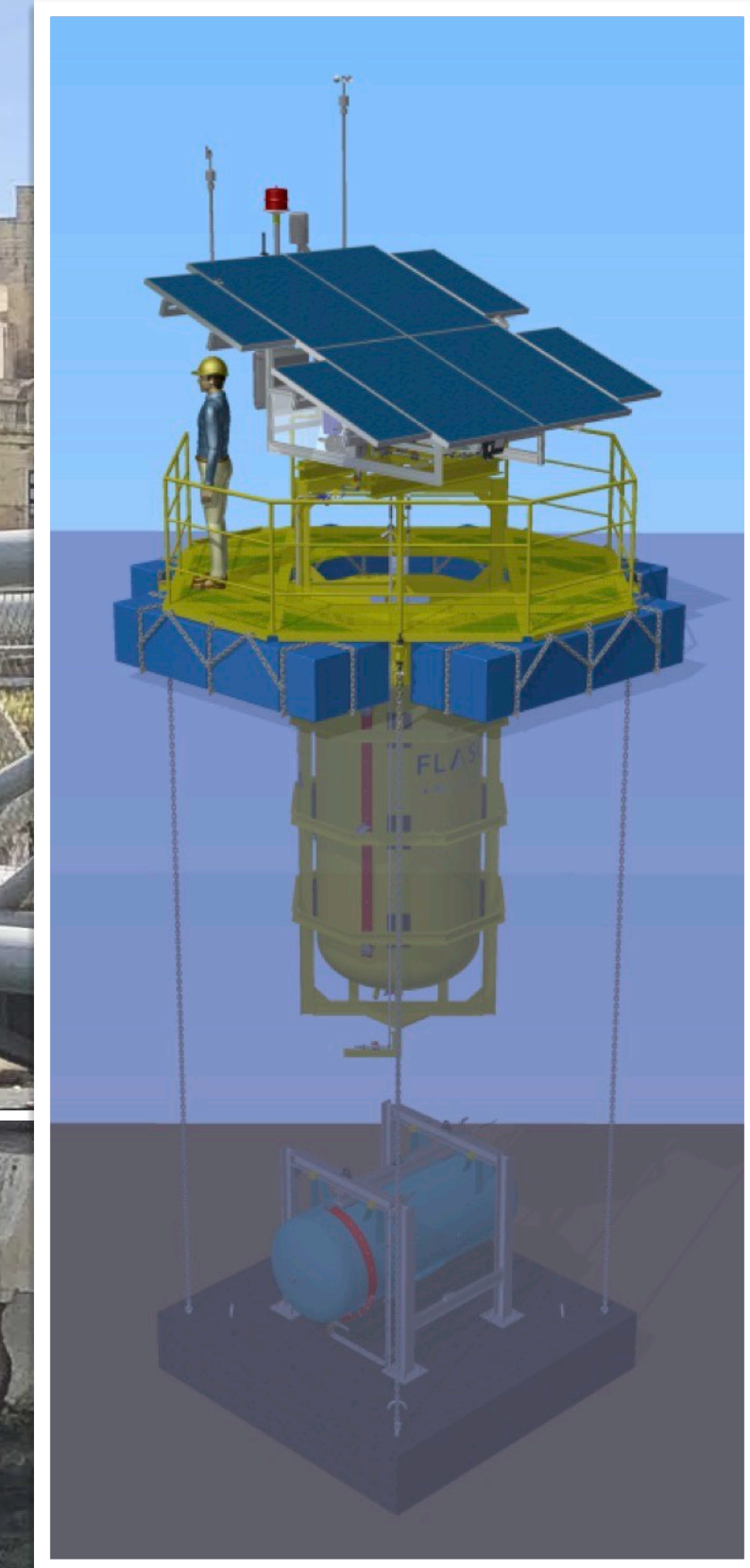
► Roundtrip Efficiency: **70-75%**

► Storage Duration: **4-12 hours**

► Operational Lifetime: **+30 years**



Prototype & Field Tests



▲ TRL 5 Prototype (2018)
(TRL 7 in 2022)

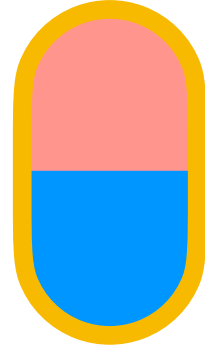
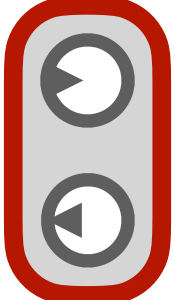
⚡ **+400**
Charging Cycles

📅 **+15 Months**
Continuous Operation

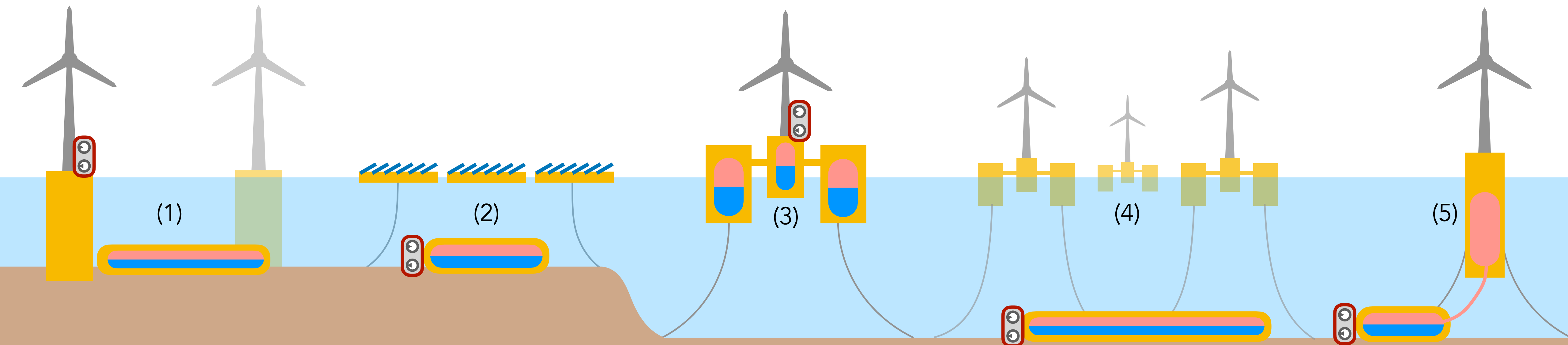
🌡️ **>96%**
Thermal Efficiency

🔌 **+98%**
System Availability

Versatility & Scalability

FLASC System =  **PCS**
Pressure Containment System +  **ECU**
Energy Conversion Unit

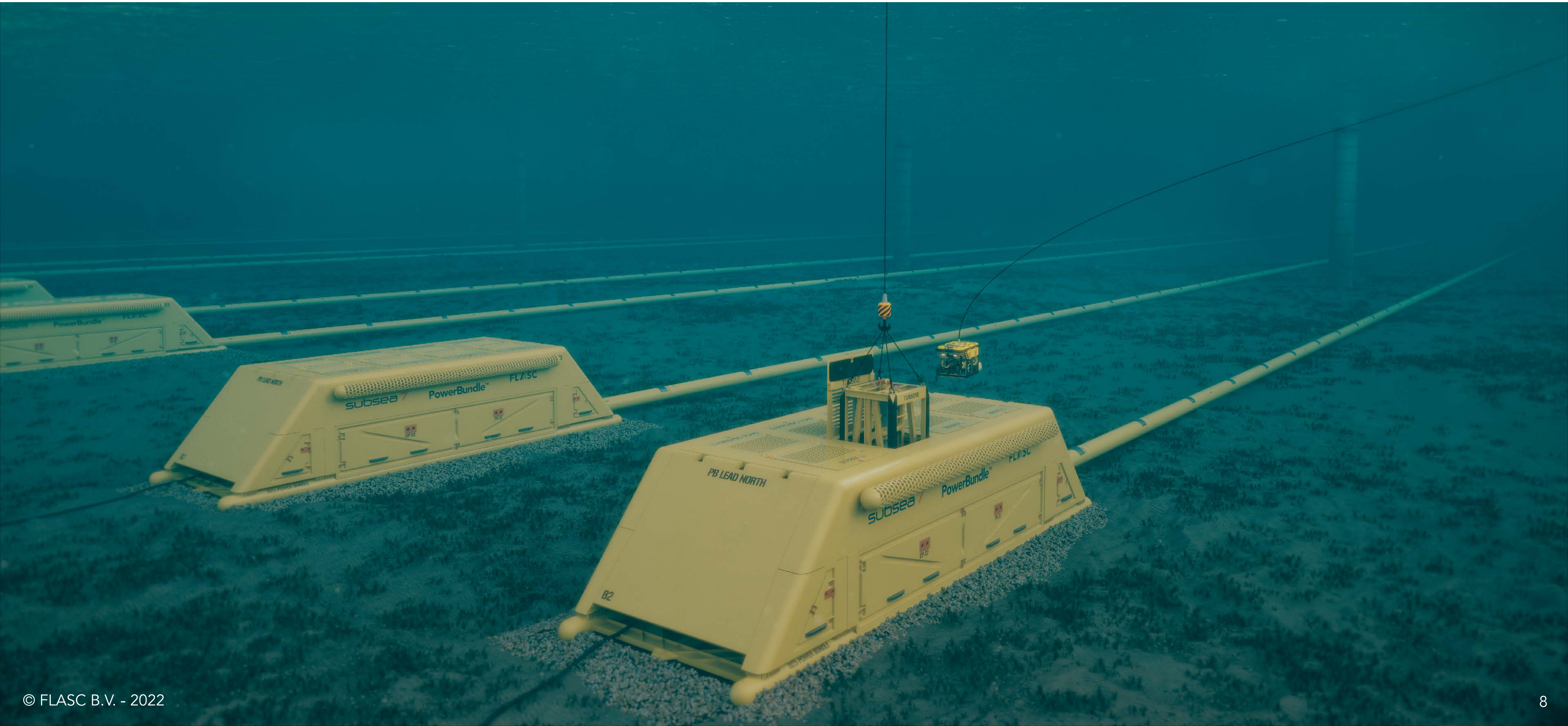
- ▶ Deliver full storage solution through strategic collaborations.
- ▶ Basic engineering and FEED support for full storage system.
- ▶ Supply ECU hardware units.



The PowerBundle Solution

Integration of FLASC energy storage into Subsea 7 Bundle technology

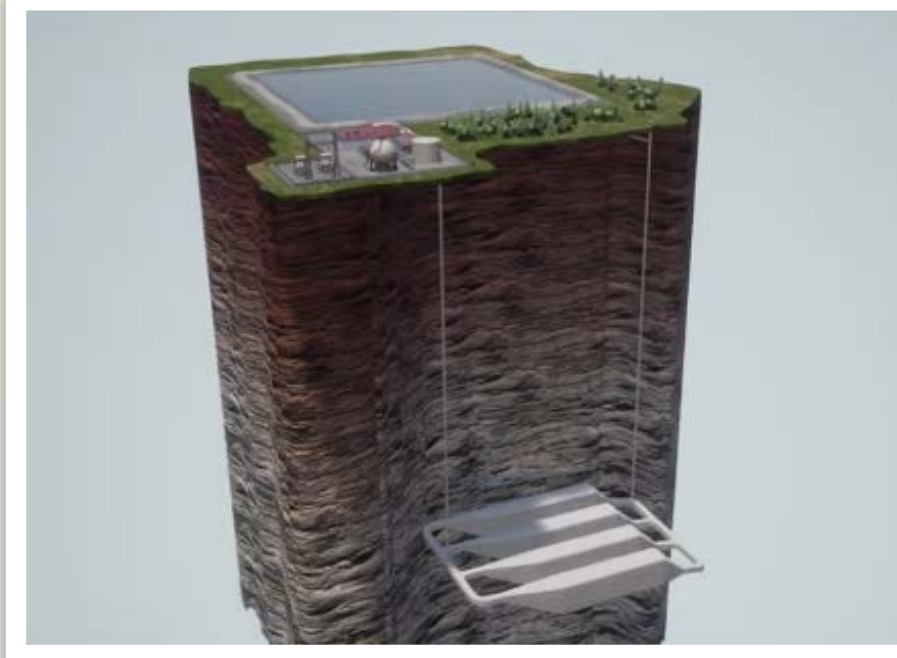
subsea 7



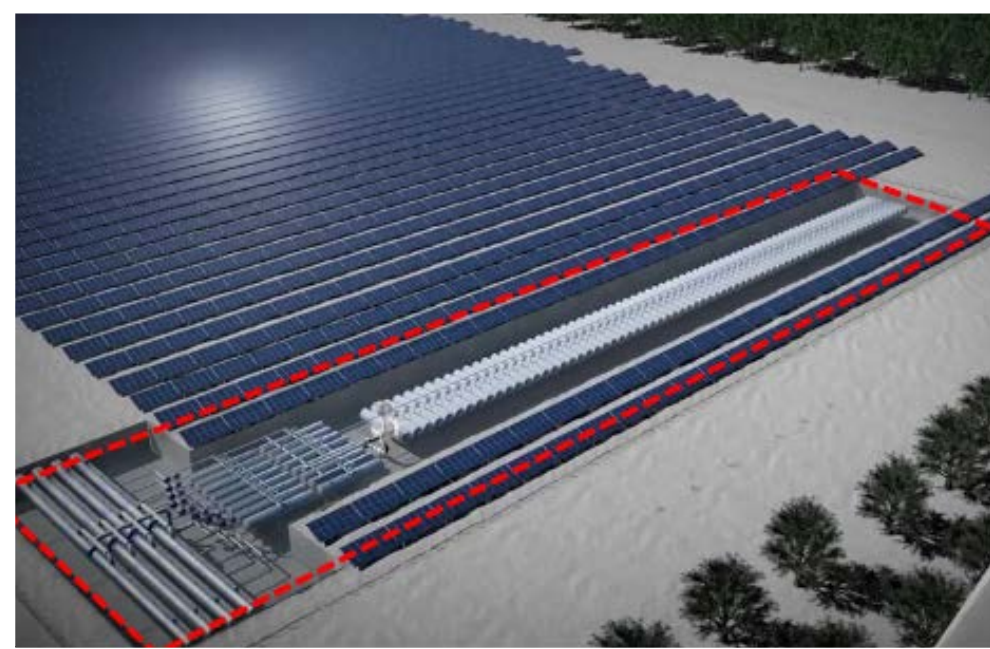
Technology Landscape Medium-Duration Technologies

Onshore Long-Duration Storage

- ▶ Wide range of solutions attracting significant investment
- ▶ Large-scale infrastructure suited for land-based applications



▲ A-CAES (Hydrostor)



▲ Land-based HPES (Augwind)



▲ ETES (Siemens Energy)



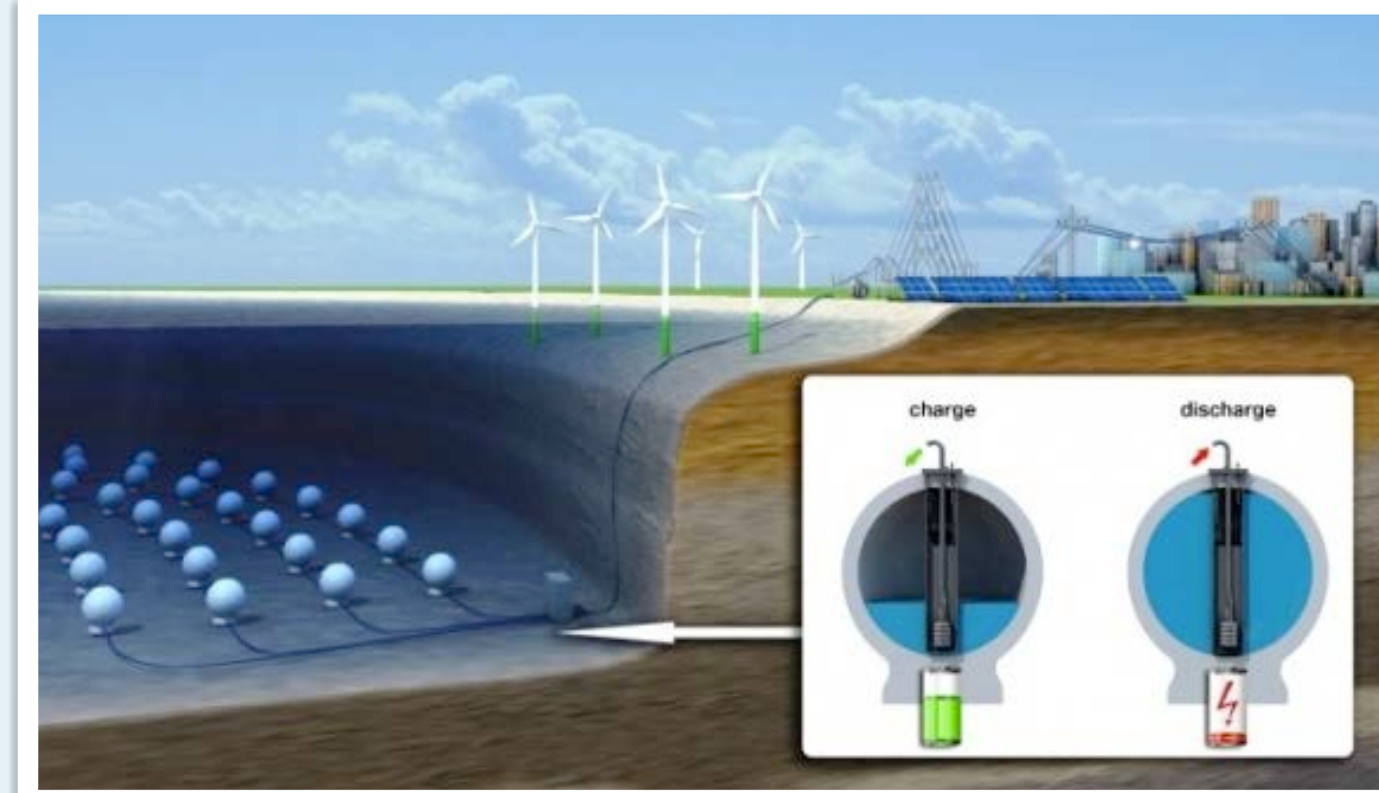
▲ Gravity Storage (Energy Vault)



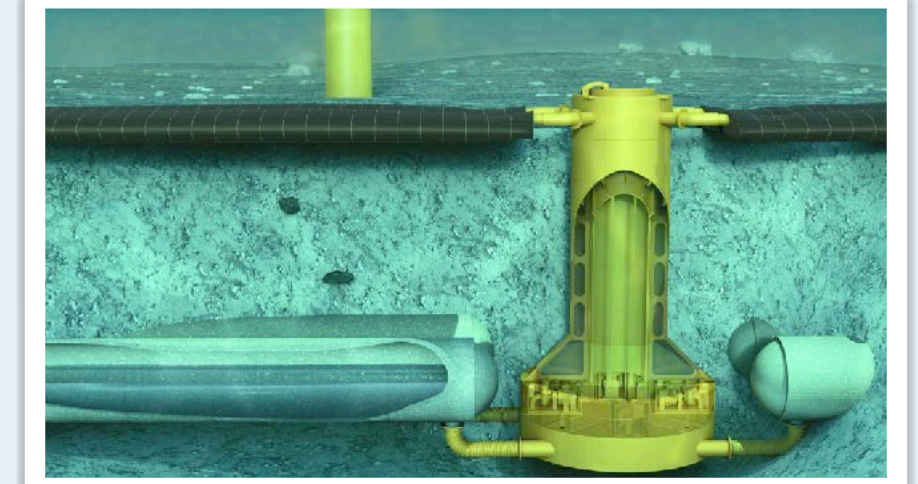
▲ LAES (Highview Power)

Offshore Storage: Deep Water

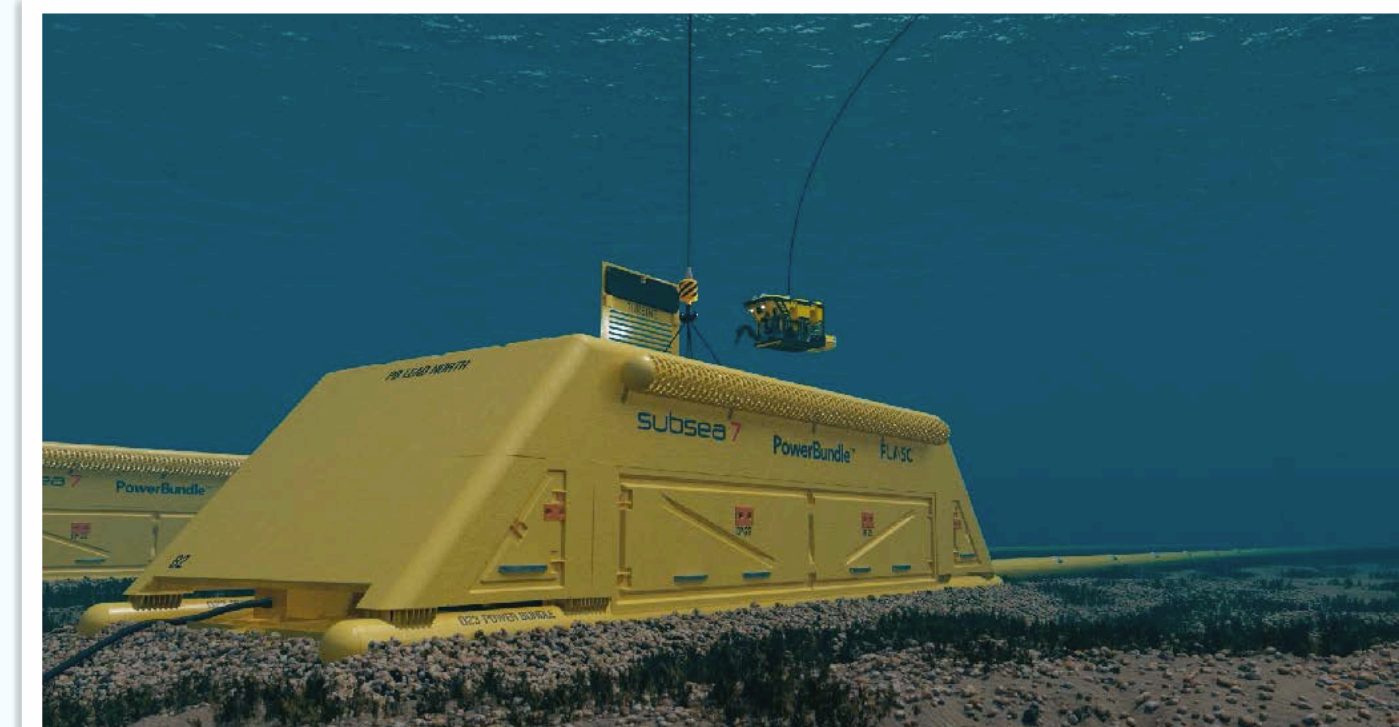
- ▶ Solutions using hydrostatic pressure require deep water



▲ StEnSea (Fraunhofer)
StEnSea Testing Campaign ▶

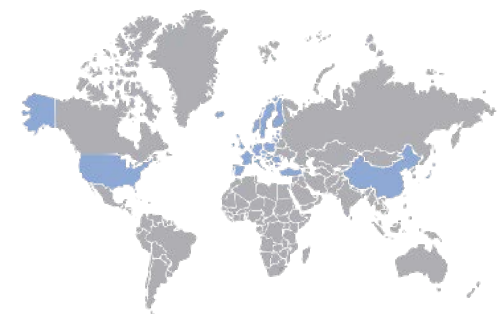
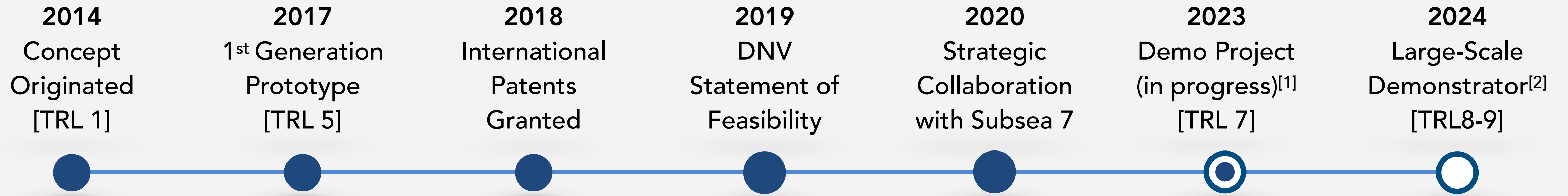


▲ Ocean Grazer



Offshore Storage: Shallow Water (<400m)

- ✓ FLASC is uniquely positioned for co-location with offshore wind



► Patents Granted
Europe, US, China, Japan



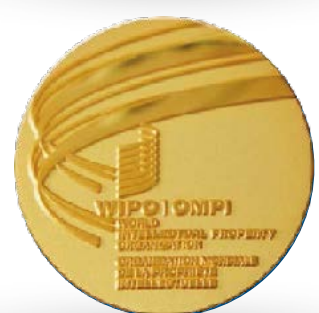
► Third-Party Validation
Statement of Feasibility



**2020 Best Offshore
Innovation Award**



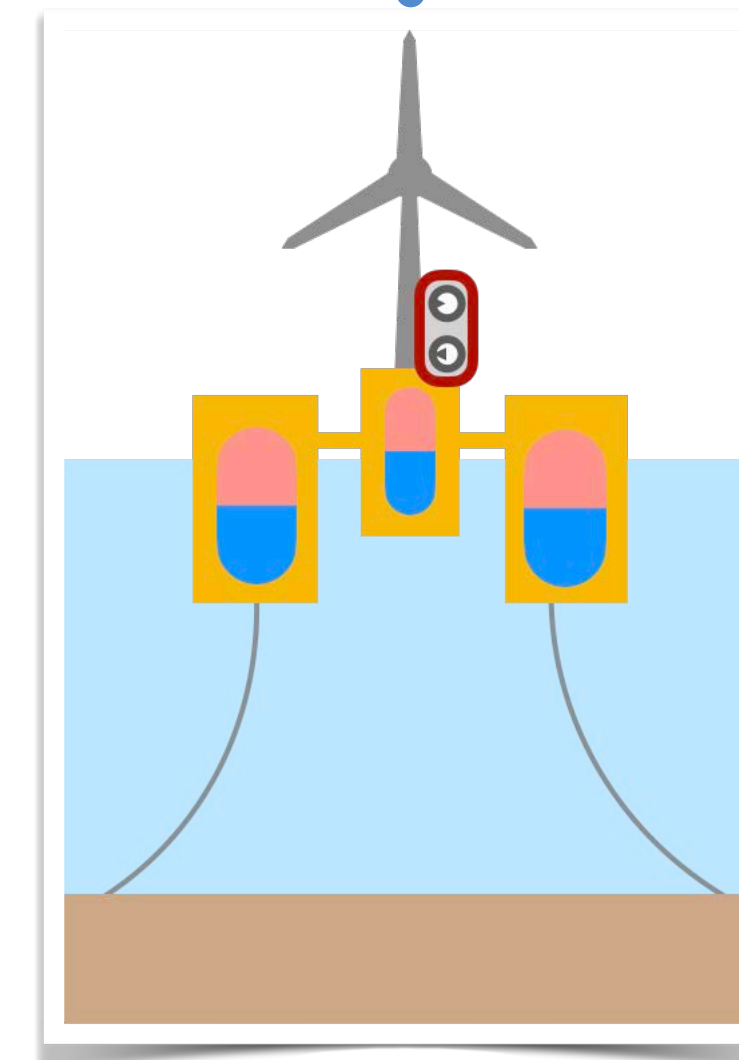
**1 of 1000 Solutions to
Change The World**



WIPO Medal for Inventors

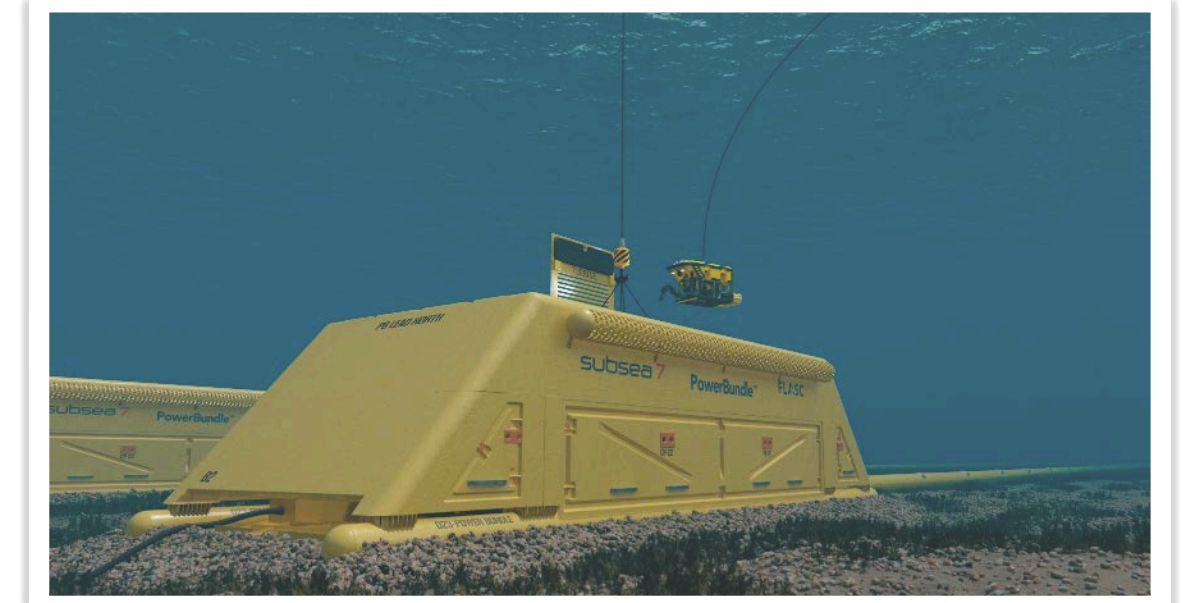


Proof-of-Concept (Malta)



Offshore Demo (Greece)

As part of ~€10m EU-funded
project (H2020 BG-05-2019)



PowerBundle Demonstrator (UK)

Subsea 7 + FLASC consortium secured funding
support from the *UK BEIS Long Duration Energy
Storage Competition*^[2] to prepare for potential
deployment in the UK energy system.



Currently Seeking:

- Pilot Project Opportunities
- Strategic Partnerships / Collaborations
- Concept & Feasibility Studies around Offshore Energy Storage

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FLASC B.V. is a spin-off from the University of Malta, established in The Netherlands with registration number: 76566404.

The company is part of the Buccaneer Delft energy & offshore accelerator.

"FLASC's solution is an innovative technology with significant potential, offering a competitive and more sustainable alternative to Li-ion battery farms."

The collaboration with FLASC will allow us to leverage Subsea 7's world-class technical expertise in the development of offshore subsea solutions to accelerate the deployment of utility scale, low maintenance, storage solutions."

Thomas Sunde

VP Strategy and Technology, Subsea 7