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Deep Purple

Empowering ocean energy systems with green hydrogen

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18.02.2021

Together we accelerate energy transition

Europe needs enormous amounts of Hydrogen to handle its energy transition

«The opportunity»

- «Hydrogen to cover 24% of world energy i 2050»
- «Annual turnover expected to be 630 billion EURO»

(EU commission 2020)

«Enablers»

- Optimal system design
- Standardization / Scale
- Speed to market
- LCOE
- People and competency

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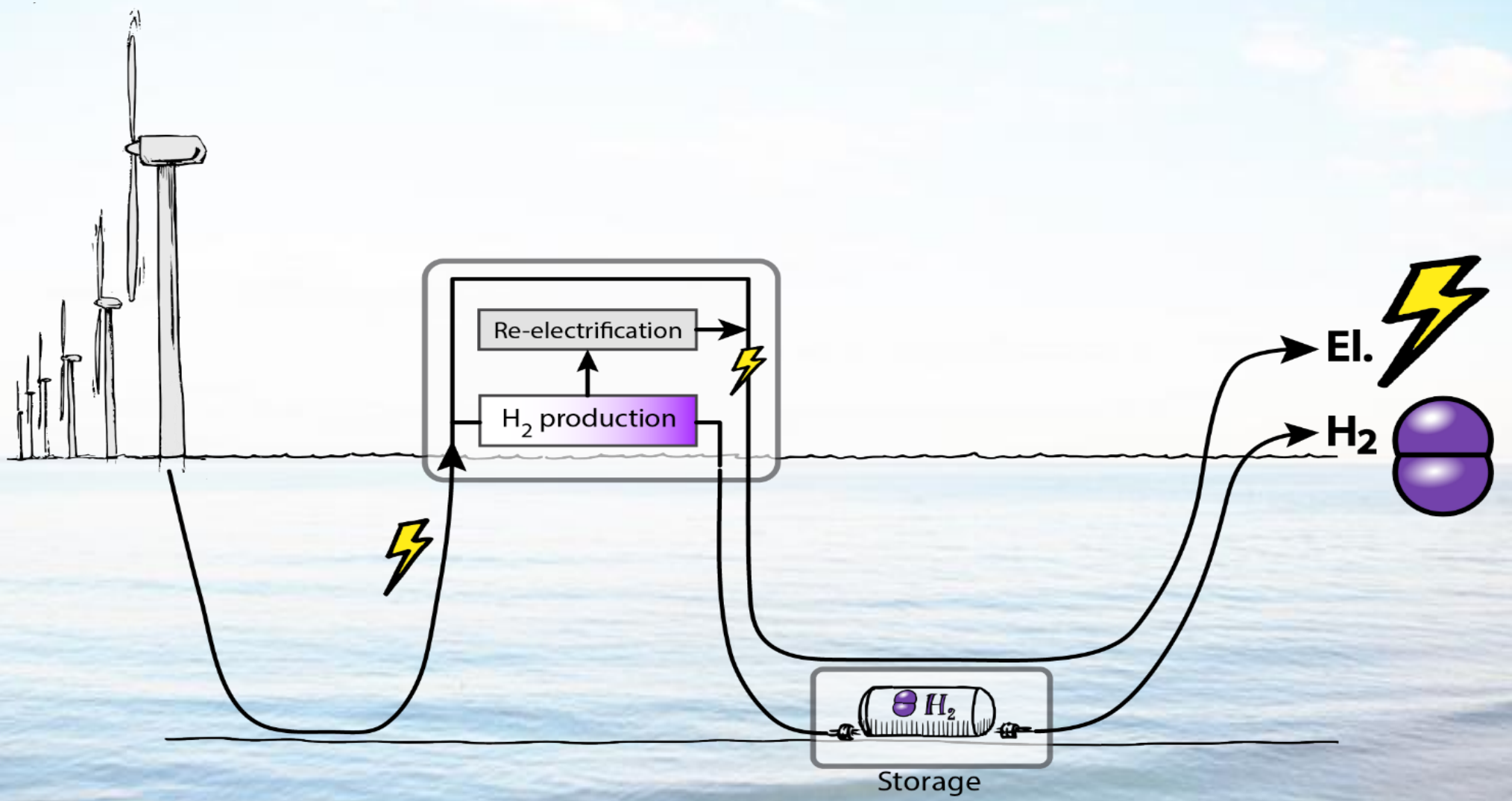
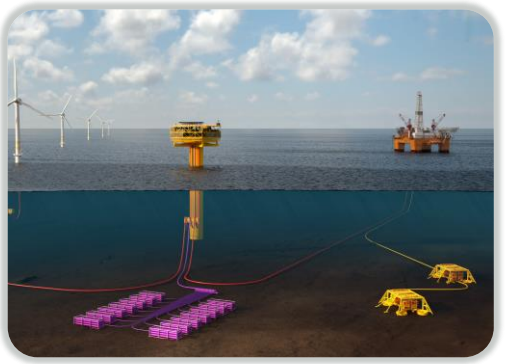
The Deep Purple system

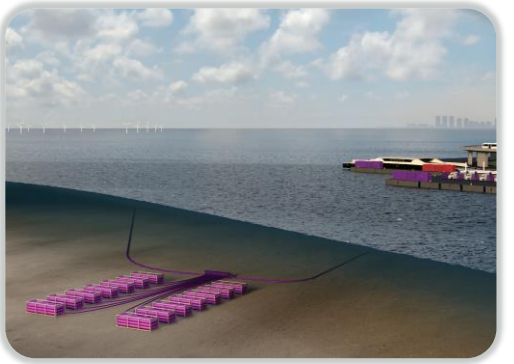


Deep Purple – several applications in the Ocean Space



Electrification by renewable and stable power to oil&gas installations

Offshore, large-scale renewable hydrogen production



Coastal subsea hydrogen infrastructure and storage

Renewable and stable power to remote islands

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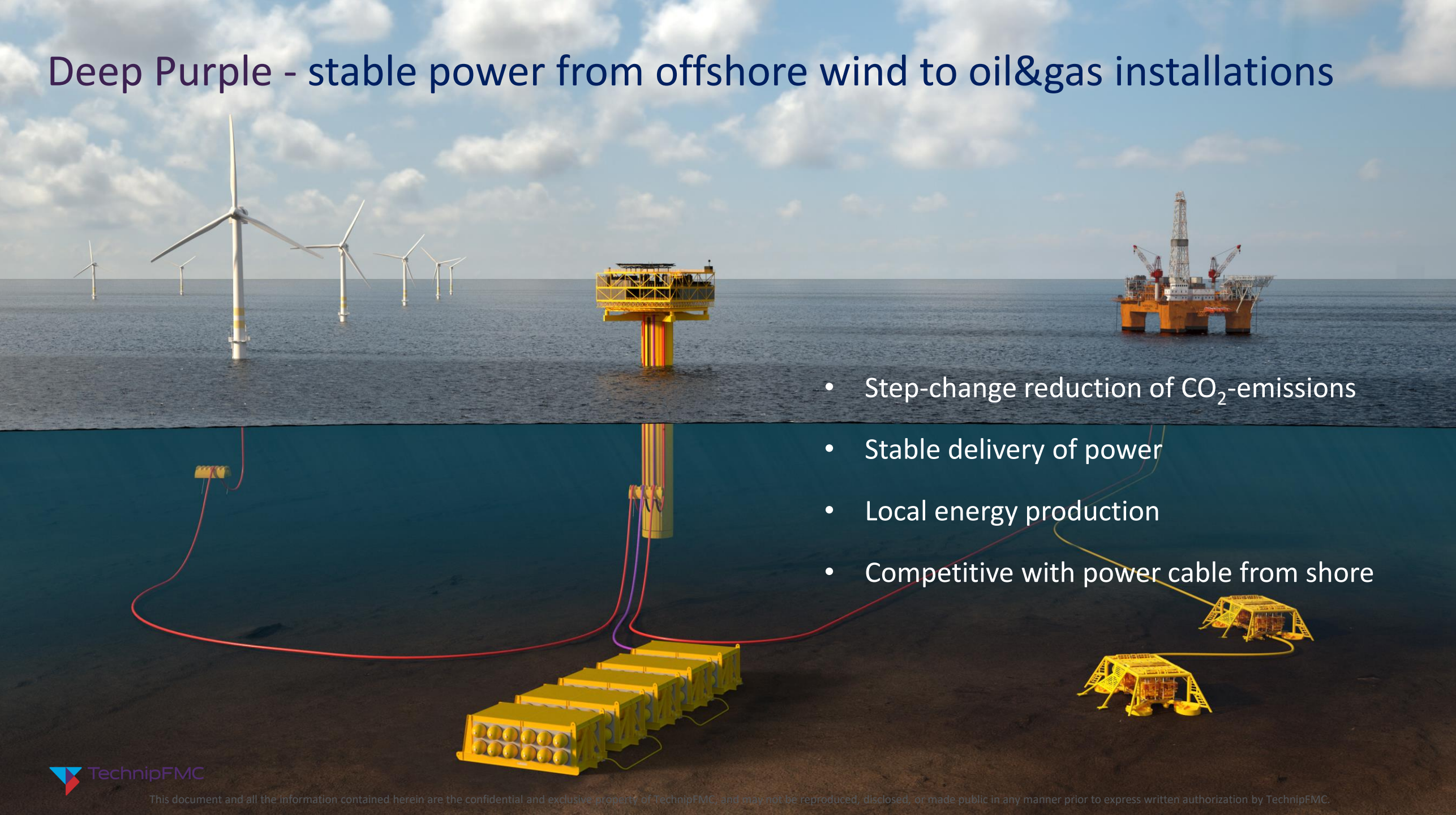
Deep Purple - stable power from offshore wind to oil&gas installations



- Step-change reduction of CO_2-emissions
- Stable delivery of power
- Local energy production
- Competitive with power cable from shore

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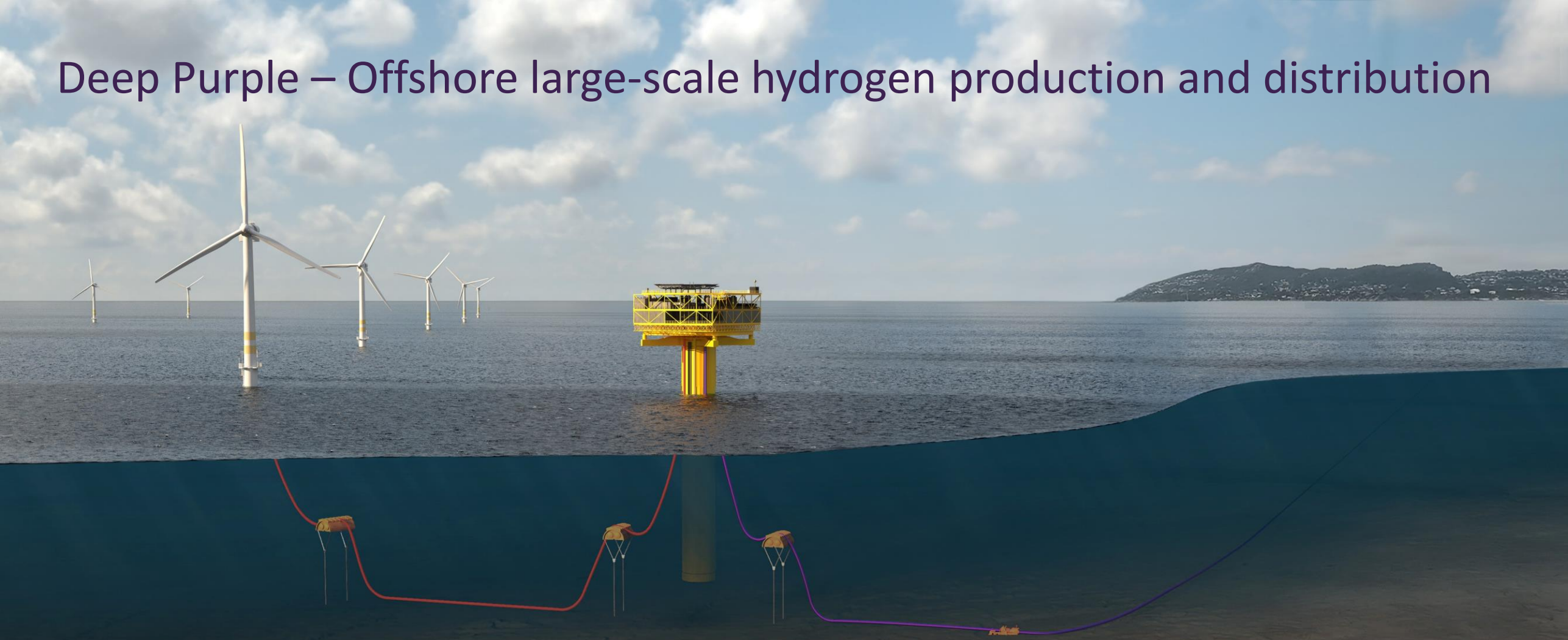
Deep Purple – Offshore large-scale hydrogen production and distribution



- Harvest the best wind conditions for high efficiency hydrogen production
- High-capacity transfer and storage of hydrogen in pipeline
- Competitive with onshore hydrogen production for long step-outs
- Potential for re-use of existing offshore infrastructure

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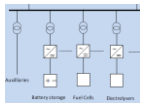
Deep Purple building blocks – a toolcase for several configurations

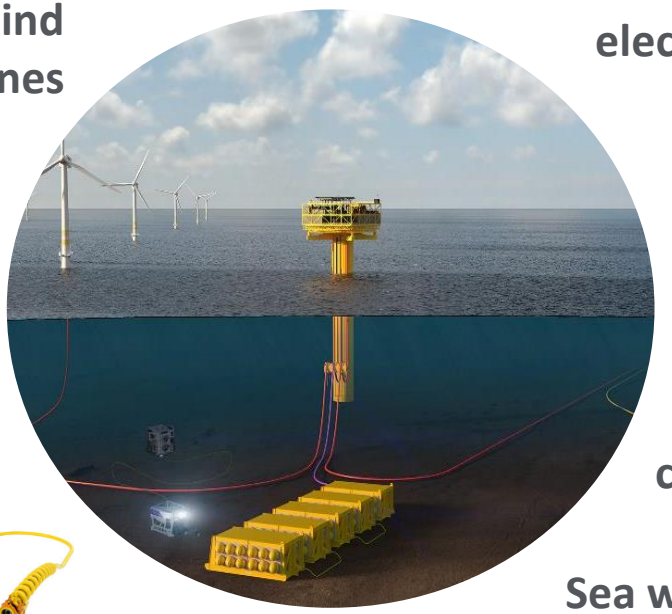
Advisory system Power and Energy management system



Wind turbines

PEM electrolyzers

Dynamic hydrogen risers



PEM fuel cells

Subsea hydrogen storage

Hydrogen compressors

Subsea hydrogen flowlines and connections

Sea water treatment

Deep Purple engineering tools:

- HyOpt – techno-economical optimization tool
- FlowManager – hydrogen process simulator
- NowiCob – availability and reliability simulator

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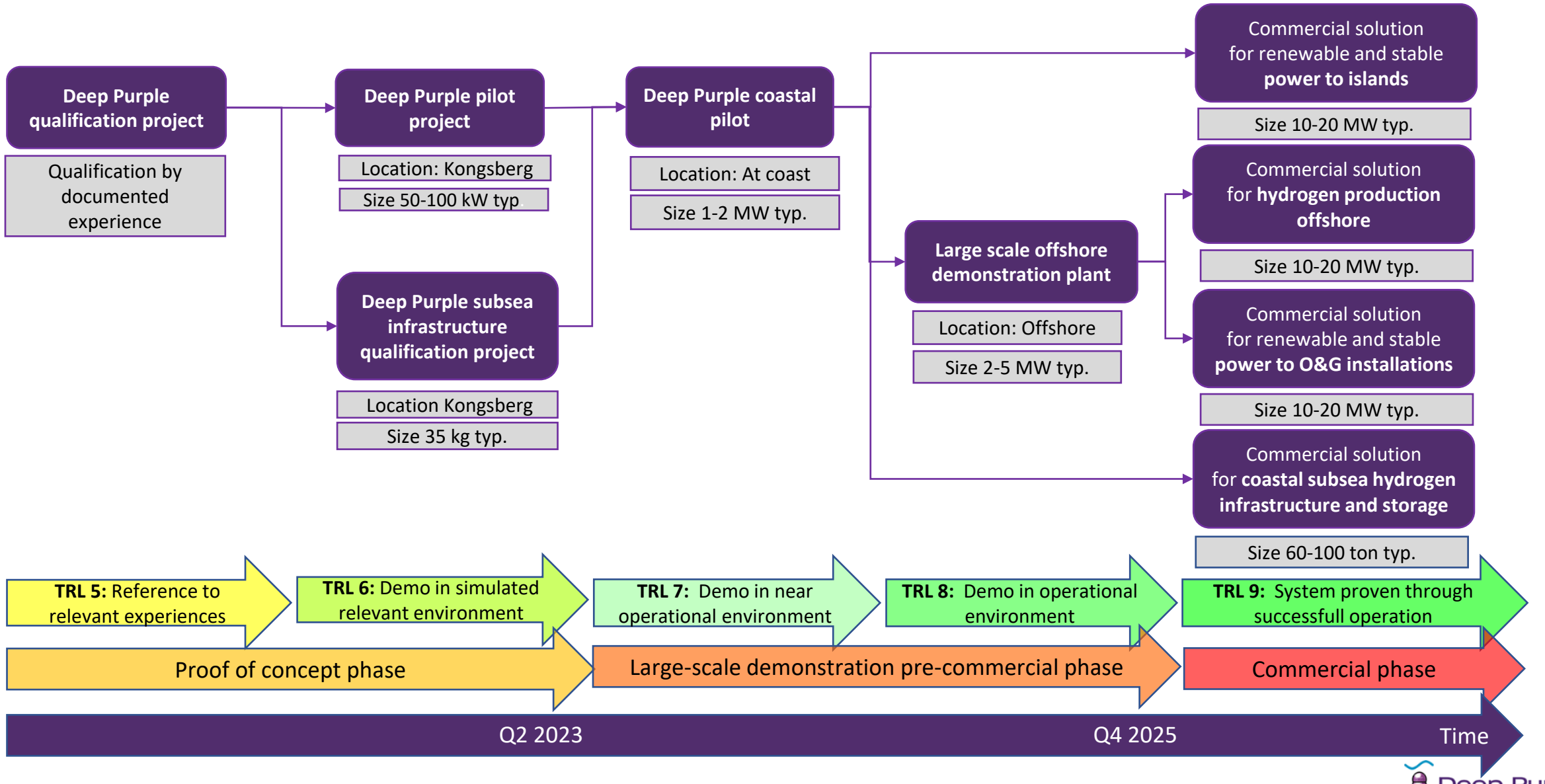
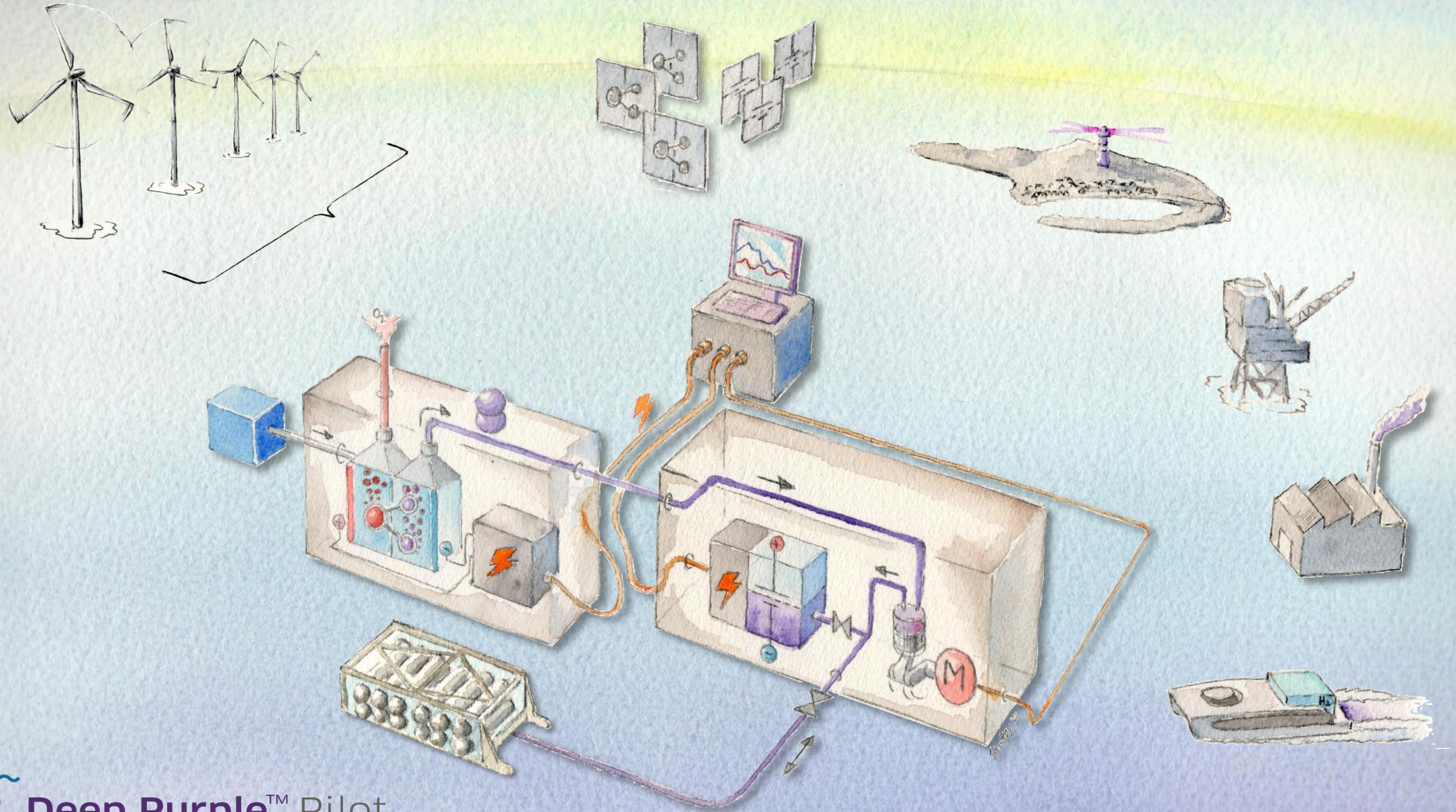
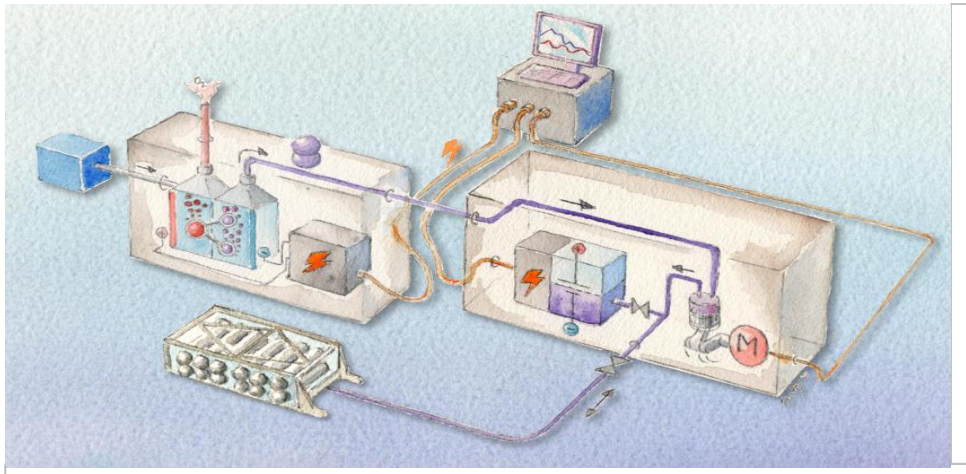
Deep Purple technology qualification roadmap





Deep Purple™ Pilot

Deep Purple™ Pilot



Plan:

- Timeline – 2021-2023
  - 2021 – Use cases, Engineering and Procurement
  - 2022 – Construction and qualification testing
- Budget: 9 MEUR

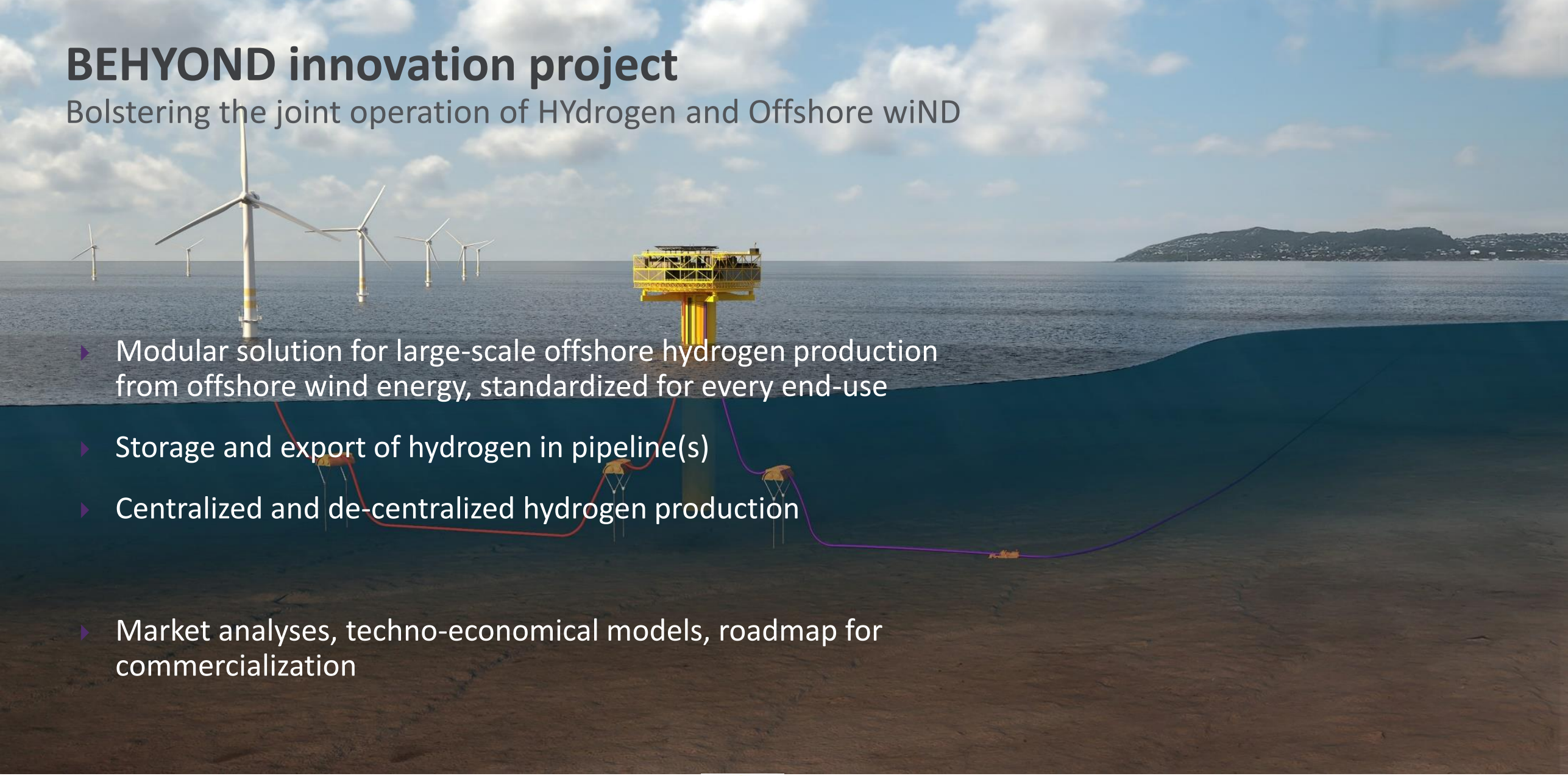
Key objectives:

- **Market:** Position partners for delivery of sustainable offshore energy systems for production of renewable hydrogen
- **Business:** Develop partners to be competitive internationally through core business and workplaces in Norway
- **Technical:** Qualify the energy system to TRL6
- **Dissemination:** Actively spread information and knowledge about the project, its results and application, grow innovation and create new jobs in Norway

TechnipFMC VATTENFALL SINTEF REPSOL nel Universitetet i Sørøst-Norge UMOE KANFA Ocean Technology SLÅTTLAND energy valley ABB Arena Ocean Hyway Cluster DNV·GL

BEHYOND innovation project

Bolstering the joint operation of HYdrogen and Offshore wiND

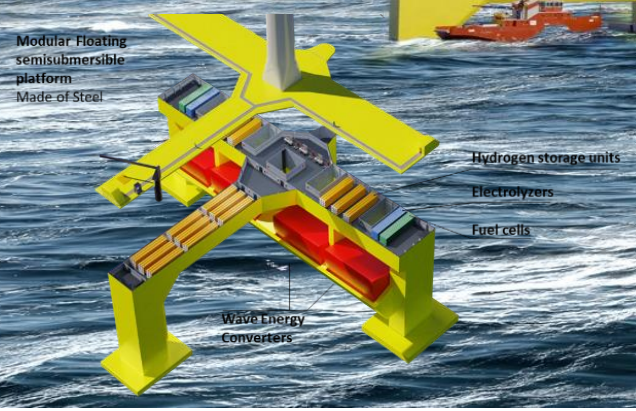


- Modular solution for large-scale offshore hydrogen production from offshore wind energy, standardized for every end-use
- Storage and export of hydrogen in pipeline(s)
- Centralized and de-centralized hydrogen production
- Market analyses, techno-economical models, roadmap for commercialization

TechnipFMC edp NEW by EDP & CTG WavEC Offshore Renewables CEiiA USN Universitetet i Sørøst-Norge

O/G Decarb innovation project and SMOOTHPOWER green deal application

- Integrated wind, wave and hydrogen solution for baseload power to oil&gas installations and remote islands
- CO_2 reduction potential up to 90%
- Piloting opportunity at Canary Islands (PLOCAN)
- 10 MW wind, 2 MW wave, 16 ton / 300 MWh hydrogen storage with electrolysers and fuel cells



TechnipFMC FLOATING POWER PLANT TOTAL DENMARK DGC DTU HYDROGEN VALLEY ENERGY INNOVATION CLUSTER