RWE

Quarterly report
Q1 2024

OranjeWind
Offshore wind farm

RWE's OranjeWind offshore wind farm will be located 53 kilometers from the Dutch coast. To tackle the challenges of fluctuating power generation from wind and flexible energy demand, RWE has developed a blueprint for the integration of offshore wind farms in the Dutch energy system.

A combination of smart innovations and investments will be used to realize this perfect match between supply and demand.

Project status: in development

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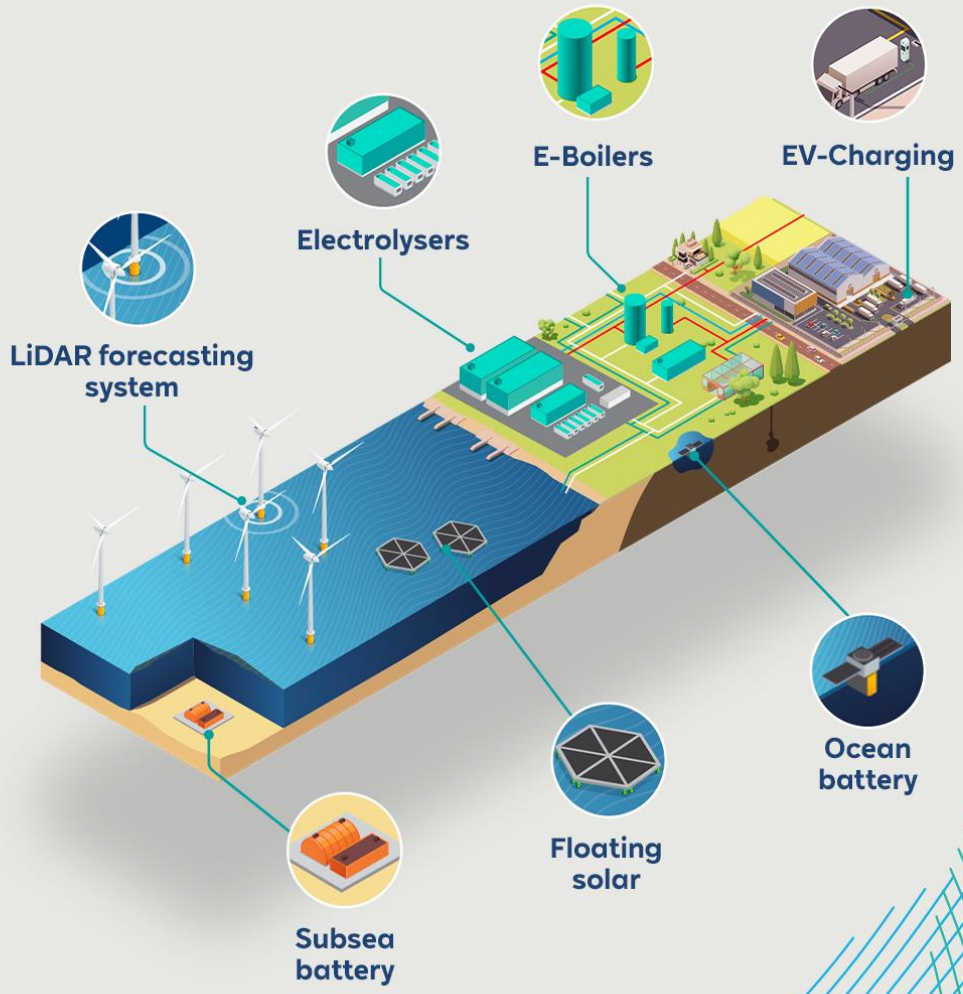
OranjeWind

The perfect match
Unlocking full system integration



Latest news (1)

RWE starts construction of utility-scale battery storage project in the Netherlands

RWE is further expanding its battery storage business worldwide. The company has now started construction of its first utility-scale Dutch battery storage project with an installed power capacity of 35 megawatts (MW) and a storage capacity of 41 megawatt-hours (MWh). A total of 110 lithium-ion battery racks will be installed at RWE's biomass plant in Eemshaven on an area of around 3,000 square metres. The storage system is planned to supply control energy and to operate in wholesale markets as of 2025.

The battery project is an important step towards a portfolio of innovative flexible assets to optimally integrate the weather-related fluctuating power generation profile of the "OranjeWind" offshore wind farm into the Dutch energy system.

Read the full press release

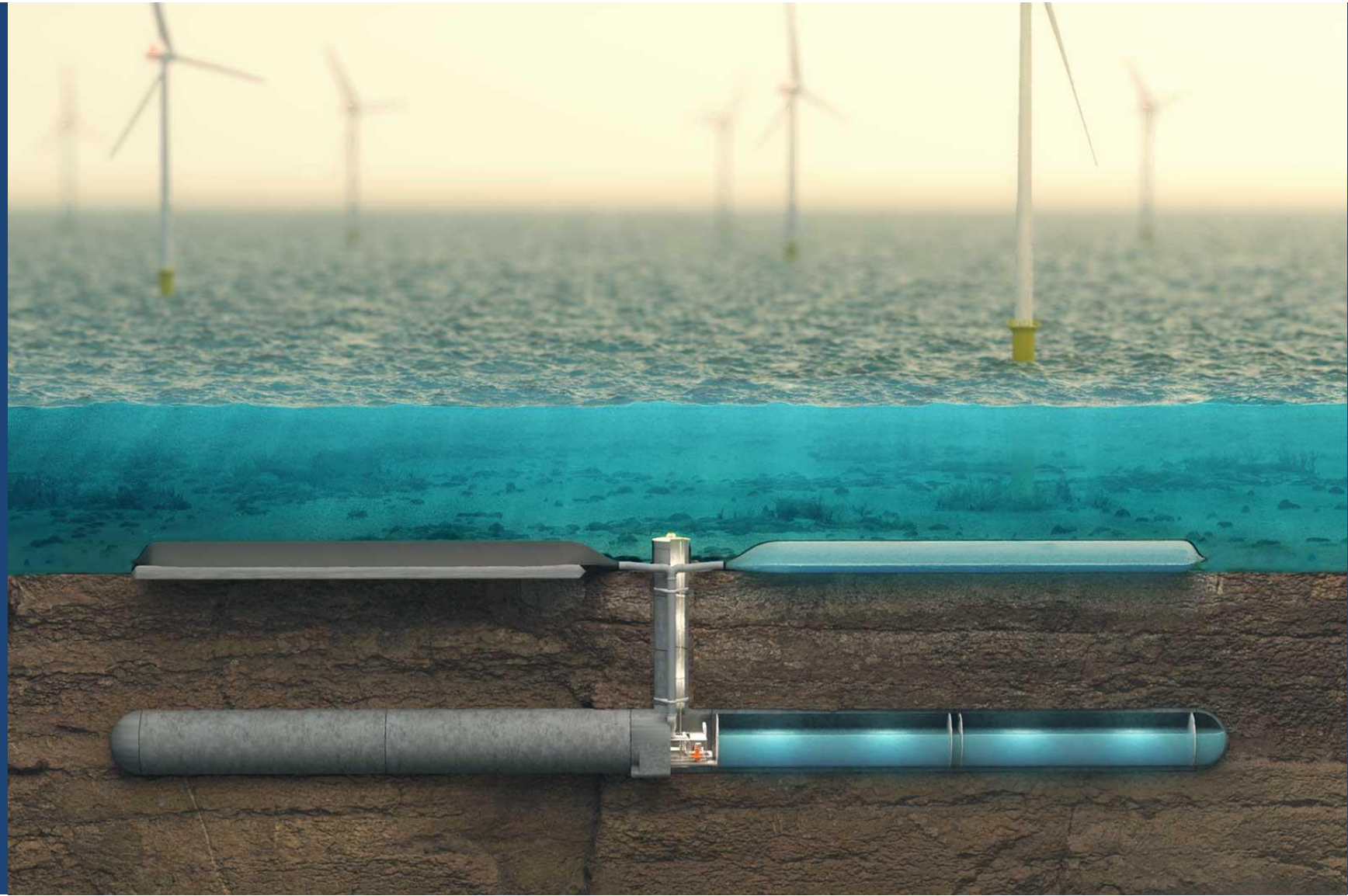
Innovations at OranjeWind (1)

Subsea pumped hydro storage power plant (Ocean Grazer)

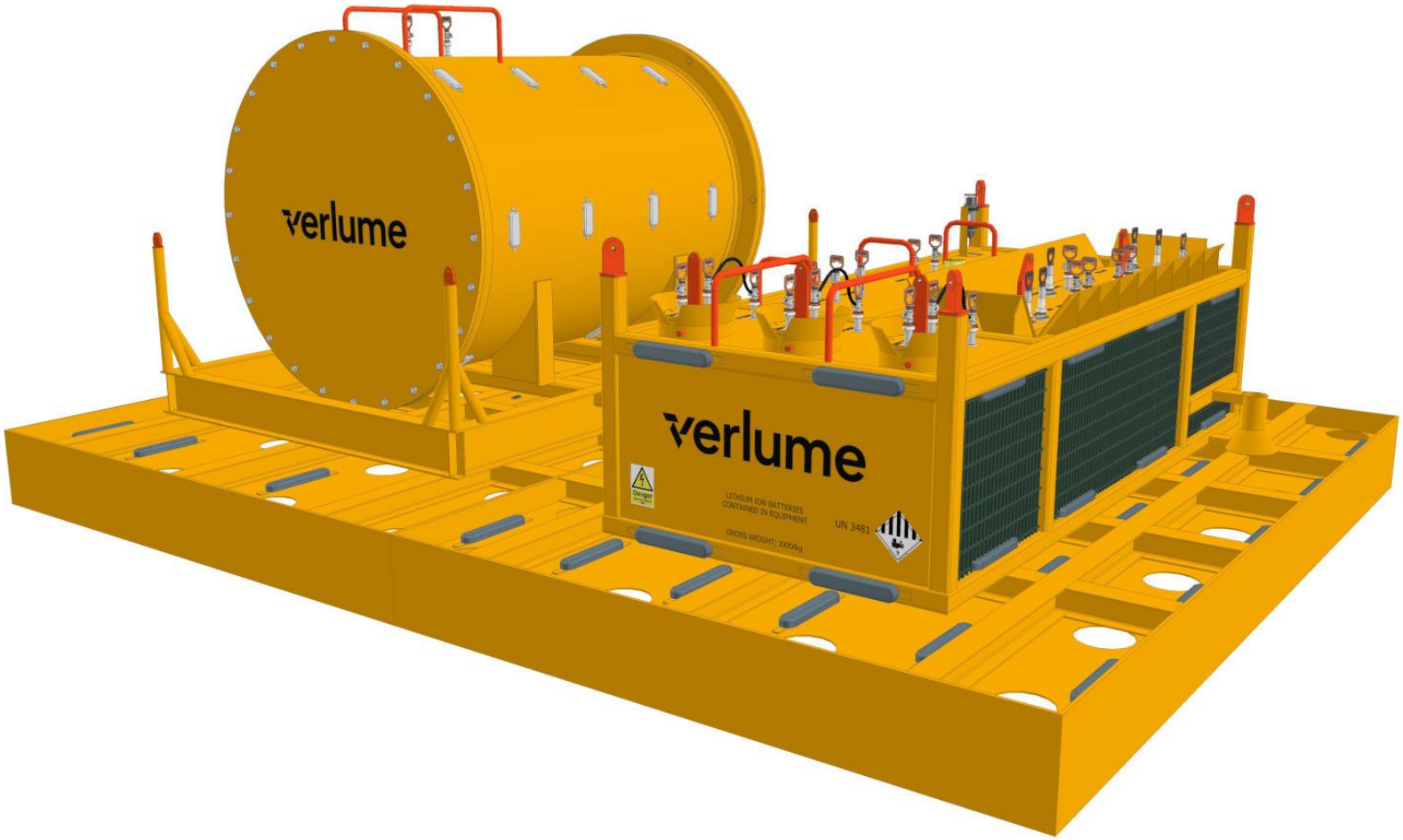
Ocean Grazer's Ocean Battery is a scalable, modular solution for energy storage that is produced by renewable sources such as wind turbines and floating solar farms at sea.
To store energy, the system pumps water from the rigid reservoirs into the flexible bladders on the seabed to store it under high pressure. When there is demand for power, water flows back from the flexible bladders to the low-pressure rigid reservoirs, driving multiple hydro turbines to generate electricity. As part of project OranjeWind, Ocean Grazer will be further developed in an inland underwater testing location.

Status update

- The cooperation agreement was signed.
- Ocean Grazer has started preparing the permit application.
- Ocean Grazer has started with the concept design.



Innovations at OranjeWind (2)



Intelligent Subsea Energy Storage (Verlume)

Verlume is bringing multi-purpose storage solutions offshore through a subsea lithium-ion battery with integrated intelligent energy management, which has a modular and highly scalable design that will lead to a more balanced power output by shaving the peak power production offshore. Beyond preventing grid curtailment, the storage solution can provide multiple offshore services, such as frequency response, black start capability for wind turbines and charging of hybrid or fully electric service vessels and providing residency for Autonomous Underwater Vehicles (AUVs). This will enable further reductions of the CO2 footprint of offshore wind farms and associated logistics.

Status update

- The basic design phase is finished (mech, electr. and control).
- RWE has designed the foundation to install the cabinets, the seabed preparation (scour protection), and started the purchasing process for the umbilical.

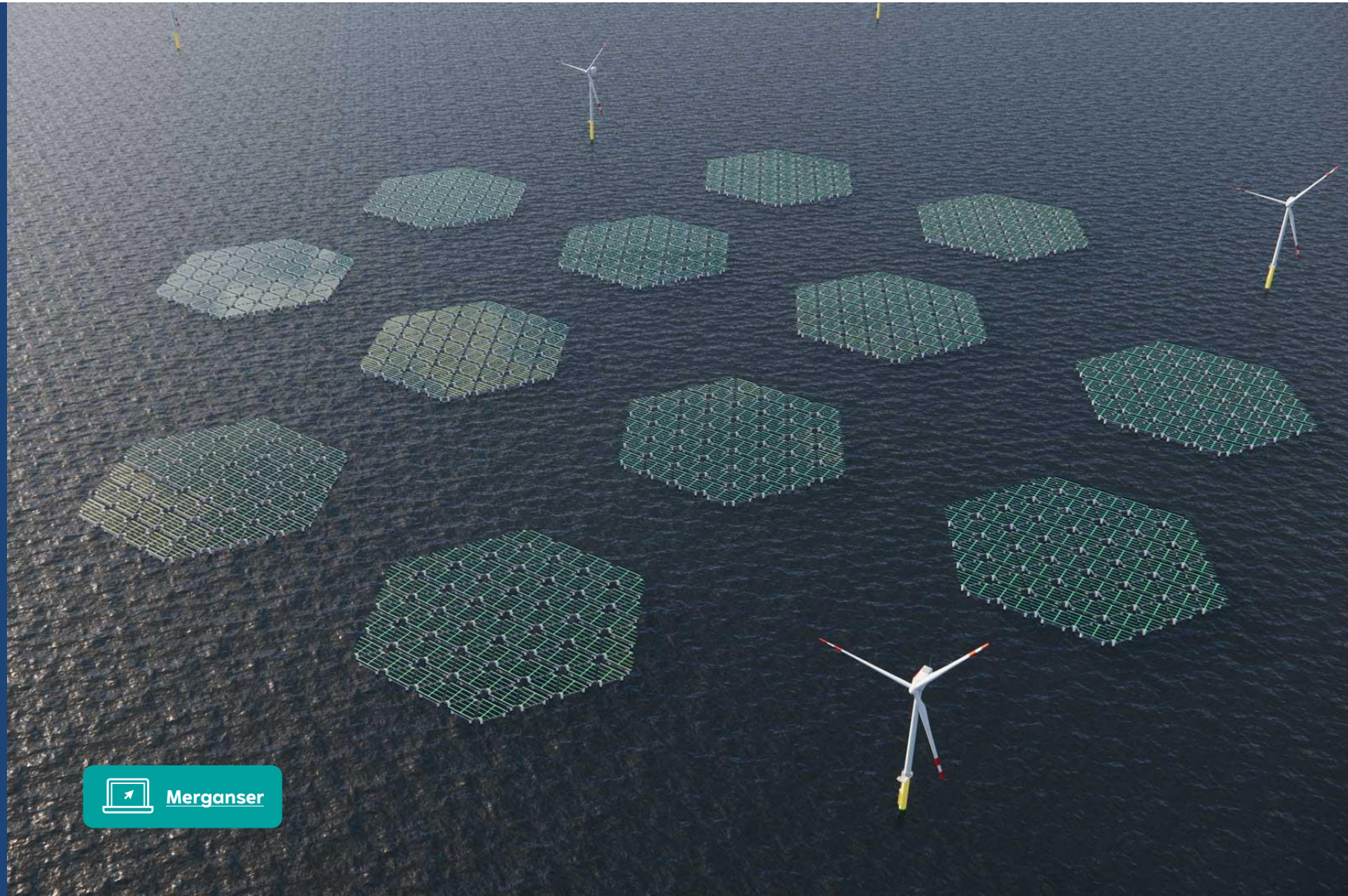
Innovations at OranjeWind (3)

Floating solar (SolarDuck)

The offshore floating solar technology, as developed by SolarDuck, provides an answer to increasing land scarcity for the generation of renewable energy. The integration of offshore floating solar into an offshore wind farm is a more efficient use of ocean space for energy generation and allows for synergies with regards to the construction and maintenance of the multi-source renewable energy plant. The result is a more balanced production profile due to the complementary nature of wind and solar resources. RWE and SolarDuck are cooperating for the first pilot installation off the Dutch coast; Project Merganser. This will lay the foundation for the larger installation at OranjeWind.

Status update

- Commissioning of Merganser pilot postponed until Summer 2024.
- Concept design phase finished; basic design phase ongoing and to be finalized in June 2024.
- RWE and SolarDuck preparing EPCI contract to be signed mid-2024



Innovations at OranjeWind (4)

LiDAR power forecasting (ForWind – Oldenburg University)

The innovative power forecasting methodology based on LiDAR (Light Detection And Ranging) has the potential to support grid stability and significantly improve the integration of wind power in future energy systems, by accurately forecasting sudden changes in power production caused by wind ramp events - strong variations of wind speed over a short period of time. Wind ramp events may cause sudden and strong changes in power leading to a significant and unexpected drop or increase of energy supply to the grid. If not forecasted accurately, both in timing and amplitude, these can result in critical grid imbalances and on the longer term hamper the further implementation of wind energy. With OranjeWind, we aim to demonstrate and further develop this innovative technology.

Status update

- Two LiDARs were purchased and ready to install at Amrumbank West as soon as weather allows.
- RWE has designed the adaptations on the main access platform for installing the Lidars at 3 HKW turbines.

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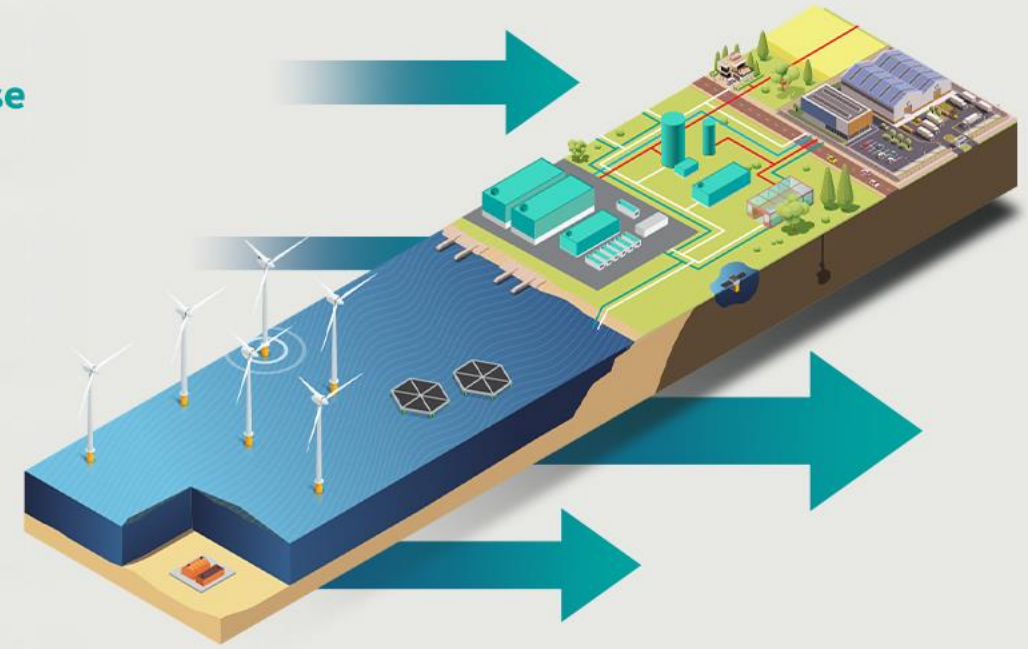
OranjeWind Knowledge

Research, communication and dissemination

Generating Knowledge

- **Collecting** In-house expertise
- **Learning from** OranjeWind
- **Facilitating** research
- **Stimulating** innovations



Sharing Knowledge

- **Initiating and joining** learning communities
- **Hosting on-site** demonstrations and events
- **Developing** workshops, webinars and teaching material
- **Contributing to** education of the future workforce
- **Publishing in** scientific journals and conferences

OranjeWind Knowledge (1)

Teachers get a tour at battery farm under construction

In order to transition to renewable energy, large-scale battery storage is needed. And we also need people who understand this technology. That's why RWE took a group of stakeholders from vocational schools to our site in Westphalia.

We showed them our 140 MW battery park under construction and talked about the future developments of large-scale battery systems and the people we need for this.

Because there is a large and growing demand for practically trained personnel in the energy sector, RWE is working closely with vocational schools. We want to ensure that battery storage has a permanent place in the vocational curriculum and make the transition from school to work easier.

OranjeWind Knowledge (2)

Winner of global innovation competition: Indeximate

Indeximate Ltd., a start-up founded in the UK in 2022, has won RWE's second global Innovation Competition. The competition was launched with the aim to find innovative solutions in the domains of system integration, circularity and environmental protection in offshore wind that can support RWE´s growth ambitions and sustainability targets.

The innovative element of their solution is the 'Indeximation' of acoustic data, ensuring a more detailed and targeted analysis of acoustic signatures in the subsea soundscape. In addition to cable condition monitoring, this system will provide for vessel as well as marine mammal identification and tracking. The technology has thus great potential for creating exciting insights into the ecological systems and supporting the preventive maintenance of RWE's global offshore wind fleet.

Read the full article

OranjeWind Knowledge (3)

RWE supervises project for students of Industrial Engineering and Management with Avans University of Applied Science

Together with Avans University of Applied Science, RWE is supervising a project of Industrial Engineering and Management.

50 students examine RWE's role in the energy transition for 11 weeks, researching business cases and opportunities. The students are guided by a team of experts from RWE who provide relevant and up-to-date information.

On February 1st, the students visited the Amercentrale in Geertruidenberg for a guided tour.

The results of the project are expected the 4th of April 2024.

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About RWE

RWE is leading the way to a green energy world. With its investment and growth strategy Growing Green, RWE is contributing significantly to the success of the energy transition and the decarbonisation of the energy system. Around 20,000 employees work for the company in almost 30 countries worldwide. RWE is already one of the leading companies in the field of renewable energy. Between 2024 and 2030, RWE will invest 55 billion euros worldwide in offshore and onshore wind, solar energy, batteries, flexible generation, and hydrogen projects. By the end of the decade, the company's green portfolio will grow to more than 65 gigawatts of generation capacity, which will be perfectly complemented by global energy trading. RWE is decarbonising its business in line with the 1.5-degree reduction pathway and will phase out coal by 2030. RWE will be net-zero by 2040. Fully in line with the company’s purpose - Our energy for a sustainable life.