



Market development of electrolysis systems taking system services into account

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Market development of electrolysis systems taking system services into account

- Core requirements
- H2 in the power grid
- H2 on/off grid


Core requirements

- Power quality INTO the electrolyser (DC)
- Power quality INTO the grid (harmonics, power factor, connection compliance)
- Match of electrolyser performance with requirements / revenues for ancillary services
 - Stack
 - BoP
- Balance of costs and benefits
 - CAPEX (more filtering, pf compensation etc.)
 - OPEX (degradation/lifetime)
- Unknowns?
 - Long term degradation/lifetime effects for DC power quality (amplitude, frequency inc. cycling)

H2 in the power grid

- Short term – flexible demand

Flexibility How we do it Solutions Reimbursement Contact



Solutions in focus

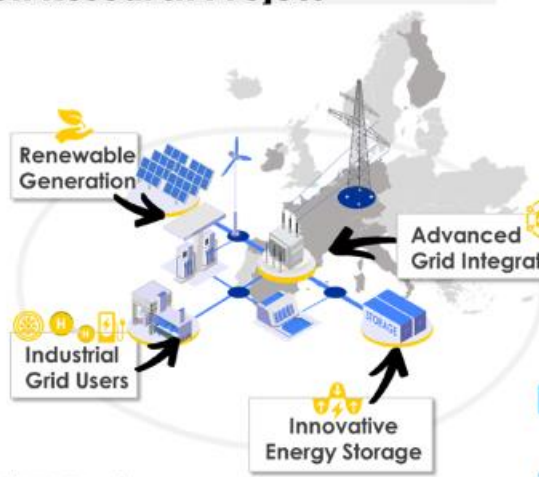
5 flexibility solutions for businesses

1. Companies with high electricity demand for the primary production process (e.g. electrolysis) can consider running their process harder or softer.
2. Companies with heat or electricity demand may consider investing in an electric boiler or industrial heat pump, then buffering heat and using it later.
3. Electricity demand for storage cooling can be well shifted over time.
4. Electricity from the grid or from local, renewable generation, can be temporarily stored in a battery or flywheel.
5. There are also plenty of opportunities outside the industry, such as smart charging of electric cars.

- Long(er) term - storage

AGISTIN – EU Horizon Research Project

Advanced Grid Interface for innovative Storage INtegration

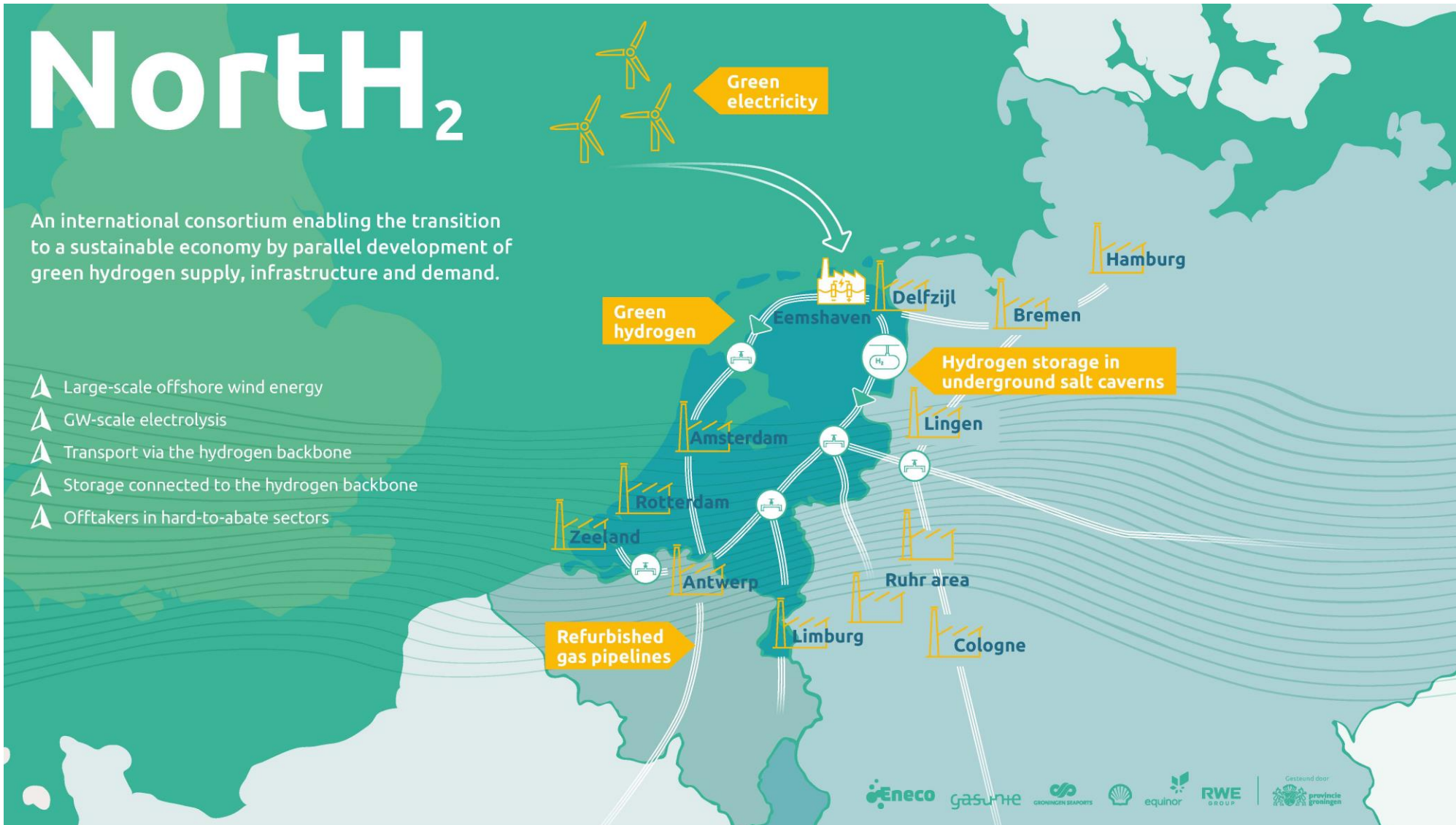


Logos of project partners:

- Fraunhofer IWES
- en^{ERG} Energiemanagement und Betriebs-elektrischer Netze
- UNIKASSEL UNIVERSITÄT
- Rte Le réseau de transport d'électricité
- SHELL
- CARTIF
- EASE European Association for Storage of Energy
- RINA
- EPRI
- infrastructures.cat
- ETH zürich
- GEYSER BATTERIES
- Ciemat ceder centro de desarrollo de energías renovables
- CITCEA

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H2 on/off grid



H2 on/off grid e.g. FlexH2 Project



FlexH2 Project

Flexible Offshore Wind Hydrogen Power Plant Module

dr.ir. Yin Sun

Shell Global Solution International B.V.

yin.sun@shell.com

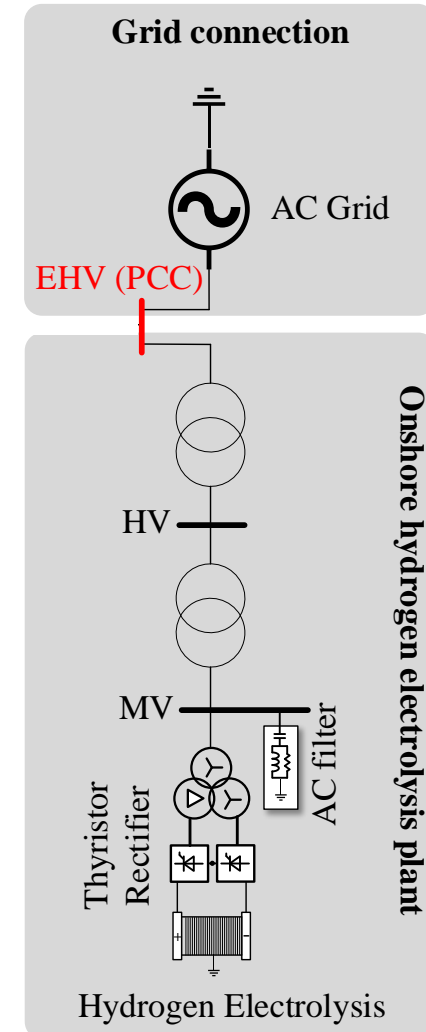
2023.11.01

FlexH2 project – hydrogen perspective

Traditional concept

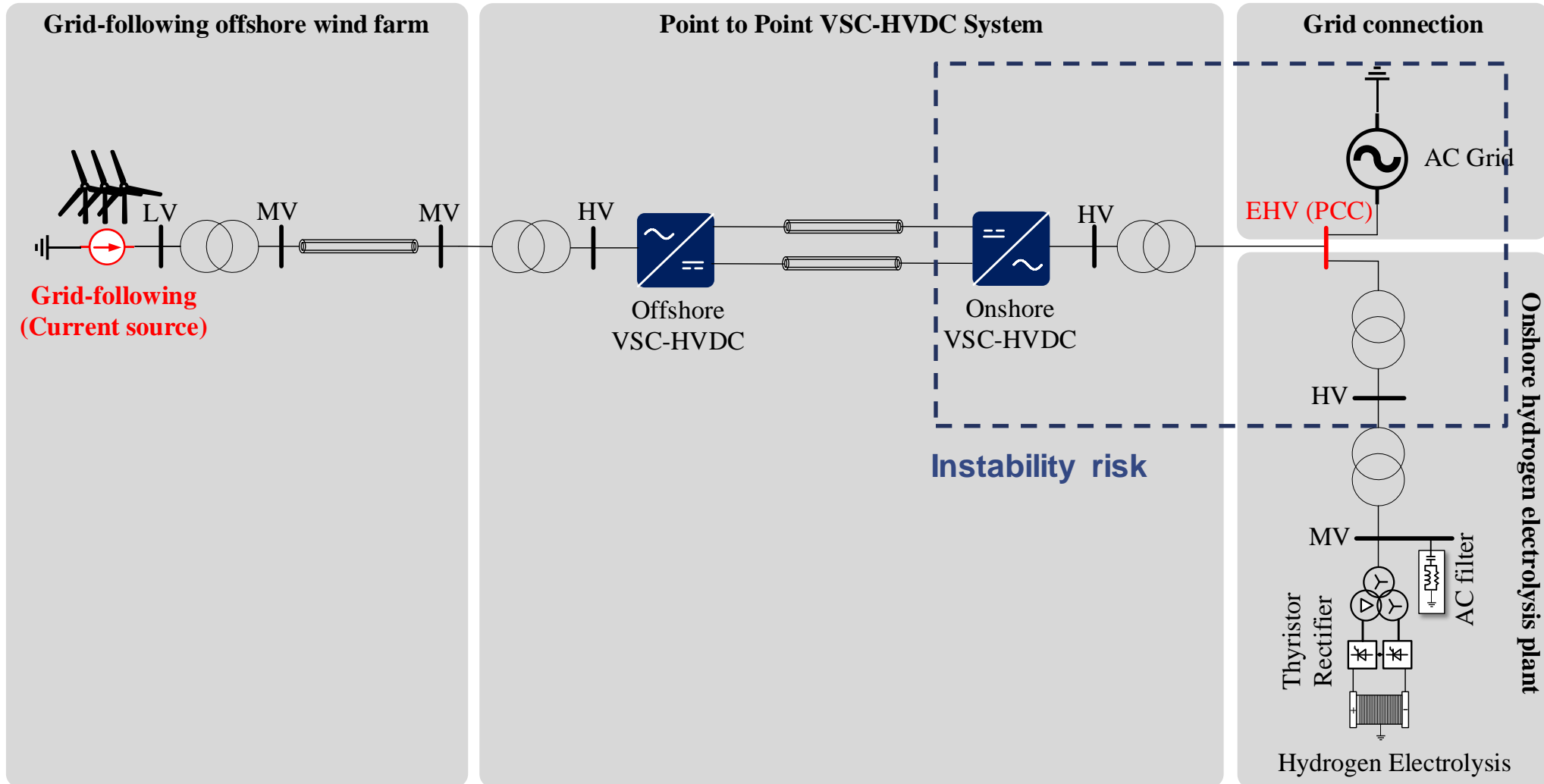
Disadvantages

1. Very high grid connection cost (and increasing)
2. Issue of grid congestion
3. This is not “green H2”



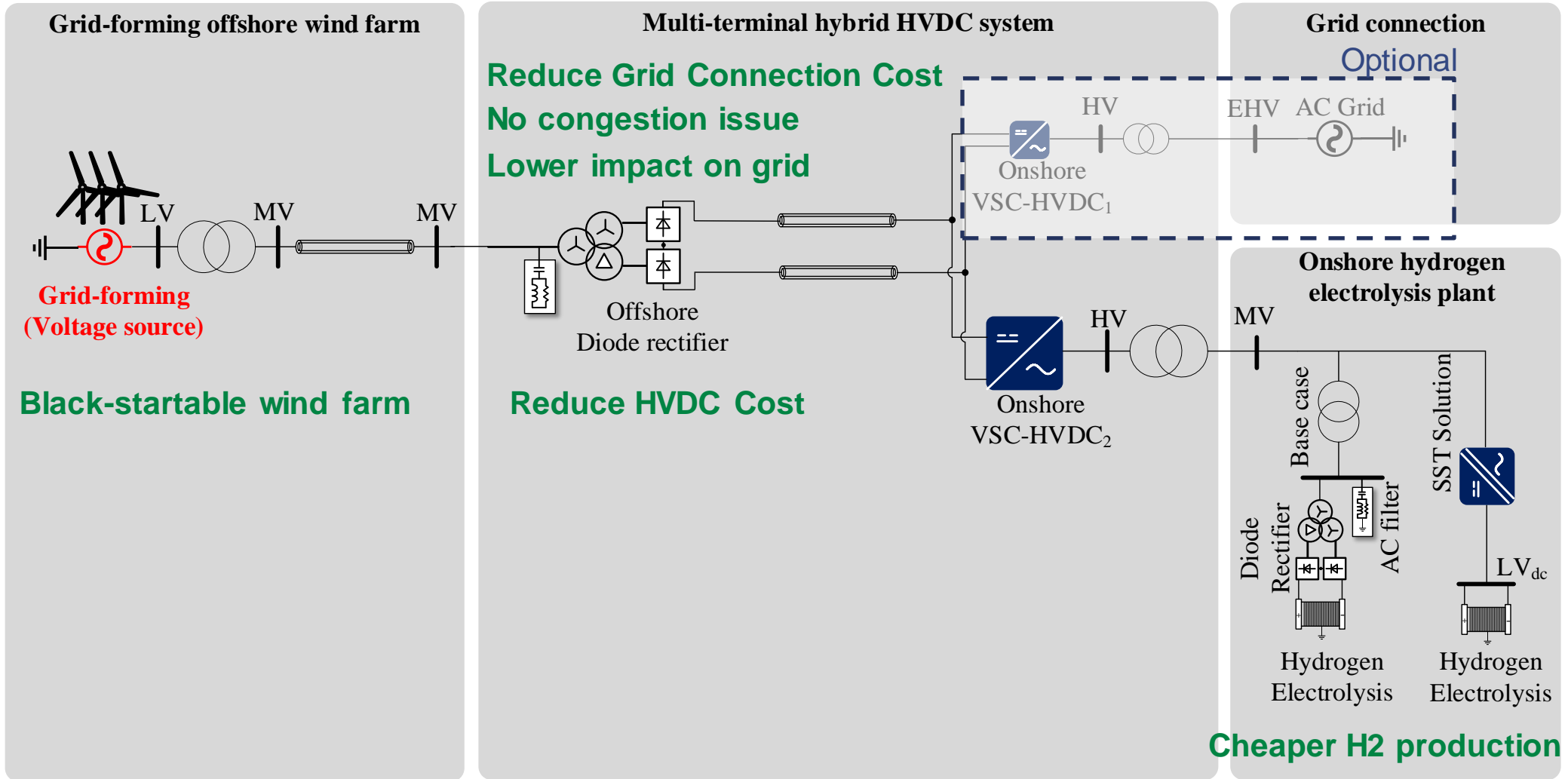
FlexH2 project – hydrogen perspective

Recent concept: parallel connection of grid and H2 production



FlexH2 project – hydrogen perspective

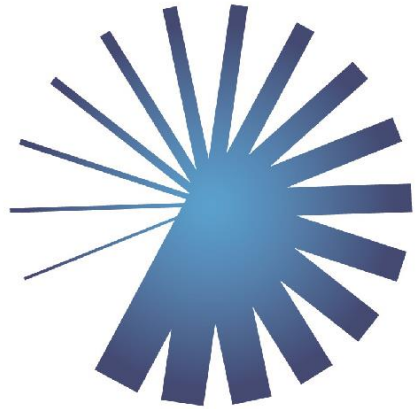
FlexH2 concept: directly-coupled offshore wind and H2 production



Project partners



FLEX-H2



grow

ABB



TU Delft



Van Oord



TNO



TU/e EINDHOVEN
UNIVERSITY OF
TECHNOLOGY

vonk



Netherlands Enterprise Agency



TKI WIND OP ZEE
Topsector Energie