Virya Energy

agenda

- **Company presentation of Virya Energy**
- **Hydrogen activities**
- **Sector coupling**
  - Opportunities and challenges
- **Case: green hydrogen production in Zeebrugge**

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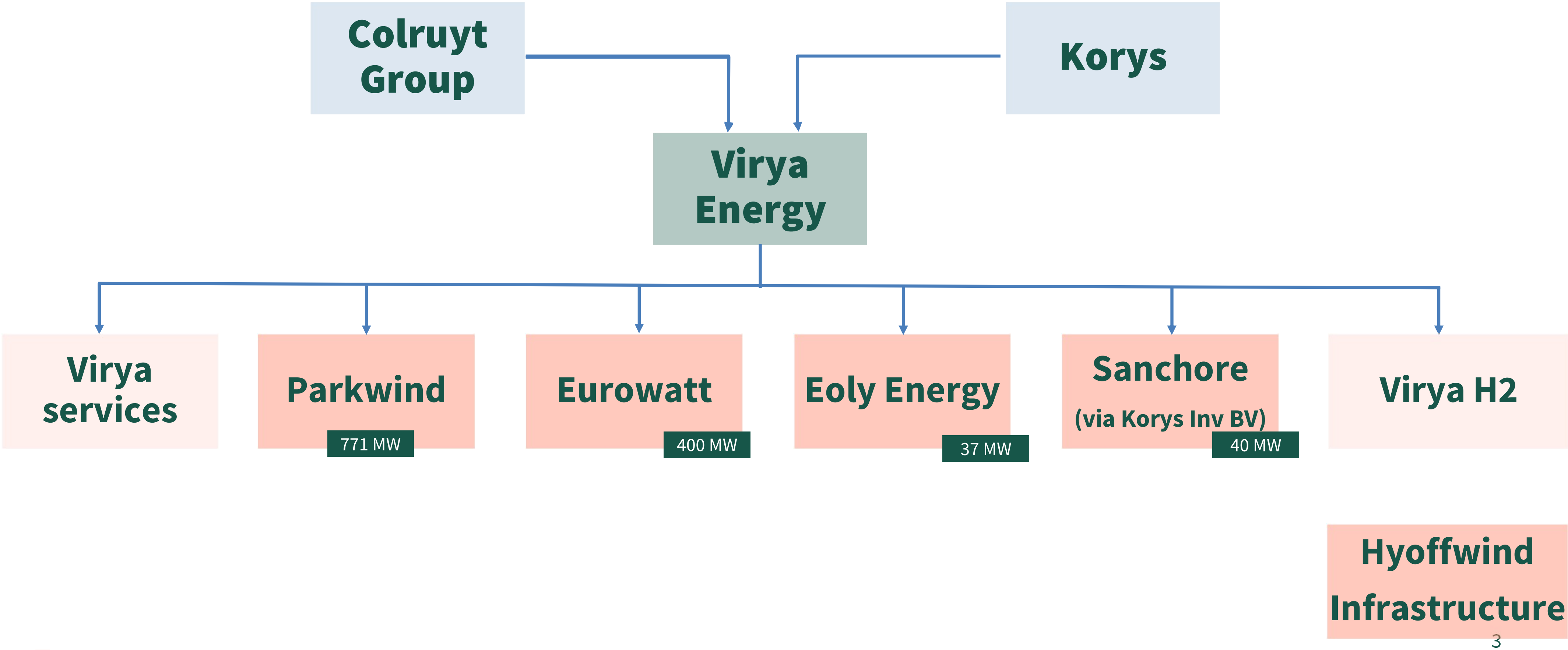
Virya Energy Group Structure



Hydrogen activities within Virya Energy

An Experienced Green H_2 Player Since 2007

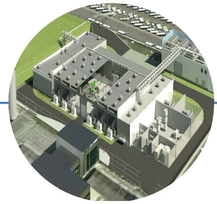
2007: First experience with forklifts. Five forklifts operating since 2018. Two indoor dispensers as from 2012

Deployment of 75 fuel cell forklifts

2011: First electrolyser (alkaline)
2015: Second electrolyser (PEM)

2016: 20 fuel cell company cars in Colruyt Group fleet, used daily by employees. Collaboration with OEM (Toyota and Hyundai)

2018: 1st multi fuel HRS (700 bar)



2018: Development of a 25MW electrolyser in Zeebrugge

2020: Colruyt group pioneers in heavy duty applications
First fuel cell trucks in Europe (26 & 44 tons)
Collaboration with OEMs and logistic companies

2021: Five hydrogen refuelling stations (HRS) in Belgium and one heavy duty truck

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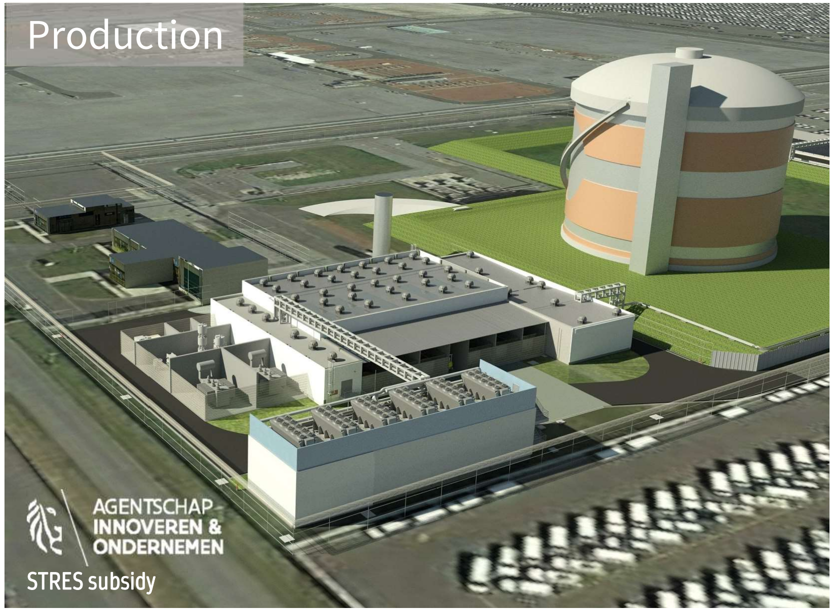
Our International Hydrogen Portfolio (2020-22)



Virya Energy and Fluxys are developing a 25 MW power plant in Zeebrugge. Using renewable electricity, they will produce hydrogen for industry, transport and for injection as green gas into the Belgian gas network from 2024. The EPC contract got signed in Q4 2021

In June 2021, Virya Energy won the public tender launched by the STIB-MIVB for the rental of a mobile hydrogen refuelling station for a bus in Brussels. Virya Energy provides the station and the hydrogen but also assist the STIB in learning the skills and knowledge necessary to operate a hydrogen bus in real conditions

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Our International Hydrogen Portfolio (2020-22)

Virya Energy and Novandi received a subsidy from the Wallonia region to develop a small-scale electrolyser of 5MW and an offsite HRS. The off-take will be secured by two barges retrofitted and heavy-duty trucks

Virya Energy is co-developing a hydrogen bunkering facility in the Port of Ostend and the retrofitting of crew transfer vessel to participate to the growth of hydrogen-powered logistics in Europe

Virya Energy, Boluda and MBZ are converting a tugboat to reduce shipping emissions and addressing local port authorities' demand for cleaner operations in the port area

Our International Hydrogen Portfolio (2020-22)

Virya Energy and the Dutch developer VOLTH2 are co-developing a 25 MW (scalable to 100MW) power plant in Terneuzen, in the North Sea Port. The company has begun planning and developing the construction of a green hydrogen plant with distribution capabilities. The permit has been granted in 2022 and the start of operations is foreseen in 2025

Virya Energy and Innovyn are looking at the feasibility of a joint project at heir site in Tavaux (France). Both companies are situated next to each other. The project aims at boosting a local value chain of hydrogen for mobility purposes

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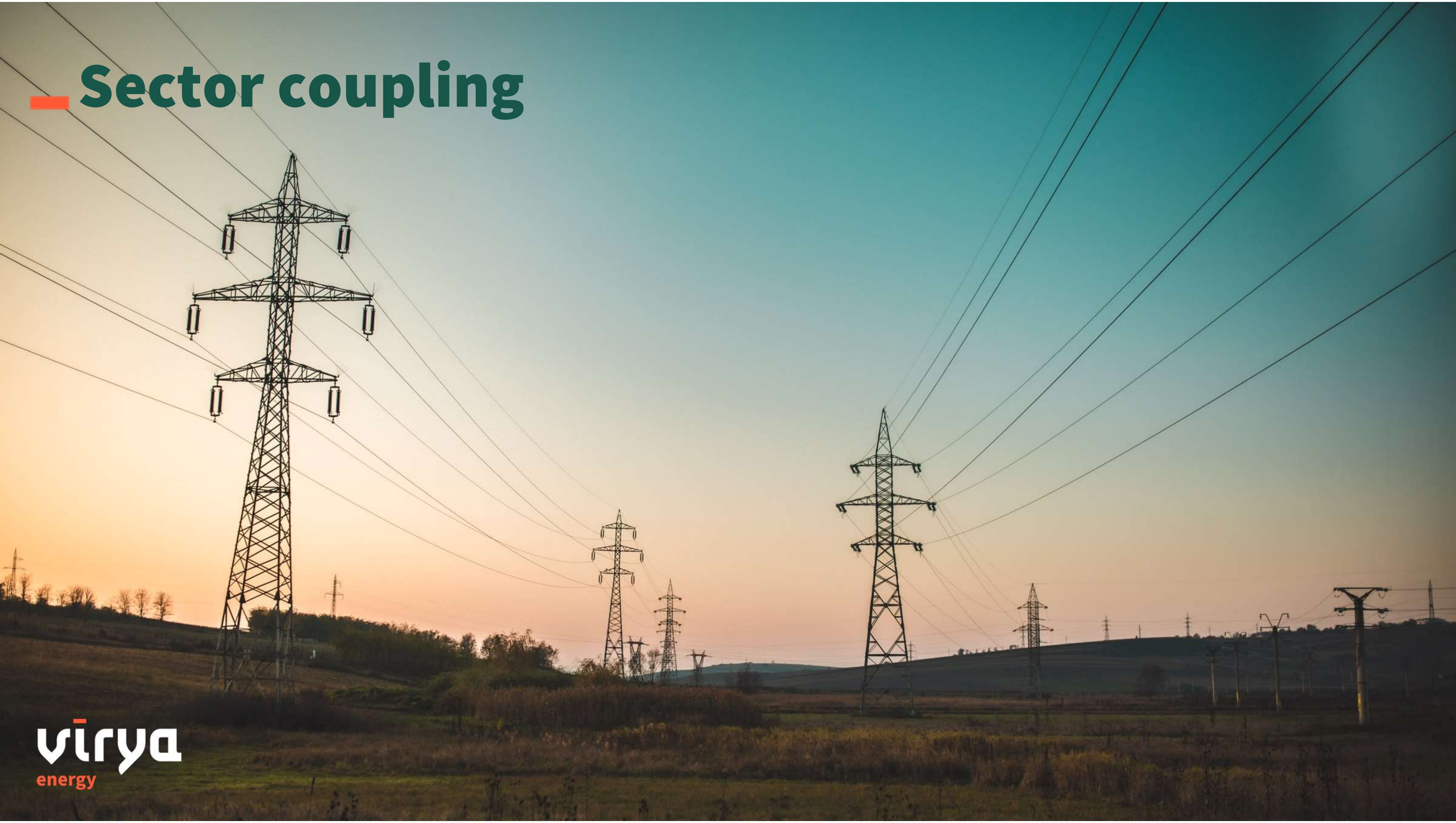
Sector coupling



What is sector coupling

- Cross vector integration: integrated use of different energy infrastructures and vectors (eg electricity, heat and gas) – power to X
- End use sector coupling: enhancing electrification and adapting end use to generation

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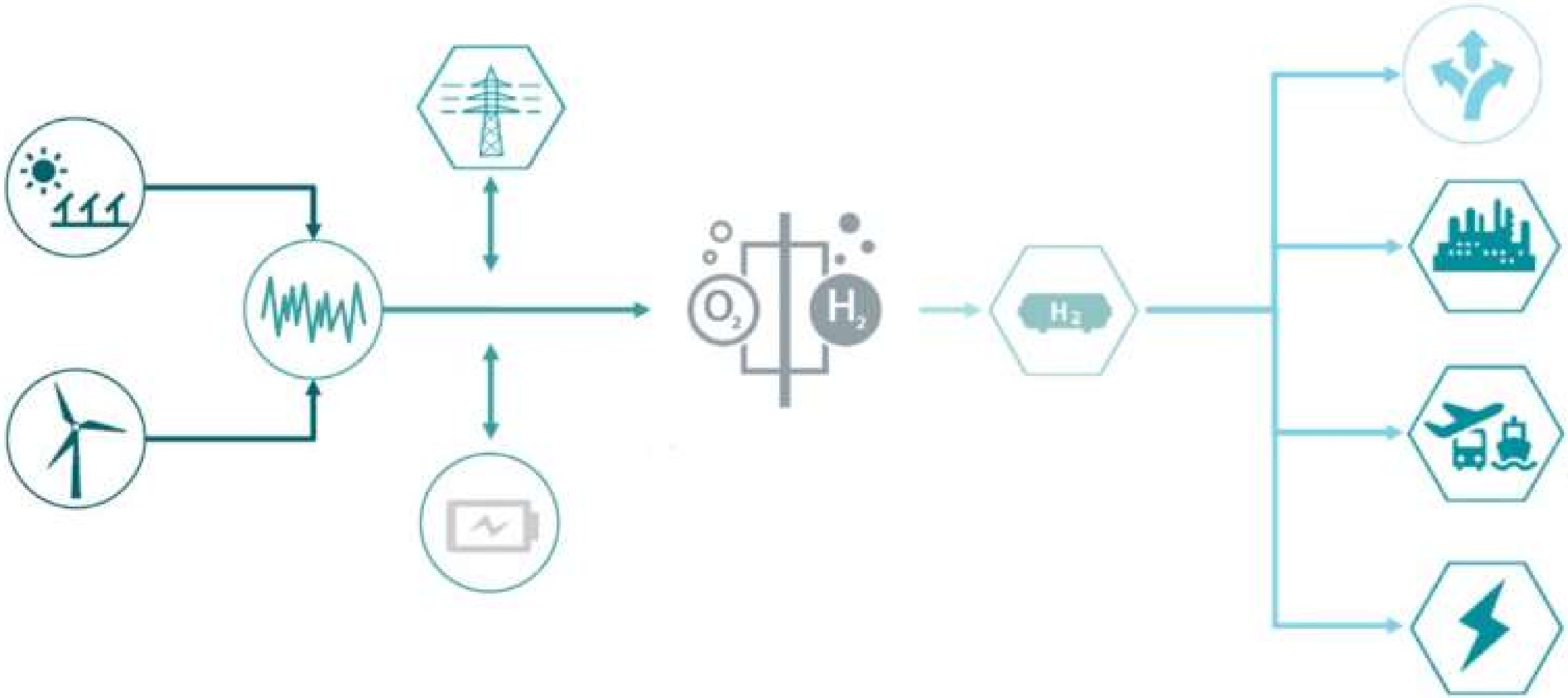
H_2 as a stabiliser for a sustainable energy system



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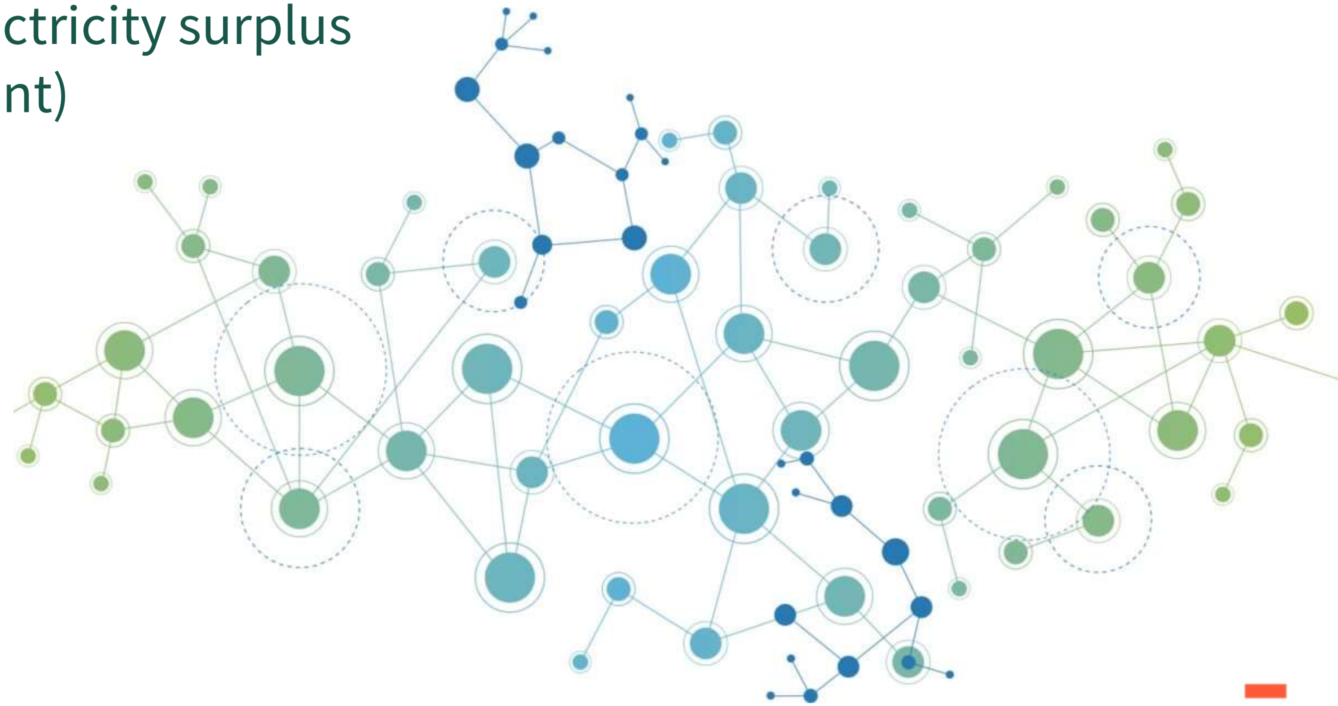
Advantages

- **Grid stability**
  - Efficiency
  - Adequacy
  - Flexibility
    - Act as a sink for renewable electricity surplus
    - Preventing spillage (curtailment)
  - Reliability



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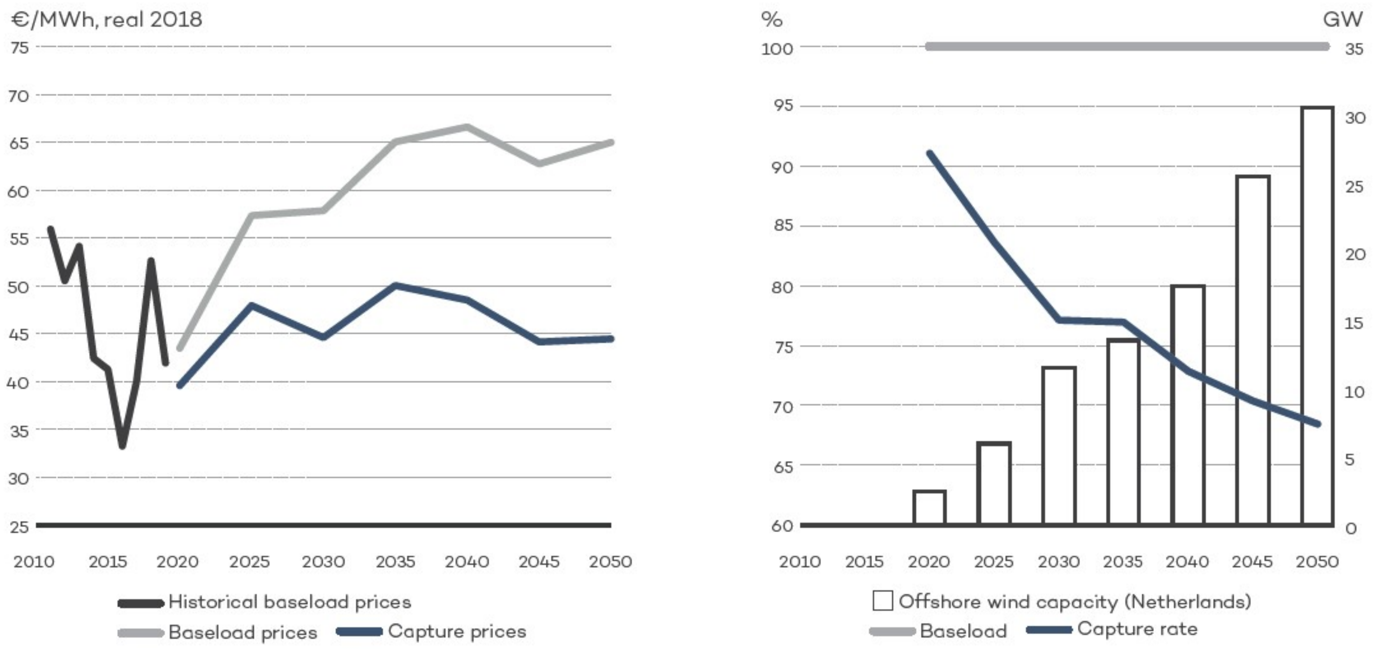
Example: future "capture rate" of offshore wind in the Netherlands

FIGURE 2 – OFFSHORE WIND CAPTURE PRICES (€/MWH), CAPTURE RATES (%) AND INSTALLED CAPACITY (GW) FOR THE NETHERLANDS IN THE REFERENCE SCENARIO



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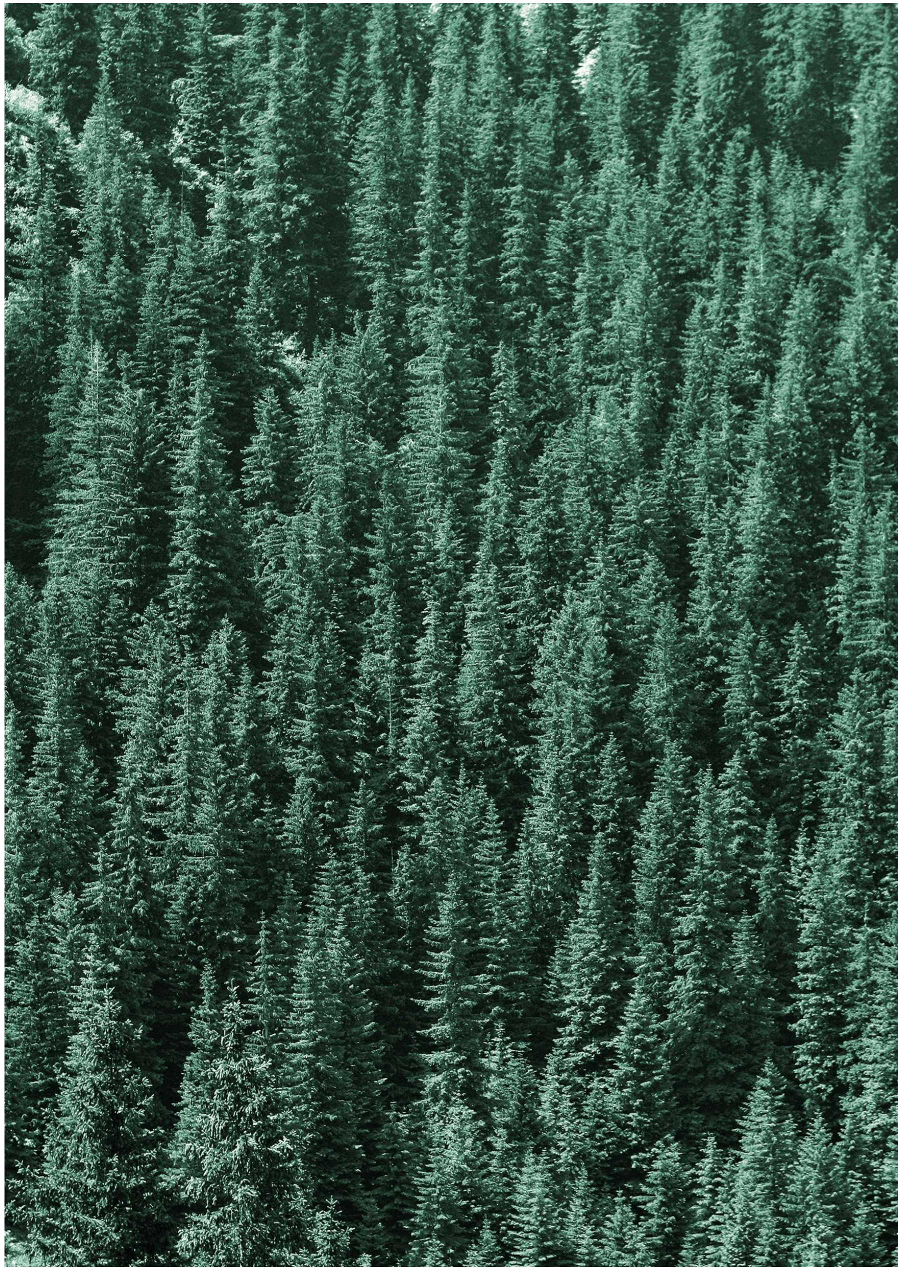
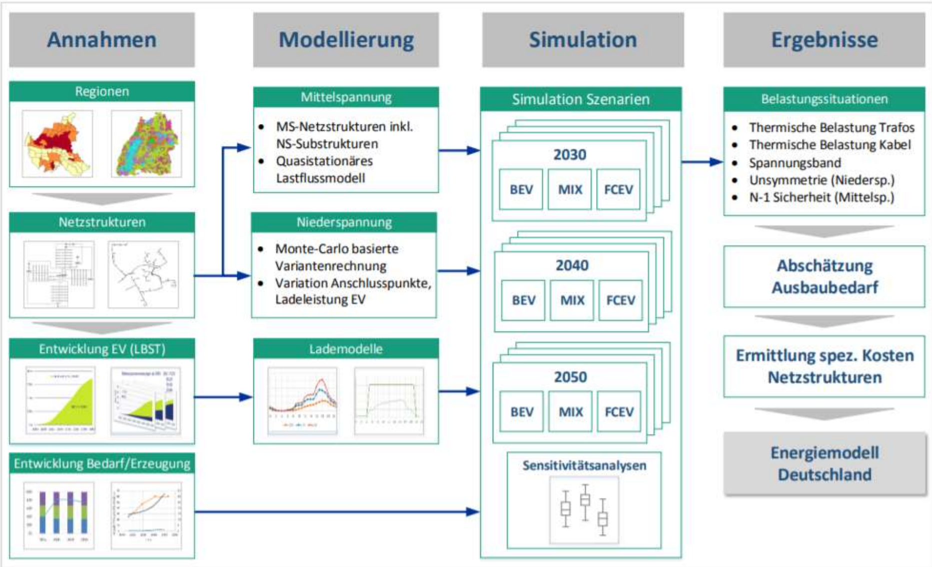
Advantages

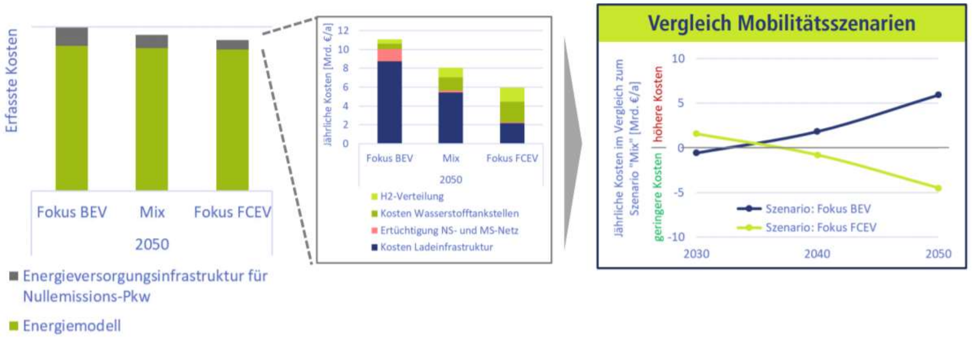
- Optimises the use of existing gas infrastructure
- Gas storage facilities could cope with seasonal differences
- Overall lower system cost
- Accelerate decarbonisation of applications/end use not suited for electrification
- Lower cost of decarbonizing



Example: zero emission mobility: systemic cost



- Kostenunterschiede langfristig vor allem durch Lade- und Betankungsinfrastruktur
- Die Kosten für private Ladepunkte haben maßgeblichen Einfluss
- H_2-Betankungsinfrastruktur vor allem bei hohen Fahrzeugzahlen kosteneffizient
- Bis 2040 weitgehend gleiche Gesamtkosten; Langfristig Vorteile steigende Anteile FCEV



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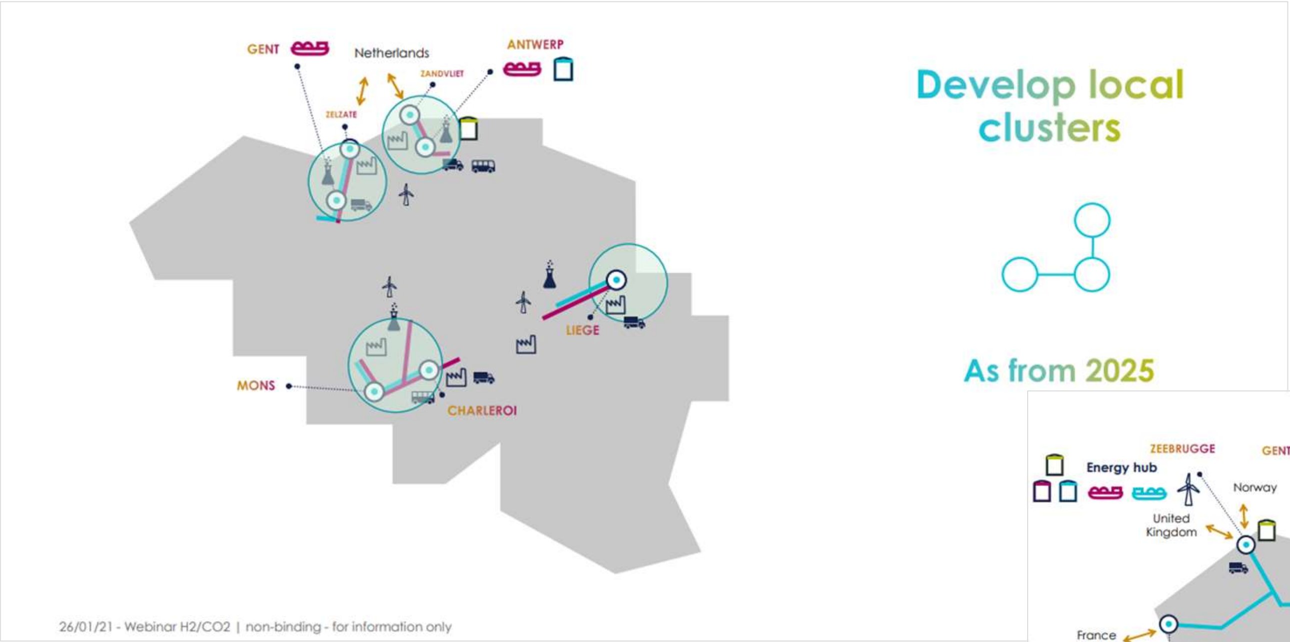
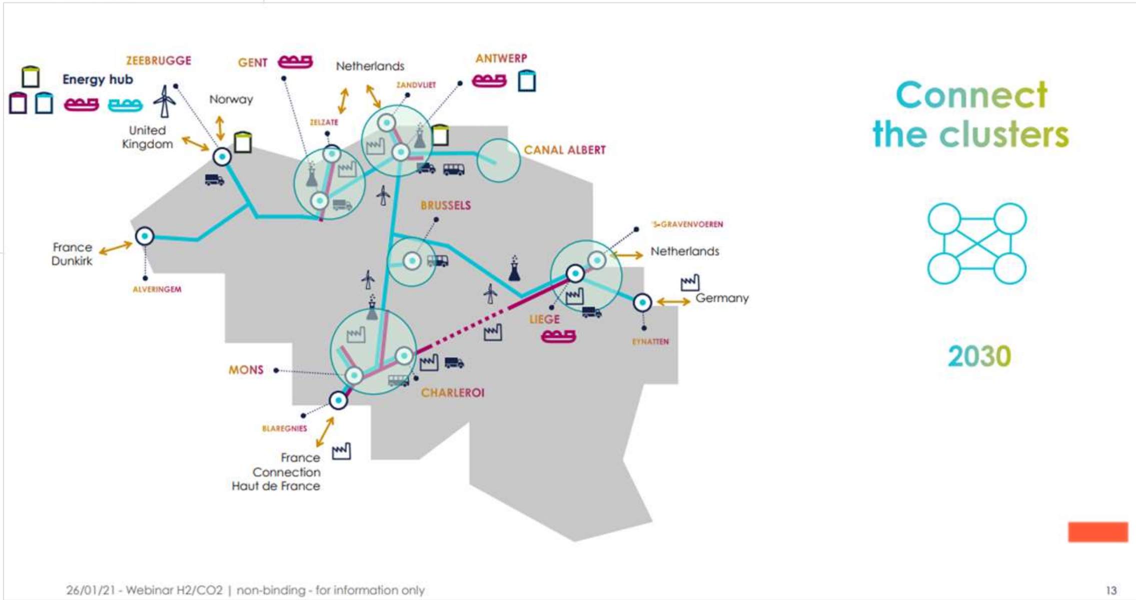
Development of dedicated H2 backbones





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Challenges

- Market dynamics
  - Competitivity of fossil fuels
- Lack of regulatory stability or coherence (eg delegated act)

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Case Study

Green H_2 production at Zeebrugg

Production

10 years of experience with local production of green hydrogen
Projet Hyoffwind: scaling up
Zeebrugge
25 MW - scalable to 100 MW

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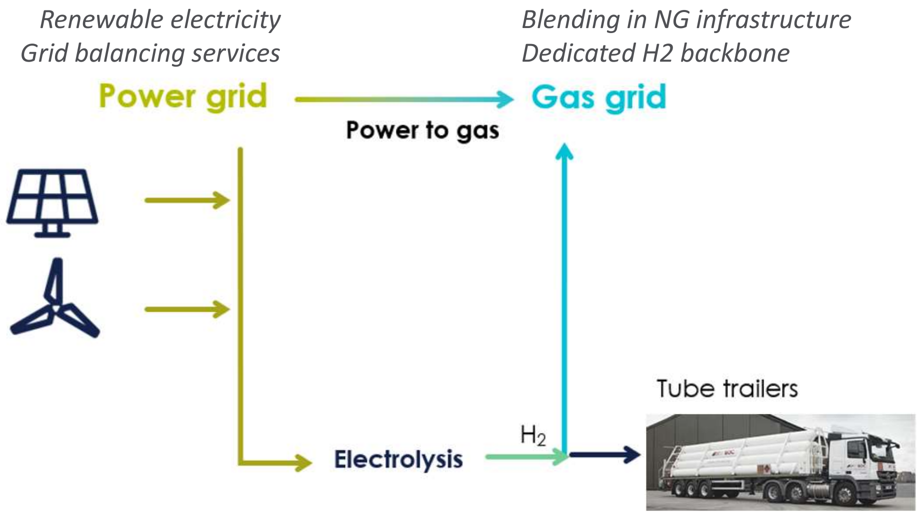
Green H_2 as a catalyst towards decarbonisation

Concept

- Virya Energy and Fluxys[1] develop the first large P2G installation in Belgium (Zeebrugge): a **25 MWe electrolyser (scalable to 100 MW)**



- Production of up to 4 kton renewable hydrogen/year in phase 1 (25 MW)
- Compression to 90 bar for injection in gas grid, 500 bar for tube trailers

Value proposition

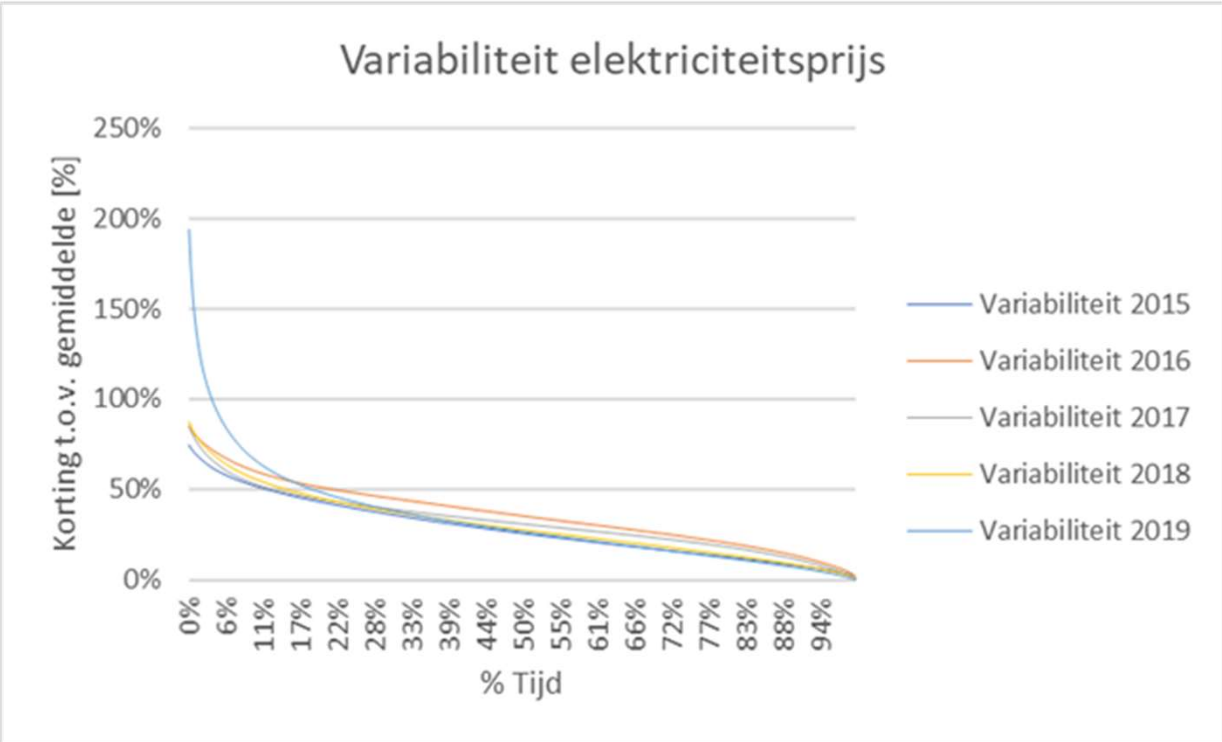
- Deliver renewable hydrogen to the market (**via tube trailers to mobility or industry, blending into the natural gas grid or connection with a hydrogen backbone**).
- This could lead to significant **GHG reductions: 1,14 Mt CO_2e over 20 years** (for 25 MW) → Positive impact for BE emission objectives
- Synergies with the electricity grid (real time balancing services for RES)

Current status

- The **Flemish government officially approved 8 M€ subsidies** for Hyoffwind. A recognition that Hyoffwind is the most mature Belgian P2G project.
- Letter of intent with offtakers of renewable hydrogen and green gas signed.
- The project development is **on track to take final investment decision in 2022.** An EPC contract has been signed with John Cockerill/Besix.

Note: (1) Fluxys is not involved in the sales and marketing of hydrogen, not in the purchase of electrity

Adapting to a fluctuating energy market



Fluctuating electricity prices (driven by ao wind and sun) lead to a:

- Potential to lower the production cost of green H2
- Potential to offer grid balancing services to the grid

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Thank you