

TotalEnergies

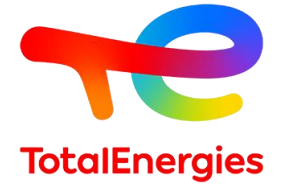
H2 from an Offshore Wind Developers perspective

The future energy carrier

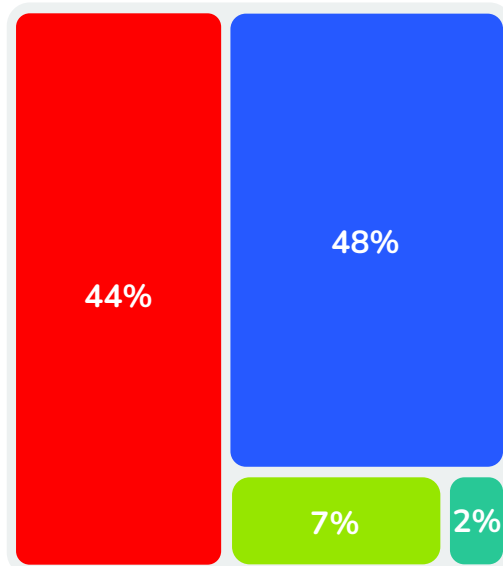
H2 Conference, Copenhagen June 2023

TotalEnergies a multi-energy company

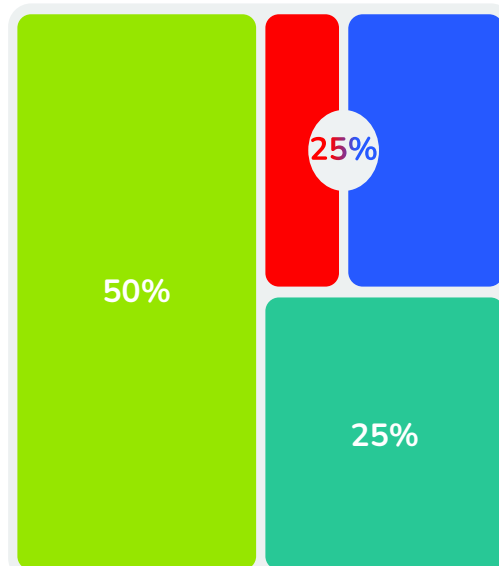
Emerging as a promising contributor to Net-Zero



2021
energy mix



2050
energy mix



CCS: 50–100 Mt CO₂e



Oil



Gas



Electricity



Hydrogen



Biomass



Wind power



Solar power

1 # Major Ambition on Renewables

Active since 2011

Target 2025 @ 35 GW

Target 2030 @ 100 GW

2 # LNG player, integrating a strong of commitment to reduce CO₂ emission

3 # CCS Development

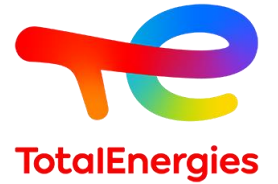
4 # Hydrogen & e-fuels

Target 2030 @ 1 Mt/y clean H₂/e-fuels

■ Oil ■ LNG & Gas ■ Renewables & Electricity ■ New Molecules (biofuels, biogas, hydrogen, or e-fuels)

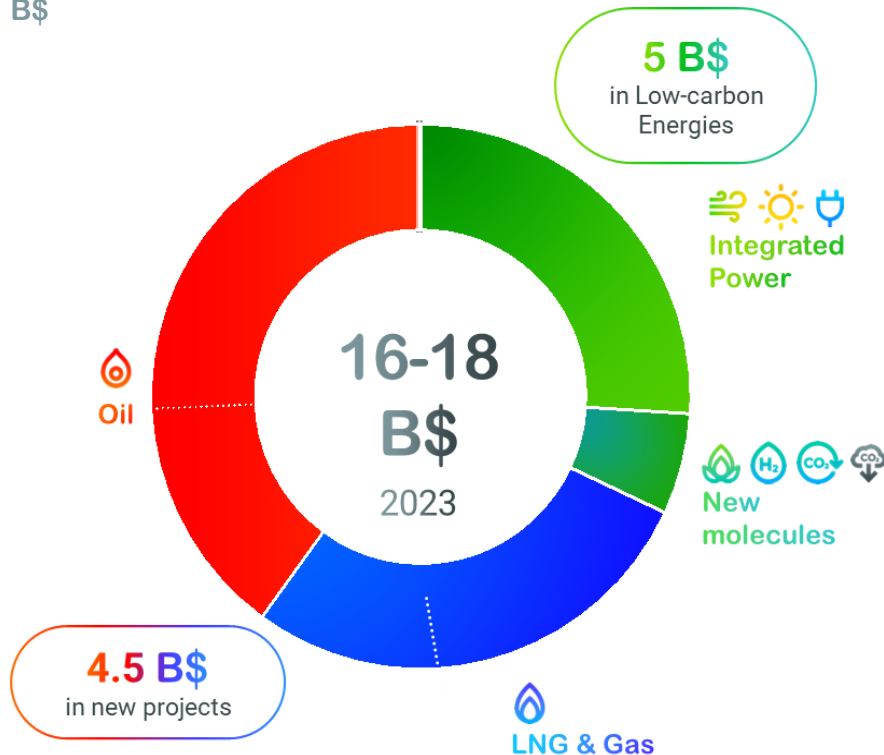
A major player in the energy transition

High level of investments in the energy transition businesses: 4B\$ in 2022 and 5B\$ in 2023



Capital investment strategy

B\$



Oil

- Maintaining the engine of the transformation
- Aligning sales to demand & production

Gas

- Growing LNG production without Russia
- Sustaining domestic production

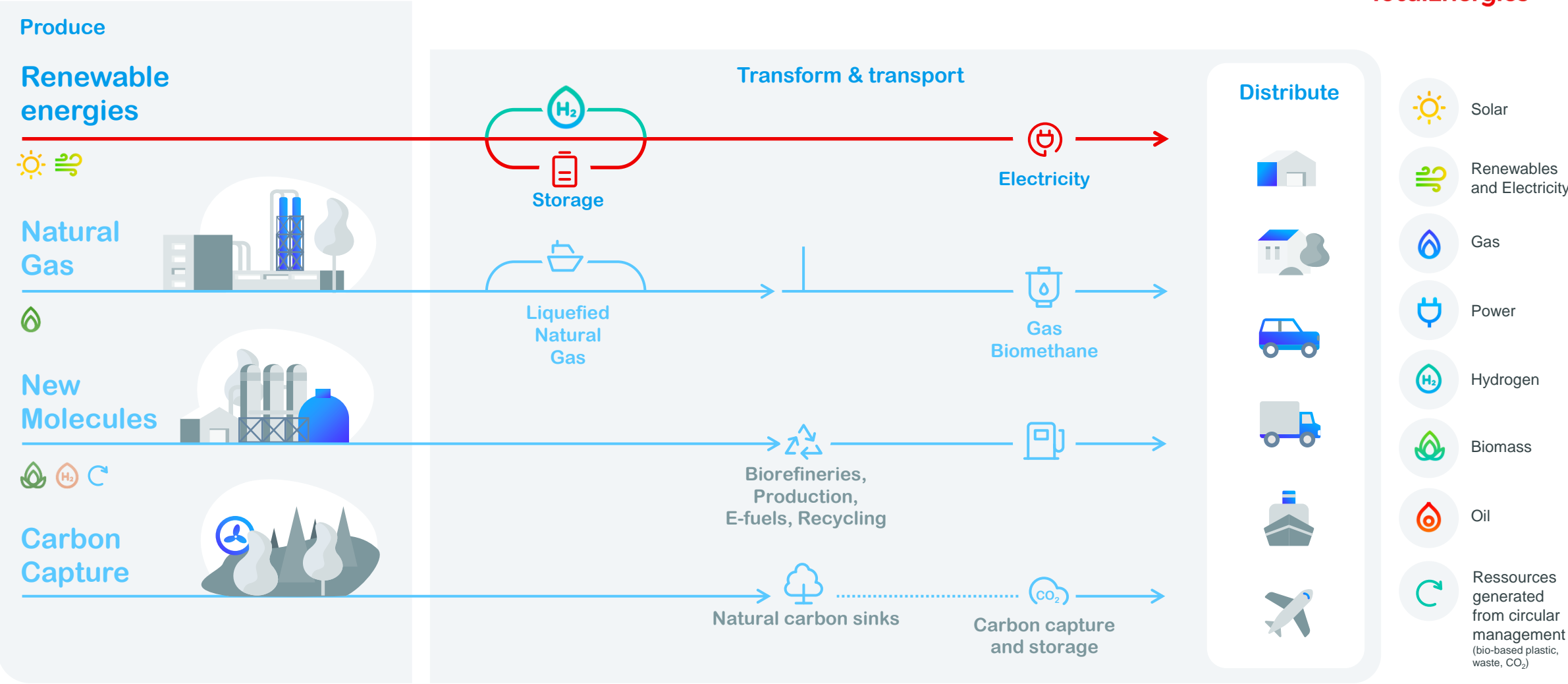
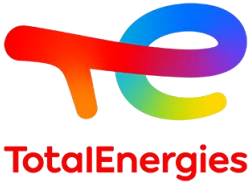
Electricity & Renewables

- Creating value from integration in electricity
- Renewables: 100 GW by 2030

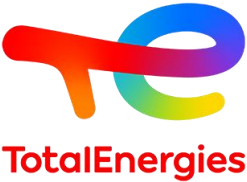
New molecules

- Growing biofuels (SAF), biogas, CCS business
- Launching first clean H2 projects

Our integrated value chain to support the energy transition



Our major announcements in 2022 – 17 GW Renewables in operation



+ United States

- Acquisition of a 50% stake in **Clearway**
- Offshore wind farm under development off the **North Carolina** coast
- Acquisition of **Core Solar**
- Offshore wind farm under development off the **New York** and **New Jersey** coast
- Acquisition of **SunPower's** industrial and commercial solar power businesses

Creation of a JV with **Casa dos Ventos** to develop a **12 GW** renewable energies portfolio

Brazil

Scotland Production begins at the **Seagreen** offshore wind farm

2-GW offshore wind farm under development (**West of Orkney**)

+ France

Eolmed floating wind project under construction in the **Mediterranean**

Japan Expansion of distributed solar power in the **Asia-Pacific** region in partnership with **Eneos**

Angola First **multi-energy project**. An initial solar power plant under construction at **Quilemba**

\$4 billion invested in low-carbon energies

Current projects in Europe and worldwide

Green H₂

Green H₂

Other offshore wind projects

- USA, UK, Denmark....

H2Ero Project



- Location : Netherland – Zeeland Refinery
- Capacity : 300 MW electrolyser
- Ren Power : Offshore Wind
- COD : 2028

Green H₂

Masshyla Project



- Location : France – La Mede Refinery
- Capacity : 120 MW electrolyser
- Ren Power : Dedicated Solar plant
- COD : 2025

Green H₂

Magallanes Project



- Location : Chile
- Capacity : 8 GW electrolyser
- Ren : Up to 10 GW wind
- FID : 2025



Hydrogen mobility 

Developing > 100 H₂ stations for heavy duty vehicles in Europe

50/50 JV with Air Liquide

- Stations to be located on strategic European corridors (France, Benelux and Germany)
- Targeting ~15% market share by 2030

Contributing to H₂ Mobility network expansion in Germany

- Targeting 200 H₂ station for trucks by 2030

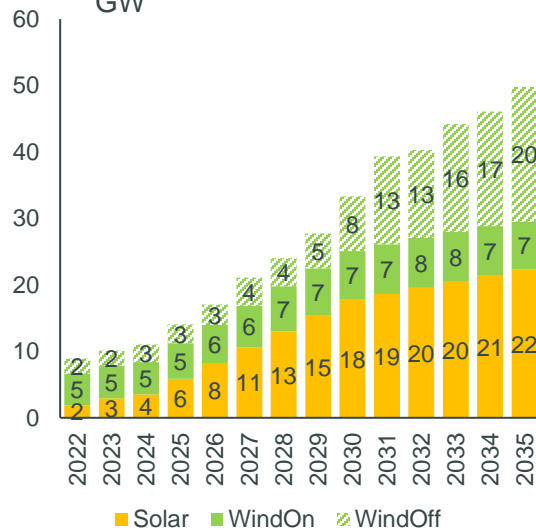
Our Strategic Partners



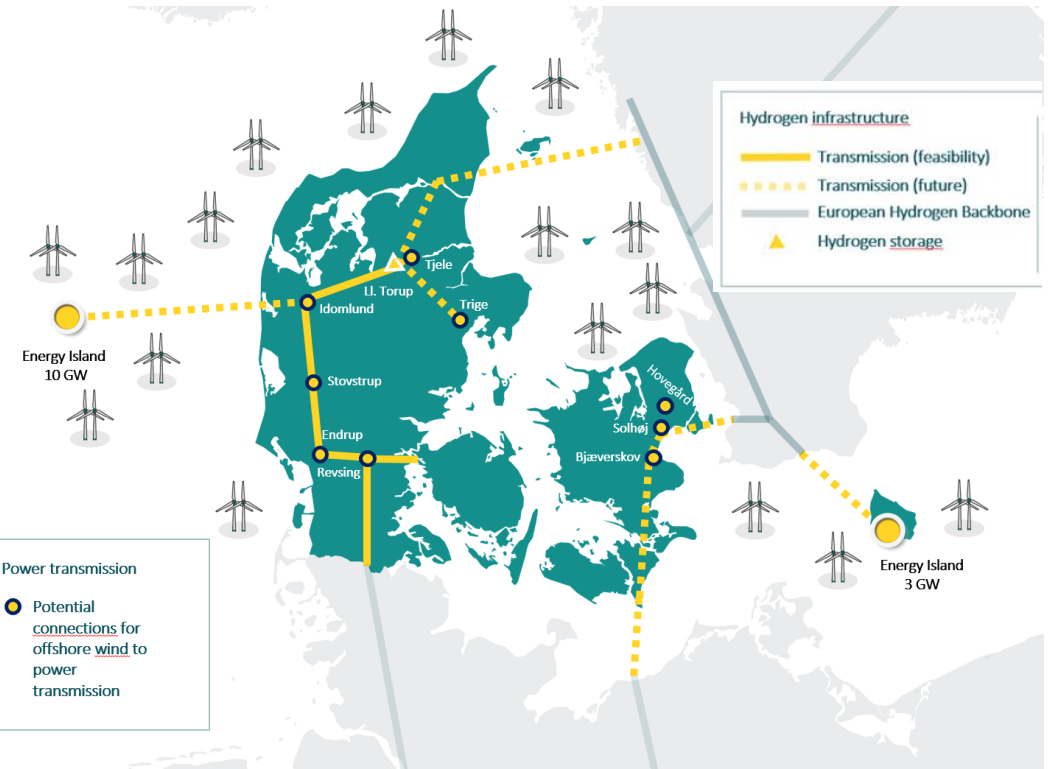
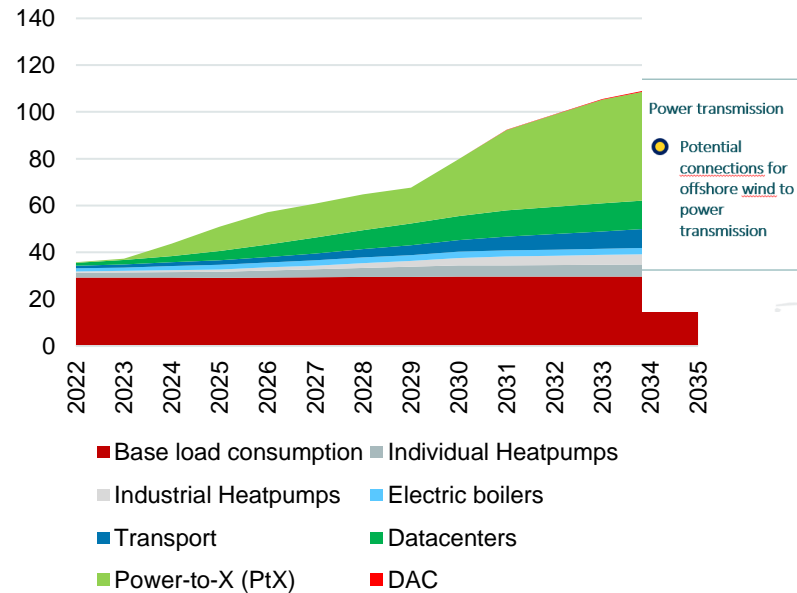
H₂ status in Denmark

- ✓ Access to Renewables
- ✓ ~40 PtX projects announced -> demand developing
- ✓ H₂ infrastructure decided, domestic and export - 1st part ready 2028

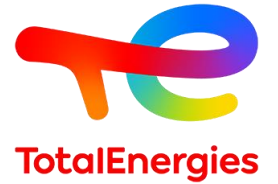
DEA REN capacity evolution
GW



Net Energy Consumption
TWh



H₂ opportunities and challenges



Opportunities

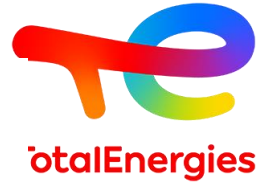
- Green H₂ accelerates low carbon energy transition
- H₂ production drives up electricity demand, as well as CCS & electrolysis development -> large offtake of power from OFW
- Technologies known....

Challenges

- Costs must come down in order to support H₂ production and industrial scale up
- Break-even prices for green power, H₂ and PtX products?
 - TSO estimate H₂ 2-3 \$/kg production price in 2030 -> Challenging to reach
 - Cheaper alternatives.....?
- Development from small local demand to regional/international market
- H₂ commercial regional/international market model
- Right incentive structure - subsidy free in the long run
- National and international hydrogen infrastructure incremental for H₂ future



DTEC: DTU TOTALENERGIES EXCELLENCE CENTER FOR CLEAN ENERGY

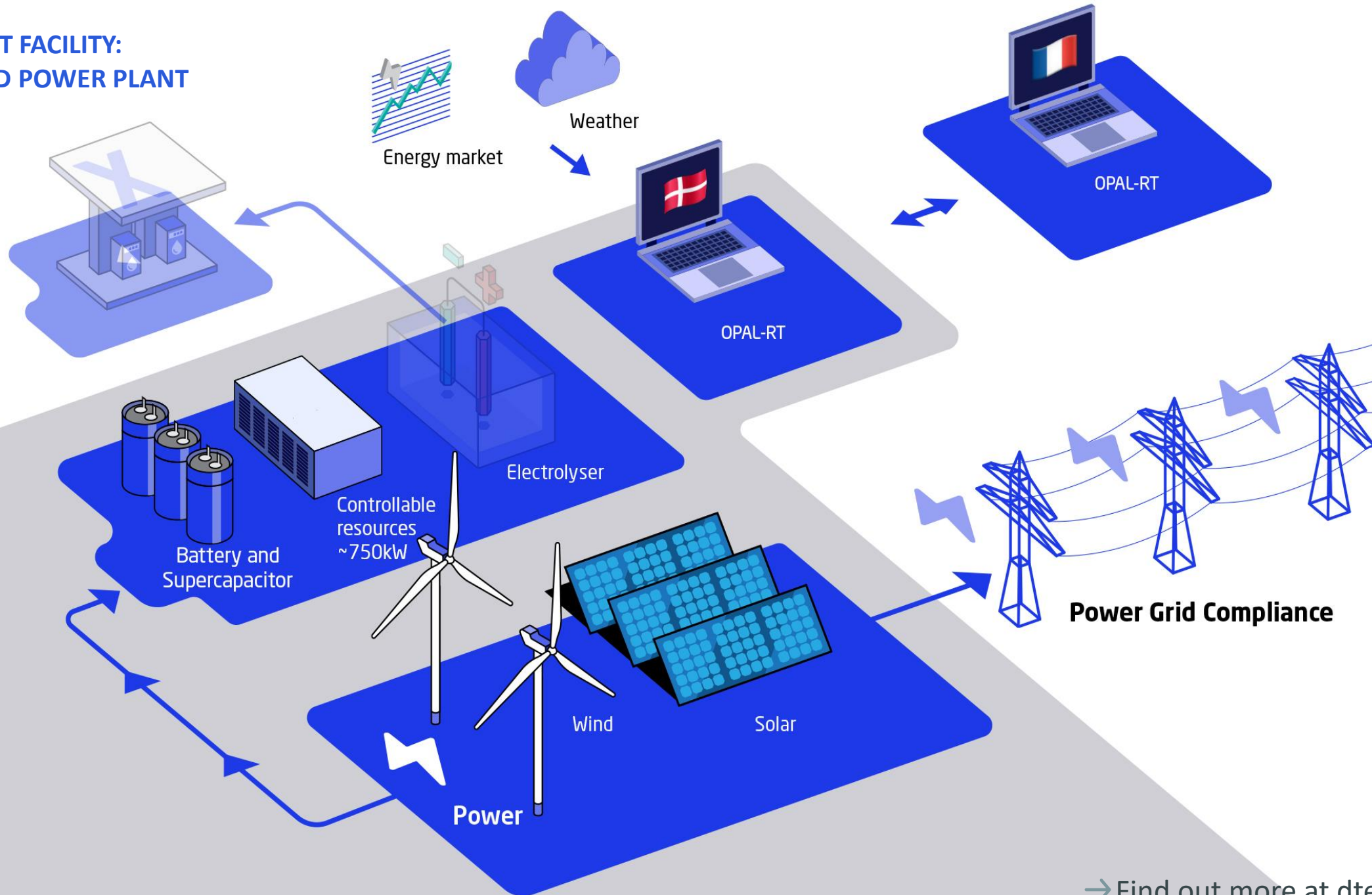


A new research and educational initiative to speed up the development of clean energy integration by:

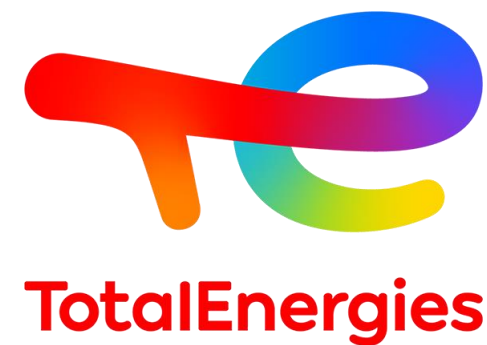
- driving research projects
- building a new pilot hybrid power plant
- running graduate programs and training



OUR TEST FACILITY: A HYBRID POWER PLANT



→ Find out more at dtec.dtu.dk



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Thank you very much

Merci beaucoup