



Connecter les énergies d'avenir

An aerial photograph of an industrial site, likely a hydrogen production or distribution facility. The site includes several large storage tanks, piping, and buildings. A green semi-transparent box is overlaid on the bottom left, containing text. A white plus sign is visible in the center of the image, and white lines connect it to various parts of the facility.

Hydrogen networks: Towards the emergence of a new market

26th April 2022



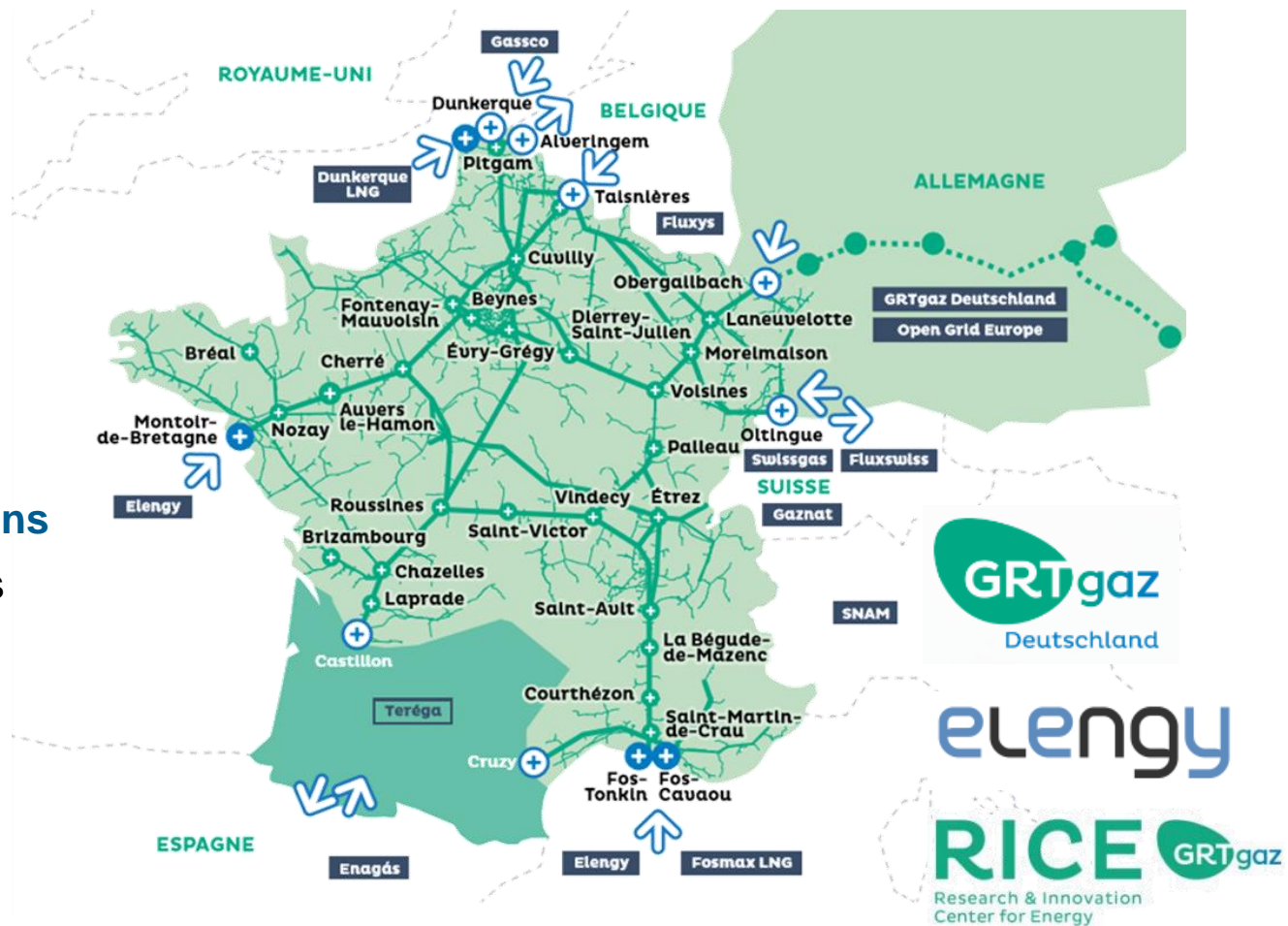
GRTgaz at a glance

Key Figures

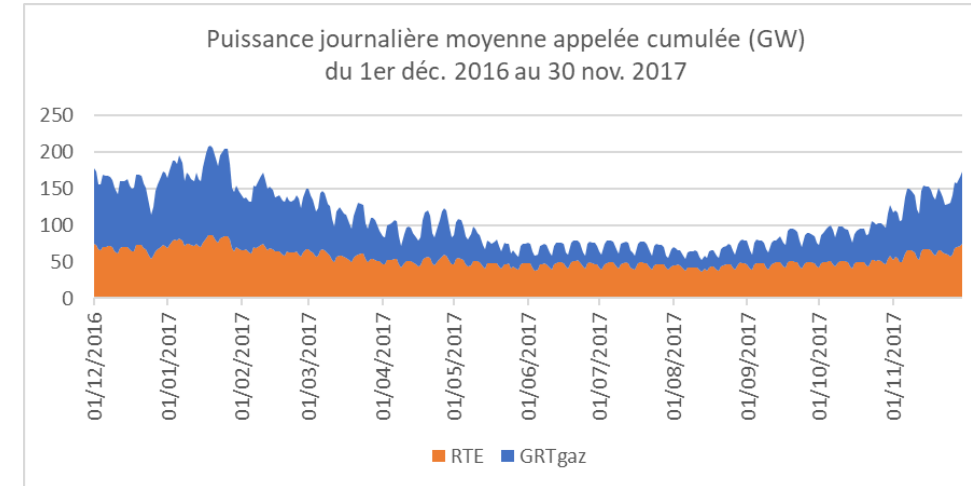
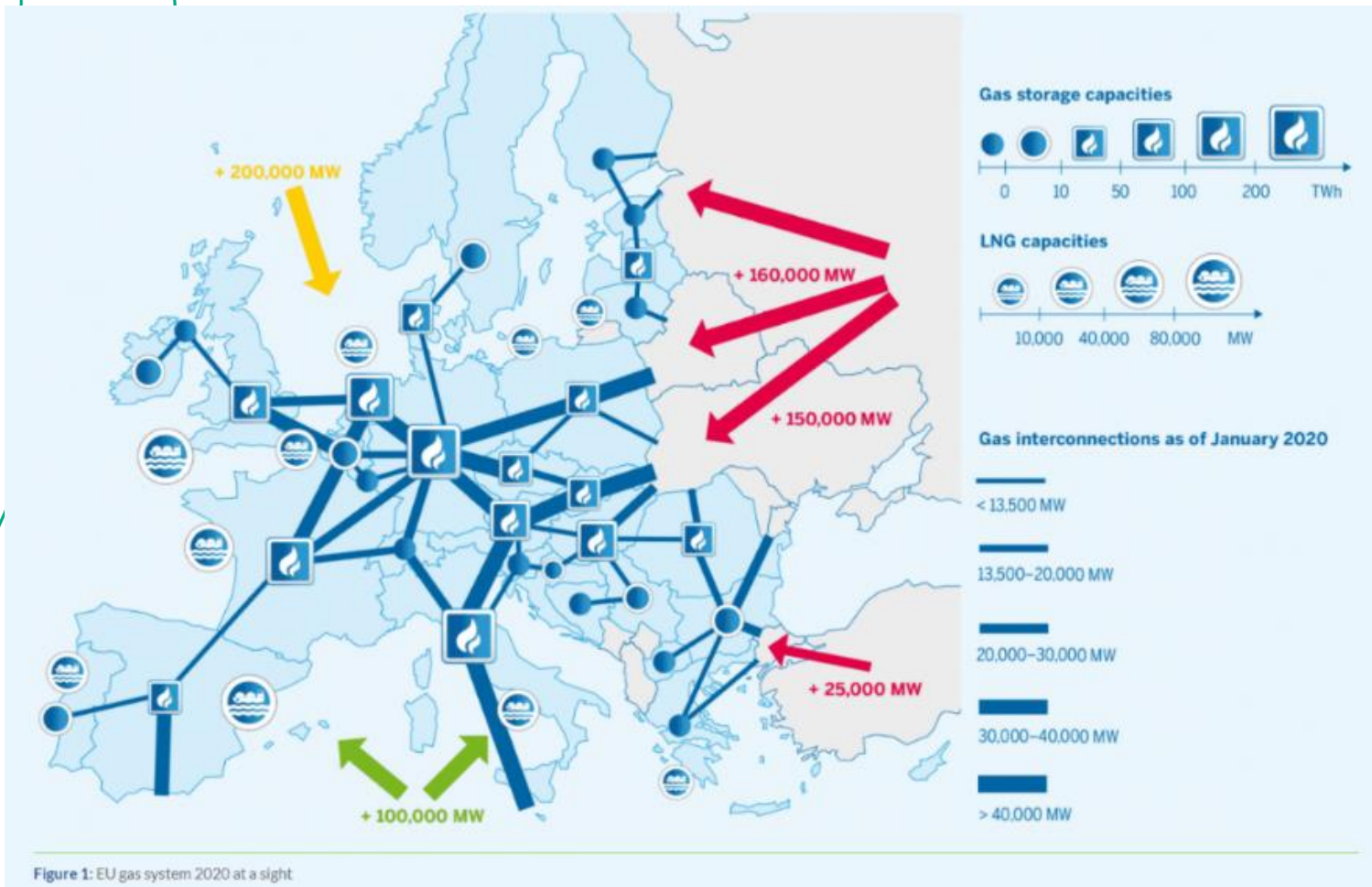
- 3 000 employees
- 32 500 km of high-pressure pipes
- 646 TWh/y transported gas
- 150 active shippers, 742 industrials customers & 19 DSO connected
- 617 MEUR COI / 386 MEUR CAPEX (2020 – subsidiaries excluded)

Strong presence in H2 related associations

- ENTSOG – board member, 6 employees seconded
- H2 Europe – chair of WG “Energy”
- Gas for Climate & H2Gar – founder
- France Hydrogène – chair
- ATEE Club Power-to-Gas – chair



Current role of gas infrastructures: competitiveness and security of supply in Europe



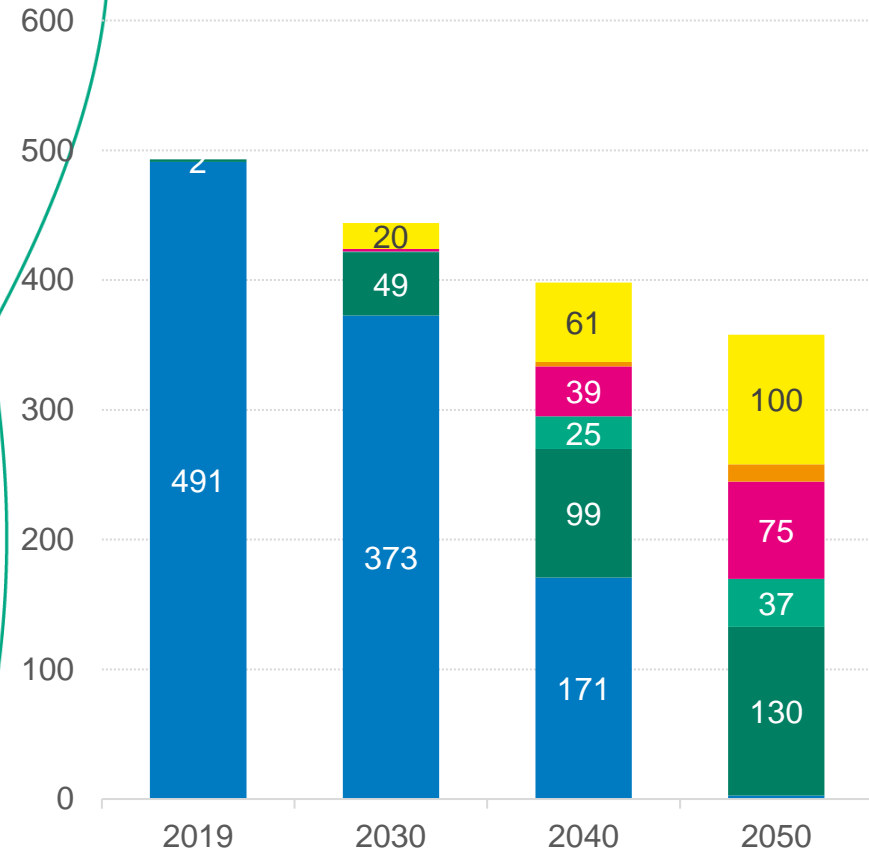
2nd februar 2012 : 102 GW of electricity 159 GW PCI of gas

Massive gas storage

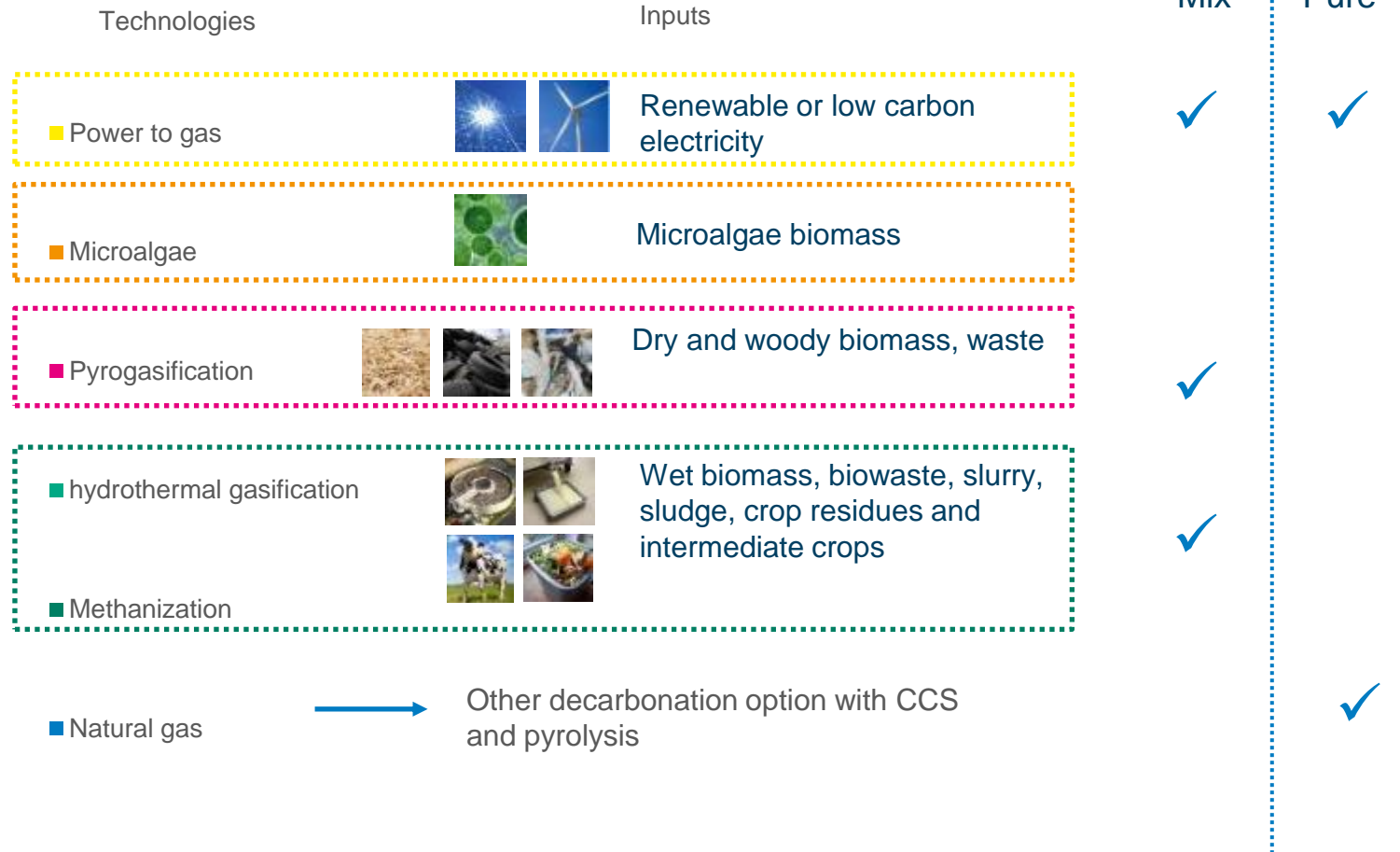
- 1 113 TWh in Europe
- 132 TWh in France (30% of the annual final consumption)

Future role: facilitating carbon neutrality, particularly with H2

TWh/y



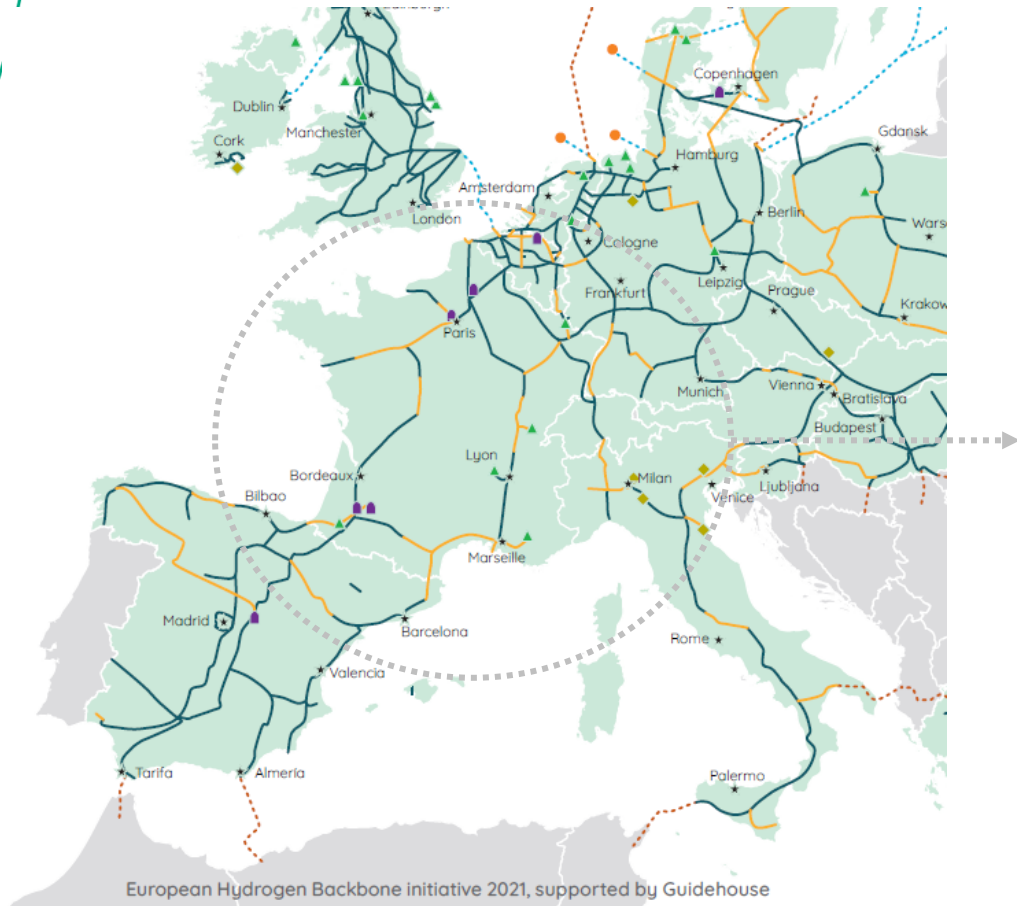
Forecast gas balance for 2020



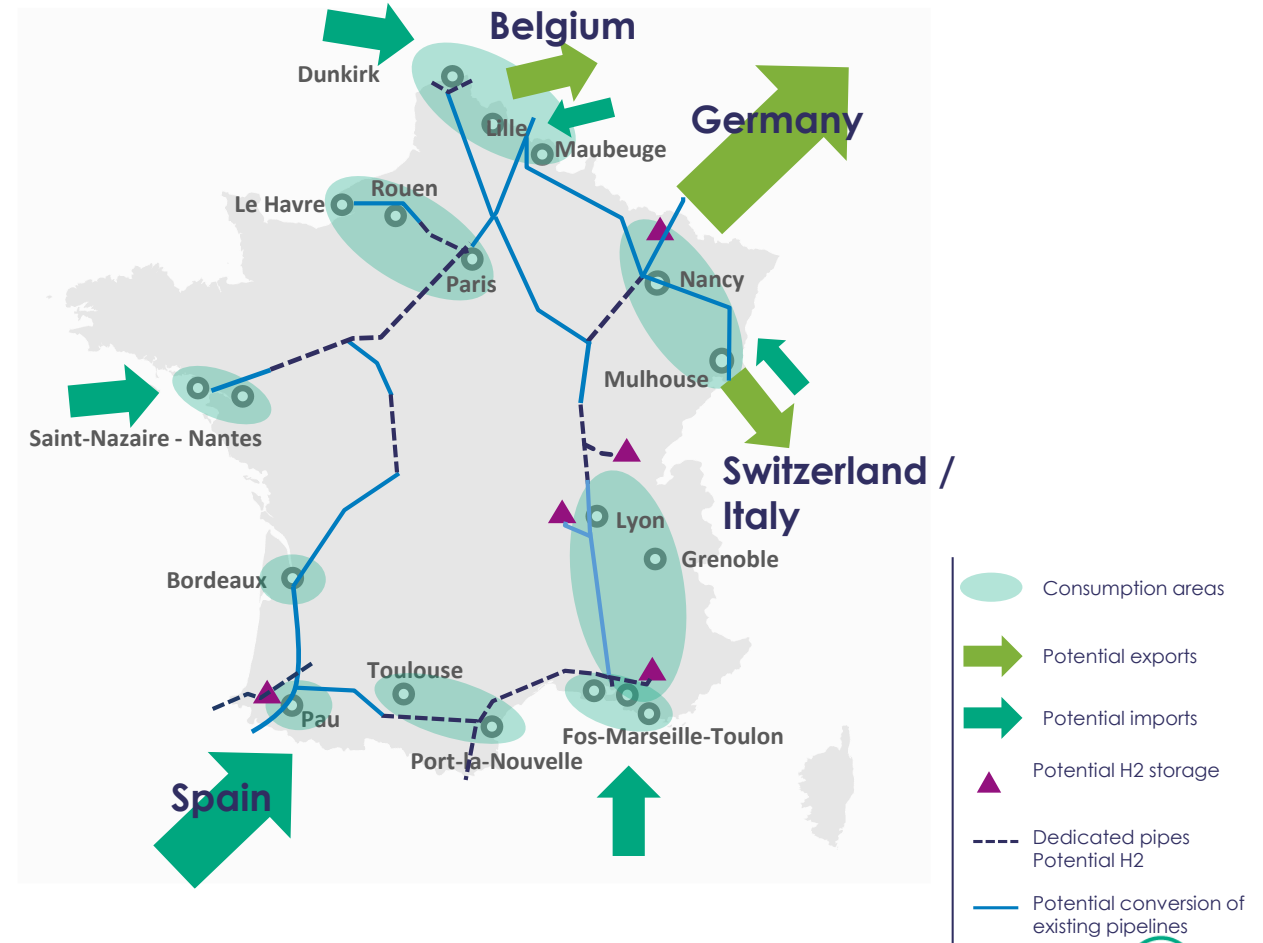
+ Our vision: a French H2 network part of the EHB

European Hydrogen Backbone by 2040

Cost of transport: €0.11-0.21 per kg of hydrogen, per 1,000 km



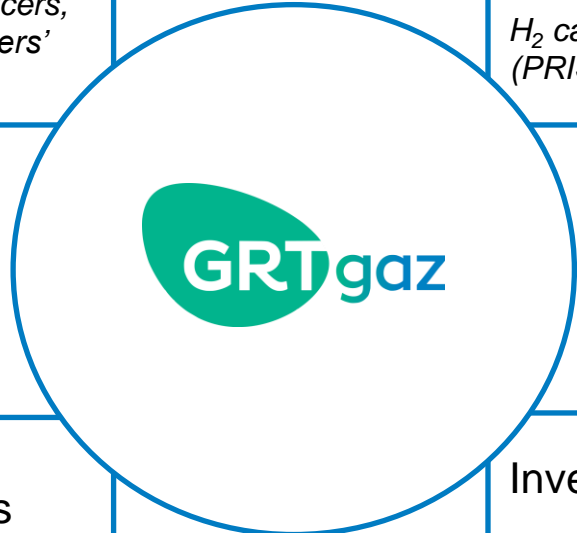
A French H2 transmission system mostly based on gas pipelines repurposing



Our ambition: become the trusted enabler of the French & UE H2 market

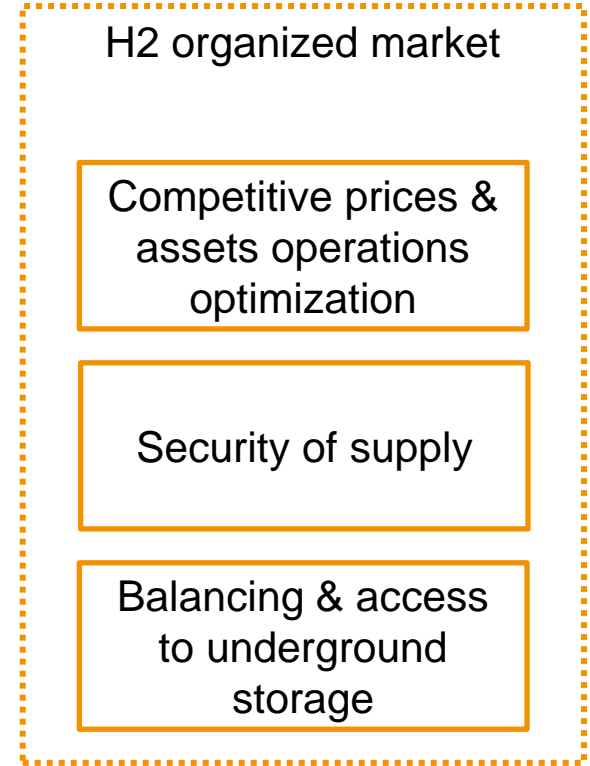
Independent TSO
No competition with producers, midstreamers & consumers' businesses


Organized market enabler
H₂ capacities nomination & trading (PRISMA), metering & traceability, open data (ODRE)...



Third part access
Open infrastructures approach

Investment planification & optimization
TYNDP approach

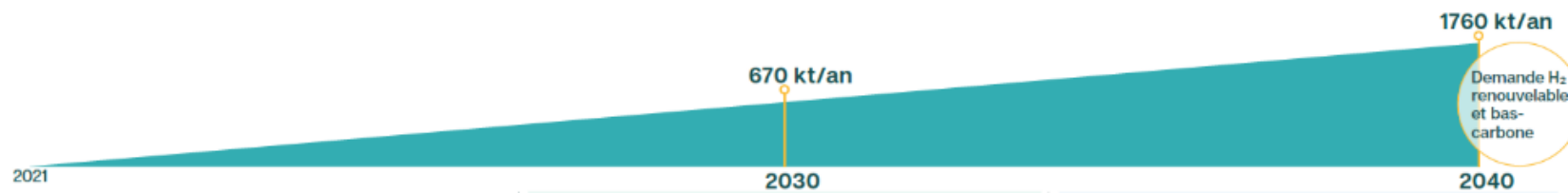


RICE  **EU R&D leader on gas pipes repurposing**
Dedicated R&D tests facilities & experienced teams

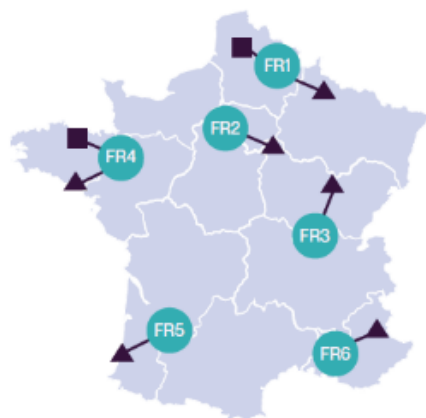
Research & Innovation Center for Energy

An optimal deployment path

Hydrogen transport and storage infrastructure" initiative within the framework of the CSF NSE



Ecosystèmes nationaux Isolés



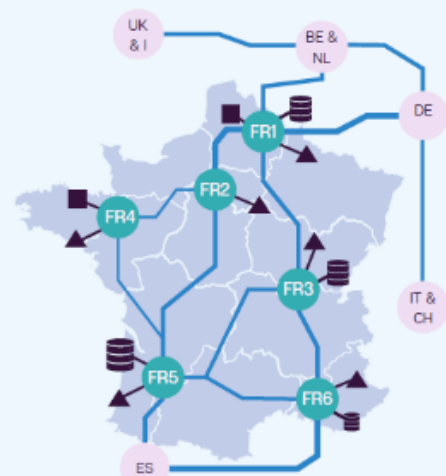
- ▲ Electrolyseurs
- Stockage souterrain
- SMR CCS

Ecosystèmes nationaux Intégrés



- 10 % réduction du coût de l'H₂ livré.
- 9 % réduction des investissements.

Ecosystèmes nationaux et Européens



- 32% réduction du coût de l'H₂ livré.
- Investissements de €1,6 Mds.

Une trajectoire sans regrets

- Développement des infrastructures hydrogène intra- et inter-bassins.
- Reconversion des infrastructures de gaz naturel existantes.
- Planification stratégique.

Autres bénéfices

- Stockage** | Sécurité d'approvisionnement, résilience du système et souveraineté énergétique nationale.
- Massification** des capacités de production d'électrolyse.
- Compétitivité** pour les industriels français.



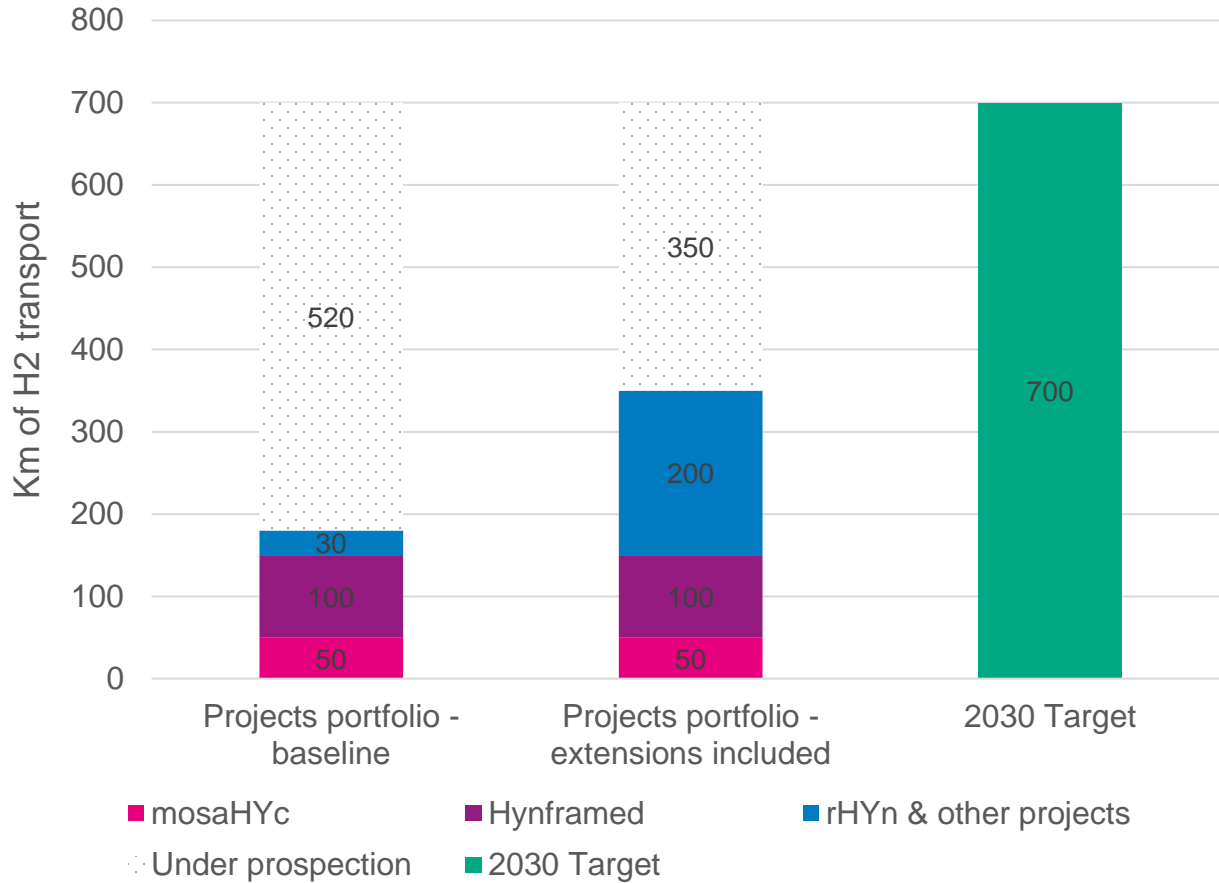
Une initiative de



Au sein du



An ambition backed by a projects portfolio with a target of 700 km of H₂ pipelines by 2030



Main origination areas



MosaHYc, a concrete example of a project serving the Grande Region Hydrogen ecosystem



Purpose:

100 km of 100% H₂ network by retrofitting of approx 80 km gas pipelines between Saarland (DE) – Lorraine (St Avold) – Luxembourg border to develop a regional hydrogen hub

H2 usage:

Steel industry
Power
Mobility

First milestone:

H2 valley creation (GRH) : 08/2021
Investment decision : S2 2022
Grants and funding currently under research

Current status

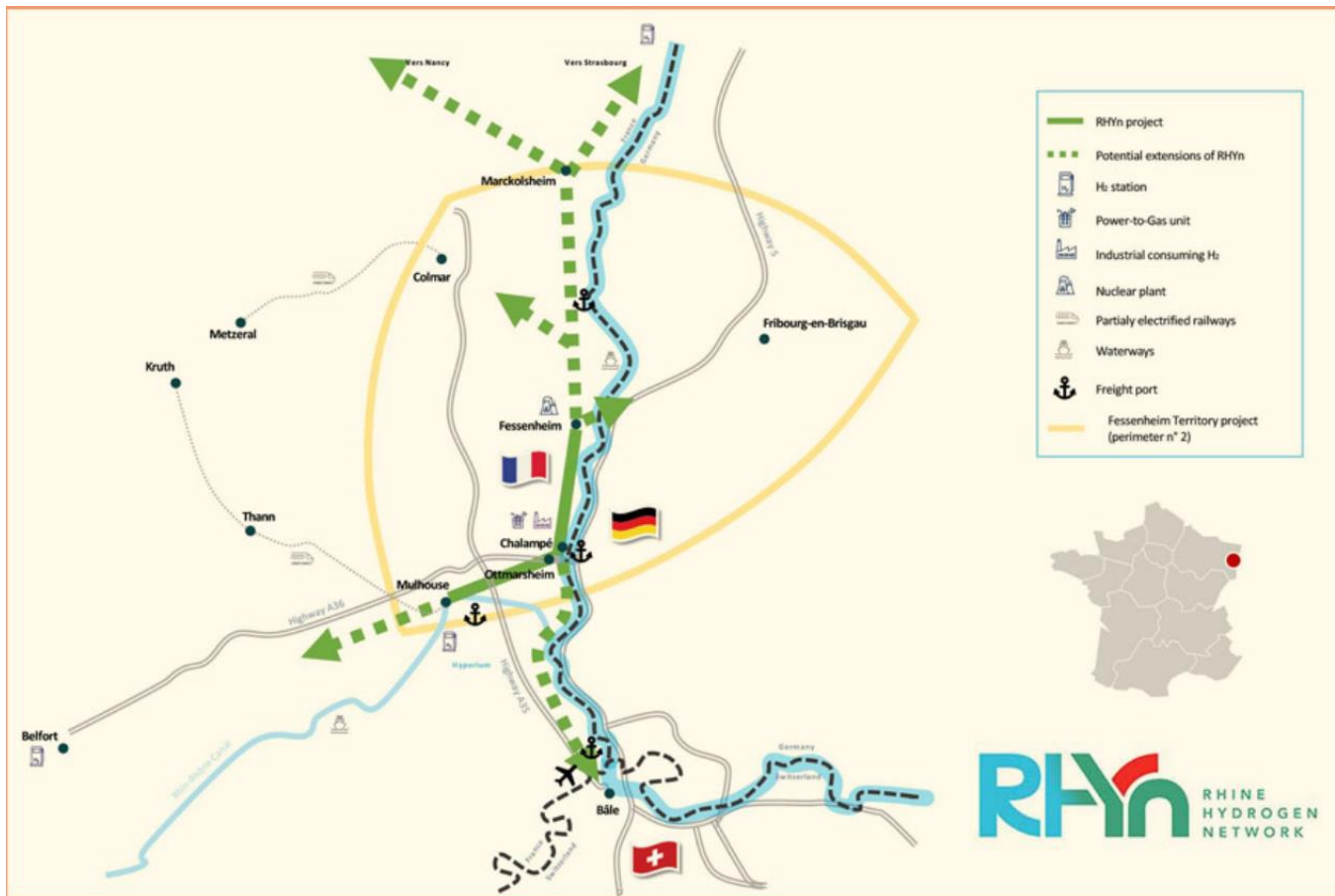
Pre-FID

End game:

Target operation date: 2026



RHYn, GRTgaz's second project to promote the Upper Rhine hydrogen ecosystem



- Connecting the Dessenheim area with the Chalampé-Ottmarsheim industrial zone by 2028, as well as the Mulhouse agglomeration for its needs in terms of mobility.
- In the following phases, this network could be extended to the south towards Basel in order to supply the airport area and to the north towards Marckolsheim to serve its industrial sites.
- GRTgaz plans to maximize the reuse of existing natural gas pipelines: out of a total of 100 km of hydrogen network, at least 60 km will come from converted pipelines.

New pipeline and conversion projects

- ❑ Project management by GRTgaz Engineering Projects Department
- ❑ Solicitation of services and companies
- ❑ Adapted issues to be mastered
 - Materials
 - Process
 - HSE

- ❑ In a first step, studies of linear





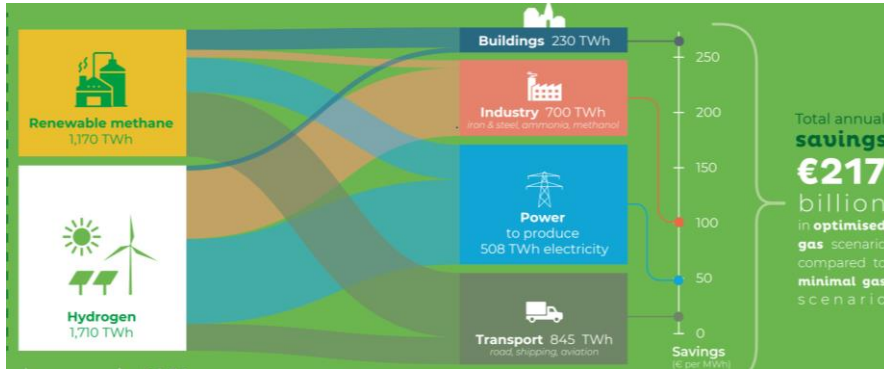
Connecting the energy of tomorrow

grtgaz.com

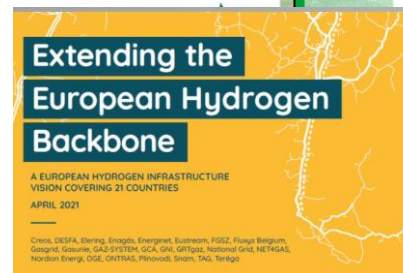
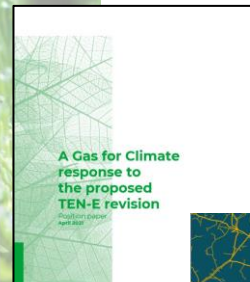
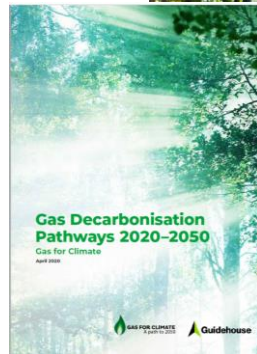
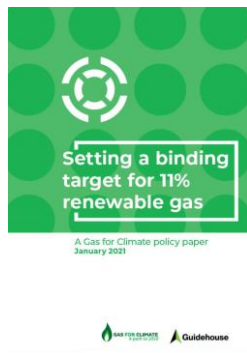
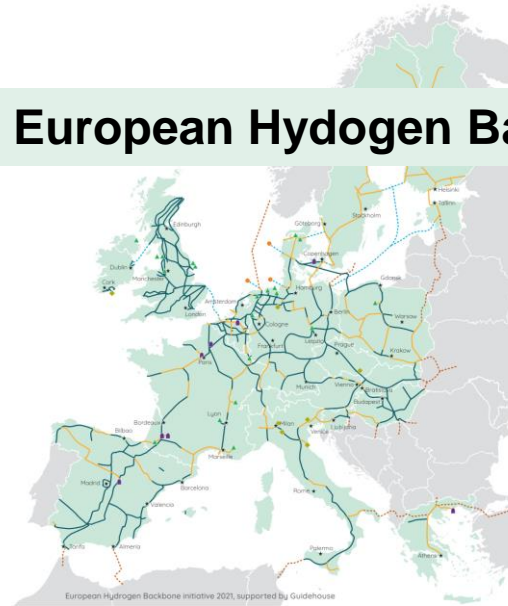
Renewable gases in Brussels



GAS FOR CLIMATE
A path to 2050



European Hydrogen Backbone





Zoom on specific H2 related know-how

Technical and operational competencies

400 high-skilled engineers & professionals

Integrated engineering and expertise departments

High skills in operation and maintenance of a network with priority on safety, monitoring of interconnected networks

Proven track-record of delivery on schedule and within budget of large projects including permitting

Track-record of hydrogen related projects: J1000, Hygreen pipeline, MosaHYc, FenHYx...

Thought leaders in H₂ metering, H₂ compression



100 high-skilled researchers

H₂ dedicated test facilities: Jupiter 1000 & FenHYx

Proprietary simulation softwares for industrial safety

Integrity of assets in the presence of H₂
Safety of operation including consultancy/services

Quality of hydrogen

Qualification of materials (chromatographs...)



Services activities to H2 market players

Assistance to the project owner/manager for design, construction and operating & maintenance activities

Consulting & audit

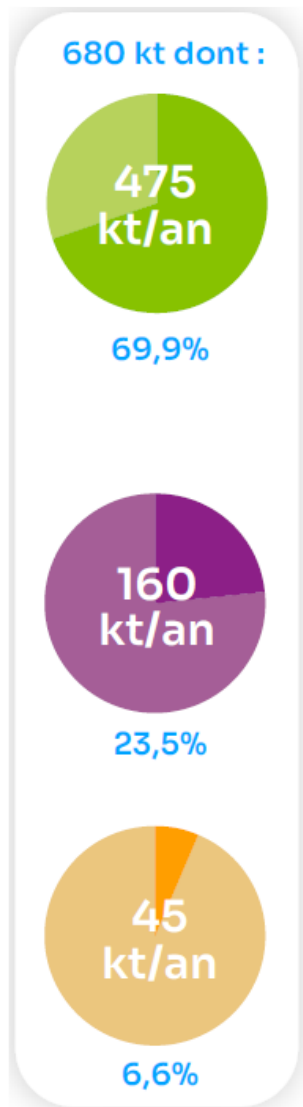
Technical due diligence

Dedicated R&D programs



H2 market driven by industry

France Hydrogen White Paper - 2021



- **70% for the industrial sector**

- Substitution of the existing H2
- New uses for decarbonization

- **23% for mobility**

300 000
véhicules légers



5 000
poids lourds



65 bateaux
et navires



100
trains



- **7% for the energy sector**