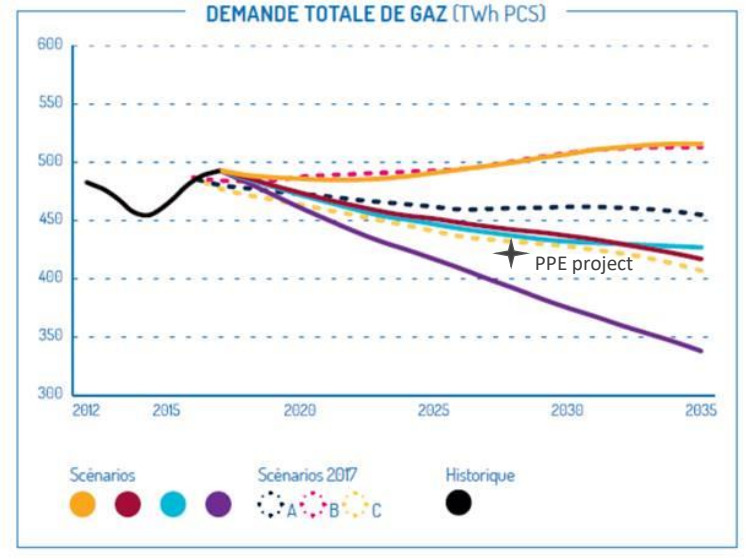
- GRTgaz in a « Union that strives for more »

- Warsaw, September 17th 2019

- In France scenarii foresee a sharp decline of gas demand mainly driven by electrification and efficiency in the heating and industry sectors

SCENARIOS OF NETWORK OPERATORS



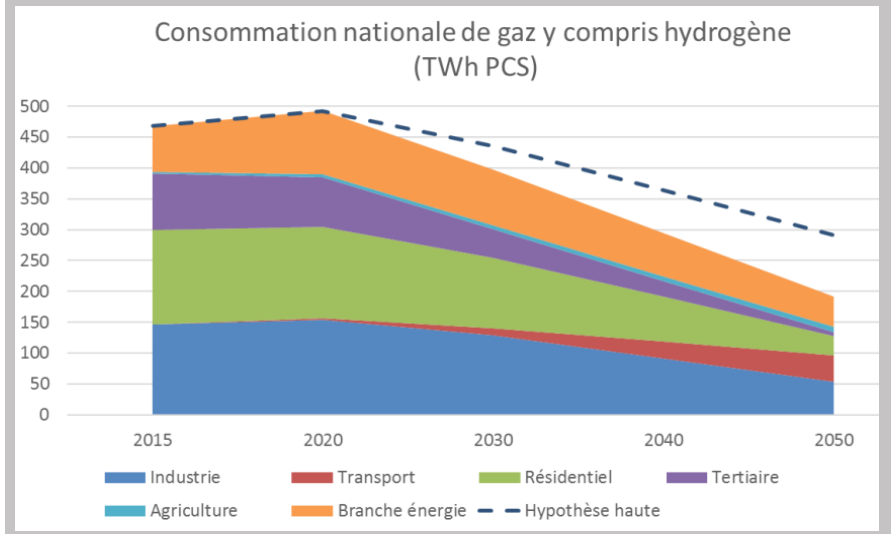
Source: Gas Outlook 2018

PPE (multi annual energy planning)

Natural gas consumption (primary energy)

- 2023 - 6% compared to 2012
- 2028: -19% compared to 2012 (ie ca. 390 TWh PCS.)

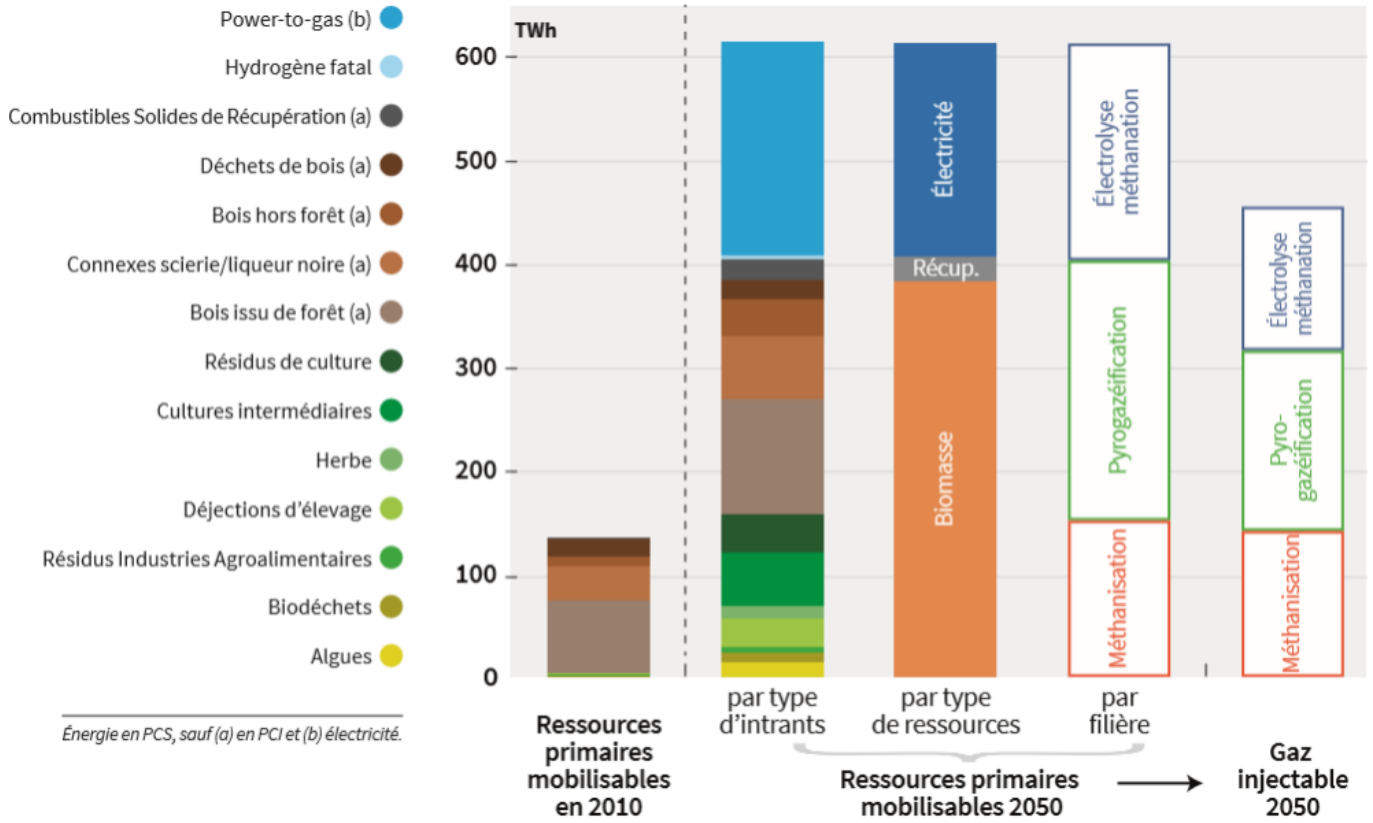
SCENARIO SNBC



- Demand from residential sector sharply lower (500 000 to 700 000 housing renovations / year vs. 300,000 / year today)
- A growing share of gases fuels mobility with 45 TWh in 2050

France : Renewable/low carbon gases have a significant potential largely untapped today

Resource availability and potential production of renewable gas



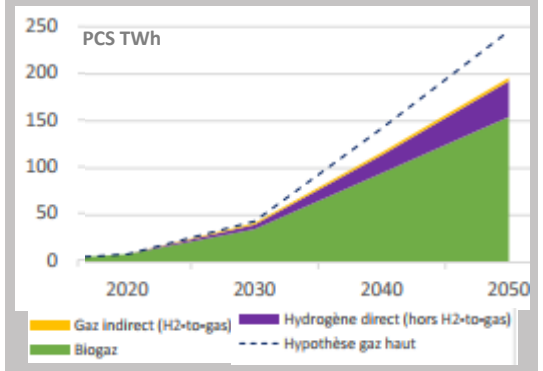
- **464 TWh per annum could be injected into the grid in 2050**
  - Without import
  - Without competition with other uses (food, raw material)
- **Cost comparable to renewable electricity** (between 110 and 150 € / MWh)
- **Low cost for adapting the gas grid**

Data : ADEME study 2050 « 100% renewable gas », 2018

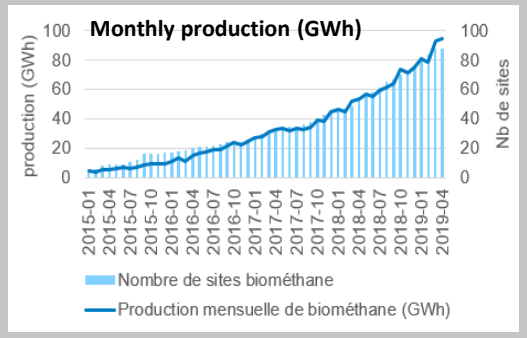
(*) according to the next update of the ADEME carbon database

- The biomethane and hydrogen industries are positioning themselves to meet the demand of renewable gas

SCENARIOS SNBC



BIOMETHANE



- The sector is structured around France gaz renouvelables

HYDROGEN

- The sector is structured
- Several projects are announced

PPE

- 24 TWh to 32 TWh of biogas in 2028, based on the production cost reductions;
- including 14 TWh 22 TWh injected onto the network

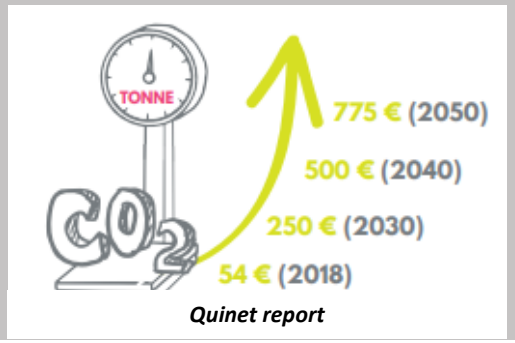
PYROGASEFICATION

- "pyrogasification" common to several sectors
- Structure in France

Projet R&D GAYA, projets industriels à l'étude	Industriels du traitement de déchets intéressés et démarrage des études	Des développeurs de briques technologiques
ENGIE	syctom, SUEZ, Séché environnement	L&L LEROUX & LOTZ, ETIA, ATMOSTAT

AND VALUE OF CO2?

- ETS market around € 25 / t
- A carbon tax to € 44.6 / t (since 2018)
- The shadow price of carbon (Quinet report)



Quinet report

- GRTgaz, key actions

Gas Advocacy

gie Gas Infrastructure Europe

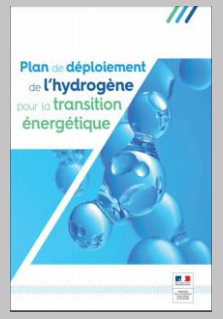
Hydrogen Europe

gas naturally making a clean future real

NGVA Europe for sustainable mobility

France gaz renouvelables

AFHYPAC



AFGNV ASSOCIATION FRANÇAISE DU GAZ NATUREL VÉHICULES

GAS FOR CLIMATE A path to 2050

MANY INITIATIVES IN THE TERRITORIES

Locally, stakeholders are organized around initiatives and clusters which are often based on start-ups

NICE SMART VALLEY

smile SMart Ideas to Link Energies

HyGreen Provence

Several pilot projects

Jupiter 1000

FenHYx

CATALYSE

Program to maximize the injection of H2 in the network

cea liten

Steel Analysis Program CH4 / H2

Plainénergie

Turning otherwise non-recycled waste into renewable gas

Méthagrid

Optimize biological methanation process

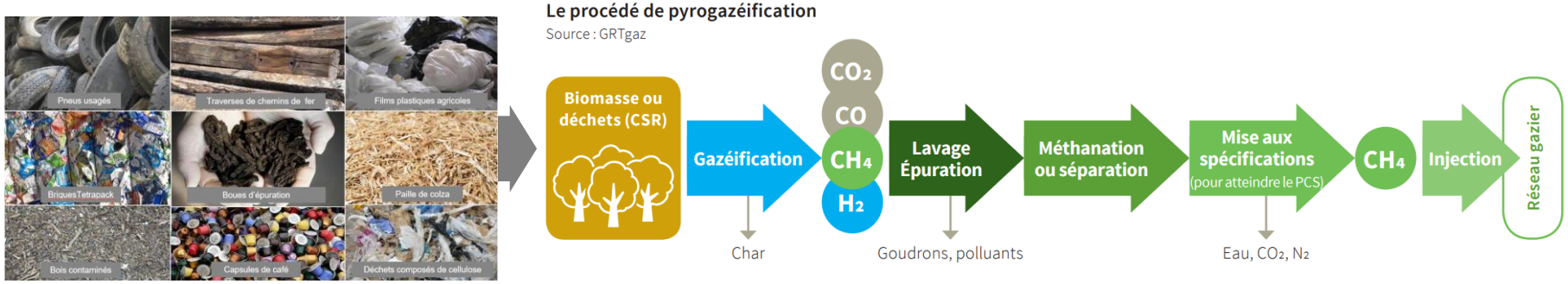
Data

OPEN DATA RÉSEAUX ÉNERGIES

appygas

• Renewable gases: Industrial demonstrators for pyrogasification

GRTgaz in partnership with ETIA Group



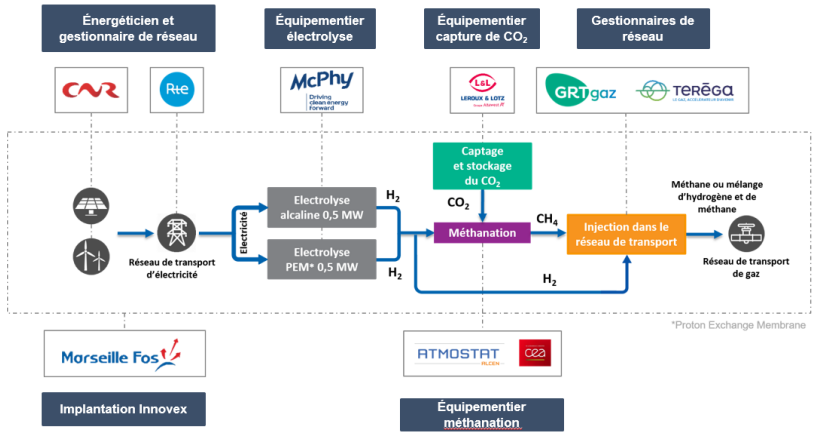
Pyrolyseur Synthane®

Méthanation catalytique

- Hydrogen : making the gas infrastructure ready

Jupiter 1000:

Inauguration in 2019



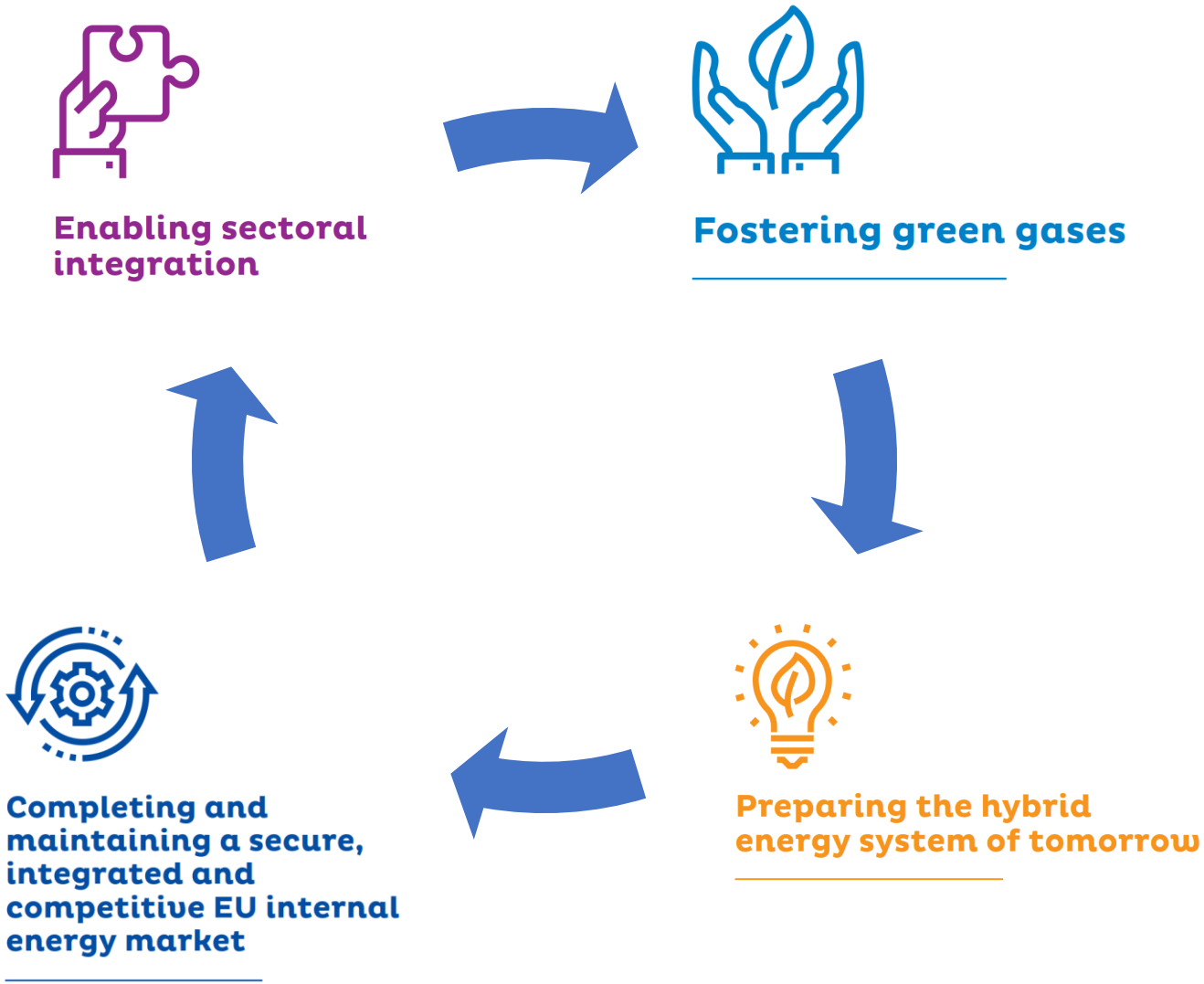
Plan de déploiement de l'hydrogène pour la transition énergétique

GRTgaz — Pilote du GT de rédaction

GRDF, storengy, R-GDS, TEREGA, elengy, RÉGAZ BORDEAUX Porteur d'énergie, SPEGNN

- French operators has delivered a report to the French government in June 2019
- It assesses the capabilities of the existing infrastructures related to hydrogen injection
- On the transmission grid, specifications already foresee up to 6% vol of H2. Results for H2/CH4 admixture with higher levels of H2 are generally consistent with studies in other countries

- Four dimensions to tackle the challenges ahead, today and tomorrow



GRTgaz

Connecter les énergies d'avenir

grtgaz.com