



Biomethane development in France

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I. GRDF's role in renewable gas development

- A) GRDF a key DSO in the energy transition**
- B) GRDF's role in renewable gas development**
- C) Strategic partnerships**

II. Biomethane in France today

- A) A recent and strong growth**
- B) Characteristics of biomethane plants**
- C) A development supported by regulated feed-in tariffs**

III. Biomethane in France tomorrow

- A) GRDF's 2030 vision for renewable gas**
- B) How to prepare the next steps**

I – GRDF's role in renewable gas development

GRDF, a key DSO in the Energy transition

GRDF (*Gas Réseau Distribution France*) is France's and EU's biggest gas distributor.



200 000 km

a network that could circle the Earth almost five times!

11 million

delivery points in France



57

biomethane plants inject in GRDF network
(out of 65 in France in September 2018)

I – GRDF’s role in renewable gas development

Renewable Gas in France

Past, present and towards 2050

Manufactured gas
Local production and
distribution

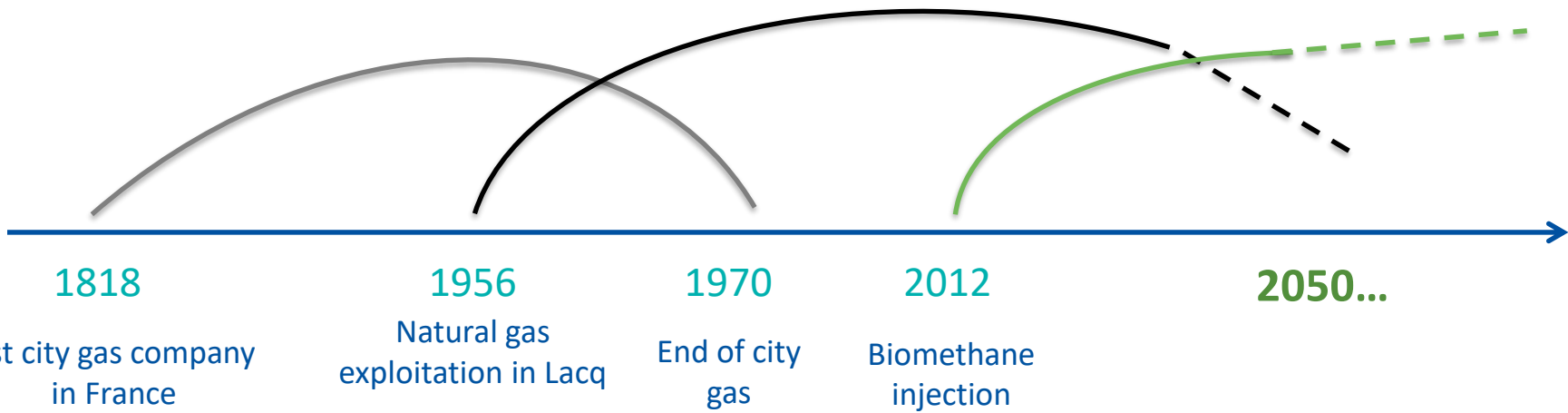
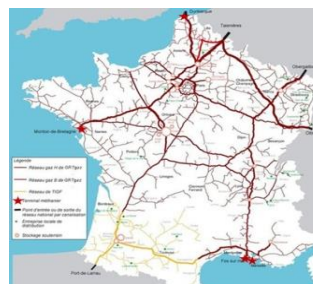
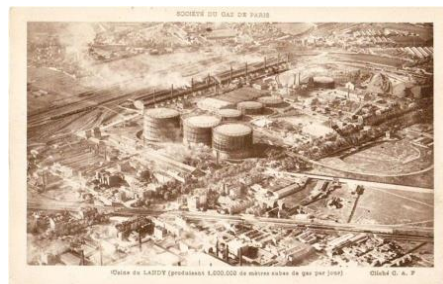
Natural gas
Centralised
infrastructures

Renewable gas
Decentralised and
interconnected infrastructures

Lightning Cooking

... Heating, Hot water...

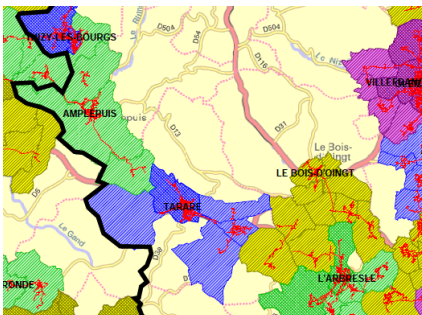
*... Mobility, Power to gas, Fuel
Cells...*



I – GRDF's role in renewable gas development

GRDF's Role in Renewable Gas Development

1



Capacity Assessment

At the request of renewable gas producers, GRDF internal experts conduct studies to evaluate the injection capacity of the proposed biomethane plant.

2



Connection & Gas Quality Control

GRDF is in charge of the injection point and of gas quality control. 40% of connection costs to gas grid are included in gas regulated price.

I – GRDF's role in renewable gas development

GRDF's Role in Renewable Gas Development

3

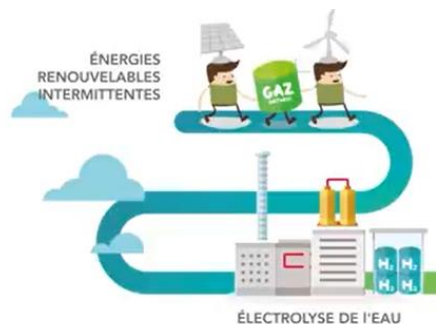


Guarantees of Origin Register

The GO system ensures that a biomethane's sale is correlated with the biomethane's production regulations.

Go's register lists the suppliers, sites and movements of GO. 75% of gas with GO is used in the form of bioCNG.

4



Research & Innovation

GRDF is a stakeholder of demonstrators aimed at proving technical and economic feasibility

Promoting the biomethane industry with the agricultural industry

We partner with nation-wide agricultural associations

- through « France Gaz renouvelable » to foster the biomethane sector
- directly with the National Agricultural Federation and Chambers of Agriculture

to promote biomethane and locally help entrepreneurs to have their plants built.

Advancing sustainability with WWF

Assessing the best ways to adapt agricultural practices

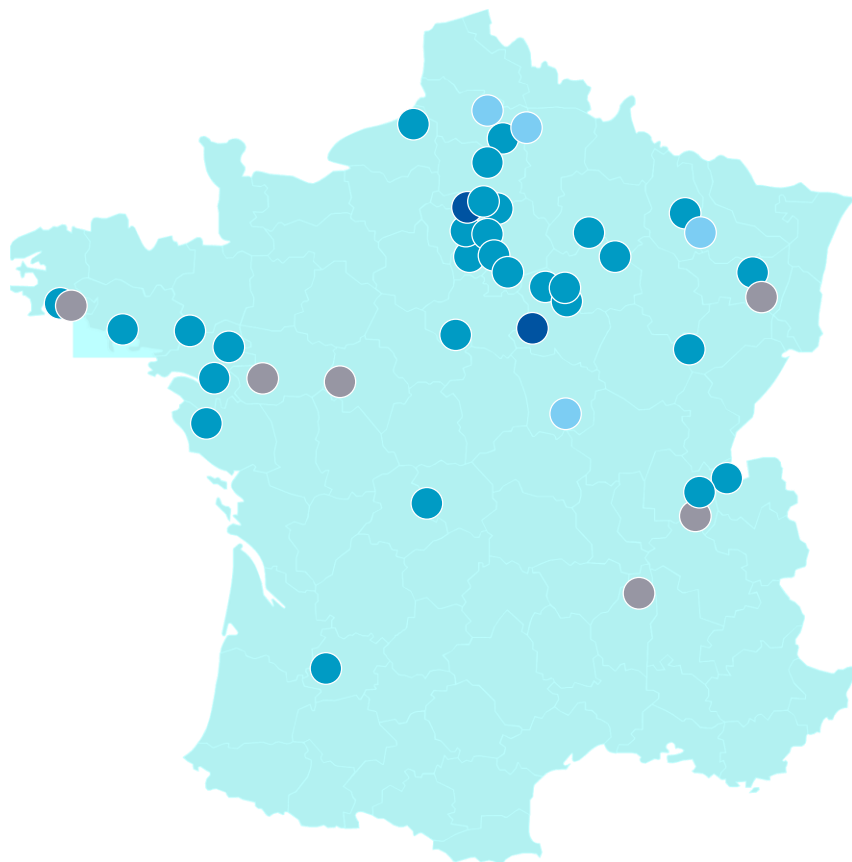
Identifying conditions to minimize impacts on environment and communities

Finding low-risk financing solutions

Promoting the integration of renewable gas in local energy policies

II – Biomethane in France today

65 biomethane injection plants in September 2018



**AGRICULTURAL
AND AGROFOOD
INDUSTRY
EFFLUENTS**

49 plants

**URBAN
WASTE**

4 plants

**SEWAGE
SLUDGE (STEP)**

8 plants

**NON HAZARDOUS
WASTE
(ISDND)**

4 plants

*Hypothesis
82 00 hours of operation in a full year. Consumption for
GRDF's medium customer = 12 MWh/year; for a truck =
256 MWh/year

Source: GRDF, September 2018

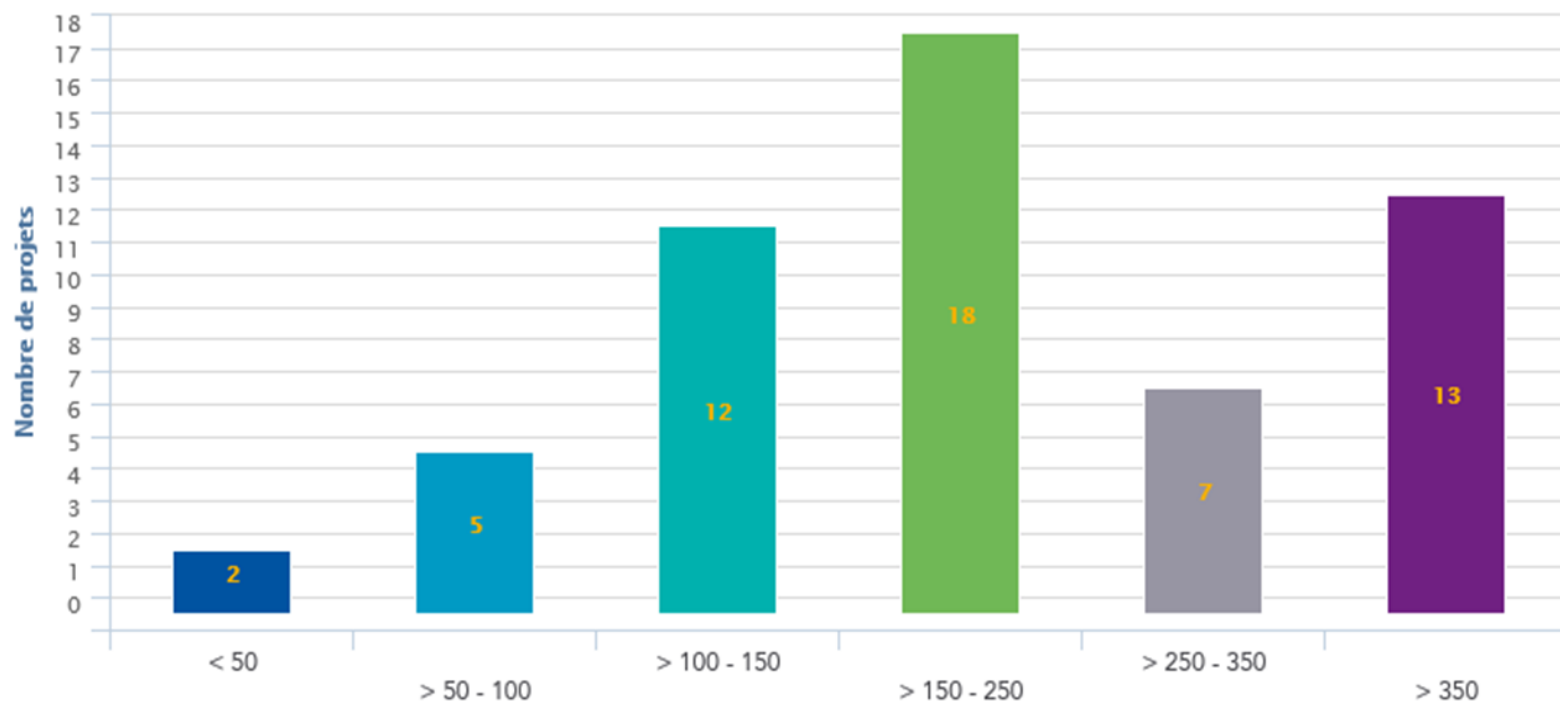
1026 GWh/year including 764 GWh/year on GRDF
network = consumption* of 85 537 households or 4010
bus using bioNGV

Characteristics of French biomethane plants

Distribution of site by type of inputs



Distribution of plants by injection capacity (Nm³/h)

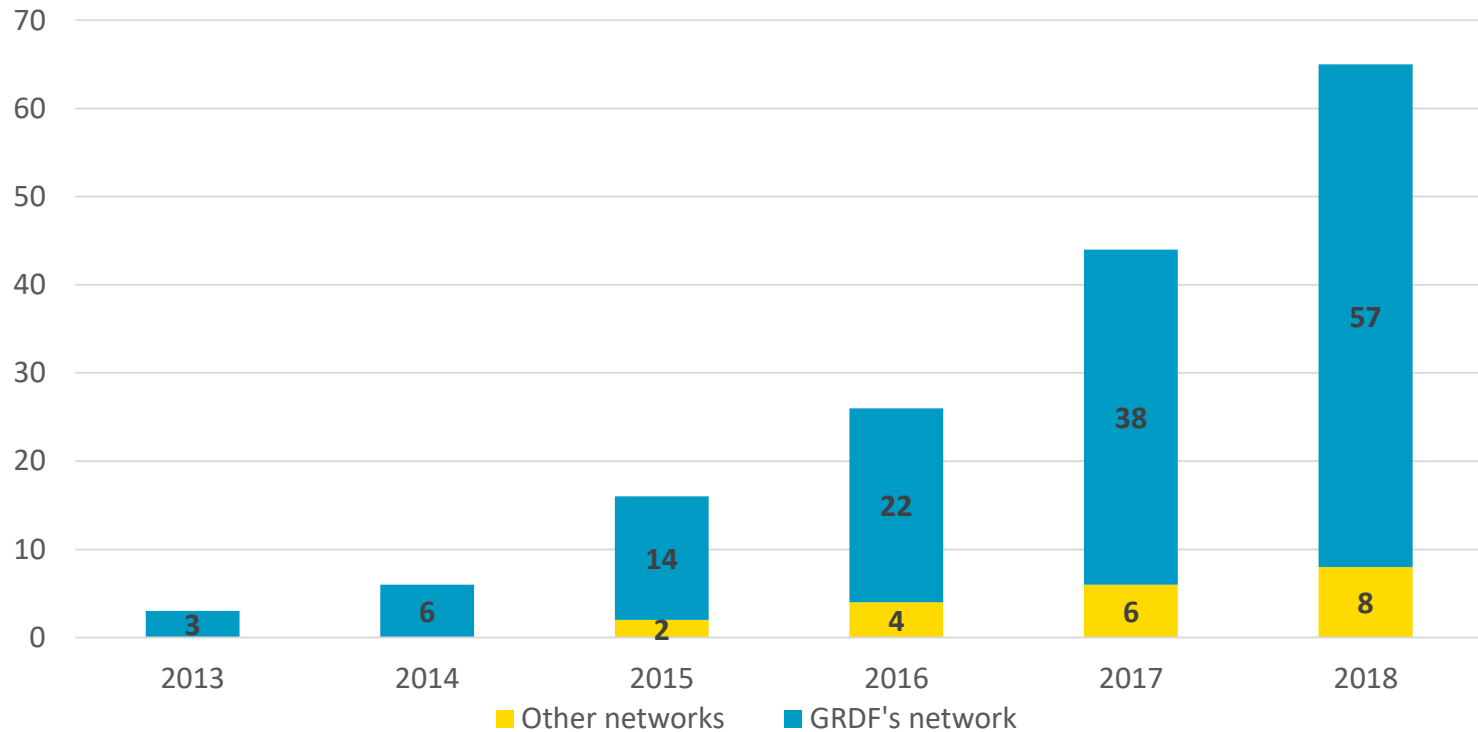


II – Biomethane in France today

A recent and strong growth

65 biomethane injection plants in September 2018

Number of biomethane plants

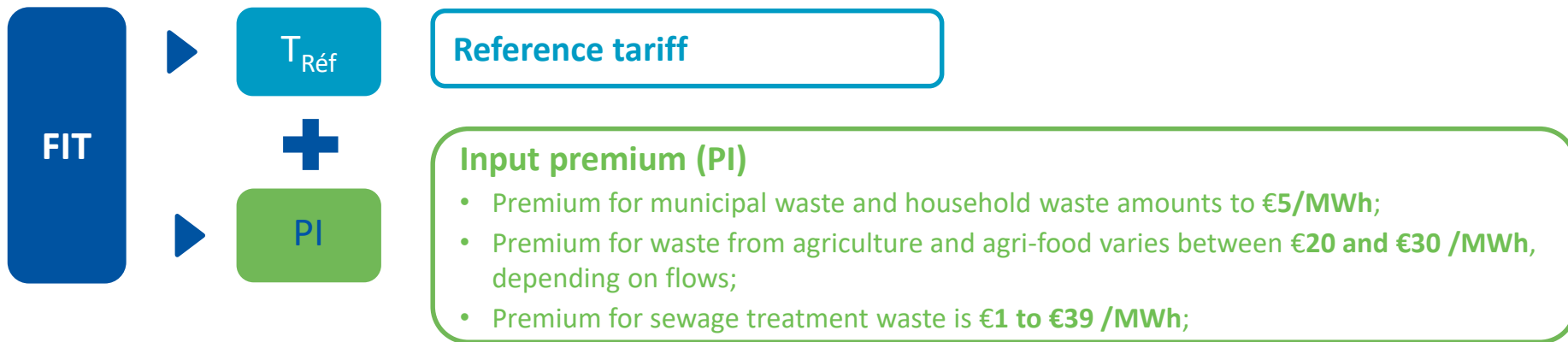


1 TWh/year capacity
including 764 GWh/year on GRDF network

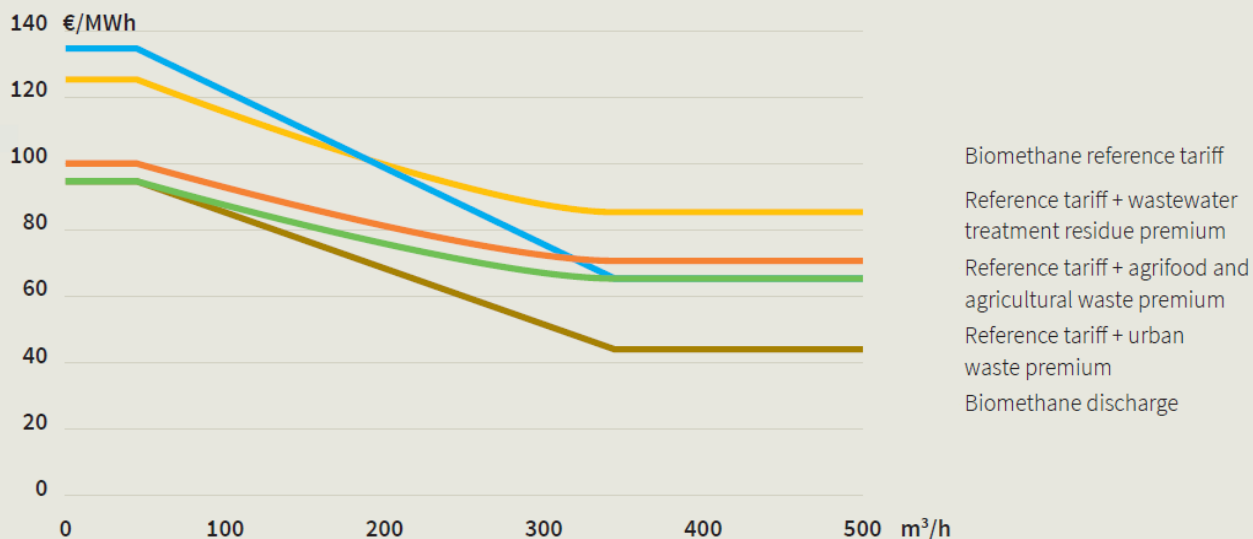
II – Biomethane in France today

Regulated in feed-in tariffs

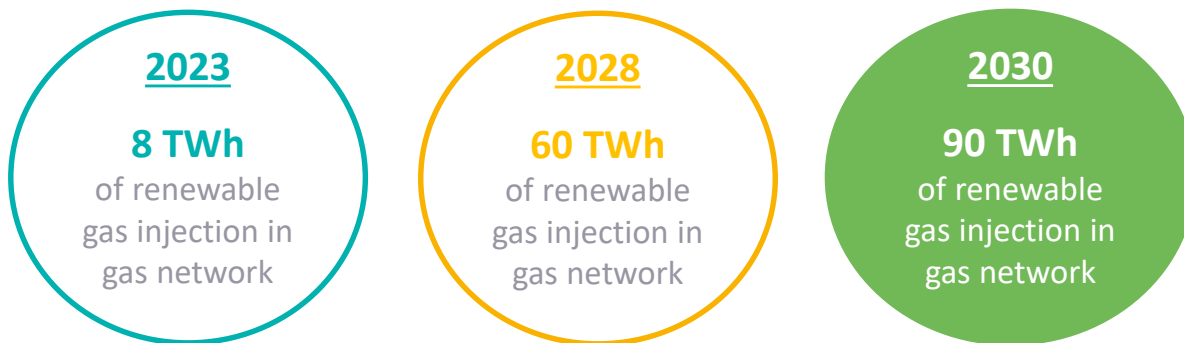
A framework ensuring competitiveness



Biomethane feed-in tariff according to the type of waste and the installation's maximum production capacity of biomethane



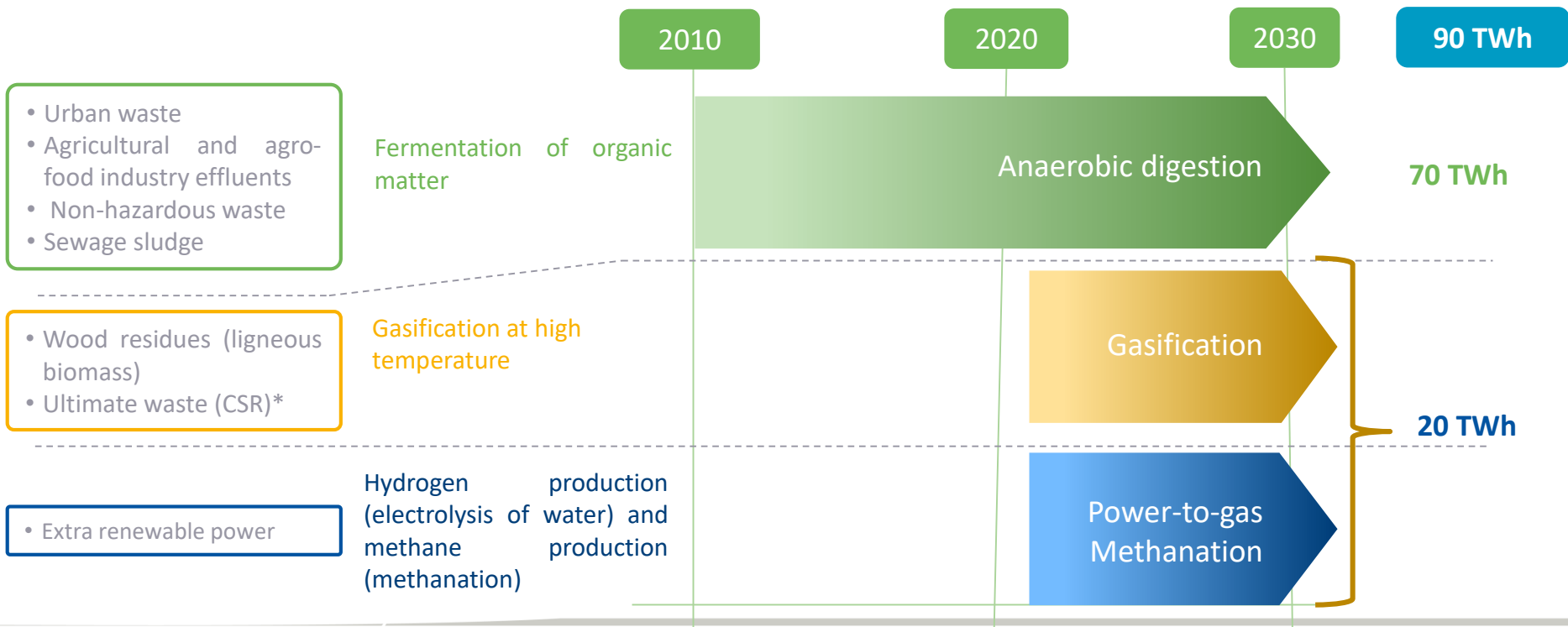
GRDF's 2030 vision



Valorised feedstocks

Process

Technical maturity



Investment for a flexible and green network

Demonstrators of reverse flow installations and hydrogen injection



- Reverse flow installations at the interface between the distribution and transport networks.
- With integration of new biomethane plants.
- 3 sites in France.

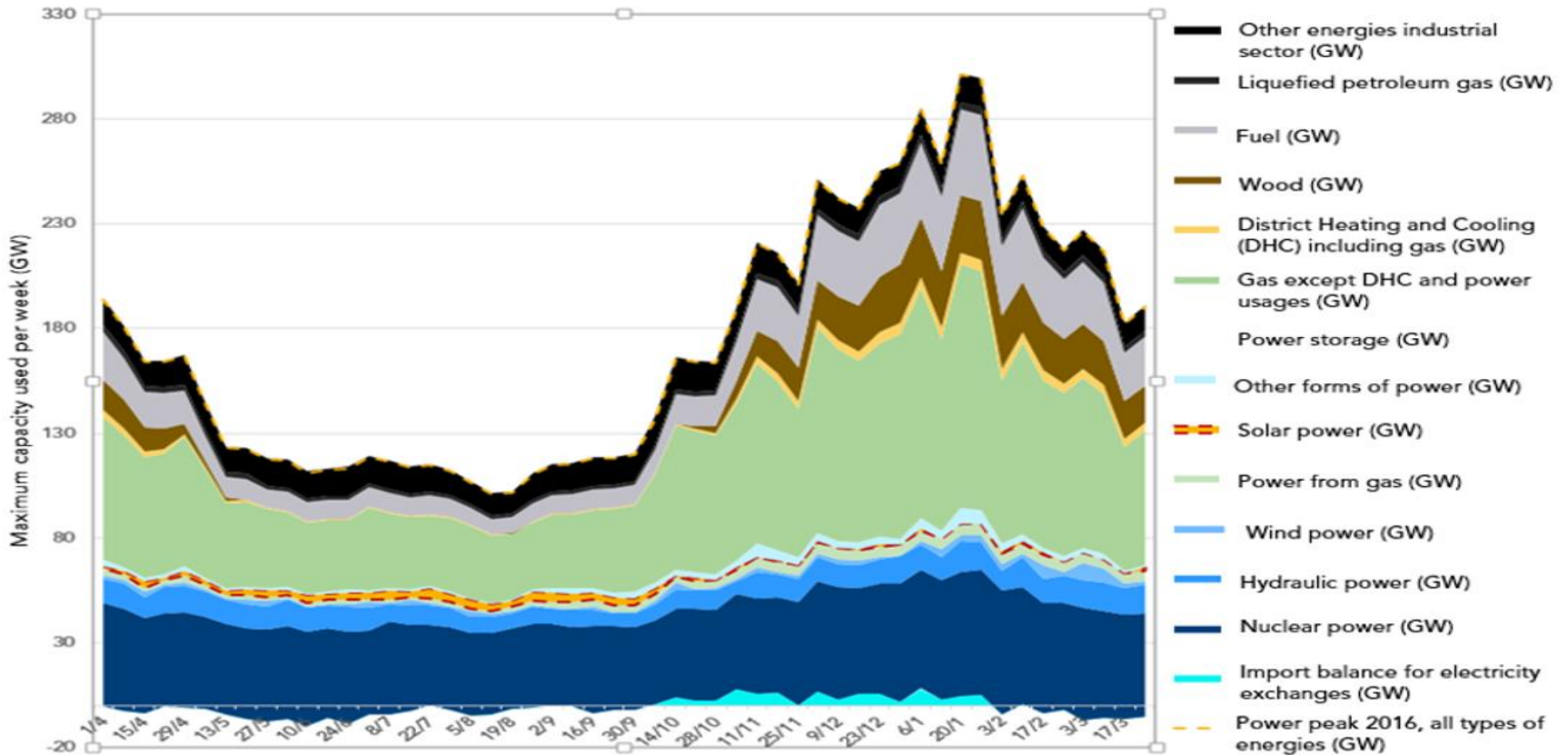


- A Power-to-gas demonstrator in a local urban area for 6 years.
- 3 technologies tested : electrolysis, storage and injection of hydrogen.
- GRDF is testing hydrogen injection from 6 to 20% in the distribution network.

Thank you !

Gas can provide flexibility to renewables driven energy system

Energy Peak per week over the period from 01.04.2016 to 31.03.2017



A French electricity system has a peak capacity of 100 GW

A gas system with an available capacity ranged between 200 and 220 GW, which accounts for more than 3 times of the nuclear French fleet

Benefits of biomethane production

1

Limiting soil erosion

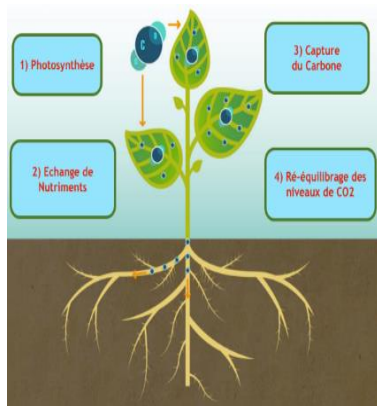
Cultivation of intermediate crops **optimizes the infiltration and retention of water in soils**. This **limits the water runoff** and therefore **the erosion of the crops parcels concerned**



2

Increase in the carbon stock in soils

Harvesting intermediate crops yields an average of 25% of organic matter (including all organic stable humiferous matter) in soils. This **increases the biomass production in roots and the residual aerial part** compared to intermediate crops left on the soil



3

Limiting water pollution

Intermediate crops capture nitrogen from the soil; thus avoiding leaching, ie the transport of this nitrogen to the groundwater. Moreover, nutrients (nitrogen, phosphorus, potassium) can be recovered from the previous spreading of digestate.



4

Interest in biodiversity

Cultivation of intermediate crops serves as a **refuge for the small fauna of the plain** (partridge, pheasant, hare ...) while bringing him food. A flowering cover will also **allow the development of insect pollinators**



5

Promotion of organic farming

Methanisation of intermediate crops results in the **creation of a digestate** which can be **used to feed the soil instead of the usual chemical fertilizers**. This helps to store green manures without loss of their nitrogen value and reduces the costs incurred by the farmer in growing seeds



6

Decrease in weed control

Intermediate crops **reduce the germination of weeds** in manure, slurry or agricultural residues such as straw by **choking**.



Independent France in gas in 2050: towards a 100% renewable gas in 2050

KEY MESSAGES

GRDF, GRTgaz and The French Energy Agency (ADEME) carried out a study to define the techno-economic conditions and feasibility for 100% renewable gas production in France by 2050

1

The total gas demand in 2050 (**277 TWh to 365 TWh**) in France could be covered by **renewable gas** thanks to the potential of local mobilizable resources (**620 TWh**)

2

A 100% renewable gas production in 2050 would **avoid about 63 MtCO₂ / year** of direct emissions

3

In 2050, the production costs of a 100% renewable gas energy mix are estimated between **116 and 153 € / MWh** (constant €)