Renewable Gas in France

Energy Comunity, 25-26th of April 2018
Who is GRDF?

The longest natural gas network in Europe

200 000 km - A network that could circle the Earth almost five times!

1 million gas smart meters already rolled out

11 million customers in France

41 biomethane injection plants operated by GRDF network (out of 48 in France as of March 2018)
Past, Present and Future of Gas

Manufactured gas
- Local production and distribution
  - Lighting, Cooking

Natural gas
- Centralised infrastructures
  - Heating, Hot water

Renewable gas
- Decentralised infrastructures
  - Heating, Mobility

1818
- 1st city gas company in France

1956
- Natural gas production in Lacq

1970
- End of city gas

2012
- Biomethane injection

2050...

... Cooking...

... Heating, Hot water...

... Heating, Mobility...

Past, Present and Future of Gas
Green Gas Answers XXI Century EU Challenges

1. Reduce significantly the greenhouse gas emissions
2. Contribute to energy flexibility
3. Reduce energy dependency
4. Rebalance the trade balance
5. Creation of direct and indirect local jobs
Overview of biomethane production in Europe

503 biomethane plants in Europe in 2017

**Austria**
(14 plants, 140 GWh/year, 2016)

**Belgium**
(1 plant, 12 GWh/year, 2018)

**Denmark**
(17 plants, 898 GWh/year, 2015)

**Germany**
(196 plants, 9,400 GWh/year, 2016)

**Finland**
(10 plants, 98 GWh/year, 2015)

**France**
(44 plants, 406 GWh/year, 2017)

**Hungary**
(2 plants, 55.5 GWh/year, 2016)

**Italy**
(1 plant, 300 GWh/year, 2018)

**Luxembourg**
(3 plants, 62 GWh/year, 2016)

**Netherlands**
(28 plants, 900 GWh/year, 2016)

**Norway**
(12 plants, 392 GWh/year, 2017)

**Spain**
(1 plant, 70 GWh/year, 2016)

**Sweden**
(71 plants, 1,297 GWh/year, 2015)

**Switzerland**
(36 plants, 277 GWh/year, 2016)

**United Kingdom**
(93 plants, 3,663 GWh/year, 2016)

Sources: (1) EBA, (2) Renewable Gas French Panorama 2017, (3) GD4S
European regulation on renewable gas

Renewable Energy Directive (RED II)

❖ Negotiations timeline

<table>
<thead>
<tr>
<th>European Commission</th>
<th>November 30th 2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>European Parliament</td>
<td>January 17th 2018 (ITRE and ENVI Committee with competence)</td>
</tr>
<tr>
<td>European Council</td>
<td>November 13th 2017</td>
</tr>
<tr>
<td>Trilogues</td>
<td>February 27th 2018, March 27th 2018 and May 17th 2018</td>
</tr>
</tbody>
</table>

❖ Key points

1. European and national renewable energy targets for 2030

2. Recognition of renewable gas as renewable energy sources

3. Possibility to create guarantee of origin for renewable gas

4. Obligation for the production of renewable gas to fulfil greenhouse gas emissions targets to be qualified as renewable energy sources (Except for small renewable gas production plants)
Renewable Gas in France today
48 biomethane injection plants in March 2018

AGRICULTURAL AND AGROFOOD INDUSTRY EFFLUENTS
34 sites

URBAN WASTE
4 sites

SLUDGE FROM WASTE TREATMENT PLANTS
8 sites

NON HAZARDOUS WASTE (ISDND)
2 sites

0.75 TWh/year of Injection Capacity
8 TWh/year of booked capacity (projects)

*Hypothesis
82,000 hours of operation in a full year. Consumption for GRDF’s medium customer = 12 MWh/year; for a truck = 256 MWh/year
In 2030, 10% of gas consumption will have to be renewable

In 2030, need 30% of renewable gas to reach 2050 decarbonization objectives
Renewable Gas in France today

French Support Mechanisms

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

- Biomethane reference tariff
- Reference tariff + sewage premium
- Reference tariff + agrifood and agricultural waste premium
- Reference tariff + urban waste premium
- Biomethane from landfill
100% of Renewable Gas in 2050 in France is Technically Feasible

Source: ADEME
Excl. Elec. Generation
Total Production Cost of 100% Renewable Gas equals Total Production Cost of 100% Renewable Electricity

FIGURE 5: TOTAL COST PER MWh OF GAS CONSUMED

- **100% R&REn**: €118-132/MWh
- **100% R&REn with high pyrogasification**: €116-127/MWh
- **100% R&REn with limited biomass for gas usage**: €133-153/MWh
- **75% R&REn**: €105-111/MWh

*For each scenario, the two production cost variants (1 and 2) are differentiated by the electricity cost hypotheses used (see Cost assessment method, 6.4.).*
If your child does not finish his/her broccoli, we will do it for him/her

This is a heating potato

Our gas is now produced with cows dung, but this does not prevent it from being cleaner
And other examples from across the EU

- Denmark
- Ireland
- Italy
Renewable gas - What is the potential at the national level? Denmark

PROGRES OF BIOGAS EXPANSION

- 4 facilities online: 400 GWh bio methane/year
- + 3 facilities in pipeline: 1 TWh bio methane/year
- + 2 facilities/year next 5 years: 2.5 TWh biomethane/year

- 2021: 10% of Denmark’s total consumption of Natural gas
  – or 1.5 x the consumption on Funen

Source: NGF Nature Energy
Renewable gas - What is the potential at the national level? Ireland

- Ireland’s final energy consumption ~ 130 TWh/annum.
- Ireland’s natural gas demand 2016 ~ 50 TWh.
- Ireland has significant bioresources which could produce ~ 40 TWh/annum of biomethane from wastes, residues and excess grass.
- Potential additional resource of 10 TWh from emerging renewable gas technologies such as gasification and power to gas.

Source: GNI, 2017
Renewable gas - What is the potential at the national level? Ireland

20% Target by 2030

- Phased deployment – initial injection hubs
- Rapid growth in Renewable Gas production
  - Gas Entry Hub enables development and growth by catchment area.

Source: GNI, 2017
Ireland - Key Stakeholders

- Agri-Food & Beverage
- Public Transport
- Biogas Developers
- Technology providers
- Gas Shippers
- Transporters
- UCC
- MaREI
- NUIG
- DCU
## Renewable gas - What is the potential at the national level? Italy

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BIOMETHANE FROM OMW</strong></td>
<td>500,000,000</td>
<td>650,000,000</td>
<td>750,000,000</td>
<td>900,000,000</td>
<td>1,200,000,000</td>
<td>1,500,000,000</td>
</tr>
<tr>
<td><strong>AGRICULTURAL BIOMETHANE</strong></td>
<td>2,000,000,000</td>
<td>3,550,000,000</td>
<td>5,500,000,000</td>
<td>8,000,000,000</td>
<td>13,000,000,000</td>
<td>18,500,000,000</td>
</tr>
<tr>
<td><strong>RENEWABLE GAS FROM NO BIOPHASIC SOURCES AND</strong></td>
<td>50,000,000</td>
<td>1,100,000,000</td>
<td>5,800,000,000</td>
<td>15,000,000,000</td>
<td>15,000,000,000</td>
<td>15,000,000,000</td>
</tr>
<tr>
<td><strong>BIOMETHANE FROM GASIFICATION</strong></td>
<td>2,500,000,000</td>
<td>4,200,000,000</td>
<td>6,300,000,000</td>
<td>10,000,000,000</td>
<td>20,000,000,000</td>
<td>35,000,000,000</td>
</tr>
<tr>
<td><strong>TOTAL Nm³ CH₄ bio</strong></td>
<td>25</td>
<td>42</td>
<td>63</td>
<td>100</td>
<td>200</td>
<td>350</td>
</tr>
<tr>
<td><strong>TWh th</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>BEST PRODUCTION COSTS PROJECTION FOB ANTE GRID INJECTION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AGRICULTURAL BIOMAS (MWh th)</td>
<td>€ 60</td>
<td>€ 50</td>
<td>€ 45</td>
<td>€ 40</td>
<td>€ 35</td>
<td>€ 30</td>
</tr>
<tr>
<td>AGRICULTURAL BIOMETHANE ANTE INJECTION (€/MWh th)</td>
<td>€ 75</td>
<td>€ 62</td>
<td>€ 56</td>
<td>€ 50</td>
<td>€ 43</td>
<td>€ 37</td>
</tr>
<tr>
<td>RENEWABLE GAS (€/MWh th)</td>
<td>€ 100</td>
<td>€ 70</td>
<td>€ 60</td>
<td>€ 50</td>
<td>€ 50</td>
<td>€ 50</td>
</tr>
</tbody>
</table>

Source: CIB, Feb 2017
Renewable gas - What is the potential in the EU?

**Eurogas PRIMES scenario in 2016 for 2050:**

- 220 bcm synthetic gas + 45 bcm biomethane
- + 35 bcm hydrogen + (120 bcm natural gas)

**ENTSOG in 2017 for 2040:**

- 49 bcm of biomethane + 4 bcm power-to-gas
- in the best scenario

**Ecofys in 2018 for 2050:**

- 98 bcm of methane + 24 bcm of renewable hydrogen by 2050 + 20 bcm from UA + BY
Thank you for your attention!

guillaume.virmaux@grdf.fr

@GVirmaux