# Looking at the long-term: Role of gas in a net-zero Europe

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## EU energy objectives

#### Market liberalisation and harmonisation

First Energy Package: 1996 (electricity), 1998 (gas). Second Energy Package: 2003.

Third Energy Package: 2009.

#### Decarbonisation

Energy and Climate Package: 2009.

### S. of Supply

Electricity Security: 2005. Gas Regulation: 2010. Strategy: 2014.

**Energy Union** 

Clean Energy
Energy Package: 2016-18 (electricity).

### Deep decarb.

Long-term low-carbon economy: 2018.



### EU mid-century climate strategy

UN Paris Agreement (December 2015)

- EU Heads of Government request the European Commission to prepare "within one year a Strategy for long-term EU greenhouse gas emissions reduction in accordance with the Paris Agreement" (March 2018)
- Commission Communication (November 2018)



### Mid-century "deep decarbonisation"



-95% CO<sub>2</sub>



- -100% CO<sub>2</sub> (net-zero, including some negative emissions)
- -86% greenhouse gases



# Which pathway?

#### All-electric

cheap ...

But all-electric might not work out simple or

Electricity is becoming green: All-electric looks like a simple answer for the energy transition

#### "Gaseous fuels"

What are the possibilities for climate-compatible gas fuels and infrastructure?

Is a multi-vector energy transition too complicated, or is it more affordable?





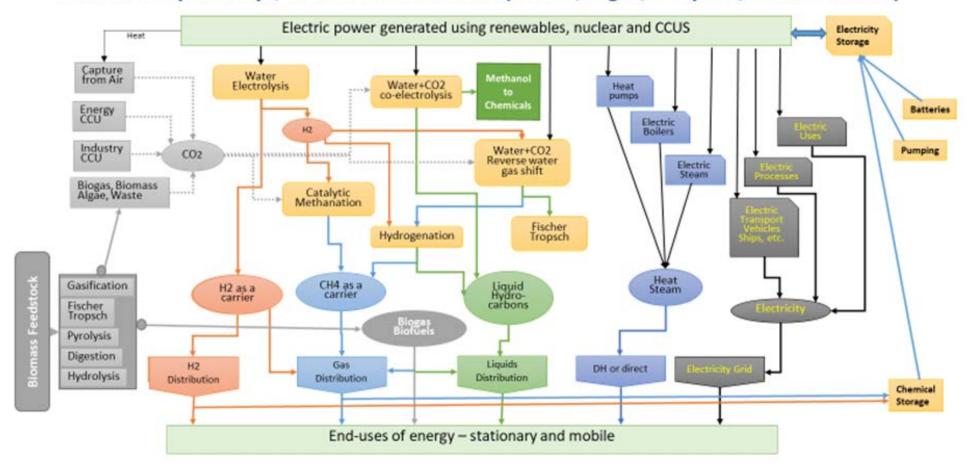
### Renewable and decarbonised gas

- CO<sub>2</sub>-neutral Green Hydrogen from Power-to-Gas (P2G) processes using renewable electricity
- CO<sub>2</sub>-neutral Blue Hydrogen produced from natural gas in combination with pre-combustion carbon capture and storage/use (CCS/U)
- Carbon negative Synthetic Methane produced from biogas or P2G in combination with post-combustion CCS
- CO<sub>2</sub>-neutral Biogas and Biomethane produced from municipal waste, agricultural residues and sewage

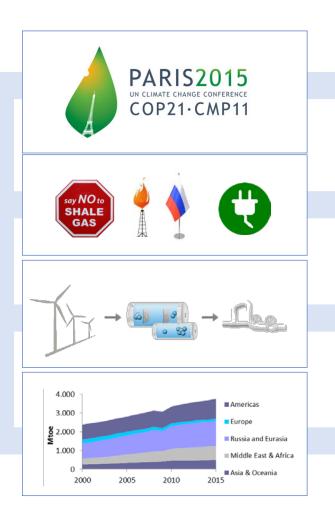


## Net-zero feedstocks and energy

Alternative pathways, in the PRIMES model (i.e. H2, e-gas, e-liquids, electrification)



### Eurogas scenarios study



#### **Scenario 1: Conventional Wisdom**

- Economy to pick up, overall lower than previous outlooks.
- Renewable energy, especially wind power, to increase.
- Nuclear power is limited by upcoming closures, but stable in the long-term.
- CCS to be developed at a slower pace than previously expected
- Increasing use of gas for shipping and truck transport.

#### **Sensitivity 1.1: Electrification**

- Aim: to assess the consequences of an increasing push towards electrification.
- Electrification is maximised in all sectors.

#### **Scenario 2: Innovative Gas**

- Aim: to assess new technological developments of recent years.
- Same macro-economic outlook as 'Conventional Wisdom'
- Exploring the potential of power-to-gas, used in full gas system.
- Reflecting current societal concerns: Less new nuclear sites to be available, and less CCS site to be available.

#### **Sensitivity 2.1: Fuel Switch**

 Aim: to assess the consequences of a fuel switch in the power sector, based on the Innovative with gas scenario, as it is found that this does not occur with current model settings. -95% CO<sub>2</sub>



### Into the future



Equinor/Vattenfall/Gasunie: conversion to run on hydrogen of the three 440 MW Magnum units of Vattenfall Nuon in Eemshaven (MoU 2017).

H21 Leeds Citygate: conversion of existing natural gas demand and distribution to hydrogen in a city of 1½ percent of the UK population (launched 2017, completion 2025)





Causeway: Gas Networks Ireland will inject renewable gas into the Irish gas network for the first time (biomethane from anaerobic digestion of agricultural residues and by-products 2018).

L'Oréal USA/ Big Run Landfill in Ashland, Kentucky: corporate purchase agreement to offset company thermal load carbon footprint from manufacturing and distribution centres with biomethane for injection into the grid.





### Thank you for your attention

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