European Framework for Power-to-X

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The EU Energy System

53% of EU energy imported in 2014

€400 billion spent on energy imports in 2014

6 Member States depend on a single external supplier for their entire gas imports

75% of EU housing stock is energy inefficient

94% of EU transport relies on oil products (of which 90% imported)

30% EU wholesale electricity prices higher than US

4.4% rise in EU household electricity prices 2012-2013

€1 trillion investments into the EU energy sector needed by 2020

€120 billion per year spent on energy subsidies (directly or indirectly)

€129 billion annual turnover of EU renewable energy businesses

How we want to reach it:

• 5 guiding dimensions
• 15 concrete actions
• 43 initiatives
European Climate & Energy Targets

2020:
- 20% GHG Emissions
- 20% RES
- 20% Energy Efficiency
- 10% Interconnection

2030:
- 40% GHG Emissions
- 27% RES
- 27% Energy Efficiency
- 15% Interconnection

2050 ambitions:
- 80-95% GHG Emissions
- European Climate & Energy Targets
RES: where are we?

Share of energy from renewable sources in gross final consumption of energy, EU-28, 2004-2014

Gross electricity generation from renewable sources, EU-28, 1990-2014

# Integration of RES

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<th>Deficit solved?</th>
<th>Surplus solved?</th>
<th>Residual load</th>
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<td><strong>Dispatchable generation</strong></td>
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<td>(hydro, biomass, fossil)</td>
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Hydrogen can support the integration of RES.
GHG emissions: where are we?

Figure 3.4: Greenhouse gas emissions by sector, EU-28, 1990, 2000, 2005 and 2012 (Million tonnes of CO₂ equivalent)

Status 2013: - 20 %

Source: European Environment Agency, Eurostat (online data code: tsdcc210)
"Power to X" in transport (1)

  - 10% RE in transport by 2020
- **Fuel Quality Directive** (98/70/EC, FQD):
  - 6% reduction in GHG intensity of road transport fuels by 2020
"Power to X" in transport (2)

- **ILUC amendment of RED & FQD (2015):**
  - 7% cap for 1st generation biofuels
  - DEFINITION: renewable liquid and gaseous transport fuels of non-biological origin = "gaseous or liquid fuels other than biofuels whose energy content comes from renewable energy sources other than biomass, and which are used in transport"
  - Indicative sub-target for advanced renewable fuels (0.5%)
  - Double-counting of advanced renewable fuels
  - Possibility to establish GHG emission default values for renewable liquid and gaseous fuels of non-biological origin (FQD)
"Power to X" in transport (3)

Directive on the deployment of alternative fuels infrastructure (2014/94/EU)

- EU-wide alternative fuels infrastructure build up, including for H2
- development of harmonized standards and common technical specifications
- targets to be set by MS in National Policy Frameworks (by 18/11/2016)
- Boundary conditions for hydrogen:
  - Member States who choose to develop it
  - Appropriate number of points
  - by end 2025
Upcoming initiatives relevant for P2X:

- New Electricity Market Design
- 2016 Summer Package
  - Effort Sharing Decision
  - Communication on decarbonisation of transport
- Renewables Package
  - Post 2020 RES legal framework (RED II)
  - Self-consumption
- ETS reform
- Energy Union Research, Innovation & Competitiveness Strategy
Issues of importance:

- Market design fit for RES
- Defining the right incentives
- Market integration
- Lower technology costs
- Develop synergies between RES & fossil fuels
- Treatment of low-carbon/carbon free content of natural gas, gas quality standards, access & tariffs
- Certification of P2G
Fuel Cells & Hydrogen 2 Joint Undertaking

- **Hydrogen Europe**
  - Industry Grouping
  - HYDROGEN EUROPE
  - 93 members

- **European Union**
  - represented by the European Commission

- **N.ERGHY**
  - Research Grouping
  - 63 members

**Budget of €1.33 billion in 2014 - 2020**

Strong industry commitment to contribute inside the programme + through additional investment
Industrial applications

Residential CHP

Transport

Renewable generation, storage and 'buffering'

Natural gas, biogas, coal, biomass

Increase of the electrical efficiency and durability of low cost FCs used for power production

Increase the energy efficiency of low cost production of hydrogen from water electrolysis and renewable sources

Methanisation feed to natural gas grid

Large scale use hydrogen to support integration of renewable energy sources into the energy systems

Reduce the use of critical raw materials

Reduction of production costs of long lifetime FC systems to be used in transport applications

By-product from Chemical Industry

Feed to electricity grid

Reduce the use of critical raw materials

FCH 2 JU (2)
Complementary activities under H2020:

- **LCE Calls**: Competitive Low-Carbon Energy
- **SPIRE**: Sustainable Process Industry through Resource and Energy Efficiency
- **NMBP**: Nanotechnologies, Advanced Materials, Biotechnology and Production
- **Inducement Prizes**
Examples of topics under 2016-2017 WP:

- **LCE 25 - 2016**: Utilisation of captured CO₂ as feedstock for the process industry; budget 10 M €; deadline 16.2.2016

- **SPIRE 08 – 2017**: CO₂ utilisation to produce added value chemicals; budget 6 – 8 M €; opening 20.9.2016; DL 19.1.2017

- **SPIRE 5 – 2016**: Potential use of CO₂/CO and non-conventional fossil natural resources in Europe as feedstock for the process industry; budget ¼ – ½ M €; CSA; deadline 21.1.2016

- **SPIRE 10 – 2017**: New electrochemical solutions for industrial processing, which contribute to a reduction of CO₂ emissions; budget 4 – 6 M €; opening 20.9.2016; deadline 19.1.2017

- **NMBP 19 – 2017**: Cost-effective materials for “power-to-chemical” technologies; budget 3 – 5 Mio €; opening 11.5.2016; deadline 27.10.2016 1st stage, 4.5.2017 2nd stage

- **Horizon Prize for CO₂ Utilisation**: budget 1.5 M €; launch 3rd quarter of 2016; deadline spring 2017
Project: STOREandGO (LCE9 2015)

EU contribution: ~ € 18 M
27 partners, Coordinator: DVGW
Duration: 48 months (2016 – 2019)
Other developments

- **FCH 2 JU Study** on Early Market Opportunities for Hydrogen in Energy Storage (2016)
More information:

- H2020 Calls for Proposals: http://ec.europa.eu/research/participants/portal
- Contact: johan.blondelle@ec.europa.eu