



ENGIE's views on the 2050 Strategy for long-term EU GHG emissions reduction

The increasing frequency and intensity of extreme climate events and disasters (summer heat waves & droughts in Northern Europe, rainstorms in Asia and hurricanes in Caribbean Region and USA) we have been facing for several years has shown how climate change has a direct impact on our lives, and is the main challenge our society faces and will continue to do so in the coming decades. The Paris agreement is the first serious and global step taken at mitigating future temperature rise, keeping it well under 2°C and pursuing efforts towards limiting it at 1.5°C.

ENGIE is fully engaged to making the Paris Agreement commitments happen and supports the European Commission in trying to find efficient pathways towards carbon mitigation, and eventually, carbon neutrality in the second half of this century, as required by the Paris Agreement. The soon to be released IPCC report on 1.5°C will provide elements to show which mitigation efforts need to be done, and how fast these are required.

It is indeed a daunting task to decarbonise the European, and beyond, the world economy, while preserving welfare and jobs under largely uncertain scenarios and costs. Policies should be coordinated at the global level, as technologies, climate goals, and climate policies have a global impact. Decarbonisation of the European economy alone should not lead to delocalisation of the European industrial base.

The energy efficiency first principle, at the heart of European policies, is wholeheartedly supported by ENGIE through all its energy service activities, in all sectors: housing, transport, commercial and industrial activities. Transitioning to a decarbonised society will not happen overnight: ENGIE supports a stepwise evolution, starting with the ambitious 2030 objectives recently adopted in the fields of energy efficiency (32.5%) and renewable energy (32%). These objectives will also mechanically lead to increased reduced GHG emissions in the European Union, on the order of 45% instead of 40% agreed in the recent Climate package. ENGIE supports increasing the GHG emissions reduction target of the EU to 45%.

Reaching ambitious objectives will not be possible without a strong carbon market. The current rally in European allowance (EUA) prices finally shows how the implementation of measures to rebalance the carbon market can have an impact, and will support investments in energy efficiency, renewable energy, and fuel switching to less emitting fuels, such as natural gas, nuclear, etc. However, past events have shown that unexpected shocks are always possible and ENGIE reiterates its support for a carbon price floor used as a backstop measure on the carbon market. Providing medium and long-term visibility and predictability remains key to attract the amount of investments needed for the energy transition.

Using the virtues of all clean energy sources and energy carriers is the best and fastest way to create a sustainable low-carbon economy. The smart combination of the electricity, gas and heat systems through sector integration can deliver early achievements, enable more renewables, lower costs and increase system resilience. This can best be achieved at city and territory scale, where international and national policies are ultimately applied.

Natural gas has long been the reliable backbone of the European energy system, providing efficiently bulk resource, flexibility, and resilience. Natural gas, can continue to play this role through the low-carbon

transition over the next years, while development of CO₂-neutral and renewable gases - including hydrogen - will gradually play a leading role in that process:

- Gas is easily stored, providing seasonal resources to meet peak heating demand
- Gas grids are capable of managing high energy demand fluctuation, making gas inherently flexible and demand responsive
- Gas enhances energy system resilience and security of supply, and gas-fired power plants offer dispatchable capacity capable to cover production gaps from variable renewables
- While the electricity system is vulnerable to adverse climate phenomena (floods, storms, temperature extremes, wind/cloud conditions) the gas system is very resilient (underground pipelines and storages, high energy density)

Sector integration, or sector coupling therefore needs to be at the centre of the future energy system. This means ensuring the holistic view and connection of the different sectors of the energy system: electricity, heat and transport, with the corresponding infrastructure in power, gas, district heating and smart energy digital information and control systems. Renewable gas and hydrogen will be the long-term energy vectors of choice for implementing this sector coupling.

Whereas predictions about 2050 remain difficult, the EU has more control about its 2030 objectives; no regret and cost-efficient measures can already be taken to decrease the cumulative impact of CO₂ emissions. For example, in electricity generation, fuel switching driven by higher CO₂ prices can already occur, replacing coal and lignite plants by natural gas-fired plants, thereby reducing emissions of those plants by more than 50% in the short term, while using existing infrastructure at a very low cost.

But emission reductions should not be limited to the power generation sector, which has historically been the one with the most intensive emission reductions, with a large intake of renewable wind and solar generation – and the easiest to target; all sectors will have to contribute, albeit in an integrated way, coupling the various energy consuming sectors. ENGIE already provides integrated solutions to cities and territories, such as heat and cooling networks, power supply combined with heat and energy and heat storage. “Energy efficiency first” is the guiding principle in all solutions, be they in buildings, transport or industry.

Regarding energy production and use, ENGIE believes that many solutions will contribute to further the decarbonisation objective: the proverbial silver bullet does not exist. For example, in 2015 in France, only 26% of final energy use was electricity, with 21 % for natural gas and 41 % for various oil products. In France also, 47% of energy use is devoted to heat. All over Europe, heat is relatively easy to green through various energy vectors: wood, biomass, especially efficient in district heating, renewable biomethane, and electrical heat pumps. Building insulation is an important first step. An Ecofys study¹ has shown that it is possible by 2050 to scale up renewable gas (biomethane and renewable hydrogen) production in the EU to a quantity of 122 billion cubic metres by 2050. It also concludes that using this gas with existing gas infrastructure, smartly combined with renewable electricity in sectors where it adds most value, can lead to €138 billion societal cost savings annually compared to decarbonisation without a role for renewable gas.

Electrification of all heat uses would be difficult as it would require large amounts of electricity storage and transport lines dimensioned for winter peaks, at high costs. Large amounts of electricity storage can only be provided by hydro-electric dams, which depends on the oro-hydrography of countries, and storable energy vectors under gaseous form, such as hydrogen.

CO₂-neutral renewable and decarbonised gas will therefore play a crucial role in achieving EU long-term climate objectives to 2050 and beyond, including carbon neutral green hydrogen from power-to-gas processes using (intermittent) renewable electricity and carbon neutral biogas and biomethane produced from municipal waste, agricultural residues and sewage reinforcing energy independence in a circular economy framework.

¹“Gas for Climate: How gas can help to achieve the Paris Agreement target in an affordable way,” Ecofys, February 2018.

In this regard, Carbon Capture and Use (CCU) can be considered as an adequate way to make natural gas CO₂-neutral and might be, in combination with green hydrogen, a promising basis for a circular economy.

As an example, studies have shown that natural gas can be fully greened in France by 2050. There are various ways to produce renewable green gas, including biomethanisation (anaerobic digestion) of agricultural waste and animal manure, and gasification of lignocellulosic waste.

Transport is responsible for another large, and continuously increasing, share of EU emissions. It is difficult to foresee which technological breakthrough will allow European citizens to benefit from the same mobility as currently. Without prejudging what will happen over the next 30 years, it is safe to say that:

- Light vehicles will probably be powered by electric (battery or hydrogen fuel cell) motors
- Heavier vehicles, such as buses and freight trucks which need a higher autonomy, will probably be powered by natural/renewable gas engines or renewable hydrogen fuel cells.

The decarbonisation of industry will proceed through more use of renewable energy, electricity but also renewable gas for process heat. Some processes will always produce CO₂ such as cement production, but some others can be decarbonised, such as the production of steel through H₂ reduction of iron ore instead of using coking coal, with decarbonised production of hydrogen from renewable electricity.

Agriculture is probably the most difficult sector to decarbonise, but recuperation of agricultural waste and woody biomass will provide a source of carbon neutral renewable gas, and hence, also contribute to the decarbonisation of other sectors, such as heating or transport.

The above shows that innovation plays a crucial role in decarbonising the economy: some of the technologies that will be used in 2050 for heating our homes or driving our cars are probably not yet developed. ENGIE is currently developing research and developments projects, for example pyrogasification of lignocellulosic matter, with a view to optimising and multiplying such installations.

The role of the European institutions in supporting industrial competitiveness through development of innovative products should provide European companies with the necessary means and incentives to further research and development in the laboratories, in their pilots and in their demonstration projects. In this regard, the EU Innovation fund currently in its design phase is a good example of the support public funding can bring to industry innovation and competitiveness. Promising technologies in hydrogen and biomethane production should receive all the support they deserve in view of their role in decarbonising the economy.

About ENGIE

We are a global energy and services group, focused on three core activities: low-carbon power generation, mainly based on natural gas and renewable energy; global networks and customer solutions. Driven by our ambition to contribute to a harmonious progress, we take up major global challenges such as the fight against global warming, access to energy to all, or mobility, and offer our residential customers, businesses and communities energy production solutions and services that reconcile individual and collective interests. Our integrated - low-carbon, high-performing and sustainable - offers are based on digital technologies. Beyond energy, they facilitate the development of new uses and promote new ways of living and working. Our ambition is conveyed by each of our 150,000 employees in 70 countries. Together with our customers and partners, they form a community of Imaginative Builders who invent and build today solutions for tomorrow.

2017 turnover: 65 billion Euros. Listed in Paris and Brussels (ENGI), the Group is represented in the main financial (CAC 40, BEL 20, Euro STOXX 50, STOXX Europe 600, MSCI Europe, Euronext 100, FTSE Eurotop 100, Euro STOXX Utilities, STOXX Europe 600 Utilities) and extra-financial indices (DJSI World, DJSI Europe and Euronext Vigeo Eiris- World 120, Eurozone 120, Europe 120, France 20, CAC 40 Governance).