What if the EU were energy independent?

The European Union (EU) can aspire to achieve energy independence through the deployment of existing and emerging technologies. Electrification, renewables and energy storage could reduce the EU’s reliance on conventional fossil fuels. What are the developments, expectations, concerns and societal implications associated with these technologies? And what initiatives and policies could lead to a resilient EU energy system, through anticipating impacts?

The EU depends on imported fossil fuels (gas, oil and coal) for about 56% of its energy needs (gross energy consumption), which in 2021 represented an energy bill of around €300 billion. The domestic production of renewable energy sources has increased significantly in recent years, to 22% of total demand.

An energy independent country will produce most of the energy it needs domestically. Currently, several fossil fuel exporters are energy independent, but independence can be achieved by any country that uses its endogenous resources to meet its energy demand. Iceland is perhaps the most interesting example of a country that by using hydropower, wind and geothermal is able to cover most (85%) of its energy needs, nearly achieving full energy independence. This is something to which the EU could aspire.

The quest for energy independence, generally defined as reducing imports of fossil fuels, is not a new energy policy objective. It has drawn attention to a range of innovative energy technologies and ambitious public policies, such as those enacted in the context of the European Green Deal.

Potential impacts and developments

EU energy policy is geared towards achieving a sustainable, secure, and competitive energy sector. The current policy agenda is driven by concerns about energy security, dependence and the alignment of the EU’s energy and climate targets, as proposed in the ‘fit for 55’ package. To reflect the different contexts at national level, each Member State maintains the right to determine its energy mix and therefore apply different approaches to pursue common energy policy goals.

If it is to achieve its energy policy goals and reduce dependence on fossil fuel imports, the EU will need to harness three key areas of technology: renewables, energy storage technologies and the mass electrification of end uses.

**Renewables:** In the EU, biomass, onshore wind, hydropower, liquid biofuels and biogas represent the bulk of the renewable energy supply. In addition, solar photovoltaics have evolved to become highly efficient and cost-effective and are currently the fastest growing source of energy in the EU. Offshore wind capacity is set to increase by a factor of at least 25 by 2030, using the vast potential of the five EU sea basins. Geothermal energy is also increasingly attracting more attention, as its potential to provide heat and electricity in some regions of the EU is significant. Overall, these technologies are mature and their fast deployment on a large scale is possible with the right enabling framework.

**Energy storage:** Breakthroughs in energy storage technologies, in particular in advanced battery systems, are essential for ensuring the reliability and stability of renewable electricity supply. Green hydrogen produced using excess renewable energy can be used as storage for various applications; it can be
converted back into electricity or used as a fuel to decarbonise heavy industry and transport. Despite its promise, there are still challenges in the area of energy storage: further technological advances are needed and the cost will have to be reduced. The regulatory framework and policies must also evolve to support the integration of energy storage systems into existing energy grids.

**Electrification**: Key to the decarbonisation of the economy and critical in achieving energy independence, electrification can cut the use of fossil fuels in the transport and heating sectors substantially with the adoption of electric vehicles and heat pumps. The European Commission expects EU demand for electricity to increase significantly, with electricity’s share in final energy consumption rising from around 25% in 2021 to approximately 30% in 2030, and close to 50% by 2050. Electrification allows more renewables to be linked into the system, and can cut energy demand by increasing end-use energy efficiency. For this, it will be vital to upgrade the EU’s electricity grids. Digital technologies and the use of artificial intelligence will meanwhile enable smart grid management and optimisation of energy production and use.

Pursuit of EU energy independence will extend beyond the key technologies listed above, however. It must also embrace other energy technologies (such as nuclear energy). Policy-makers will also have to consider these technologies’ potential to generate fresh import dependencies, however.

**Anticipatory policy-making**

Success in achieving energy independence is rooted in the deployment of clean energy technologies. These technologies displace fossil fuels, and in doing so disrupt global geopolitics, national and local economies (e.g. coal mining regions), and energy affordability for both people and businesses, potentially leading to unexpected outcomes. The integration of renewable energy sources into existing infrastructure meanwhile poses technical challenges, requires significant investment and can affect biodiversity and land use. Policy-makers also need to anticipate the necessary upskilling and reskilling of the workforce, while ensuring the rules for the functioning of the internal market are transparent.

The fact that the deployment of clean energy technologies can cause other import dependencies, as has been the case with EU reliance on imported solar photovoltaic technologies and batteries, must be addressed. The indirect energy required to produce goods and services that are subsequently imported or exported is not generally accounted for when discussing energy independence; but it can have significant environmental and socio-economic impacts. An example of this was the increased prices of imported electricity, fertilisers, and chemicals resulting from the recent natural gas shortages.

Restructuring manufacturing supply chains, sourcing raw materials, increasing materials circularity and producing clean energy domestically are all key to cutting indirect energy imports, but also contribute to achieving the EU’s strategic autonomy goals, and delivering on its green industrial plan. Policy instruments such as the carbon border adjustment mechanism can help to level the global playing field for producers of CO₂-intensive goods (steel, cement, iron and steel, aluminium, fertilisers, electricity and hydrogen).

Continued decisive action is needed at EU level. REPowerEU is one such ambitious initiative that seeks to reduce EU dependence on Russian fossil fuels and accelerate the energy transition. Engaging with stakeholders, from industry experts to environmental advocates, is essential for inclusive and effective policy formulation. A collaborative approach, meanwhile, as illustrated by the coal regions in transition initiative or the recent launch of the European wind power action plan, can deliver a timely response to societal concerns, while speeding up a balanced energy transition to the benefit of all.

In conclusion, achieving EU energy independence is a dynamic and multifaceted process. It involves harnessing innovation, addressing environmental and socio-economic concerns, and responding to global challenges. If it succeeds in becoming energy independent, and therefore less reliant on fossil fuels, the EU will however enhance its economic stability significantly, reduce geopolitical risks, and be able to contribute more decisively to the ambitious global climate goal of achieving net zero by 2050.