Supplement – October/November 2020

La Lettre des Entretiens Européens

Rapprocher - Débattre - Fraterniser

Nuclear energy and its innovations for a sustainable recovery in Europe?

Claude Fischer Herzog
Director
Les Entretiens Européens & Eurafricains

Meeting the demand for low-carbon electricity and creating a new circular economy with multi-recycling in Europe is more than just a scientific and technical challenge. It is an economic and political challenge too.

The aim of the "Green Deal" is to make Europe the first carbon-neutral continent, but imposing ever less energy consumption and ever more renewable energy sources (RES) in the energy mix will not be enough to build a "green new world"[1]. In fact, producing 80% of energy from RES by 2050 – and 100% by 2100 – is not just an unrealistic target; to achieve that target, we would have to destroy all our gas-fired and nuclear power plants.

At the OECD, the IEA and the IPCC, many well-known voices have been raised in warning to the institutions about the sharply rising cost of RES above the 40% share mark[2], the storage problems, the impact of intermittency on grids (even "smart" grids), the need to choose a back-up source from coal, gas or nuclear power, and the impossibility of meeting our climate goals without nuclear power.

There will also be huge challenges to overcome in terms of helping countries to change their energy mix, bearing in mind their assets and systems, as well as the employment impact for those which rely heavily on fossil fuels. The vote of the European Parliament for 27 billion for gas in the «just transition» accompanied by an amendment for a 60% reduction in EGES in 2030 is contradictory. And hydrogen will not be the solution for now.

As we know, nuclear power is a long-term solution that requires political stability, a clear vision, and careful planning of investments in new facilities and R&D to lay the groundwork for the future. If the COVID 19 crisis has taught us anything, it is that a lack of vision and planning can have tragic consequences! Europe must not make the same mistake as it did with other high added-value industries by surrendering the nuclear lead to countries like China or Russia, which have planned large-scale investment in the sector and have developed a diverse range of third-generation technologies (such as SMRs and floating nuclear power plants), as well as building fourth-generation reactors (known as rapid neutron reactors, or RNRs) that run on spent fuel, thus closing the fuel cycle in a virtuous manner. The United States is aware of Chinese and Russian dominance, and has developed a strategy to restore American leadership.[3]

Preserving our strengths and staying in the race

The European Union has an efficient network of nuclear power plants[4], the renewal of which must be planned in advance, with the gradual introduction of new technologies. The majority of second-generation reactors are being upgraded to prolong their operating life (see the Grand Carénage project in France). Some countries, such as Finland, France and the United Kingdom, have invested in PWRs (third-generation Pressurised Water Reactors)[5], and PWR projects exist in Hungary and the Czech Republic. New, fourth-generation technologies are already up and running in Russia or are being trialled in China, but are still in the research phase in the European Union.

An international forum was created in 2020 to promote cooperation on a number of promising fourth-generation technologies that meet requirements in terms of sustainability, safety and reliability, cost competitiveness, protection and proliferation resistance. Europe joined the forum in 2003, and Euratom fostered the creation of technological platforms that are working on developing projects and publishing a research and innovation agenda[6]. It has strong skills in nuclear science, and internationally recognised research institutes are working on these new technologies: France's CEA has stopped work on

---

[1] *The 2030 target of 32% renewables in Europe's final energy consumption can be achieved only if the share of renewables in the electricity mix is 57% (it is currently 32.3%).*

[2] *See the OECD/NEA study: "The Costs of Decarbonisation", 2019; and the article by Hervé Fischer, "Renewable electricity, a societal choice that will cost Europe dear", in* La Lettre des Entretiens Européens*, October 2019.*

[3] *See the article by Samuele Furfari, dated 5 June 2020: "The European Union left behind by the geopolitics of civil nuclear energy".*

[4] *In late September 2019, the European Union had 126 nuclear reactors spread across 14 different countries. The industry comprises several thousand companies and employs 800,000 people. More than half of installed capacity is in France, which has 58 reactors (accounting for 63.1 GW of a total 118 GW in Europe).*

[5] *EDF is investigating the possibility of building six new PWRs, at the government's request; and the UK plans to build two new PWRs at Sizewell C, on the east coast of England.*

[6] *See the MOST and ALISIA projects within the 5th FPRD, the EVOL project within the 6th FPRD, the SAMOFAR and SAMOSAFER projects within the Horizon 2020 programme, as well as national programmes in France, such as PACEN, NEEDS etc.*

ASTRID, a 600-MWe sodium-cooled demonstration reactor. However, it is continuing its research into RNRs while focusing on the multi-recycling of the MOX in third-generation reactors. The CNRS is working on a molten salt fast reactor (MSFR) that meets Gen4 criteria[7]; Belgium is financing the MYRRHA project in Mol, involving an accelerator-driven reactor demonstrator that should be in operation by 2030…

A technology timeline that reflects different objectives

All of these research programmes have their advantages and their drawbacks, but their timelines are different and they do not perform the same functions. The multi-recycling of the MOX in PWRs is expected to be in operation by 2050: because waste is used, storage is no longer needed; but waste has less energy value, so uranium is still needed to enrich it (not to mention the cost of recycling, which is higher than that of storage). Gen4 technology does both: waste is recycled, less uranium is needed, and production is multiplied a hundredfold; but it will take several decades of work before it can be used in the industry, and the operating costs may be higher given the complexity of the system. Furthermore, the ITER project[8], designed to produce nuclear fusion power on an industrial scale, is doubtless even further from completion and is a challenge that will continue into the next century.

Why compare technologies? They do not perform the same functions or meet the same requirements, and they depend on future strategy. How can requirements be anticipated? Based on what strategy? Nuclear technology as a transitional or a long-term source of energy? The debate must be able to develop as part of the sustained recovery from the global economic crisis, and in line with our energy security objectives and our commitment to reducing greenhouse gas emissions, with short-term solutions implemented over the long term…

Towards "permanent, structured cooperation" between nuclear states

Along with the "Green Deal" - the objectives of which must be clarified[9] - the European Union needs an "energy solidarity pact" allowing Member States to develop nuclear energy if they so decide. In addition, the nuclear industry should be included in the recovery plan and the "taxonomy", and should be entitled to European funding for investment in technology, research and development[10]. How can cooperation be improved within the Union and with neighbouring countries? Euratom – where decisions are taken unanimously – is in an impasse because of a handful of countries like Austria, where nuclear energy (and therefore Gen4 technology) are taboo subjects! Why not take a leaf from the defence sector's book and build "permanent, structured cooperation" between nuclear states?

This would not only enable the development of a competitive and sustainable nuclear industry open to international cooperation, with projects to increase production capacity in the territories; it would also allow the pooling of research and development costs, with a view to producing hydrogen for transport, to innovating in new sectors such as heating networks, digital technology and health, and to being operational by 2050 and fully ready by 2100.

Claude Fischer Herzog,
Director of Les Entretiens Européens

---

[7] *See the conference hosted by G2E TER on 26 May, with the participation of Claude Fischer Herzog.*

[8] *International Thermonuclear Experimental Reactor: the experimental, tokamak-type, civil nuclear fusion reactor is located in Cadarache.*

[9] *Cf. A contribution for a revision of the European energy strategy: the recommendations of Les Entretiens Européens in Helsinki - November 2019. www.entretiens-europeens.org*

[10] *See the petition from sixty MEPs «Nuclear energy in taxonomy regulation» addressed to European Commissioner Valdis Dombroskis - May 2020. See also the letter from Polish Minister Michal Kurtyka to European Commisssioner MS Kadri Simons - June 2020*