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'THE NUCLEAR FUEL CYCLE IN 2040: THE CHALLENGES AND SOLUTIONS TO ACHIEVE SUSTAINABLE NUCLEAR GENERATION IN EUROPE'

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A review of the Pan-European Fuel Cycle; the benefit of international nuclear cooperation in the 21st century.

Jonathan Hart & Brett Longstaffe, 08/02/2046

Looking back to the predicament of the nuclear industry in the early 21st century, it is easy to see why many commentators considered nuclear power to be a technology resigned to the past. Despite much media clamour about a 'nuclear renaissance' at the turn of the century, progress was in danger of stalling. Significant delays to the construction of new nuclear plants and a fragile political climate led some to question whether Europe would follow through on the rhetoric about planned nuclear new build.

At the Paris COP21 talks it was acknowledged, on an international scale, that nuclear power must play an important role in combating climate change. Politicians, however, faced continued pressure from public groups to pursue a '100% renewables' scenario, despite widespread expert acknowledgement that this was a likely unfeasible solution to the climate problem. This was later demonstrated for the world to see as Germany's decision to close its existing nuclear generation by 2022, led it to miss its 2020 CO_2 emissions targets.

It is the authors' view that the startling subsequent turnaround of the European nuclear industry in the 2020s, was based in no small part on the groundbreaking international cooperation that was forged between European states as they moved towards a truly Pan-European nuclear fuel cycle. This was a move which had wide ranging benefits for Europe and has represented a significant step in solving the ongoing international climate crisis.

In a globalised nuclear world dominated by the growth of China, India, and a resurgent US industry, European nations realised that they could not afford to pass up on the benefits gained as a result of working closely together to extend the scope of the Euratom Treaty to deliver a single Pan-European Fuel Cycle. In business, individuals should always play to their strengths; an effective team is that which makes the most of the diverse capabilities of its members whilst working toward a common goal. Each state could offer something different to the table and, by sharing expertise, resources and capabilities, individual states were able to focus their investments on their own fortes. To name but a few:

- UK; Advanced Manufacturing, fuel fabrication and decommissioning and rapid new build;
- France; Plant operations, advanced aqueous reprocessing and reactor design;
- Kazakhstan; Uranium extraction expertise and plentiful natural resources;
- Sweden; Waste disposal public relations;
- Finland; Geological disposal construction experience.

The creation of this 'Energy Union' was not without challenges. Several key hurdles had to be overcome in the face of some forceful political opposition.

1. Harmonisation of nuclear regulations, and regulator cooperation;
2. Movement of nuclear technology and materials;
3. A 'supergrid', including load following to support higher renewable penetrations;
4. Financing structures;
5. Treaties ensuring continued cooperation;
6. Coordination of public relations.

This groundbreaking development showed the world what can be achieved if countries work together in a global market. A case study discussing the challenges that were faced, the solutions that were developed and the benefits subsequently gained will be published next month.