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Meeting The Challenges Of European Fast Reactor Development

Research & Development

29 Nov (NucNet): Nöel Camarcat, chairman of the European Sustainable Nuclear Industrial Initiative (ESNII) and Electricité de France's special advisor on research and development, talks to NucNet about the next steps for the ESNII task force and the challenges for the French Astrid sodium-based fast reactor.

NucNet – With the official launch of the European Sustainable Nuclear Industrial Initiative (ESNII), what can you tell us about funding and the extent of industry participation? In particular, how developed are plans for funding the French Astrid project?

Camarcat: The money will be primarily decided by the leaders of the consortia (for the projects), and so far the consortia are still led by government, especially for the two main projects: Astrid and Myrrha. Afterwards, there will be a financing scheme. The so-called 'Deloitte report' was produced to address this question (See 'Funding opportunities and legal status options for the future European Sustainable Nuclear Fission Industrial Initiative of the Strategic Energy Technology Plan': ftp://ftp.cordis.europa.eu/pub/fp7/euratom-fission/docs/deloitte-gen4-022010-full-report.pdf)

Then there is the question of risk. This is particularly true for Astrid, which has to lead to a real industrial project. It is too risky a project for industry alone. So in the Deloitte report we said industry participation should be limited to 20 percent because of the risk. These are not commercial nuclear projects. They have all the risks of nuclear projects plus unknown technology. Industry takes part, but in a limited manner. It cannot carry the whole risk.

NucNet – Who will become involved in the financing of the ESNII projects?

Camarcat: We need a financing scheme under which we have public money from the European Commission and national governments. If that is not enough, then there would be loans from the European Investment Bank. However, we have not approached the Bank, so this is hypothetical at this stage. We have been asked many times why this isn't a commercial project. One day it will become a full commercial project, but not yet. The first point was defining the project: getting the players organised and defining what has to be done in the next three years to 2013. This is the implementation plan, but the scope is beyond 2020. We found the money for the first three

years, which is important. Longer term financing will have to be tackled from 2013 and beyond.

NucNet – With regards to developments for the ESNII task force itself, when will industrial and intellectual property issues between the consortia partners come into play?

Camarcat: When we are beyond the conceptual design phase of all these projects, then we will have to discuss among ourselves what the intellectual property rights are. That is to say, whatever anyone can take and not take. But usually when you discuss intellectual property rights you have funding. People have put money on the table and the amount of money you put on the table gives you or doesn't give you intellectual property rights. It is early, but we are thinking about it.

NucNet - There are differences between sodium-cooled and gas-cooled reactors. Why is the choice of sodium-based technology preferable?

Camarcat: Very simply, sodium technology has been deployed before. This sodium technology has been deployed in Europe, up to quite a large scale, and EDF was operator for the Super-Phénix reactor in Creys-Malville. So we know the technology well, but it has to be improved. In France it has to be improved dramatically and it is a tough task.

NucNet - What are the principal technological challenges for sodium-cooled reactors?

Camarcat: Sodium reacts with air and water, so it's always a problem. You have to take special care to prevent the sodium-to-water and sodium-to-air reaction. The reactor vessel is full of sodium and you cannot see inside it, so special ultrasonic technologies have to be developed, in order to see what you are doing. Then you have problems specific to fast neutron physics. These are the technological challenges, but the one most talked about is the chemical reactivity.

NucNet – The ESNII task force provides documentation describing the fast reactor technologies now under development. Why is the issue of proliferation raised with respect to sodium-based technologies in particular?

Camarcat: Non-proliferation was always a concern because people said this technology could produce separated plutonium. But you can work around this and use processes which do not separate plutonium. There are new processing or reprocessing methods. But the research on this came much later than that undertaken in the 1970s. In the 1970s when the technology was developed – but not deployed – these processes did not exist. Of course, the world was also different.

NucNet – To what extent is non-proliferation an industry issue?

Camarcat: Everybody will say they want the technologies. We can do the technologies, but the first thing about non-proliferation is safeguards… we must implement good safeguards. This requires political courage, and this courage should be used to say 'implement good safeguards first' and do not take refuge behind technology. But

if you have clever technologies, then you spread a lot of knowledge. You can take the people who have this knowledge to develop other technologies. This you will never beat.

In industry we say that if you make the technologies too complex, they will be hard to deploy. So the balance is a fine balance. Ad we also say there should be good safeguards. But safeguards are not done by industry but by governments, and industry follows the rules of the governments.

NucNet – Is ESNII going to foster the establishment of consortia and public private partnerships, or is this something which will be undertaken by national governments?

Camarcat: With respect to the Astrid project, the French government has issued a framework in the Journal Officiel de le République française. It is an official document between the CEA and State (11 September 2010: see http://www.journal-officiel.gouv.fr). It defines how the French state wants to bring industrial partners early into the project, which is what we are doing. This includes players in French industry such as Areva, EDF and the CEA, which are the historical partners. But the government has said that we want to invite other partners from all of Europe.

NucNet – These ESNII projects are very much European projects, but Myrrha has signed collaboration agreements with China and Kazakhstan. What about global collaboration for the other projects?

Camarcat: In sodium technologies, the French are working with the Japanese. There are two agreements. There is a French government agreement and EDF has a separate bilateral agreement with the two main institutions of Japan – the JAEA (Japan Atomic Energy Agency) and the Federation of Electric Power Companies of Japan. So we also collaborate with utilities. This is for a sodium-cooled fast reactor and it is an important agreement with good technical value.

EDF also has a technical agreement with Rosatom of Russia. The Russians have been operating this technology at Beloyarsk for 30 years and with a good record. They are building an 800 megawatt reactor, BN-800, and they are said to be looking at the possibility of deploying the technology in China. We understand China is having discussions. It was important for us to understand the engineering capabilities of the 'few-hundred' megawatt class of sodium-cooled reactor. This is why we went to Russia, because we have had no experience of building such reactors in France since about 1986. That is a long time ago, so there was a question of what type of engineering organisation and structure should be put in place with respect to research reactors.

Background

The ESNII task force was established in 2007 under the umbrella of the Sustainable Nuclear Energy Technology Platform (SNETP, which puts in place a technology roadmap for European nuclear energy to 2050). ESNII supports the development of three fast reactor technologies – sodium-cooled, gas-cooled and lead-cooled – with the construction of a prototype sodium-cooled fast reactor scheduled by 2020. 2040 is the overall target for the deployment of Generation IV fast neutron reactors. Astrid, the sodium-based 'reference technology' is anticipated to cost 5 billion euro (6.6 billion US dollars)

to the year 2020, and is backed by the French government. The Belgian government-backed Myrrha project and the separate lead fast reactor demonstration plant are set to cost 1.96 billion euro, while the Allegro gas-cooled fast reactor is expected to cost 1.2 billion euro.

More information

ESNII Concept Paper (October 2010): http://www.snetp.eu" target="_blank">http://www.snetp.eu

Sustainable Nuclear Energy Technology Platform: http://http://www.snetp.eu" target="_blank">http://www.snetp.eu

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