

The hoped-for nuclear power renaissance depends upon a reliable network of subcontractors capable of supplying the necessary hardware and software. But years of stagnation in the nuclear power sector have left production capacity in a precarious state.

Rebuilding the nuclear network

Photo: Firefly Productions/Corbis

| by Yves de Saint Jacob

Some 200 experts meeting in Paris for the 4th Annual European Nuclear Power conference organised by Platts in July, assessed the conditions which will determine whether the nuclear power renaissance in the world will be a resounding success – or will end up in a great disappointment.

Because either scenario is possible. Thierry Dujardin, Deputy Director Science and Development of the OECD Nuclear Energy Agency, put forward two scenarios, a high and a low estimate, for the situation in 2050. From 439 reactors operating presently, there could be as few as 600 or as many as 1,400. In other words, nuclear capacity could increase by a factor of between 1.5 and 3.8. A big difference.

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One of France’s leading experts, Colette Lewiner, former scientific advisor to EDF and a consultant with Capgemini, drew up a list for the conference of positive and negative factors that could affect the development of nuclear power. On the negative side: fossil energy prices decline, CO₂ prices decline, demand slowdown, credit crunch impacting project development. On the positive side: construction costs should decrease, public opinion getting more positive, decreasing incentives for renewables, security of supply back on the European agenda, climate negotiations under more positive auspices.

One essential condition for making possible a new growth in nuclear power production, is the reinstatement at a global level of a strong industrial network of subcontractors. The nuclear industry is dependent on a network of thousands of supply companies that must be able to produce very high quality materials and services. However, the long period of stagnation in the nuclear sector, has seriously impaired this infrastructure.

‘Being out in the cold for many years, the nuclear industry has lost a lot of know-how’, says Lewiner. ‘Moreover, the older generation of engineers, who have built the existing plants, is coming up for retirement. So it essential to recruit and train competent people and to recreate and boost a high quality supply network.’

Lewiner points to the problems Areva is having in building the Finnish Olkiluoto power station. ‘They won the contract a few years ago in very competitive conditions. These difficulties are increased by the consortium structure of the client who has, in addition, stringent conditions for local subcontracting. It is likely that

Areva, which has accepted a turnkey contract for this new type of reactor, didn’t budget sufficiently for these factors and did not put up a strong and experienced enough management team. All these factors have led to delays and increased costs, although presently corrective action has been taken.’

Heavy-duty |

According to French sources, some 500 companies are involved in the construction of a single nuclear power station (and this is not counting the future service suppliers involved in the running of the station.) These may be international suppliers or local companies. For example, six suppliers from outside the US – located in Italy, Spain, France, Canada, Japan and Korea – have been involved in supplying replacement components for US plants in the past two years.

These companies not only supply the heavy-duty machinery, like the reactor tanks or steam generators, but also the thousands of smaller components, like the valves and electrical connectors. These last, despite their relatively small size, are frequently the subject of very strict specifications, in order to guarantee their functioning in extreme conditions. A typical example is the electrical connector which should not melt or become detached even in the event of an earthquake or a nuclear accident.

As for heavy-duty hardware, the situation is even more difficult. ‘Ultraheavy forgings are a current pinch point’, says Ricardo G. Perez, Senior Vice-President of Global Growth and Innovation at US supplier Westinghouse. However, Perez notes that steps are being taken to remedy the situation. ‘Expansion of forging capabilities is proceeding rapidly in countries such as the UK (Forge Masters), China (Shanghai Electric Co and DEC) and Korea (Doosan). Given the expansion of nuclear power in India, this market is also expected to develop its indigenous ultra-heavy forging capabilities.’

Bernard Salah is Senior Vice-President Nuclear Engineering at EDF, the French electricity group, which does not construct its own reactors or nuclear material but is a recognised expert in assembling nuclear power stations. With his great experience as the architect of 58 power stations built in France from the mid-1970s onwards, as well as in the construction and management of the completed plants, he is in a good position to evaluate the situation. ‘The iron and steelworks which produce the very large components, of a much greater size than anything else in the industry, are limited in their capacity by the level of demand’, he says. ‘There is only one foundry in the world, Japan Steel Works, which can forge components greater than 300 tonnes, which are needed for the tanks and the alternator shafts in a power station. With the nuclear renaissance, other manufacturers around the

world are investing in similar equipment in order to be able to produce large components, but we are still going to have to wait a few years before these factories are operational.' In the meantime, the major constructors are therefore forced to reserve construction slots, often several years in advance, with Japan Steel Works.

Perez points to another sector which is under pressure. 'Another area of specialty materials is the supply of nuclear grade chrome-nickel alloy for heat exchangers. Current suppliers exist in France, Japan (Mitsubishi) and Sweden (Sandvik). Expansion of these facilities and re-commissioning of our own manufacture is currently under evaluation.' But he is optimistic. 'We are convinced that both these areas of supply – heavy forging and alloys – are well on their way to ramping up to meet the global demand.'

Dynamic |

The question of maintaining quality control as the pressure of demand on subcontractors increases is another crucial issue, particularly in the matter of the small components. EDF, as operating company, carries out a complete inspection of every component headed for their power stations at the moment of manufacture. 'Experts travel all over the world to see the suppliers to check that everything is as it should be according to the contract and the specifications laid down. They go through the

manufacturing process step by step and give their formal approval before the process gets underway', Salah explains.

Lewiner underlines that the market will react in a dynamic way. She recalls that at the time France's nuclear plan was drawn up, EDF took great pains to organise and create a network of subcontractors working to the high-quality standards necessary for the nuclear industry. 'There is no reason to be pessimistic about this now, as nuclear development is a long drawn-out process anyway. We must take the time to recreate this industry and bring it up to standard again. In those countries where they are starting up again, or which are just starting, it is essential to be sure that either an effective national subcontracting network is in place or to that certain components can be imported', she says.

She expects that in the future, Asian-made components are going to be even more important. 'China is going to be a qualified manufacturer of nuclear components and we will have to incorporate it into a global policy.' As for nuclear safety, she says it is 'essential that the new nuclear countries set up their own safety agencies with suitably competent staff and a degree of independence both from the political authorities and the operators. It is one of the prerequisites for the construction of new nuclear plants.' ■

Mixed prospects for nuclear renaissance

Colette Lewiner, Global Sector Leader, Energy, Utilities and Chemicals, at consultancy firm Capgemini, and former scientific advisor at EDF, sees mixed prospects for a nuclear renaissance. In Asia, development is going ahead as planned, she says. 'China has even decided to speed things up with plans to put six nuclear reactors into operation each year for the next few years. I believe that they will succeed, as it is the same rhythm we kept up in France in the late 1980s.'

India also has an ambitious programme and has now access to western technology, thanks to agreements it signed in 2008. 'The debate currently underway in India is what role foreign players will have: operating the reactors or simply supplying equipment and services.' Other countries, particularly South Korea, are continuing with their ambitious nuclear programmes. In the Middle East, several countries intend to turn to nuclear power to satisfy their growing demand for electricity as well as keeping their gas production for export.



In the US, with the new Administration's focus on renewable energies, the Capgemini expert believes that the current ambition of building more than 30 new reactors will be reduced. 'The 2005 Energy Bill Act includes \$18 billion of

guaranteed loans for the first three or four reactors. These projects will go ahead, but it will be much more difficult for the others, particularly as most American utilities are relatively small and have difficulties getting loans.'

In Europe, the former Eastern bloc countries have to a greater or lesser extent been hit by the recession, which is likely to delay their nuclear programmes. The financial and economic crisis has also been severely felt in Russia and will probably have the effect of slowing down their ambitious nuclear programme.

In Western Europe, Lewiner believes the UK is probably the only country which is going to build a large number of new nuclear reactors. In Germany, the September election's outcome will be crucial: either the new government will endorse the current policy of a phasing out the existing nuclear power plants, or it will allow them to be operated until the end of their technical lifetime. ■