

Talking Points at the INPRO Dialogue Forum on Global Nuclear Energy Sustainability:

Licensing and Safety Issues for SMR-

Panel Session on Monday 29 July 2013

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1-Introduction

Since the beginning of the Nuclear Energy Development in the world, Designers, Vendors and Operators have been facing to more and more nuclear safety requirements, driven by Nuclear Regulatory Bodies, legal framework and public.

After nuclear accidents in the world, Experience Feedback has been taken into account as well, in order to increase Nuclear Safety requirements.

After Generation 1 and Generation 2 reactors built in the period 1970-2000, the Generation 3 reactors are now under construction in some countries (France, USA, China, Russia, Korea, India, etc...). After Fukushima accident, “Stress tests” on generation 3 reactors design were conducted and new “Post Fukushima requirements” were published by Nuclear Regulators to cope with extreme hazards.

Due to more and more nuclear safety requirements, designers, vendors and operators were facing to an increasing of investment cost which forces nuclear Industry to design large scale reactors at nominal power 1000 MW, 1400 MW and more such as EPR at 1700 MW, in order balance the electricity generation energy cost. In parallel, construction activities on site for large nuclear reactors are more and more complex with more risks on schedule and investment cost.

It is a fact today that countries having limited financial capacities and limited network are more and more prudent in launching new nuclear power plant construction based on large nuclear reactor.

2- SMR could be a response for many countries

Both letters “S” and “M” are important in SMR concept. But for me, “M” means MODULAR instead of MEDIUM size. Why?

Whatever the size of the reactor, it is mandatory to design today a reactor in line with Generation 3 safety requirements with “Post Fukushima” additional features taking into account severe accidents occurrence (external and internal hazards: seism, Tsunami, flooding, loss of internal and external power, loss of heat sink, etc...), reduction of Emergency Planning Zone.

Although medium size reactor project needs less investment cost, but design, manufacturing, construction on site will be “very traditional” with few benefit on safety, construction schedule, risk management Therefore it is quite obvious that electricity generation cost will not be very competitive in front of alternative generation.

But to the contrary, manufacturing of integrated modules such as a whole integrated primary circuit, a set of many auxiliaries modules, fully assembled and tested in factories is a key factor to target the ensure safety linked with the best quality and to reduce and control the construction schedule. This is the best way to minimize the investment cost which is the key factor reducing electricity generation cost.

“PLUG and PLAY” is the modularization concept. By this way, construction schedule on site can be drastically reduced, therefore to shorten the financial cost, and reduce the electricity generation cost.

In addition Small core power in the range of 150 MWe with low volumic and linear power density can ensure a safe passive design to cope with “post Fukushima” requirements. Small power with adapted external reactor vessel cooling system can ensure the lowest core damage frequency and ensure In Vessel Retention of core melting in case of severe accident. Passive system can ensure sufficient grace period in the range of 7 to 10 days.

SMR can also be built in many areas, even isolated with few cooling fresh or sea water, by adapting conventional island, with small network capacity.

By modularization, it is easy to duplicate a full “plant module”, twice, three or four times, built step by step, enabling to start one or two plant modules, then to increment addition modules to suit the profiles of “small utilities” or “new nuclear countries” . Of course many Balance Of Plant equipment can be shared by several “plant modules”.

It is more easy with SMR to design undergrounded building reactor (fully or semi) which ensures high protection against extreme internal or external hazards.

In my opinion, SMR should use mature design and proven technology of components; otherwise, it cannot be easily licensed. Manufacturing of components and modules should be based on large scale duplication to decrease unit price.

3 Licensing and Safety

SMR modularization concept should be “internationally licensed” enabling to have a certification, performed once and not repeated in all countries. Why nuclear industry based on SMR “plant module” cannot follow such principles in force in airplane industry”? This is a challenge for our nuclear Safety regulators in the frame of international cooperation supported by IAEA!

By this way, nuclear safety will be enhanced with a standard design, high quality controls in factory, limited site construction works (less welding, less cable pulling, simple startup procedures, and standard operation documents suiting operation crew).

4 Expectations and suggestions for this forum

I hope that during this forum, we can share our views on the benefit of SMR in terms of nuclear safety, modularization, duplication and mass production in factory with high levels of quality control, shipped to the field by road, rail or barge and built as “PLUG and PLAY” objectives.

Worldwide, more than 20 nuclear technology vendors are developing SMR in a wide range of size and technologies showed in IAEA document “Status of Small and Medium Size reactors”.

It is important to exchange on these different concepts:

- On how inherent safety they are in front of “Post Fukushima requirements” they are
- On both mature design and mature technology (components, qualification, etc...)in order to evaluate licensing and certification time schedule

Thank you very much.