Who is working on cost?

Straddling the river Aare in the canton of Aargau, the Paul Scherrer Institute is Switzerland's largest research institute.

In the Nuclear Energy and Safety Research division of this national centre of excellence, 220 people work on:

- Safety, waste management & decommissioning
- Advanced and innovative concepts, new technologies
- Education

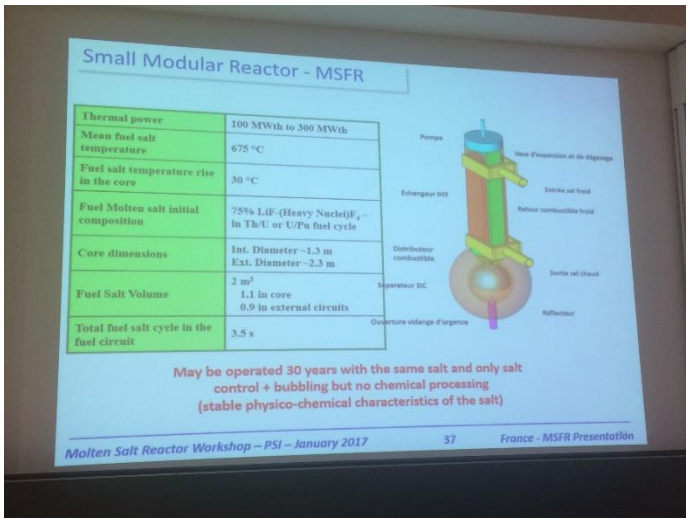
Switzerland joined the Generation IV international forum's molten salt reactor project in 2015 and PSI has become an active member of the European SAMOFAR research project, focused on the intrinsic safety advantages of the Molten Salt Fast Reactor (MSFR).

So it was a natural choice for PSI to host a workshop on 24th January 2017 on the GIF's work on molten salt reactors.

About a hundred people from 18 countries attended the conference, which included presentations by contributors from China, the United States, Australia, Russia, France, Switzerland and the European Union.

Here is a summary of some of the key points from the workshop:

- The United States has joined the GIF molten salt reactor project following the signature of a memorandum of understanding on 5th January 2017
- China has completed the detailed design for a 10MW solid fueled, molten salt cooled reactor. The detailed design for a liquid fueled reactor is underway.
- In China, a team of 600 people are working full time on the TMSR program, with an additional 200 graduate students.
- Studies of a prototype version of the MSFR reactor have led to a proposal for a « small modular reactor » version of this technology.



- The United States Nuclear Regulatory Commission (NRC) has published roadmap documents for the licensing of non-light water reactors. Over the next 5 years they will work on molten salt reactors, to develop a capability to provide operating licenses to companies developing the technology.
- ML16356A670 NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness
- ML16294A181 NRC Non-Light Water Reactor (Non-LWR) Vision and Strategy - Staff Report: Near-Term Implementation Action Plans - Volume 1 – Executive Information
- ML16334A495 NRC Non-Light Water Reactor (Non-LWR) Vision and Strategy - Staff Report: Near-Term Implementation Action Plans - Volume 2 – Detailed Information

- Terrestrial Energy USA has informed the NRC of its intention to request an operating license by October 2019 at the latest.
- A new start-up, Kairos Power, has been created in California to bring solid fueled, molten salt cooled reactor technology to market.
- From 2nd to 4th July 2017 the SAMOFAR program will organize a workshop at Politecnico di Milano's Como campus, within the framework of their work package 6 on education.

Following the presentation by Jérôme Serp, Engineer at France's CEA and leader of the GIF molten salt reactor project a question was asked:

"**In the generation IV molten salt reactor project, who is working on cost?**"

This question seemed to bother the members of the project somewhat. The reply was that within the GIF framework, people are working on costing *methodologies*, but that no-one is working on the specific cost of the different molten salt reactor solutions. This is in contrast with the various start-up companies, who are working on technology **and** cost.

This is curious, because two of the eight generation IV goals are related to economics:

"Economics-1: Generation IV nuclear energy systems will have a clear life-cycle cost advantage over other energy sources."

"Economics-2: Generation IV nuclear energy systems will have a level of financial risk comparable to other energy projects."

Research is a process which transforms money into ideas, and development is a process which transforms ideas back into money.

In a nuclear reactor, the chain reaction stops if the splitting of atoms doesn't produce enough neutrons. In a research and development process, it's the number of Euros in the system which counts. To do more research, it's essential to show developers that the ideas generated have a chance of allowing a cost competitive technology to be brought to market. To get to an "R&D critical mass", we need costings.

We know that the intrinsic safety advantages of molten salt reactors can produce large gains in the cost of building a power station, and in the cost of the energy produced. But how much? In the generation IV international forum's molten salt reactor project, it's time to put **economics before neutronics**.