Concluding Remarks of the GIF Workshop

Thank you very much for very active discussions in these three days. I am very impressed by the discussion here, new information and new idea. It was great fun to have group discussions in the small group. Let me say some concluding remarks based on my understanding. This is not conclusions, but my impressions.

1. Advanced Manufacturing and Material

Some key technologies were introduced, 1) 3D printing of components which have complicated geometry, 2) powder metal and HIP technique, again for complex component without welding, 3) coating technology to avoid corrosion issue, and so on.

In the summary of the group discussions, several significant points are depicted. Among these, my view is as follows:

1) SMR has some advantage for small components and easy to apply the new technologies. But point is economy and also early deployment of the plants to apply such new technologies. The new technologies have also potential to enable online monitoring during component manufacturing process. It has potential to change the production process of regulation and costs. Classification of Nuclear and Non-nuclear grade components might be changed by such techniques and it brings huge cost reduction.

If so, regulation rules to apply such new technologies to nuclear grade components and manufacturing are required. The code and standards were discussed yesterday. But before the standards, requirement from regulator is needed to establish the standards of ASME, for example. GIF has some channels to discuss with regulatory people, like today or through IAEA, and OECD/NEA. If it is needed, GIF will be able to contribute.

2) One more issue is a kind of platform to gather information or experiences of new technologies on the advanced manufacturing and material. It is tightly connected with IP issues. But more general information of experiences of applications of success and failure for new technologies, schematic ideas of technology, and plans of required infrastructures, such general information might be useful for community of the advanced manufacturing and material. If we can have common component tests for reduction of the cost or for the establishment of the code and standards from the ideas of platform, it will be great.

3) Simulation and qualification are also key issues of the collaborations not only for new technologies but also for new regulation rules, which will need help of simulations to cover the freedom of complex geometry of order-made component manufacturing, not one by one but covering in general.

2. R&D collaboration and opportunity using infrastructures

We had discussions today with LWR base SMR vendors and also regulatory people. Some parts will be common to Gen-IV reactors developments, like advanced manufacturing, modularisation, and digital architectures. There are significant needs of infrastructures for the component tests, demo of passive safety system, and also software infrastructure, S.J. Kim san pointed out. In my view, Regulation rules for risk-informed approach and smaller EPZ will be also common to Gen-IV reactors. Development of PRA methodologies to define the risk curve of probability and consequence of the reactors will be next priorities for the soft collaboration.

We had more discussions on MSR, LMFR, HTGR and Non-Electric applications. We found several points of collaborations using infrastructures. The component experiments are one of key issues. Platform of the information and experiences, like Czech Republic for MSR, might be useful also in this area.

One more point is irradiation reactors and facilities. International collaboration scheme is needed like HALDEN. Hydrogen production and also heat utilisation has large potential as a cross cutting issue to enlarge the advanced reactors of future to go to the Low Carbon Society.

3. Needs from SMR vendors, just the session before

The GAIN contributes R&D needed for reactor deployment via large knowledge in national labs. from 1960'. Access to the data has legal difficulty of negotiation with university or national labs. Simple process is needed. However, international collaboration has more complexity of the data access. It is one of the points and related to Hittner san's suggestions.

Priority for early deployment is the general standards on QA, ISI, so on. International code and standard are helpful for the cost reduction. To standardise design, not for site to site, will contribute the cost reduction.

On the regulator point of view: Code and standards can speed-up the regulation process by reliable path through ASME for example. But the process can be more efficient. Irradiation data can be used for several purposes of rector developments and also regulations under a well-organised collaboration. This is helpful suggestion for us.

4. As final remarks, let me point out the following things

- Define the future of the AMME TF with a new TOR to be proposed for the next EG/PG meeting
- Define the future of the RDTF => in short term it is to produce the final report it is on-going, then to think about the future of this TF. Just an idea is a new TF of methodology on Computing Code Verification Validation and related Qualification including collaborations of experiments using the infrastructure.
- Try to extract from the workshop conclusion for the next SIAP Charge (maybe something like "How to pursue and increasing the exchanges with SMR vendors after this workshop, " but we need discussion with Eric of SIAP chair.
- Finally, if major of our participants think that this workshop has a success, we can imagine how to vitalise this movement of collaboration, this kind of Workshop will be a candidate as a regular meeting one time for two to three years.

I appreciate all participants to this workshop and also great support by Sama and Sylvia of OECD/NEA.

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