

NEAC International Subcommittee Report

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Background

- **China has the fastest growing commercial nuclear power program in the world (24 new NPPs currently under construction), with the total installed capacity likely to exceed that of the U.S. in about one decade**
- **Expansion of China's commercial nuclear power program aligns well with U.S. policy initiatives, including climate change**
- **China also has a very aggressive RD&D program on advanced reactors, including sodium fast reactors, high temperature gas cooled reactors, and molten salt reactors**
- **Chinese RD&D programs can be characterized by their ability to emulate others and then demonstrate others' technologies rather than coming up with innovative ideas**

Background (cont'd)

- **Continued collaboration with China provides opportunities to U.S. companies in commercial nuclear exports and can also leverage U.S. limited funds for advanced reactor R&D**
- **Collaboration with China has other potential long-term benefits**
 - **Enhancing global nuclear safety**
 - **Increasing nuclear security**
 - **Developing human capital with a strong safety culture**
- **Potential pitfalls in collaborating with China center on protection of intellectual property (IP), but it is well recognized and it is believed that practices exist to properly deal with this issue for nuclear energy collaboration**

DOE Charge to NEAC International Subcommittee

- **Review the existing bilateral and multilateral nuclear collaboration between the U.S. and China, as well as joint commercial activities between the two countries**
- **Make recommendations on potential approaches and mechanisms to increase the effectiveness of this collaboration in support of USG objectives, in particular as they relate to RD&D and the U.S. nuclear industry**
- **Risks of collaboration should be considered and recommendations made to minimize any potential negative impacts on U.S. interests**
- **Make recommendations to enhance the benefits of continued and/or additional collaboration**

Existing Collaborations with China

- **Bilateral Programs**
 - **Peaceful Uses of Nuclear Technology (PUNT)**
 - **U.S. – China Bilateral Civil Nuclear Energy Cooperation Action Plan**
 - **DOE – China Academy of Sciences (CAS) Collaboration**
- **Multilateral Programs**
 - **International Framework for Nuclear Energy Cooperation (IFNEC)**
 - **Generation IV International Forum (GIF)**

Subcommittee Activities

- **NEAC International Subcommittee met on May 6-7 and on October 29-30, 2015, in Washington DC to obtain input from both U.S. government and private sector organizations**
- **Presentations to the Subcommittee were made by:**
 - **Department of Energy**
 - **Department of Commerce**
 - **Director, Nuclear Energy Policy, National Security Council**
 - **Nuclear Regulatory Commission**
 - **National Laboratories (INL, ORNL, and ANL)**
 - **Universities (MIT, Texas A&M, UC Berkeley, and U of Michigan)**
 - **Commercial nuclear companies (Westinghouse Electric Company, NuScale Power, Fraser Energy Consulting, and Lightbridge)**
- **These presentations and associated discussions provided the input to the Subcommittee to “answer the charge” from DOE**

Findings

- **U.S. and China have a real and tangible shared interest in addressing climate change – cornerstone upon which to build collaborative initiatives in nuclear energy**
- **DOE can be an enabler in international nuclear energy collaboration to help further USG policy objectives**
- **Continued close cooperation with China in commercial nuclear energy will benefit U.S. companies, will further U.S. policy interests, and will create domestic jobs; however, benefits to our industry may be short term, depending on how we advance our own technologies and foster domestic production**

Findings (cont'd)

- **U.S. policy could benefit from a closer working relationship with China in nuclear export controls and other aspects of nuclear non-proliferation because of our shared interests in seeing that nuclear energy is safe, proliferation resistant, and that there is a manageable method for waste disposal**
- **U.S. commercial companies appear to have a good grasp on the risks associated with IP control when collaborating with the Chinese and DOC has excellent training and software tools to help understand and manage the risks**
- **It appears that China views collaboration with the U.S. government and with U.S. industry as being more important and more critical than does the U.S. because they seek to be a global supplier of nuclear technology**

Recommendations

- **DOE should develop a more clear strategy for international collaboration in the peaceful uses of nuclear energy**
- **DOE should look for opportunities for its laboratories, universities, and/or vendors to perform analytical benchmark problems in collaboration with the Chinese**
- **DOE should decide which of the various advanced reactor technologies make the most sense from a U.S. policy perspective and channel the vast majority of laboratory and other department resources into these technologies**
- **What the Chinese do with derivative U.S. technologies must be carefully monitored. The DOE through collaborative R&D should consider ways of helping to monitoring this**

Recommendations (cont'd)

- **DOE should be looking to establish a “forward looking” collaborative approach with the Chinese that credits all past RD&D that it has supported in advanced reactor technologies**
- **U.S. university system should be treated as a strategic asset and an extremely valuable component in the engagement with the Chinese on nuclear R&D**
- **DOE should continue to look for opportunities under their various programs where the NRC could be “brought along” to help provide capacity training to the Chinese regulator in selected areas that could improve the overall regulatory environment and safety culture in China**

Recommendations (cont'd)

- **The Chinese would likely be interested in accident tolerant fuel – an area where the U.S. has a very active program and a substantial lead; DOE should consider engaging the Chinese from a position of strength in this area**
- **Consideration should be given to collaborate with the Chinese on design finalization and deployment of U.S. born SMR technology as a means of retaining U.S. influence, market share, and some significant domestic manufacturing**
- **DOE should promote collaboration with the Chinese on the open fuel cycle. Joint RD&D on the safety and economics of long-term dry storage could be an appealing approach to promoting this strategy**

Questions?