R&D Programs to Support the Nuclear Fuel Cycle[1]

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Thank you, Mr. Chairman. Good morning Ladies and Gentlemen.

Wolf Haefele argued in his plenary speech at the Global 93 Conference in Seattle that the first wave of nuclear power deployments with an open fuel cycle was destined to saturate at the share under 20% of global electricity production, because nuclear power was put into an existing technical and institutional infrastructure characterized by the use of oil, coal and gas. And he urged us to prepare ourselves for evolution or even revolution in the future, tentatively storing spent fuel internationally, as one cannot treat nuclear power like chemical power, uranium like yellow coal.

Today, we are witnessing global emergence of interest in the construction of nuclear power plants because of increasing energy demand, pressure to reduce greenhouse gas emissions, rising fossil fuel prices, the improving safety and economy of nuclear power and the pursuit of security of energy supply.

However, the NEA has projected in its recent nuclear energy outlook that, even in a high case, the nuclear power's share in power generation will go down from the current 16% level to 14% in 2030 and then rise to 22 % in 2050. In other words, we will be in a dawn of the second nuclear age, a dawn that will continue for a few decades more, though we are moving toward the horizon growing light beyond the valley before us.

Then, what should the global nuclear community do in this dawn? My answer is first, we should deliver assistance to countries that consider the introduction of nuclear power to build the necessary nuclear infrastructure: second, we should train young generation of nuclear scientists and engineers who are to sustain the development and utilization of nuclear energy toward the future: And last but not least we should promote carefully planned yet highly aggressive research and development programs and those that support the fuel cycle, in particular, across three different time frames; short-term, mid-term and long-term.

The short-term R&D program should aim at the safe and effective utilization of existing LWR and its fuel cycle systems. In the case of Japan, major efforts are devoted to demonstrate the safety of geologic repositories for the vitrified waste from the reprocessing operations and to improve reprocessing technology and the waste management technology, in particular; the performance of mixed oxide fuel and the waste forms generated in the fuel cycle, in addition to through re-evaluation of seismic safety of every nuclear facilities in Japan.

The major mid-term R&D program is that to develop next generation LWRs that will replace ageing plants starting from 2030 or so. A central R&D topic in the fuel cycle area of this program is to develop highly reliable high-burnup fuels aimed at a goal of 70,000 MWD/T or more with uranium enrichment above 5%.

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Long-term R&D programs are those to exploit a nuclear energy's innate feature, namely, its economically harvestable resource base good for a millennium of world energy supply by closing the fuel cycle. In Japan we are promoting the R&D of a fast reactor and its fuel cycle technology that can make nuclear technology competitive and sustainable in the energy supply market beyond 2050, in cooperation with like-minded countries in international society. Our current program goals are to produce by 2015 a conceptual design of a fast reactor and its fuel cycle system that can satisfy the performance goals of safety, economy, sustainability, and proliferation resistance, and to operate its prototype system at around 2030.

Currently we are exploring candidate technologies for a sodium cooled fast reactor that loads mixed oxide fuel that contains miner actinides as ingredients. Specifically, we are exploring advanced reprocessing technology that can efficiently recover miner actinides (MAs) as well as plutonium from spent fuel and advanced technology to fabricate such fuel. In parallel, we are also promoting base technology programs on nuclear cross sections, critical components of heterogeneous recycling and double strata recycling of MAs utilizing ADS and so on.

Furthermore, we are encouraging to promote projects to develop long-refueling-interval reactors that can break the dilemma between energy security and nuclear nonproliferation by the support of regional fuel cycle centers.

In promoting these R&D activities, we should also make efforts to resolve socio-political issues accompanied with the utilization of these technologies, as the specification of the performance goals such as safety and nonproliferation should be largely defined in the socio-political context.

Specifically, let look into the goal of high proliferation resistance, as we are exploring miner actinide recycling technologies assuming that they will contribute toward making the generation IV fast reactor and its fuel cycle system a very unattractive route for diversion of weapons-usable materials and providing adequate physical protection against acts of sabotage including terrorism, in addition to the reduction of heat generation rate of HLW.

In deciding the importance of this goal, I believe it legitimate for us to ask whether or not it is necessary for a country to pursue high proliferation resistance of its nuclear energy systems, when the country accepts the IAEA's Additional Protocol, confirming the Agency's right and obligation to access sites and information related to nuclear material production technologies and nuclear weaponization activities, making private interviews with individuals who may know about such activities.

One school of thought insists that in that case the required level of proliferation resistance should mainly be related to the concern of sabotage. Other claims however that you should make the probability of failure to make nuclear weapons covertly and overtly after the breakout from the NPT high enough, taking into consideration of the intervention by the UN Security Council, as security perceptions of a country can change very rapidly.

Dr Elbaradei, DG of the IAEA made a similar argument at the Beijing conference this spring. According to him, countries that have mastered uranium enrichment and plutonium separation can be viewed as nuclear weapons capable states, meaning they could develop nuclear weapons within a short time span if they walked out of the NPT or launched clandestine programmes. In his opinion, the NPT gives too narrow a margin of security and therefore

ultimately, a multinational approach to the entire fuel cycle - including the back end - has great potential to facilitate the expanded safe and secure use of nuclear energy for peaceful purposes, while reducing the risk of proliferation.

In summary we are standing at a cross road to decide whether we should take his argument seriously and develop fast reactor systems that fit to a large-scale regional fuel cycle center under multilateral control, or we should pursue systems that can exist as an exception to this may-be-global standard, making them quite ineffective for weaponization purposes even if a nation who decide to walk out of the NPT should use them for weaponization.

I found in the program of this week that there are several time-slots assigned to the discussion about this kind of topics. I sincerely hope you the very success of this conference and such discussions. Thank you for your attention.