

## Self Consistent Nuclear Energy System

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### Summary

The occurrence of a big nuclear accident including the destruction of 3BWRs has given a tremendous shock to the world. After three years and a half has passed and the situation has somewhat changed to discuss on the accident cool as to make fact finding and find out future direction of nuclear research and development.

The main topics being now talked and discussed are:

- 1) Basic principles of nuclear research and developments are checked and reconfirmed
- 2) The importance of Monju does not change however the application of Monju type fast reactor to reduction of radiological burden of nuclear waste should be considered.
- 3) In parallel to energy, treatment of radioactive waste shall be made as to volume reduction and at the same time an effort shall be made also to annihilate the radioactivity.
- 4) The NPPs which have been stopped since the Fukushima accident shall satisfy the safety requirements requested by the Nuclear Regulatory Commission and prepare for restart.

On this occasion it is highly desired to discuss the objectives of nuclear development and whole aspects of nuclear science and technology. The discussion should be based on the future prospects that the nuclear science and technology supports the basis of future civilization and makes clear the relation and collaboration with modern civilization based on the chemical reactions.

SCNES is named after "Self Consistent Nuclear Energy System" with the meaning to satisfy the five objectives such as energy generation, fuel production, safety assurance, environmental

protection and non-proliferation simultaneously within confines of the assets of nuclear fission reaction.

The concept “Self Consistent Nuclear Energy System” is proposed in 1992 as a scientific concept of nuclear energy system where we treat five objectives which satisfy the resource demand and environmental protection

The five objectives as shown in Fig.1 are energy, fuel, safety, transmutation of radioactive waste and non-proliferation.

The development of nuclear fission energy system up to now have been so called a steady effort aiming at the ultimate goal as shown in Fig.2 .

If we understand the nuclear fission energy system this way the structure of SCNES can be re-expressed to the role sharing of SCNES where the objective oriented nuclear reaction occurs in a nuclear fission reactor to keep energy balance and birth of nuclear material like TRU, non-radioactive FPs and radioactive ones.

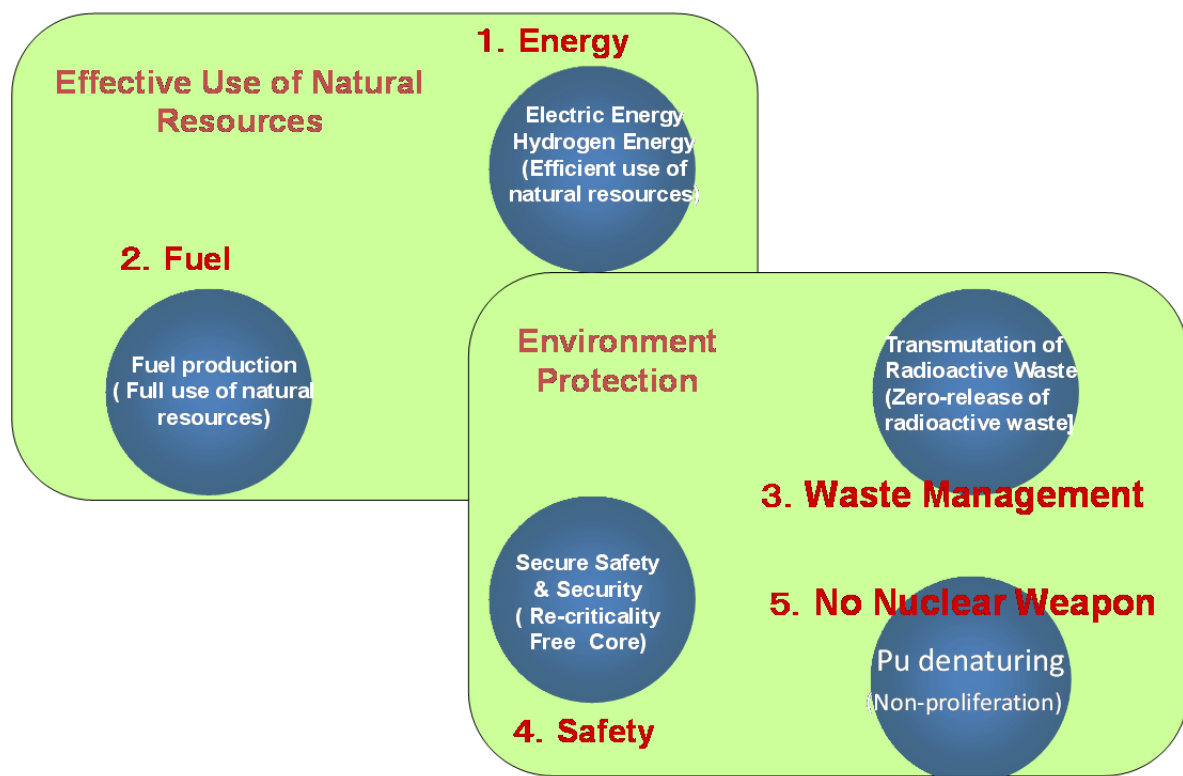


Fig.1 Self Consistent Nuclear Energy System

For SCNES nuclear fuel cycle is indispensable for the harmonious nuclear energy system as discussed later.

It is recommended to find out the scientific possibility and then make a technological approach to satisfy energy resource demand and environmental protection simultaneously.

If the “simultaneous accomplishment of ensuring resource and protecting the environment” is expressed in one phrase of the nuclear energy, it will be nuclear energy system with “Full-recycling and Zero-release” with use of assets of nuclear fission reaction.

If the zero release means the extinction of radioactivity, this could mean a world with no radioactive waste. In addition, when it is achieved to close the material flow in the material recycling system, this means zero-release of waste to the environment after transmutation to radioactive nuclide with short half- life.

One of the argument for this process is how long time is allowed for the decay of long life fission product (LLFPs).

The technological solution supported by scientific background how to treat the radioactive waste is one of the key issues to convince the public that the future civilization based upon nuclear energy can be depended upon and believable.

This is the reason why SCNES is expressed as “Full recycling and Zero-release.

The presentation hereafter is focused on the nuclear energy system utilizing nuclear fission reaction of heavy element. The presentation leads also to discussion on what the nuclear energy system can do within the assets resulting from the nuclear fission reaction i.e about 3 of neutrons and 200Mev of energy .

In the formulation of future nuclear energy system, it is important however, to take into account the future civilization as well as society expects harmonization rather than utilization on the nuclear science and technology.

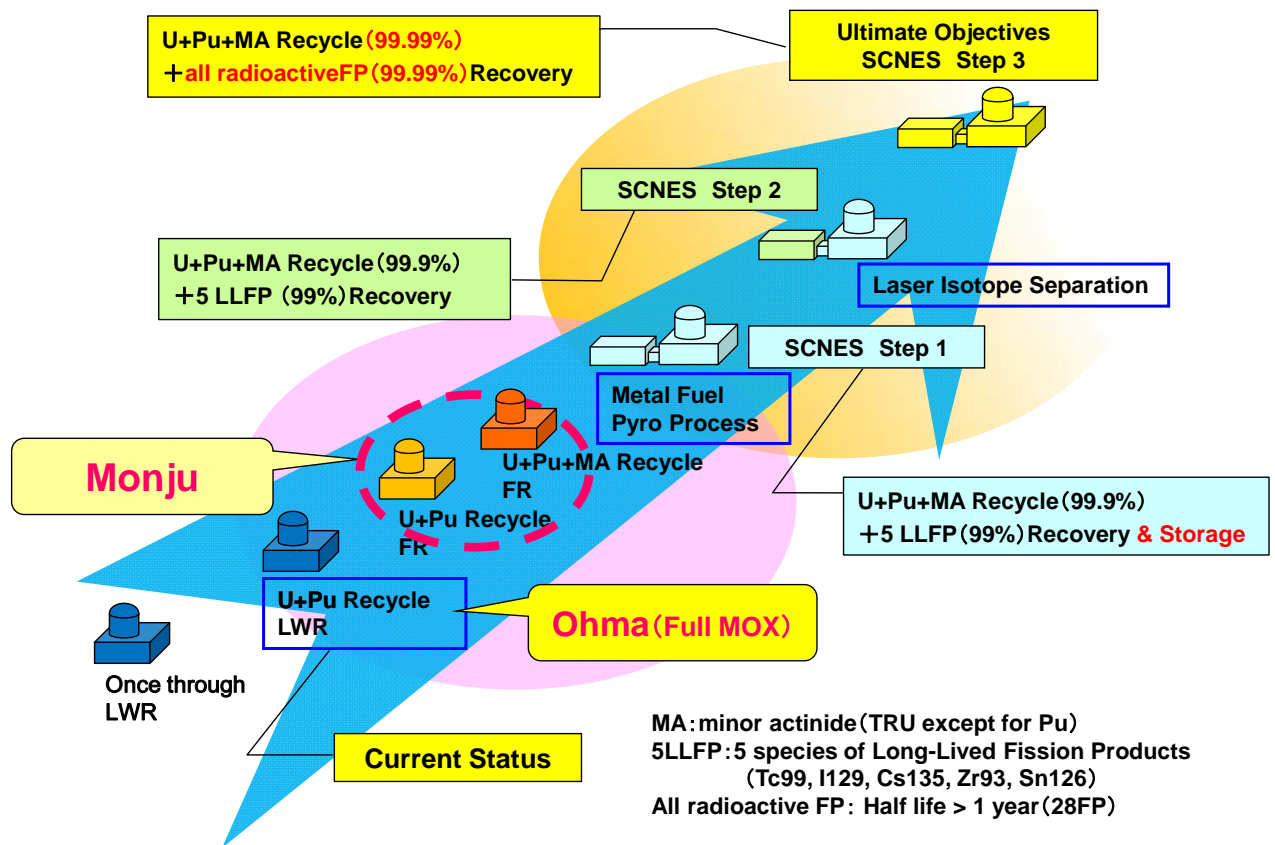


Fig.2 Phased approach toward Zero-release